

**Curriculum for
Certificate Programme in
COMPUTER MAINTENANCE AND
PROGRAMMING ASSISTANT**

**For
Maharaja Ranjit Singh Punjab Technical
University, Bathinda (Punjab)**



Prepared By:

Curriculum Development Centre
**National Institute of
Technical Teachers Training and Research
Sector 26, Chandigarh - 160 019**

January, 2017

FOREWORD

Rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In order to cope with the challenges of handling new materials, machines and technologies, we have to develop human resources having appropriate competencies. There is an increasing demand of skilled workforce in India in particular and the world over in general. Under the new circumstances, India faces a challenging task of meeting the technical manpower requirement, especially in the area of skilled workforce to cater to industrial needs. Efforts have to be made so that passouts from our technical institutions are acceptable at global level.

Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Technical institutions play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab to start the skill oriented integrated courses at certificate, diploma and degree level, as per the needs of the industry, are laudable.

In order to meet the future requirements of technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of technical programmes at various levels. The curricula for various programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of programme and various courses.

The success of any technical programme depends upon its effective implementation. However best the curriculum document is designed, if it is not implemented properly, the output will not be as per expectations. In addition to acquisition of appropriate physical resources, availability of motivated, competent and qualified faculty is equally essential for effective implementation of the curricula.

It is expected that MRSPTU will carry out curriculum evaluation on a continuous basis to identify the new skill requirements. At the same time, it is expected that innovative methods of course offering will be used to develop desired skills and infuse the much needed dynamism in the system.

Dr. M.P. Poonia
Director
National Institute of
Technical Teachers Training & Research
Chandigarh

PREFACE

Curriculum document is a comprehensive plan of an educational programme. It is through the curriculum that the educational objectives of a programme are achieved. It has to be ensured that the curriculum is dynamic, articulated, balanced, data based, feasible, and as per industrial needs. Curriculum Development Centre at NITTTR, Chandigarh has been extending services to technical education system of the states in northern region in developing and updating their curriculum on regular basis.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab assigned the project for developing the curriculum of some integrated programmes to this institute in the month of May 2016. A series of curriculum workshops were held during the months of June-July, 2016. This curriculum document is an outcome of the extensive discussions held with the representatives from various organizations, technical institutions and industry during the curriculum workshops. While developing the study and evaluation scheme and detailed contents, the following aspects have been kept in mind :

- Employment Opportunities of Certificate holders
- Job role of certificate holders
- Learning outcome of the Programme
- Mobility of students for their professional growth

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Industrial Training in the curriculum. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which units on Communication Skills have been introduced in both the semesters of the certificate course.

We hope that this curriculum document will prove useful in producing skilled manpower at desired level in the state of Punjab. The success of this outcome-based curriculum depends upon its effective implementation and it is expected that MRSPTU will make all efforts to create better facilities, develop linkages with the world-of-work and foster conducive and requisite learning environment as prescribed in the curriculum document.

Professor and Head
Curriculum Development Centre
NITTTR, Chandigarh

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance and guidance received from the following persons:

- i) Vice Chancellor, Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bhatinda, Punjab for entrusting this project of curriculum design to NITTTR, Chandigarh.
- ii) Director, College Development Council MRSPTU for his support and active involvement in the curriculum development.
- iii) Director, National Institute of Technical Teachers' Training and Research, Chandigarh for his support and academic freedom provided to Curriculum Development Centre.
- iv) All the experts from industry/field organizations, universities, ITIs and other technical institutions for their professional inputs during curriculum workshops.
- v) Faculty from different departments of NITTTR, Chandigarh for content updation.
- vi) Shri Yogendra Kaushal, Stenographer, Curriculum Development Centre, NITTTR, Chandigarh for processing the document.
- vii) Shri Mohan Lal Bindal, Assistant, Curriculum Development Centre for his support and secretarial assistance in the conduct of curriculum design workshops.

Coordinator

SALIENT FEATURES OF THE PROGRAMME

1.	Sector	:	IT-ITES
2.	Name of the Certificate Programme	:	Computer Maintenance and Programming Assistant
3.	Entry Qualification	:	Matriculation or equivalent NSQF Level as prescribed by MRSPTU, Bathinda
4.	Duration of the Programme	:	One Year
5.	Intake	:	30
6.	Pattern of the Programme	:	Semester Pattern
7.	NSQF Level	:	Level - III
8.	Ratio between theory and Practice	:	20 : 80 (Approx.)

2. **JOB ROLE AND JOB OPPORTUNITIES**

The role of a **Computer Maintenance and Programming Assistance** to support and maintain computer systems, desktops, and peripherals. This includes installing, diagnosing, repairing, maintaining, and upgrading all hardware and equipment while ensuring optimal workstation performance. The person will also troubleshoot problem areas in a timely and accurate fashion, and provide end user training and assistance where required. He will also provide support and maintain computer network systems and its peripherals. This includes installing, diagnosing, repairing, maintaining, and upgrading computers and basic network hardware and equipment while ensuring optimal network performance. The person will also troubleshoot problem areas in a timely and accurate fashion, and provide end user training and assistance where required. Install, maintain and setup LAN with Internet Connection and protection/security. After completion of the course the trainees shall be qualified for one or more of the following job roles:

Job Roles

- Installing, maintaining and repairing software or hardware
- Troubleshooting different computer issues
- Determining and installing appropriate protection/security measures
- Install, configure, and maintain common end user application software. May train and provide assistance to end users.
- Installing, maintaining and repairing network hardware
- Troubleshooting different computer network issues
- Installing and Configuring basic computer networks
- Providing technical support on-site or via phone or email
- Troubleshoots software and hardware problems related to Internet applications.
- Install, maintain and setup network with computers, printers and other peripheral equipment as well as configure broadband equipment.

Job Opportunities

On successful completion of this course, students should be able to find gainful job opportunities in the divisions of different industries like those listed below besides exploring possibilities of being an entrepreneur and be self-employed. The list given below is only indicative and not comprehensive.

(a) Wage Employment

- Service Division (IT enabled services, maintenance service and installation of computer services)
- Assembly and Quality Control Division
- Web Development Industries

- Publishing Industry
- Animation Industry
- Data Processing Industry
- Telecommunication Sector
- Teaching Organizations (Polytechnics, Vocational Institutions etc)
- Networking(LAN, WAN etc)
- Defence Services/Police Services/Cyber Services/Forensic Services
- Call Centres, BPO etc.

(b) Self Employment

- Small scale unit doing third party service and maintenance of computer systems and networks
- Small scale vendor of computer cards, computer peripherals and electronic components and devices
- Setting up of computer assembly unit (small scale)
- Web Designing/Publishing/Software Development Entrepreneurship
- Internet Kiosk Operator
- Cyber Cafe setup and management etc.

3. LEARNING OUTCOMES OF THE PROGRAMME

After undergoing the programme, the students will be able to:

- Operate computer system and various peripherals, search engines and email.
- Assemble, install and configure network elements
- Install Window Operating System and software
- Use all the applications of MS Office
- Create web pages using HTML and CSS
- Create and manage databases and tables
- Design and develop a website
- Make audio-video images and movies using multimedia and creative designs
- Use different content management systems and create websites and blogging pages
- Work in industrial environment on any project.

CONTENTS

Sr. No	Particulars	Page No.
-	Foreword	(i)
-	Preface	(ii)
-	Acknowledgements	(iii)
1.	Salient Features of the Programme	1
2.	Job Role and Job Opportunities	2
3.	Learning Outcomes of the Programme	4
4.	Study and Evaluation Scheme	5
5.	Guidelines for Assessment of Student Centred Activities	7
6.	Detailed Contents of Various Units	8-39

FIRST SEMESTER

1.1	Communication Skills	8
1.2	Computer Fundamentals	10
1.3	PC Assembling, Disassembling and Networking	12
1.4	Installation and Working of Operating Systems	15
1.5	Office Automation	18
1.6	Fundamentals of Internet and Webpage Development	21
-	Industrial Training – I (4 Weeks)	23

SECOND SEMESTER

2.1	Basic Sciences	24
2.2	Relational Data Base Management System	26
2.3	Programming Concepts Using PHP and MySQL	28
2.4	Multimedia and Creative Design	31
2.5	Content Management System	35
2.6	Project Work	37
-	Industrial Training – II (4 Weeks)	39

7.	Resource Requirements	40-42
7.1	List of Tools/Equipment	40
7.2	List of Consumables	41
7.3	List of Recommended Books	42
8.	Recommendations for Effective Curriculum Implementation and Evaluation	43
9.	List of Contributors/Experts	44

**4. STUDY AND EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN
COMPUTER MAINTENANCE AND PROGRAMMING ASSISTANT**

FIRST SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1		*Communication Skills	8	24	1	25	50	75	25	1	75	3	100	175
1.2		Computer Fundamentals	16	48	3	25	50	75	25	1	75	3	100	175
1.3		PC Assembling, Disassembling and Networking	16	112	5	25	75	100	25	1	75	3	100	200
1.4		Installation and Working of Operating Systems	16	80	4	25	50	75	25	1	100	3	125	200
1.5		Office Automation	16	80	4	25	50	75	25	1	100	3	125	200
1.6		Fundamentals of Internet and Webpage Development	16	80	4	25	50	75	25	1	100	3	125	200
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training (during vacation)			-	-	4	-	-	-	-	-	100	3	100	100
Total			88	472	27	150	350	500	150	-	625	-	775	1275

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ **Industrial Training**

After examination of 1st Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

Total weeks per Semester = 16 Total working days per week = 5 Total hours per day = 7

Total hours in a Semester = 16 x 5 x 7 = 560

One credit is defined as one hour of lecture per week or two hours of practicals per week for one semester. Fractions in credits have been rounded to nearest integer.

SECOND SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1		*Basic Sciences	48	-	3	25	-	25	50	2	-	-	50	75
2.2		Relational Data Base Management System	16	80	4	25	50	75	25	1	100	3	125	200
2.3		Programming Concepts Using PHP and MySQL	32	96	5	25	50	75	50	2	100	3	150	225
2.4		Multimedia and Creative Design	16	80	4	25	50	75	25	1	100	3	125	200
2.5		Content Management System	16	64	3	25	50	75	25	1	75	3	100	175
2.6		Project Work	-	64	2	-	50	50	-	-	75	2	75	125
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training			-	-	4	-	-	-	-	-	100	3	100	100
Total			128	432	27	125	275	400	175	-	550	-	725	1125

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ **Industrial Training**

After examination of 2nd Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

5. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 25 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- i. 5 Marks for general behavior and discipline
(by Principal in consultation with all the trainers)
- ii. 5 Marks for attendance as per following:
(by the trainers of the department)
 - a) 75% Nil
 - b) 75 - 80% 2 Marks
 - c) 80 - 85% 3 Marks
 - d) Above 85% 5 Marks
- iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 15 - National Level participation or inter-University competition
 - b) 10 - Participation in two of above activities
 - c) 5 - Participation in internal sports of the University

Note: There should be no marks for attendance in the internal sessional of different subjects.

UNIT – 1.1 : COMMUNICATION SKILLS	
LEARNING OUTCOMES: After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Speak confidently. • Overcome communication barriers. • Write legibly and effectively. • Listen in proper prospective. • Read various genres adopting different reading techniques. • Respond to telephone calls effectively. 	
Practical	Theory
(24 Hours)	(08 Hours)
	Basics of Communication <ul style="list-style-type: none"> • Process of communication • Types of communication - formal and informal, oral and written, verbal and non-verbal • Objectives of communication • Essentials of communication • Barriers to communication <p style="text-align: right;">(1 hour)</p>
<ul style="list-style-type: none"> • Looking up words in a dictionary (meaning and pronunciation) <p style="text-align: right;">(2 hours)</p>	Functional Grammar and Vocabulary <ul style="list-style-type: none"> • Parts of speech • Tenses • Correction of incorrect sentences <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Self and peer introduction • Greetings for different occasions <p style="text-align: right;">(1 hour)</p>	Listening <ul style="list-style-type: none"> • Meaning and process of listening • Importance of listening • Methods to improve listening skills Speaking <ul style="list-style-type: none"> • Importance • Methods to improve speaking • Manners and etiquettes <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Newspaper reading <p style="text-align: right;">(1 hour)</p>	Reading <ul style="list-style-type: none"> • Meaning • Techniques of reading: skimming, scanning, intensive and extensive reading <p style="text-align: right;">(1 hour)</p>

<ul style="list-style-type: none"> • Vocabulary enrichment and grammar exercises • Exercises on sentence framing accurately (6 hours) 	<p>Functional Vocabulary</p> <ul style="list-style-type: none"> - One word substitution - Commonly used words which are often misspelt - Punctuation - Idioms and phrases <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Reading aloud articles and essays on current and social issues • Comprehension of short paragraph (5 hours) 	
<ul style="list-style-type: none"> • Write a short technical report • Letter writing (3 hours) 	
<ul style="list-style-type: none"> • Participate in oral discussion • Respond to telephonic calls effectively • Mock interview (6 hours) 	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT – 1.2 : COMPUTER FUNDAMENTALS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Operate computer system and various peripherals.
- Work on Windows control panel.
- Work on search engines
- Communicate through emails, send and receive files through emails.

Practical (48 Hours)	Theory (16 Hours)
<ul style="list-style-type: none"> • Identify various peripherals of a computer system such as Printers, keyboard, mouse, scanners, MODEM, speakers, microphone, projectors, monitors and other display devices. • identify various cables and connectors used. • Draw and explain block diagram of a computer system with peripherals. <p align="right">(10 hours)</p>	<ul style="list-style-type: none"> • Introduction to various input & output devices. <p align="right">(3 hours)</p>
<ul style="list-style-type: none"> • Identifying Motherboard, various cards, memory slots, microprocessor and other important chips. <p align="right">(5 hours)</p>	<ul style="list-style-type: none"> • Define hardware and software. Define memory and its types: primary & secondary memory. Measurements of memory: bit, byte, MB, GB, TB, etc) • Introduction to RAM and ROM. <p align="right">(5 hours)</p>
<ul style="list-style-type: none"> • Identify various ports, HDD, CD drive, DVD drives and their connectors. <p align="right">(3 hours)</p>	<ul style="list-style-type: none"> • Differentiate between HDD, CD, DVD and other drives(ZIP) <p align="right">(2 hours)</p>
<ul style="list-style-type: none"> • Start and shutdown a PC. • Use various icons and buttons. • Working with windows. <p align="right">(4 hours)</p>	
<ul style="list-style-type: none"> • Making Files and folders in Windows. • Coping folders to auxiliary memory. • Setting up parental controls in Windows. <p align="right">(6 Hours)</p>	
<ul style="list-style-type: none"> • Work on various options of control panel. <p align="right">(10 hours)</p>	

<ul style="list-style-type: none"> • Identify various browser on internet • Create an email id. Receive and send mails with attachments-Zip and Unzip files. <p style="text-align: right;">(6 hours)</p>	<ul style="list-style-type: none"> • Explain internet. Discuss various applications of internet. • Introduction of various browsers. <p style="text-align: right;">(4 hours)</p>
<ul style="list-style-type: none"> • Working on search engines. • Search relevant topics and making an assignment of the same. <p style="text-align: right;">(4 hours)</p>	<ul style="list-style-type: none"> • Introduction to search engines <p style="text-align: right;">(2 hours)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 1.3 : PC ASSEMBLING, DISSEMBLING AND NETWORKING	
LEARNING OUTCOMES:	
After undergoing this unit student shall be able to:	
<ul style="list-style-type: none"> • Demonstrate the assembling and dissembling of a PC. • Install and configure of network elements on a network. • Setup basic steps to ensure network security. • Protect the system from virus and removing virus. 	
PRACTICAL	(112 Hours)
THEORY	(16 Hours)
<p>Assemble and Disassemble a PC (28 hrs)</p> <ul style="list-style-type: none"> • Steps for assembling a PC and commonly used devices such as installing a SMPS in a cabinet, fixing a processor in a mother board, installing RAM in a motherboard, pinning a cooling fan in a mother board. Demonstrate all electrical and other safety precautions. • Fix a Hard drive and DVD and connect the data and power cables. • Connect the cables from the SMPS to motherboard, hard disc, drives etc. Establishing data connection to motherboard, hard disc, drives. • Disassemble a PC with proper safety precautions. 	<ul style="list-style-type: none"> • Introduction to computers, classification, generations, applications. Basic blocks of a digital computer. b) Hand Tools Basics and Specifications. a) Types of cabinets, • Precautions to be taken while removing and reconnecting cables (2 hrs)
<p>Components of the Computer Network, Crimping, punching and cabling (24 hrs)</p> <ul style="list-style-type: none"> • Familiarization with various network devices, connectors and cables. • Make a layout of network. • Crimping practice with straight and cross CAT 6 cables. • Punching practice in IO Box and patch panel. 	<ul style="list-style-type: none"> • Introduction to Computer Network - Advantages of Network , peer-to-peer and Client/server Network. • Network Topologies - Star, Ring ,Bus, Tree ,Mesh , Hybird. • Type of networks – Local area network (LAN), Metropolitan area Networks (MAN), Wide Area Networks (WAN) and Internet , Ethernet, Wi-Fi, Bluetooth, Mobile Networking, Wire

<ul style="list-style-type: none"> Practice on cabling in a lab with HUB/Switch and IO Boxes and patch panel. Fitting Switch Rack. 	<p>and wireless Networking.</p> <ul style="list-style-type: none"> Difference between Intranet and Internet. Communication media & connectors - unshielded twisted-pair (UTP), shielded twisted-pair (STP), fiber optics and coaxial cable: RJ-11, RJ-45, understanding color coding of CAT6 cable 568A and 568B convention. Introduction to data communication - analogue and digital signal <p style="text-align: right;">(4 hrs)</p>
<p>Install and Configure a Network (20 hrs)</p> <ul style="list-style-type: none"> Install and Configure a Peer-to-Peer Network using Windows Software. Making cables by crimping. Connect computers using Bluetooth. Connect computers using configuration of routers and switches. Practice on Basic Programmable switch Configuration. 	<ul style="list-style-type: none"> Theory of different OSI Model - the functions of different layers in OSI model Introduction to Network Components - Modems, Firewall, Hubs, Bridges, Routers, Gateways, Repeaters, Transceivers, Switches, Access point, etc - their functions, advantages and applications. <p style="text-align: right;">(2 hrs)</p>
<p>IP Addressing and TCP/IP (12 hrs)</p> <ul style="list-style-type: none"> Practice on IP Addressing technique (IPV4/IPV6) subnetting and supernetting the network. 	<ul style="list-style-type: none"> Protocols, TCP/IP, FTP, Telnet etc. Classes of IP Addressing Introduction to setting IP Address (IPV4/IPV6) and Subnet Mask and Supernet Mask. <p style="text-align: right;">(2 hrs)</p>
<p>Sharing Resource and Internet Connection (12 hrs)</p> <ul style="list-style-type: none"> Sharing Resource and Advance sharing settings. Configuring Internet Connection on a PC using Broadband or Dongle. Use Internet for setting E-mail accounts. 	<ul style="list-style-type: none"> Concept of Internet Architecture of Internet DNS server Internet Access Techniques ISPs example - Broadband/Dialup/Wifi <p style="text-align: right;">(2 hrs)</p>

<p>Network Protection and troubleshooting (8 hrs)</p> <ul style="list-style-type: none"> • Setting up basic Protection using public keys and MAC address filter. • Integrate wired with wireless network. • Power over Ethernet(PoE). • Troubleshooting wired and wireless network. 	<ul style="list-style-type: none"> • Understanding the use of wired and wireless networks • Protecting a Network • Network performance study and enhancement • Use of wi-fi hot spot with Mobile and laptop. <p style="text-align: right;">(2 hrs)</p>
<p>Network Security (8 hrs)</p> <ul style="list-style-type: none"> • Practice on firewall technologies to secure the network perimeter. • Practice LAN security considerations and implement endpoint and layer 2 security features . • Wi-Fi configuration to implement security considerations. 	<ul style="list-style-type: none"> • Modern Network Security Threats and the basic of securing a network. • Secure Administrative Access, security considerations. Cryptography. • Wi-Fi security considerations. <p style="text-align: right;">(2 hrs)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Presentation
- Viva-voce
- Drawing
- Assembly and disassembly

UNIT - 1.4 : INSTALLATION AND WORKING OF OPERATING SYSTEMS

LEARNING OUTCOMES:

After undergoing this unit student will be able to:

- Install Windows OS, drivers and other software.
- Manage disks, files and folders, User Accounts.
- Use and troubleshoot issues using Task Manager.
- Take backup and perform recovery of data.
- Use essential accessories

PRACTICAL	(80 Hours)	THEORY	(16 Hours)
<ul style="list-style-type: none"> • Access and change Setup of BIOS- identifying the different options in BIOS and their purpose, changing the Boot sequence (4 hrs) • Practice on Windows Installation - Install Windows 7/8 or latest version of OS, Mac, Linux and Unix. Installation of drivers to use various components and peripherals. (10 hrs) • Installation of various Application and System software (10 hrs) • Practice on installation of various software such as MS Office, Libre Office, Open Source and utilities, chat, voice and video etc.) (4 hrs) • Checking the proper installation of various softwares. (4 hrs) • Uninstalling the software (4 hrs) • Executing application programs. (4 hrs) • User Management: Add, remove, enable, disable, delete User Accounts) - Setting properties and access rights of different users. (4 hrs) 		<ul style="list-style-type: none"> • Introduction to operating system. Functions and types of an operating system (2 hrs) • Disk operating system, Concept of GUI. (1 hr) • Use of Desktop , My computer, network neighbourhood / network places, Recycle bin, task bar, start menu, tool bar, and menus. (1 hr) • Properties of files and folders. (1 hr) • Executing application programs. (2 hrs) • Properties of connected devices. (2 hrs) • Applications under windows accessories. (2 hrs) • Windows Help. (1 hr) • Control panel, Installed devices and properties, Utilities for recovering data from defective/bad hard disks. (2 hrs) • Introduction to removable storage devices, Bulk data storage devices- magnetic, optical, magneto optical drives, WORM drives. CD ROM drives, DVD ROM drive and CD WRITER and 	

<ul style="list-style-type: none"> • Use and apply various windows power options. Put the system in sleep or hibernate mode. (4 hrs) • Practice on Windows Help. (2 hrs) • Disk Management (Create, delete and format partitions)- Opening disk management tool, identifying primary and secondary partitions. Understanding purpose of various partitions. Accessing files in various format options. Accessing external disks and pen drives, Using Disk management tools- check disk, Disk cleanup, Disk Defragmentation. (10 hrs) • File Management (working with Files and Folders using File Explorer)- Identifying the type of file from extension. Changing properties of a file, Sharing of file. Exploring different options of Windows file explorer. Making file hidden and visible, Recognizing difference between system and user files. Scanning a file using anti-virus. Opening and copying a file from external device to system hard disk, Writing data on CD/DVD. Erasing files from CD/ DVD (10 hrs) • Task Management: use and troubleshoot issues with task manager) - Using various options of task manager. Data Backup and recovery. (2 hrs) • Using essential accessories-notepad, word pad, paint brush, calculators, calendar, character map, system tools, entertainment, Using Multimedia and windows media player and sounds. (4 hrs) • Data Backup and recovery. Creation of Recovery CD – Using the recovery CD, Booting the system in safe mode, booting the system from pen drive, CD Drive, external hard drive. (4 hrs) 	<p>use different modes of writing on a CD and Latest trends in backup devices/media. (2 hrs)</p>
--	--

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Presentation
- Viva-voce
- Software installation and operation

UNIT - 1.5 : OFFICE AUTOMATION

LEARNING OUTCOMES:

After undergoing this unit student will be able to:

- Use word processing software to create and save document files.
- Apply basic formula on data using spreadsheet software.
- Create presentation and insert different multimedia objects in presentation file using presentation software.
- Create simple table to store data in MS Access software.

PRACTICAL	(80 Hours)	THEORY	(16 Hours)
<p>Word Processing Software: MS Office/ Libre Office</p> <ul style="list-style-type: none"> • Familiarization with the Word window components. • Create, save and Edit documents using Word. • Insert headers, footer, watermarks, Bookmarks, Hyperlinks and other objects. • Page setup and Printing Documents using word. • Insert bullets, numbering, border etc. • Inserting and formatting tables and other objects. • Use templates, autocorrect tools, macros and the mail merge tool. • Check spelling and synonyms and antonyms. • Work with Page layout, margin settings and printing documents. • Typing practice using open source typing tutor tools. Speed of typing is 20 w.p.m. • Practice of using shortcut keys. <p style="text-align: right;">(20 hrs)</p>		<p>Word Processing</p> <ul style="list-style-type: none"> • Introduction to the various applications in office. • Introduction to Word features, Office button, toolbars. • Creating, saving and formatting and printing documents using Word. <p style="text-align: right;">(4 hrs)</p>	

<p>Spread Sheet Application: MS Excel</p> <ul style="list-style-type: none"> • Create, Save and Format Excel Spreadsheets. • Use Absolute, Relative and mixed referencing, linking sheets, Conditional formatting etc. • Use Excel functions and formulas of all major categories. • Use various data types in Excel, Sorting, filtering, goal seek and validating data. • Create and format charts. • Import and Export Excel Data. • Perform data analysis using “what if” tools. • Modify Excel Page setup, page break and printing. • Analysing data using charts, data tables, goal seek and scenarios. • Apply and use of Excel and Word in any project. (20 hrs) 	<p>Spread Sheet Application</p> <ul style="list-style-type: none"> • Introduction to Excel features and Data Types. • Cell referencing. Use of functions of various categories, linking Sheets. • Introduction to various functions in all categories of Excel. • Concepts of Sorting, Filtering and Validating Data. • Introduction to Reporting. (4 hrs)
<p>Working with presentations Using Libre Office/MS Power point</p> <ul style="list-style-type: none"> • Create Slides, Inserting Objects and displaying slide shows in MS Power point/Open Office. • Use different slide layouts. • Animate Slide transitions and Objects. • Insert images, audio, video, chart, tables etc in slides. • Grouping and ungrouping of various objects. • Insert page number, bullets and header/footer etc. • Creating Slide Shows. • Create a simple presentation project using Libre Office. • Take printout in handout format. • Working with Libre Office for word processing and worksheet application. (20 hrs) 	<p>Working with presentations Using Libre Office/MS Power point</p> <ul style="list-style-type: none"> • Introduction to Power Point and its advantages. • Introduction to the properties and editing of images. • Fine tuning the presentation and good presentation techniques. (4 hrs)

<p>Application of MS ACCESS</p> <ul style="list-style-type: none"> • Create database and design a simple table in Access. • Enforce Integrity Constraints and modify the properties of tables and fields. <p style="text-align: right;">(20 hrs)</p>	<p>Application of MS ACCESS</p> <ul style="list-style-type: none"> • Concepts of Data, Information and Databases. • Rules for designing good tables. Integrity rules and constraints in a table. <p style="text-align: right;">(4 hrs)</p>
--	--

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Presentation
- Viva-voce

UNIT - 1.6 : FUNDAMENTALS OF INTERNET AND WEB DEVELOPMENT

LEARNING OUTCOMES:

After undergoing this unit student will be able to:

- Browse web sites using popular browsers and access their history.
- Communicate with other on Internet using e-mail and social networking sites.
- Access various services provided on cloud by different service providers and will be able to upload and download files securely
- Create web pages by inserting different multimedia elements and hyperlinks using HTML and CSS.

PRACTICAL	(80 Hours)	THEORY	(16 Hours)
<p>Internet Concepts</p> <p style="text-align: right;">(60 hrs)</p> <ul style="list-style-type: none"> • Demonstrate use of various types of internet like Broadband, Wireless, 2G, 3G, 4G, LAN Wi-Fi. etc • Explore different types of browsers like Mozilla Firefox, Google Chrome, Safari and their various functionalities like viewing history and downloads, working cookies, allowing pop-up etc. • Accessing various search engine on web browsers and search content on it. • Demonstrate the use and significance of various types of Domain name space and protocol like SSL, HTTP, HTTPS by using any browser. • Use ftp protocol to transfer any file by using software like FileZilla etc. or use various types of other protocol like telnet, SMTP, POP etc. • Live communication practice using text, audio and video by using various tools like GTALK, SKYPE etc. • Create an ID in Social networking site like Facebook, Twitter etc. and explore it various functions. • Explore various free cloud services like Google drive and drop-box etc. by creating id on it. 		<p>Internet Concepts</p> <p style="text-align: right;">(12 hrs)</p> <ul style="list-style-type: none"> • Introduction of concept of world wide web (www), internet, web browsers, various types of servers and search engines. • Concepts of Domain name space. • Introduction to video chatting tools, VOIP and Social Networking concepts. • Concept of cloud storage and open source web server. • Introduction to Internet Security, various threats and attacks, • Introduction and salient features of cybercrime and copyright law. 	

<ul style="list-style-type: none"> • Implement security aspects by using firewall. • Identify viruses in the systems and removing them by using anti-viruses. • Configure Outlook mail service in PC/Mobile phones etc. • 	
<p>Introduction to HTML (20 hrs)</p> <ul style="list-style-type: none"> • Create Simple HTML page by using heading tag, body tag, title tag, paragraph tag etc. • Format HTML by using table tag and list tags etc. • Design and develop web page with forms and form controls like radio button, check box, field box, button and other controls. • Create web page using basic features of CSS. • Design and edit webpages by using WYSIWYG web design tool. • Insert image, audio, video, links and marquees text in a web page. 	<p>Introduction to HTML (4 hrs)</p> <ul style="list-style-type: none"> • Concept and introduction of Static and Dynamic Web pages. • Introduction to HTML and various tags in HTML. • Introduction to HTML structure, tags, features and uses.

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

INDUSTRIAL TRAINING – I (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 1st Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

UNIT – 2.1 : BASIC SCIENCES	
LEARNING OUTCOMES:	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Apply the basic principles of maths in solving the basic problems of the trade. • Apply the basic principles of physics in solving the basic problems of the trade. 	
Practical	Theory (48 Hours)
	<p>Mathematics</p> <ul style="list-style-type: none"> • Basic Algebra – algebraic formula. Simultaneous equation – quadratic equations (4 hours) • Simultaneous linear equation in two variables (3 hours) • Arithmetic and geometric progression, sum of n-terms, simple calculations. (3 hours) • Mensuration – Find the area of regular objects like triangle, rectangle, square and circle; volumes of cube, cuboid, sphere cylinder (6 hours) • Trigonometry - Concept of angle, measurement of angle in degrees, grades and radians and their conversions, T-Ratios of Allied angles (3 hrs) • Co-ordinate Geometry - Cartesian and polar coordinates, conversion from cartesian to polar coordinates (2 hrs) • Concept of Differentiation and Integration (3 hrs)
	<p>Physics</p> <ul style="list-style-type: none"> • FPS, CGS, SI units, dimensions and conversions (2 hours) • Force, speed, velocity and acceleration – Definition, units and simple problems (3 hours)

	<ul style="list-style-type: none"> • Stress and strain, modulus of elasticity (2 hours) • Heat and temperature, its units and specific heat of solids, liquids and gases (4 hours) • Electricity and its uses, basic electricity terms and their units, D.C. and A.C., positive and negative terminals, use of switches and fuses, conductors and insulators (5 hours) • Work, Power and Energy-Defination, units and simple problems (4 hours) • Concept of force, Inertia, Newton's First law of motion; momentum and Newton's second law of motion; Impulse; Newton's third law of motion. (2 hrs) • Friction and Lubrication (1 hour) • Law of conservation of energy (1 hour)
--	--

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

UNIT - 2.2 : RELATIONAL DATABASE MANAGEMENT SYSTEM	
LEARNING OUTCOMES:	
After undergoing this unit student will be able to:	
<ul style="list-style-type: none"> • Create and manage Databases and Tables. • Apply integrity constraints to tables. • Access data from various tables by writing simple SQL queries. • Write nested queries to fetch data from tables. 	
PRACTICAL	(80 Hours)
THEORY	(16 Hours)
Database Fundamental (46 hrs)	Database Fundamental (8 hrs)
<ul style="list-style-type: none"> • Installing a RDBMS • Install My SQL. • Create Database through GUI • Create tables and assigning primary key • Inserting Data into table • Retrieving Data from table • Applying integrity Constraints in tables 	<ul style="list-style-type: none"> • Introduction to Data base and DBMS • Why we need DBMS? • Type of DBMS: Relational DBMS, Object Oriented DBMS, Network DBMS, Hierarchical DBMS & their uses. • Benefits of RDBMS • Architecture of RDMBS • Working with Tables, Rows, Attributes, Data Types • Concept of Key Attribute, Primary Key, Candidate key, Concepts of Foreign Key, Integrity Constraints.
Query Languages (34 hrs)	Query Languages (8 hrs)
<ul style="list-style-type: none"> • Create Data base using DDL • Create Table use DDL • Altering table using DDL • Inserting Data using DML • Updating Data using DML • Deleting Data using DML • Fetching Data from table using Select query using various SQL clauses and Operators • Executing nested queries 	<ul style="list-style-type: none"> • Introduction to Query language • Structured Query Language • Type of SQL Language : DDL, DML,TCL • DDL : CREATE, DROP , ALTER • DML : SELECT, INSERT, UPDATE, DELETE • SQL clauses : SELECT, FROM, WHERE, GROUP BY, HAVING, ORDER BY • Various Operators: =, <, >, ^, v, AND, OR, BETWEEN, IN, Like (% , _) • Group Functions : MAX(), MIN(), SUM(), COUNT() • Nested Query

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 2.3 : PROGRAMMING CONCEPTS USING PHP AND MySQL	
LEARNING OUTCOMES:	
After undergoing this unit student will be able to:	
<ul style="list-style-type: none"> • Create small programs using basic PHP concepts. • Apply In-Built and create user defined functions in PHP programming. • Design and develop a Web site using form controls for presenting web based content. • Debug the Programmes and Create dynamic Website/Web based Applications, using PHP, MySQL database 	
PRACTICAL	(96 Hours)
THEORY	(32 Hours)
Introduction to PHP (22 hrs) <ul style="list-style-type: none"> • Installing PHP for (Windows, Wamp server , XAMP server) • Integrate HTML with PHP • Write a PHP script to display Welcome message. • Write a PHP script to demonstrate arithmetic operators, comparison operator, and logical operator. • Write PHP Script to generate result and display grade. • Write PHP Script to find maximum number out of three given numbers. 	<ul style="list-style-type: none"> • Configuration of PHP, Apache Web Server, MySQL and Open Source • Relationship between Apache, MySQL and PHP(AMP Module) • PHP Structure and Syntax • Constants , Variables: Static and Global Variable • Conditional Structure and Looping, PHP operators • User Defined function, argument function, variable function, Return function (9 hrs)
Working With Functions (24 hrs) <ul style="list-style-type: none"> • Write PHP script to demonstrate Variable function • Write PHP script to obtain factorial Using function • Write PHP script to demonstrate string function. • Write PHP script to demonstrate Date functions. • Write PHP script to demonstrate Math functions. • Write PHP script to demonstrate Array functions database using PHP 	Introduction to: <ul style="list-style-type: none"> • Variable Functions • string functions • MATH functions • Date functions • Array Functions (9 hrs)

<p>Working with DATA and Forms (20 hrs)</p> <ul style="list-style-type: none"> • Write PHP script to demonstrate File functions. • Create student registration form using text box, check box, radio button, select, submit button. • Combine HTML and PHP codes together on single page, Redirecting the user. • Create Website Registration Form using text box, check box, radio button, select, submit button. • Display user inserted value in new PHP page. 	<ul style="list-style-type: none"> • Reading data using Form Controls - Text Fields, Text Areas, CheckBoxes, Radio Buttons, List Boxes, Password Controls, Hidden Controls, Image Maps, File Uploads, Buttons • Submitting form values, using \$_Get and \$_Post Methods, \$_REQUEST • Accessing form inputs with Get/Post functions <p style="text-align: right;">(8 hrs)</p>
<p>Cookie, Session and Error Handling (15 hrs)</p> <ul style="list-style-type: none"> • Setting a cookie with PHP. • Deleting a cookie. • Creating session cookie. • Working with the query string • Creating query string. • Starting and Destroying session • Working with session variables , Passing session IDs • Write two different PHP script to demonstrate passing variables through a URL. • Write two different PHP script to demonstrate passing variables with sessions. • Write PHP script to demonstrate passing variables with cookies. • Write a program to keep track of how many times a visitor has loaded the page. • Write an example of Error-handling using exceptions. 	<ul style="list-style-type: none"> • Introduction to cookies and sessions • Error Types in PHP • Error/Exception handling in PHP <p style="text-align: right;">(4 hrs)</p>

<p>Database Connectivity using MYSQL (15 hrs)</p> <ul style="list-style-type: none"> • Installation of MySQL • Integration of PHP with MySQL • Connection to the MySQL Database • Write a PHP script to connect MySQL server from your website. • Write a program to read customer information like cust_no, cust_name, Item_purchase, and mob_no, from customer table and display all these information in table format on output screen. • Write a program to edit name of customer to “surbhi” with cust_no =1, and to delete record with cust_no=3. • Write a program to read employee information like emp_no, emp_name, designation and salary from EMP table and display all this information using table format. • Create a dynamic web site using PHP and MySQL. 	<ul style="list-style-type: none"> • Concepts of MySQL • MySQL structure and syntax • Types of MySQL tables and Storage engines • MySQL commands <p style="text-align: right;">(2 hrs)</p>
---	--

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 2.4 : MULTIMEDIA AND CREATIVE DESIGN

LEARNING OUTCOMES:

After undergoing this unit student will be able to:

- Draw pictures using pixels and bitmapped image
- Make a simple digital collage for a project
- Create, animated graphics, add sound and inter-activity.
- Make audio and video movies with multimedia effects

PRACTICAL	(80 Hours)	THEORY	(16 Hours)
Adobe Photoshop	(30 hrs)	Adobe Photoshop	(6 hrs)
<p>Working with Images: Zooming & Panning an Image</p> <ul style="list-style-type: none"> • Working with Multiple Images, Rulers, Guides & Grids • Undoing Steps with History <p>Resizing & cropping images :</p> <ul style="list-style-type: none"> • Pixels & Resolution • The Image Size Command • Resizing for Print & Web • Cropping & Straightening an Image • Adjusting Canvas Size <p>Working with basic selection Tools:</p> <ul style="list-style-type: none"> • Selecting with the Elliptical Marquee Tool • Using the Magic Wand & Free Transform Tool • Selecting with the Regular & Polygonal Lasso Tools • Using the Magnetic Lasso Tool • Using the Quick Selection Tool & Refine Edge 		<ul style="list-style-type: none"> • Introduction to images, common graphics, Pixels, resolution. • Understand the following formats:- ai, pdf, eps, svg, svgz, psd, bmp, gif, jpg, pcx, pct, png, raw, sct, tga, tiff, vst. • Fundamental concept of Photoshop tools, creating and modifying layers, controlling transparency-opacity and blends modes, layer styles and layer groups, filters and effects, • Introduction to various shortcuts to work Efficiently 	

Getting started with layers:

- Working on background Layer
- Creating, Selecting, Linking & Deleting Layers
- Locking & Merging Layers
- Copying Layers, Using Perspective & Layer Styles
- Introduction to Blending Modes
- Blending Modes, Opacity & Fill
- Creating & Modifying Text

Painting in photoshop:

Using the Brush Tool

- Creating & Using Gradients
- Creating & Working with Brushes
- Using the Pencil & Eraser Tools
- Painting with Selections

Photo retouching:

The Red Eye Tool

- The Clone Stamp Tool
- The Patch Tool & the Healing Brush Tool
- The Spot Healing Brush Tool
- The Color Replacement Tool
- The Toning & Focus Tools

Working with the pen tool

Understanding Paths & the Pen Tool

- Creating Straight & Curved Paths
- Creating Combo Paths
- Creating a Clipping Path

Creating special effects

Getting Started with Photoshop Filters

- Creating Text Effects
- Applying Gradients to Text

<p>Exporting your work</p> <p>Saving with Different File Formats</p> <ul style="list-style-type: none"> • Saving for Web & Devices 	
<p>Flash (25 hrs)</p> <ul style="list-style-type: none"> • Drawing with Brush and Paint tool on Stage and Work Area. • Design and Animate Characters in Flash. • Work with text tool on Layer and layer folder <ul style="list-style-type: none"> - Adding a Border to Text in Flash • Create Animations Using Shape Tweens <ul style="list-style-type: none"> - Creating an Oscillating Shape Tween • Create animations using Motion Tweens <ul style="list-style-type: none"> - Creating a Rotating Motion Tweens • Create a Rotating Star Motion Tweens • Create and animating masks • Create a Flying Spinning Object • Moving Objects Along a Path • Create and Import Graphics using Graphic symbols. 	<p>Flash (5 hrs)</p> <ul style="list-style-type: none"> • About Flash and General overview – Stage and Work area of Flash, using guides, grid & rulers. • Using frames and key frames, Working with time line. • Using layers – to create a layer, to create a layer folder, to show or hide a layer or folder, to view the contents of the layer as outlines, to change the layer height in the timeline, to change the order of the layers or folders. • Using Guide layers. • Drawing in Flash – to draw with a pencil tool, to paint with a brush tool, to draw with pen tool. • Using colors in Flash, to use a gradient fill. • Importing Artwork, Video and Audio. • Different file formats in Video & Audio. Flash • Compatible Audio & Video file formats
<p>Corel Draw (25 hrs)</p> <ul style="list-style-type: none"> • Use Customizing Options in CorelDraw. • Identify tools in the toolbox and use several common tools <p>Using text and Color:</p> <ul style="list-style-type: none"> • Working with paragraph text. • Working with color. • Working with Special text effects. 	<p>Corel Draw (5 hrs)</p> <ul style="list-style-type: none"> • Basics of CorelDraw, such as creating and saving documents, using fonts, resizing, rotating and moving documents and getting help. • Bitmap and vector effects, layers, lenses and masks, while creating a collage of images and text on a chosen topic. • Introduction to various shortcuts to work Efficiently

<p>Working on Layouts and layers:</p> <ul style="list-style-type: none">• Special page layouts.• Arranging Objects.• Using layers. <p>Work on Styles and templates.</p> <p>Work with Advanced Effects:</p> <ul style="list-style-type: none">• Custom creation tools.• Working with bitmaps.	
--	--

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Presentation
- Viva-voce
- Drawing

UNIT - 2.5 : CONTENT MANAGEMENT SYSTEM

LEARNING OUTCOMES:

After undergoing this unit student will be able to:

- Install and use different content management systems
- Create and publish contents using different themes in CMS
- Create own website and blogging page.
- Use admin panel to set up basic properties of a web page

PRACTICAL	(64 Hours)	THEORY	(16 Hours)
<p>CMS: Wordpress</p> <ul style="list-style-type: none"> • Installation of Wordpress. • Explore various components of Admin Panel. • Changing and setting-up various themes available on wordpress website or embed custom theme. • Upload a custom header, add more content with widgets, setting custom fonts and colors etc. • Create various types of menus and their related functions. • Create and publishing a Post. • Create a page and posting it to show on user end. • Implement various functions like tag a post, set favourite a post, bookmarking social networking site to a post. • Create a blogging page or a discussion forum by using WordPress. <p style="text-align: right;">(48 hrs)</p>		<ul style="list-style-type: none"> • Concept and fundamentals of various CMS like Wordpress, Joomla etc. • Concept and introduction of pages, post and menus and widgets etc. <p style="text-align: right;">(11 hrs)</p>	
<p>CMS: Joomla</p> <ul style="list-style-type: none"> • Install Joomla CMS. • Explore admin panel components and front end features. • Set-up home page, various other pages, menus, footer section on front end. <p style="text-align: right;">(16 hrs)</p>		<ul style="list-style-type: none"> • Concept and introduction of Joomla CMS <p style="text-align: right;">(5 hrs)</p>	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Software installation and operation

UNIT – 2.6 : PROJECT WORK (48 Hours)

<p>LEARNING OUTCOMES:</p> <p>After undergoing this unit student will be able to:</p> <ul style="list-style-type: none"> • Implement the theoretical and practical knowledge and skills gained through various units into an application suitable for a real practical working environment, preferably in an industrial environment. • Explain the working of industrial environment and its work ethics. • Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge and skills, as required. • Work in collaboration and prepares project report. • Troubleshoot hardware and software problems.

Project Work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through various units in a solution of particular problem or by undertaking a project. The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students.

For this purpose, students should be asked to identify a project execute the same. It is also essential that the trainer/instructor/faculty of the trade conducts a brainstorming session to identify suitable project assignments for the students.

The project assignment can be individual assignment or a group assignment. There should not be more than 3 students, if the project work is given to a group.

The students should identify themselves or accept the given project assignment at least two to three months in advance. The project work identified in collaboration with industry should be preferred. trainer/instructor/faculty is expected to guide the project work of all the students.

The project assignments may consist of:

- Installation of computer systems, peripherals and software
- Web page designing including database connectivity and Web Hosting
- Database applications
- Networking (Cabling, Hubs, Switch etc)
- Software applications
- Fabrication of components/equipment (computer related components)
- Fault-diagnosis and rectification of computer systems and peripherals
- Multimedia Applications
- Computer Graphics
- Desktop Publishing
- Configuration of Network Operating System (Windows, Linux)

The following organizations may be considered for arranging the project based professional training:

- IT industries
- Telecommunication industries
- Police Department/Cyber Crime Divisions/Forensic Departments
- Industries dealing with Networking
- Industries dealing with Hardware and Software maintenance
- Start-ups dealing with Software development and Hardware Installation/ maintenance
- Research projects in Government institutions.

Means of Assessment

- Assignments and quiz/class tests
- Report writing
- Viva-voce

INDUSTRIAL TRAINING – II (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 2nd semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

7. RESOURCE REQUIREMENTS

7.1 LIST OF TOOLS/EQUIPMENT

Sr. No.	Name of the Item	Quantity (in Numbers)
1.	Desktop Computers With latest configuration available in the market.	30
2.	Laptop with latest configuration available in the market	01
3.	Wi-Fi Router, Modem	01
4.	Internet connection (With high speed)	As required
5.	Laser Printer	02
6.	Optical Scanner	01
7.	Digital Web Cam (With High Resolution)	01
8.	DVD Writer	01
9.	Blu-ray writer	01
10.	LCD Projector with antiglare screen	01
11.	2 KVA on line UPS	02
12.	Crimping tool RJ45/RJ11	04
13.	Barcode scanner	01
14.	Digital multimeters, 3.5 digit hand held type	10
15.	USB mini dongle for Bluetooth devices connection	10
16.	External hard disk	02
17.	Power meters	04
18.	Cabinets (PC) of different models	08
19.	Mother boards (Different type)	08
20.	Processors of different make	08
21.	Hard Disks (ITB)	08
22.	Optical Drives (CD ROM)	08
23.	Card readers	10
24.	Memory cards	10
25.	Soldiers	10
26.	Pen Drive different capacity	08
27.	Hub/Switch (8 port/24 port)	01 each
28.	Network Rack	01
29.	Computer Tool Kits	10
30.	Cutter	10

LIST OF SOFTWARE

(All the software should be of latest version available in the market)

Sr. No.	Name of the Item	Quantity (in Numbers)
1.	Ms-Office	As per requirement
2.	Anit-Virus	As per requirement
3.	Flash, Photoshop and Coral Draw	As per requirement
4.	Open source software	As per requirement
5.	Data recovery Software	04

7.2 LIST OF CONSUMABLES

Sr. No.	Name of the Item	Quantity (in Numbers)
1.	White Board markers	15
2.	Duster Cloth(2' by 2')	20 Pcs
3.	Cleaning Liquid 500 ml	2 bottles
4.	Xerox Paper (A4)	As required
5.	Full scale papers (Legal)	2 rims
6.	Cartridges for printer	As required
7.	RJ 45 connectors, RJ 11	As required
8.	Optical mouse	As required
9.	Key board	As required
10.	SMPS	As required
11.	CMOS Batteries	As required
12.	CDs	50
13.	DVDs	50
14.	Wall Clock	1 for theory room, 1 for lab
15.	Soldering wire and paste	As required
16.	Various types of Button Cells	As required
17.	Dry cell	As required
18.	Hand brush	15
19.	RAM DDR3 or higher	As required
20.	VGA and Power Cables	As required

7.3 LIST OF RECOMMENDED BOOKS

1. Trade Theory of COPA by National Instruction Media Institute (NIMI)
2. Trade Practical of COPA by National Instruction Media Institute (NIMI)
3. Trade Assignment of COPA by National Instruction Media Institute (NIMI)
4. Trade Instructor's Guide of COPA by National Instruction Media Institute (NIMI)
5. Learning Desktop Publishing by Ramesh Bangia; Khanna Book Publishing Co. Pvt.Ltd., New Delhi
6. Hardware and Software of Personal Computers by SK Bose; Wiley Eastern Limited, New Delhi
7. HTML, CSS, JavaScript, Perl, Python and PHP by Schafer Textbooks; Wiley India.

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.
2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.
3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.
4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.
5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.
6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

9. LIST OF CONTRIBUTORS/EXPERTS

- a) Following experts participated in the workshop to design curriculum of certificate programme in 'Computer Maintenance and Programming Assistant' with NSQF alignment for MRSPTU, Bathinda on 29-30 June, 2016 at NITTTR, Chandigarh.

1.	Dr. Ashok Kumar Goel, Professor & Head, Electronics and Communication Engineering Department and Director, College Development Council, MRSPTU Campus, Dabwali Road, Bathinda, Punjab
2.	Dr. Naveen Aggarwal, Associate Professor, University Institute of Engineering and Technology (UIET), Panjab University, Sector-25, Chandigarh
3.	Shri Vipin Gupta, Managing Director, U-Net Solutions, Moga, Punjab
4.	Shri N.S.Dhindsa, Govt. Polytechnic College for Girls, Patiala
5.	Shri Santosh Kumar Yadav, Lecturer, CCET, Diploma Wing, Sector-26, Chandigarh.
6.	Smt. Sonu Satija, Instructor, Govt. Industrial Training Institute for Women, Chotti Baradari, Patiala
7.	Ms. Navjot Kaur, Group Instructor, Head Quarter, Department of Technical Education and Industrial Training, Sector 36, Chandigarh
8.	Shri Jasvinder Singh, Govt. Industrial Training Institute, Phase-5, Mohali, Punjab
9.	Ms. Manpreet Kaur, Govt. Industrial Training Institute for Women, Sector-11, Chandigarh
10.	Ms. Seema Bhalla, Instructor, Govt. Industrial Training Institute, Patiala
11.	Shri Y. Jagadeesh, Govt. Industrial Training Institute, Sector-28, Chandigarh
12.	Shri Amrendra Sharan, Junior System Programmer, Computer Science Department, NITTTR, Chandigarh
13.	Shri Pardeep Kumar Bansal, System Programmer, Computer Science Department, NITTTR, Chandigarh
14.	Shri Alok Deep, Computer Science Department, NITTTR, Chandigarh
15.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
16.	Prof. PK Singla, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

- b) Following experts participated in the workshop to design curriculum of certificate programme in 'Computer Maintenance and Programming Assistant' with NSQF alignment for MRSPTU, Bathinda on 29 July, 2016 at NITTTR, Chandigarh.

1.	Smt. Sonu Satija, Instructor, Govt. Industrial Training Institute for Women, Chotti Baradari, Patiala
2.	Smt. Rekha Handa, Instructor, Govt. Industrial Training Institute, Sector 28, Chandigarh

- c) Following experts participated in the workshop to review the curriculum of certificate programme in 'Computer Maintenance and Programming Assistant' for MRSPTU, Bathinda on 20 January, 2017 at NITTTR, Chandigarh:

1.	Dr. MM Malhotra, Ex-Principal, TTTI, Chandigarh
2.	Shri Arvind Dixit, Advance Technology, Sector 24, Chandigarh
3.	Dr. Ashok Kumar Goel, Director, College Development Council, MRSPTU, Bathinda, Punjab
4.	Shri Kulmohan Singh, Ex-HOD, Electrical Engg., CCET (Diploma Wing), Sector 26, Chandigarh
5.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
6.	Shri Rakesh Goel, Estate Officer, NITTTR, Chandigarh
7.	Shri Pritpal Singh Aulakh, GZSCCET, Bathinda
8.	Shri Naib Singh, Sr. Technician, GZSCCET, Bathinda
9.	Shri Jagdip Singh, , Sr. Technician, GZSCCET, Bathinda
10.	Prof. PK Singla, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh
11.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

Curriculum
for
Certificate Programme
In
ELECTRICIAN
for
**Maharaja Ranjit Singh Punjab Technical
University, Bathinda (Punjab)**



Prepared By:

Curriculum Development Centre
National Institute of
Technical Teachers Training and Research
Sector 26, Chandigarh - 160 019

January, 2017

FOREWORD

Rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In order to cope with the challenges of handling new materials, machines and technologies, we have to develop human resources having appropriate competencies. There is an increasing demand of skilled workforce in India in particular and the world over in general. Under the new circumstances, India faces a challenging task of meeting the technical manpower requirement, especially in the area of skilled workforce to cater to industrial needs. Efforts have to be made so that passouts from our technical institutions are acceptable at global level.

Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Technical institutions play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab to start the skill oriented integrated courses at certificate, diploma and degree level, as per the needs of the industry, are laudable.

In order to meet the future requirements of technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of technical programmes at various levels. The curricula for various programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of programme and various courses.

The success of any technical programme depends upon its effective implementation. However best the curriculum document is designed, if it is not implemented properly, the output will not be as per expectations. In addition to acquisition of appropriate physical resources, availability of motivated, competent and qualified faculty is equally essential for effective implementation of the curricula.

It is expected that MRSPTU will carry out curriculum evaluation on a continuous basis to identify the new skill requirements. At the same time, it is expected that innovative methods of course offering will be used to develop desired skills and infuse the much needed dynamism in the system.

Dr. M.P. Poonia
Director
National Institute of
Technical Teachers Training & Research
Chandigarh

PREFACE

Curriculum document is a comprehensive plan of an educational programme. It is through the curriculum that the educational objectives of a programme are achieved. It has to be ensured that the curriculum is dynamic, articulated, balanced, data based, feasible, and as per industrial needs. Curriculum Development Centre at NITTTR, Chandigarh has been extending services to technical education system of the states in northern region in developing and updating their curriculum on regular basis.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab assigned the project for developing the curriculum of some integrated programmes to this institute in the month of May 2016. A series of curriculum workshops were held during the months of June-July, 2016. This curriculum document is an outcome of the extensive discussions held with the representatives from various organizations, technical institutions and industry during the curriculum workshops. While developing the study and evaluation scheme and detailed contents, the following aspects have been kept in mind :

- Employment Opportunities of Certificate holders
- Job role of certificate holders
- Learning outcome of the Programme
- Mobility of students for their professional growth

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Industrial Training in the curriculum. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which units on Communication Skills have been introduced in both the semesters of the certificate course.

We hope that this curriculum document will prove useful in producing skilled manpower at desired level in the state of Punjab. The success of this outcome-based curriculum depends upon its effective implementation and it is expected that MRSPTU will make all efforts to create better facilities, develop linkages with the world-of-work and foster conducive and requisite learning environment as prescribed in the curriculum document.

Professor and Head
Curriculum Development Centre
NITTTR, Chandigarh

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance and guidance received from the following persons:

- i) Vice Chancellor, Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bhatinda, Punjab for entrusting this project of curriculum design to NITTTR, Chandigarh.
- ii) Director, College Development Council MRSPTU for his support and active involvement in the curriculum development.
- iii) Director, National Institute of Technical Teachers' Training and Research, Chandigarh for his support and academic freedom provided to Curriculum Development Centre.
- iv) All the experts from industry/field organizations, universities, ITIs and other technical institutions for their professional inputs during curriculum workshops.
- v) Faculty from different departments of NITTTR, Chandigarh for content updation.
- vi) Shri Yogendra Kaushal, Stenographer, Curriculum Development Centre, NITTTR, Chandigarh for processing the document.
- vii) Shri Mohan Lal Bindal, Assistant, Curriculum Development Centre for his support and secretarial assistance in the conduct of curriculum design workshops.

Coordinator

1. SALIENT FEATURES OF THE PROGRAMME

1.	Sector	:	Power & Energy
2.	Name of the Certificate Programme	:	Electrician
3.	Entry Qualification	:	Matriculation or equivalent NSQF Level as prescribed by MRSPTU, Bathinda
4.	Duration of the Programme	:	One Year
5.	Intake	:	30
6.	Pattern of the Programme	:	Semester Pattern
7.	NSQF Level	:	Level - III

2. JOB ROLE AND JOB OPPORTUNITIES

a) Job Role

A certificate holder in Electrician is responsible for wiring, servicing, testing, repair and maintenance of general electrical appliances and control instruments by identifying faulty parts.

b) Job Opportunities

On successful completion of this course, the students will be gainfully employed in the following areas:

- i) Various electrical appliances manufacturing industry.
- ii) Maintenance section of Govt. organizations/private/public sector.
- iii) Work as certified electrician.
- iv) Self employed.

3. LEARNING OUTCOMES OF THE PROGRAMME

After undergoing the programme, students will be able to:

1. Draw and interpret D.C. and A.C. circuits
2. Use different types of electrical tools and measuring instruments
3. Identify and rectify different types of faults in electrical equipments/appliances
4. Install and test different types of domestic and industrial wiring circuits
5. Maintain and troubleshoot electrical machines and starters
6. Perform and test winding for electrical machines
7. Apply basic principles of math and physics in solving trade problems
8. Communicate effectively in English with others
9. Describe the characteristics/properties and uses of material related to the trade

CONTENTS

Sr. No	Particulars	Page No.
-	Foreword	(i)
-	Preface	(ii)
-	Acknowledgements	(iii)
1.	Salient Features of the Programme	1
2.	Job Role and Job Opportunities	2
3.	Learning Outcomes of the Programme	3
4.	Study and Evaluation Scheme	4
5.	Guidelines for Assessment of Student Centred Activities	6
6.	Detailed Contents of Various Units	7-23

FIRST SEMESTER

1.1	Communication Skills	7
1.2	Engineering Drawing (Electrician)	9
1.3	Basic Electricity	10
1.4	Electrical Measuring Instruments	11
1.5	Electrical Machines - I	13
-	Industrial Training - I (4 Weeks)	14

SECOND SEMESTER

2.1	Basic Sciences	15
2.2	Repair and Maintenance of Electrical Installations	17
2.3	Electrical Machines - II	19
2.4	Electrical Controls and Switchgears	21
-	Industrial Training - II (4 Weeks)	23

7.	Resource Requirements	24-29
7.1	List of Tools/Equipment	25
7.2	List of Consumables	28
7.3	List of Recommended Books	29
8.	Recommendations for Effective Curriculum Implementation and Evaluation	30
9.	List of Contributors/Experts	31

4. STUDY AND EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN ELECTRICIAN

FIRST SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1		*Communication Skills	8	24	1	25	50	75	25	1	75	3	100	175
1.2		Engineering Drawing (Electrician)	-	48	2	-	50	50	75	3	-	-	75	125
1.3		Basic Electricity	32	128	6	25	75	100	50	2	100	4	150	250
1.4		Electrical Measuring Instruments	16	80	4	25	50	75	25	1	100	4	125	200
1.5		Electrical Machines - I	48	128	7	25	75	100	50	2	100	4	150	250
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training (during vacation)			-	-	4	-	-	-	-	-	100	3	100	100
Total			104	456	26	100	325	425	225	-	475	-	700	1125

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ Industrial Training

After examination of 1st Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

Total weeks per semester = 16 Total working days per week = 5 Total hours per day = 7

Total Hours in a semester = 16 x 5 x 7 = 560

One credit is defined as one hour of lecture per week or two hours of practicals per week for one semester. Fractions in credits have been rounded to nearest integer.

SECOND SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1		*Basic Sciences	48	-	3	25	-	25	50	2	-	-	50	75
2.2		Repair and Maintenance of Electrical Installations	32	128	6	25	75	100	50	2	100	4	150	250
2.3		Electrical Machines - II	48	128	7	25	75	100	50	2	100	4	150	250
2.4		Electrical Controls and Switchgears	32	96	5	25	50	75	50	2	100	4	150	225
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training			-	-	4	-	-	-	-	-	100	3	100	100
Total			160	400	27	100	225	325	200	-	400	-	600	925

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ **Industrial Training**

After examination of 2nd Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

5. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 25 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- i. 5 Marks for general behavior and discipline
(by Principal in consultation with all the trainers)
- ii. 5 Marks for attendance as per following:
(by the trainers of the department)
 - a) 75% Nil
 - b) 75 - 80% 2 Marks
 - c) 80 - 85% 3 Marks
 - d) Above 85% 5 Marks
- iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 15 - National Level participation or inter-University competition
 - b) 10 - Participation in two of above activities
 - c) 5 - Participation in internal sports of the University

Note: There should be no marks for attendance in the internal sessional of different subjects.

UNIT – 1.1 : COMMUNICATION SKILLS			
LEARNING OUTCOMES:			
After undergoing this unit, the students will be able to:			
<ul style="list-style-type: none"> • Speak confidently. • Overcome communication barriers. • Write legibly and effectively. • Listen in proper prospective. • Read various genres adopting different reading techniques. • Respond to telephone calls effectively. 			
Practical	(24 Hours)	Theory	(08 Hours)
		Basics of Communication <ul style="list-style-type: none"> • Process of communication • Types of communication - formal and informal, oral and written, verbal and non-verbal • Objectives of communication • Essentials of communication • Barriers to communication <p style="text-align: right;">(1 hour)</p>	
	<ul style="list-style-type: none"> • Looking up words in a dictionary (meaning and pronunciation) <p style="text-align: right;">(2 hours)</p>	Functional Grammar and Vocabulary <ul style="list-style-type: none"> • Parts of speech • Tenses • Correction of incorrect sentences <p style="text-align: right;">(2 hours)</p>	
	<ul style="list-style-type: none"> • Self and peer introduction • Greetings for different occasions <p style="text-align: right;">(1 hour)</p>	Listening <ul style="list-style-type: none"> • Meaning and process of listening • Importance of listening • Methods to improve listening skills Speaking <ul style="list-style-type: none"> • Importance • Methods to improve speaking • Manners and etiquettes <p style="text-align: right;">(2 hours)</p>	
	<ul style="list-style-type: none"> • Newspaper reading <p style="text-align: right;">(1 hour)</p>	Reading <ul style="list-style-type: none"> • Meaning • Techniques of reading: skimming, scanning, intensive and extensive reading <p style="text-align: right;">(1 hour)</p>	

<ul style="list-style-type: none"> • Vocabulary enrichment and grammar exercises • Exercises on sentence framing accurately (6 hours) 	<p>Functional Vocabulary</p> <ul style="list-style-type: none"> - One word substitution - Commonly used words which are often misspelt - Punctuation - Idioms and phrases <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Reading aloud articles and essays on current and social issues • Comprehension of short paragraph (5 hours) 	
<ul style="list-style-type: none"> • Write a short technical report • Letter writing (3 hours) 	
<ul style="list-style-type: none"> • Participate in oral discussion • Respond to telephonic calls effectively • Mock interview (6 hours) 	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 1.2 : ENGINEERING DRAWING (ELECTRICIAN)

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Identify and use engineering drawing materials and instruments.
- Prepare free hand sketches of electrical tools and instruments.
- Identify and use symbols of various electrical devices.
- Read and interpret electrical installation plans.
- Read and draw wiring diagrams of electrical installations, bell circuits etc.
- Read diagrams of MDB, ELCB, MCB.

Practical	(48 hours)	Theory
<ul style="list-style-type: none"> • Introduction to engineering drawing instruments, materials, drawing board and drawing sheets (3hours) • Different types of lines in engineering drawing as per BIS (3 hours) • Free hand sketching of electrical tools and instruments (6 hours) • Scales of drawings (2 hours) • Symbols used in electrical installations as per BIS (6 hours) • Drawing of fuse, MCB, ELCB, MDB, insulators (8 hours) • Wiring diagrams of electrical installations (10 hours) • Wiring diagram of bell circuits and staircase (10 hours) 		

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Sketching
- Drawing

UNIT - 13 : BASIC ELECTRICITY	
LEARNING OUTCOME:	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Explain concepts of basic electricity terms • Implement safety and preventive measures • Identify and utilize various electrical accessories • Identify and use symbols of electricity • Draw and connect basic electrical circuits • Calculate various electrical parameters 	
Practical	Theory
(128 hours)	(32 hours)
<ul style="list-style-type: none"> • Demonstration of safety signs, basic injury prevention, artificial respiration and use of fire extinguisher. (24 hours) 	<ul style="list-style-type: none"> • Care and safety working habits. Types of fire extinguishers and usage. Introduction to Indian Electricity Rules (8 hours)
<ul style="list-style-type: none"> • Practice of using cutting pliers, screw drivers etc. Skinning cables and jointing practice of single strands/multi strand conductors. Practice of bare conductor joints like britannia, straight, T, western union joints. Practice of using micrometer, crimping tool, thimbles, lugs etc. Practice of soldering and brazing (56 hours) 	<ul style="list-style-type: none"> • Define electricity terms (voltage, current, power) and symbols in electricity. Explanation and definition of conductors, insulators and semi-conductors. Types of wires/cables, joints and their uses. Solder, flux and brazing techniques (10 hours)
<ul style="list-style-type: none"> • Demonstration of electrical accessories e.g. switches, sockets, holders, plugs, MCB, ELCB, MCCB etc. (24 hours) 	<ul style="list-style-type: none"> • Introduction to electrical accessories (6 hours)
<ul style="list-style-type: none"> • Verification of Ohm's Law. Calculate electrical energy. Verification of laws of series, parallel and combination circuits. (24 hours) 	<ul style="list-style-type: none"> • Ohm's Law. Simple electrical circuit problems. Law of series, parallel and combination circuits. (8 hours)
	<ul style="list-style-type: none"> • Basic properties of material used for electrical conductors, insulators and electric devices like RLC, diode transistor

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT- 1.4 : ELECTRICAL MEASURING INSTRUMENTS	
LEARNING OUTCOME:	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Explain working principle of different measuring instruments • Identify and use different measuring instruments • Use various safety measures • Connect the circuits as per given specifications • Differentiate between AC and DC supply 	
Practical	Theory
(80 hours)	(16 hours)
<ul style="list-style-type: none"> • Measure voltage, current, resistance and power using ammeter and voltmeter (10 hours) 	<ul style="list-style-type: none"> • Working principle of analog and digital ammeter and voltmeter, their connections and safety measures to be taken during use (2 hours)
<ul style="list-style-type: none"> • Identify different types of measuring instruments and their connectors (10 hours) 	<ul style="list-style-type: none"> • Types of instruments (indicating, recording, integrating and effects based) (2 hours) • Deflecting torque, controlling torque, damping torque (2 hours)
<ul style="list-style-type: none"> • Measure insulation value of different cables using insulation tests (10 hours) 	<ul style="list-style-type: none"> • Working of insulation tester and earth tester, safety measures to be taken during use of instruments (1 hour)
<ul style="list-style-type: none"> • Measure value of different resistors using multimeter and also note down their voltage and current variation in tabular form (10 hours) 	<ul style="list-style-type: none"> • Multimeter – Principle of digital multimeter, study their different controls, frequently occurring problems in digital multimeter (2 hours)
<ul style="list-style-type: none"> • Measure power factor in polyphase circuit using voltmeter, ammeter and wattmeter (10 hours) 	<ul style="list-style-type: none"> • Define power factor, working principle of power factor meter and their connections (2 hours)
<ul style="list-style-type: none"> • Perform the connections of 3 phase energy meter (10 hours) 	<ul style="list-style-type: none"> • Working principle of 3 phase and single phase digital energy meter, their connection diagrams and errors during utilization (2 hours)

<ul style="list-style-type: none"> • Measure speed of motor using tachometer (7 hours) 	<ul style="list-style-type: none"> • Working of tachometer, analog and digital tachometer (1 hour)
<ul style="list-style-type: none"> • Measure power of inductor using wattmeter (7 hours) 	<ul style="list-style-type: none"> • Working principle of wattmeter and connections (1 hour)
<ul style="list-style-type: none"> • Measuring intensity of various light sources using lux meter (6 hours) 	<ul style="list-style-type: none"> • Working of lux meter (1 hour)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 1.5 : ELECTRICAL MACHINES - I

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Identify various A.C. and D.C. electrical machines
- Identify and use various A.C. motors, D.C. motors and transformers
- Identify and utilize various instrument transformers like C.T./P.T.
- Assemble and disassemble small A.C. and D.C. motors, single phase transformers
- Identify and rectify general faults in electrical machines

Practical	(128 hours)	Theory	(48 hours)
• Identification of parts of D.C. machine (12 hours)		• General concept of electrical machines (5 hours)	
• Connection of shunt generators. Voltage build-up in D.C. generator (20 hours)		• Principle of D.C. generator, parts of D.C. generator (5 hours)	
• Identification of parts and terminals of D.C. motors. (12 hours)		• Terms used in D.C. motors, types of D.C. motors (5 hours)	
• Practical application of D.C. motors and their uses (28 hours)		• Starters used in D.C. motors (15 hours)	
• Identification of types of transformers (20 hours)		• Principles and working of transformers. 1 ϕ and 3 ϕ transformers (8 hours)	
• Demonstration of current and potential transformers, testing of transformer oil (20 hours)		• Construction of transformers, dehydration and oil testing of transformer oil (4 hours)	
• Care and maintenance of transformers (16 hours)		• Construction of instrument transformers like C.T./P.T. (6 hours)	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

INDUSTRIAL TRAINING – I (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 1st semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

UNIT – 2.1 : BASIC SCIENCES	
LEARNING OUTCOMES:	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Apply the basic principles of maths in solving the basic problems of the trade. • Apply the basic principles of physics in solving the basic problems of the trade. 	
Practical	Theory (48 Hours)
	<p>Mathematics</p> <ul style="list-style-type: none"> • Basic Algebra – algebraic formula. Simultaneous equation – quadratic equations (4 hours) • Simultaneous linear equation in two variables (3 hours) • Arithmetic and geometric progression, sum of n-terms, simple calculations. (3 hours) • Mensuration – Find the area of regular objects like triangle, rectangle, square and circle; volumes of cube, cuboid, sphere cylinder (6 hours) • Trigonometry - Concept of angle, measurement of angle in degrees, grades and radians and their conversions, T-Ratios of Allied angles (3 hrs) • Co-ordinate Geometry - Cartesian and polar coordinates, conversion from cartesian to polar coordinates (2 hrs) • Concept of Differentiation and Integration (3 hrs)
	<p>Physics</p> <ul style="list-style-type: none"> • FPS, CGS, SI units, dimensions and conversions (2 hours) • Force, speed, velocity and acceleration – Definition, units and simple problems (3 hours)

	<ul style="list-style-type: none"> • Stress and strain, modulus of elasticity (2 hours) • Heat and temperature, its units and specific heat of solids, liquids and gases (4 hours) • Electricity and its uses, basic electricity terms and their units, D.C. and A.C., positive and negative terminals, use of switches and fuses, conductors and insulators (5 hours) • Work, Power and Energy-Defination, units and simple problems (4 hours) • Concept of force, Inertia, Newton's First law of motion; momentum and Newton's second law of motion; Impulse; Newton's third law of motion. (2 hrs) • Friction and Lubrication (1 hour) • Law of conservation of energy (1 hour)
--	---

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

UNIT - 2.2 : REPAIR AND MAINTENANCE OF ELECTRICAL INSTALLATIONS**LEARNING OUTCOME:**

After undergoing this unit, the students will be able to:

- Identify various types of electrical installations and appliances
- Carry out trouble shooting and repair common faults in the electrical installations
- Install wiring of any building
- Install wiring for single and three phase motor connections
- Measure the earth resistance
- Carry out earthing and maintain it
- Install batteries and carry out maintenance of batteries
- Perform general repair and maintenance of domestic appliances
- Identify and use various types of luminaries

Practical	(128 hours)	Theory	(32 hours)
<p>Domestic and Industrial Wiring</p> <ul style="list-style-type: none"> • Lab. or live project based wiring exercise. Making students familiar with selection of various items required • Live/lab. Project on UPS/inverter wiring • Termination of wires/cables on bus bar and motors using thimbles and cable glands • Electric load calculation <p style="text-align: right;">(20 hours)</p> <p>Earthing</p> <ul style="list-style-type: none"> • Practice on measurement of earth resistance • Practice on maintenance of earthing/earthing pit • Practice on carrying out earthing <p style="text-align: right;">(24 hours)</p> <p>Cell/Battery</p> <ul style="list-style-type: none"> • Practical exercise of battery connection • Practical exercise on battery charging and maintenance <p style="text-align: right;">(28 hours)</p>		<p>Domestic and Industrial Wiring</p> <ul style="list-style-type: none"> • Different types of domestic wiring • Types of switches/sockets/MCB/ELCB • Types of wires/cables/sizes • Types of panels/distribution boards • Testing of wiring like continuity, insulation resistance, polarity testing etc. <p style="text-align: right;">(8 hours)</p> <p>Earthing</p> <ul style="list-style-type: none"> • Types of earthing • Need of earthing • Measurement of earth resistance, study of earth tester • Maintenance of earthing <p style="text-align: right;">(4 hours)</p> <p>Cell/Battery</p> <ul style="list-style-type: none"> • Types of batteries, battery charging, series/parallel connection • Care and maintenance of lead acid battery <p style="text-align: right;">(4 hours)</p>	

<p>Domestic Appliances</p> <p>Repair and maintenance of following:</p> <ul style="list-style-type: none"> • Washing machine • Immersion rod • Hot plate • Geyser – gas/electric • Electric oven • Hair drier • Fans • Electric iron • Microwave oven • Inverter • Air cooler/water cooler/AC/Refrigerator connection • Mixer grinder • Water pump • Sandwich toaster • RO installation/repair <p style="text-align: right;">(32 hours)</p> <p>Luminaries</p> <p>Practical exercises on connections of various types of luminaries like:</p> <ul style="list-style-type: none"> • Single tube • Double tube • Sodium vapour • Mercury vapour • Neon lamps • Halogen lamps • Metal halides • CFL, LED etc. <p style="text-align: right;">(24 hours)</p>	<p>Domestic Appliances</p> <p>Introduction to concept and types of various domestic appliances:</p> <ul style="list-style-type: none"> • Washing machine – types • Fan – types/working • Electric iron – types and working • Inverter - concept of wiring • Desert cooler connection • Water pump • Mixer/grinder • Immersion rod • Hot plate • Electric oven • Microwave oven • Hair drier • Electric toaster • Induction heating <p style="text-align: right;">(8 hours)</p> <p>Luminaries</p> <ul style="list-style-type: none"> • Introduction of various types of luminaries being used such as sodium, mercury, LED, CFL etc. • Connections of commonly used luminaries such as sodium vapour, mercury vapour, tube light, metal halide lamps, LED, CFL etc. • Single and double tube fluorescent lamp fitting connections <p style="text-align: right;">(8 hours)</p>
--	---

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making
- Viva-voce
- Software installation and operation

UNIT - 2.3 : ELECTRICAL MACHINES - II

LEARNING OUTCOME:

After undergoing this unit, students will be able to:

- Identify various AC motors, alternators
- Identify and utilize tools and instruments required for winding.
- Use various AC motors and AC motor starters
- Use alternator for practical needs
- Identify various winding material
- Wind and rewind small AC/DC motors and transformers

Practical	(128 hrs)	Theory	(48 hrs)
<ul style="list-style-type: none"> • Identification of parts of various single phase and 3 phase AC motors 	(20 hrs)	<ul style="list-style-type: none"> • Theory of single phase and 3 phase AC motors, construction, working and details of these motors 	(8 hrs)
<ul style="list-style-type: none"> • Practice on running on various starters like DOL, star delta, 	(20 hrs)	<ul style="list-style-type: none"> • Study of various starters used in 3 phase motors like DOL, start delta 	(8 hrs)
<ul style="list-style-type: none"> • Speed control and practical application of AC motors like squirrel cage, slip ring, synchronous motor, single phase motors-capacitor motors, universal motors, split phase motors, over-hauling of AC motors etc. 	(30 hrs)	<ul style="list-style-type: none"> • Care and maintenance of single phase and 3 phase synchronous motors. Theory of working and diagram of various single phase motors like capacitor motor, universal motor and split phase motor 	(12 hrs)
<ul style="list-style-type: none"> • Identification of parts and terminals of alternator. Connection for starting, and running of alternator. 	(20 hrs)	<ul style="list-style-type: none"> • Various parts of alternator 	(8 hrs)
<ul style="list-style-type: none"> • Practice on winding of small AC motors like ceiling fan and single phase transformers. 	(38 hrs)	<ul style="list-style-type: none"> • Material used in electrical machine winding. Theory of winding material used in winding purposes. Single phase motor and transformer winding techniques. 	(12 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making
- Viva-voce
- Assembly and disassembly

UNIT - 2.4 : ELECTRICAL CONTROL AND SWITCHGEARS	
LEARNING OUTCOME:	
After undergoing this unit, students will be able to:	
<ul style="list-style-type: none"> • Select and use switching devices • Identify and use various types of fuse • Identify and draw control circuit • Identify ELCB, MCB and their utilization and installation • Identify and utilize various tools and control instruments 	
Practical	(96 hrs)
Theory	(32 hrs)
<ul style="list-style-type: none"> • Demonstration of switchgear (8 hrs) • Electrical connection diagram of switch, isolator and circuit breaker (10 hrs) 	<ul style="list-style-type: none"> • Introduction to switchgear, difference between switch, isolator and circuit breaker (2 hrs) • Concept of fuse, switch unit (2 hrs)
<ul style="list-style-type: none"> • Demonstration and study of various type of fuses, testing of fuses (10 hrs) 	<ul style="list-style-type: none"> • Fuse and its purpose, types of fuse and their application (4 hrs)
<ul style="list-style-type: none"> • Practice of making electrical connections of M.C.B.; E.L.C.B.; M.C.C.B. installations (12 hrs) • Testing of M.C.B. and E.L.C.B. and other circuit breakers (10 hrs) 	<ul style="list-style-type: none"> • Introduction to M.C.B., E.L.C.B., M.C.C.B; relay - salient features and their uses. (6 hrs) • Study of different circuit breakers (ACB, VCB, OCB, MCCB) and lightning arresters (6 hrs)
<ul style="list-style-type: none"> • Demonstration and study of control circuit and power circuit of D.O.L. starter (10 hrs) • Demonstration and study of control circuit and power circuit of star delta starter (8 hrs) • Demonstration and study of reversing the direction of three phase induction motor using contactor control circuit (10 hrs) • Demonstration of remote control circuit of three phase induction motor (8 hrs) • Study and demonstration of overload relay (10 hrs) 	<ul style="list-style-type: none"> • Introduction to magnetic contactor control circuits and power circuit (6 hrs) • Application of contactor control circuit (6 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making
- Viva-voce
- Assembly and disassembly

INDUSTRIAL TRAINING – II (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 2nd semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

7. RESOURCE REQUIREMENT

7.1 LIST OF TOOLS/EQUIPMENT

a) TRAINEES TOOL KIT FOR 30 TRAINEES +1 INSTRUCTOR

Sr. No.	Names of the Items	Quantity
1.	Steel Tape, 15 m length	31 Nos.
2.	Plier Insulated, 150 mm	31 Nos.
3.	Plier Side Cutting, 150 mm	31 Nos.
4.	Screw Driver, 100 mm	31 Nos.
5.	Screw Driver, 150 mm	31 Nos.
6.	Electrician Connector, screw driver insulated handle thin stem, 100 mm	31 Nos.
7.	Heavy Duty Screw Driver , 200 mm	31 Nos.
8.	Electrician Screw Driver thin stem insulated handle, 250 mm	31 Nos.
9.	Punch Centre , 150 mm X 9 mm	31 Nos.
10.	Knife Double Bladed Electrician	31 Nos.
11.	Neon Tester	31 Nos.
12.	Steel Rule 300 mm	31 Nos.
13.	Hammer, cross peen with handle	31 Nos.
14.	Hammer, ball peen With handle	31 Nos.
15.	Gimlet 6 mm.	31 Nos.
16.	Bradawl	31 Nos.
17.	Scriber (Knurled centre position)	31 Nos.
18.	Pincer 150 mm	31 Nos.

b) SHOP TOOLS, INSTRUMENTS AND MACHINERY

Sr. No.	Names of the Items	Quantity
1.	C- Clamp 200 mm, 150 mm and 100 mm	2 Nos each
2.	Spanner Adjustable 150 mm,300mm	2 Nos each
3.	Blow lamp 0.5 ltr	1
4.	Melting Pot	1
5.	Ladel	1No
6.	Chisel Cold firmer 25 mm X 200 mm	2
7.	Chisel 25 mm and 6 mm	2 Nos each
8.	Hand Drill Machine	1
9.	Portable Electric Drill Machine 6 mm capacity	1
10.	Pillar Electric Drill Machine 12 mm capacity	1
11.	Allen Key	1 set
12.	Oil Can 0.12 ltr	1
13.	Grease Gun	1 No
14.	Outside Micrometer	2
15.	Motorised Bench Grinder	1

16.	Rawl plug tool and bit	2 set
17.	Pulley Puller	2
18.	Bearing Puller	2
19.	Pipe vice	4
20.	Thermometer 0 to 100 deg Centigrade	1 No.
21.	Scissors blade 150 mm	4 Nos.
22.	Crimping Tool	2 sets
23.	Wire stripper 20 cm	2 Nos.
24.	Chisel Cold flat 12 mm	2 Nos.
25.	Mallet hard wood 0.50 kg	4 Nos.
26.	Hammer Extractor type 0.40 kg	4 Nos.
27.	Hacksaw frame 200 mm 300 mm adjustable	2 Nos.each
28.	Try Square 150 mm blade	4 Nos.
29.	Outside and Inside Divider Calliper	2 Nos.each
30.	Pliers flat nose 150 mm	4 Nos.
31.	Pliers round nose 100 mm	4 Nos.
32.	Tweezers 100 mm	4 Nos.
33.	Snip Straight and Bent 150 mm	2 Nos.each
34.	D.E. metric Spanner	2 Nos.
35.	Drill hand brace	4 Nos.
36.	Drill S.S. Twist block 2 mm, 5 mm 6 mm set of 3	4 Set
37.	Plane, smoothing cutters 50 mm	2 Nos.each
38.	Gauge, wire imperial	2 Nos.
39.	File flat 200 mm 2nd cut	8 Nos.
40.	File half round 200 mm 2nd cut	4 Nos.
41.	File round 200 mm 2nd cut	4 Nos.
42.	File flat 150 mm rough	4 Nos.
43.	File flat 250 mm bastard	4 Nos.
44.	File flat 250 mm smooth	4 Nos.
45.	File Rasp, half round 200 mm bastard	4 Nos.
46.	Soldering Iron 25 watt, 65 watt, 125 watt	2 Nos.each
47.	Copper bit soldering iron 0.25 kg.	2 Nos.
48.	Desoldering Gun	4 Nos.
49.	Hand Vice 50 mm jaw	4 Nos.
50.	Table Vice 100 mm jaw	8 Nos.
51.	Pipe Cutter to cut pipes upto 5 cm. dia	4 Nos.
52.	Pipe Cutter to cut pipes above 5 cm dia	2 Nos.
53.	Stock and Die set for 20 mm to 50 mm G.I. pipe	1 set
54.	Stock and Dies conduit	1 No.
55.	Ohm Meter; Series Type & Shunt Type	2 Nos. each
56.	Multi Meter (analog) 0 to 1000 M Ohms,2.5 to 500 V	2 Nos.
57.	Digital Multi Meter	6 Nos.
58.	A.C. Voltmeter M.I. 0 –500V A.C	1 No.
59.	Milli Voltmeter centre zero 100 – 0 – 100 m volt	1 No.
60.	D.C. Milli ammeter 0 -500m A	1 No.
61.	Ammeter MC 0-5 A, 0- 25 A	1 No. each
62.	A.C. Ammeter M.I. 0-5A, 0-25 A	1 No. each
63.	Kilo Wattmeter 0-1-3 kw	1 No.

64.	A.C. Energy Meter, Single phase 5 amp. Three Phase 15 amp	1 No. each
65.	Power Factor Meter	1 No.
66.	Frequency Meter	1 No.
67.	Flux meter	1 No.
68.	Wheatstone Bridge with galvanometer and battery	1 No.
69.	Laboratory Type Induction Coil	1 No.
70.	DC Power Supply 0-30V, 2 amp	1 No.
71.	Rheostat 0 -1 Ohm, 5 Amp 0 -10 Ohm, 5 Amp 0- 25 Ohm, 1 Amp 0- 300 Ohm, 1 Amp	1 No. each
72.	1 Phase Variable Auto Transformer	1 No.
73.	Battery Charger	1 No.
74.	Hydrometer	1 No.
75.	Miniature Breaker 16 amp (Raw Material)	1 No.
76.	Working Bench 2.5 m x 1.20 m x 0.75 m	4 Nos.
77.	Fire Extinguisher CO2, 2 KG	2 Nos.
78.	Fire Buckets	2 Nos.
79.	Tachometer	1 No.
80.	Current Transformer 415 Volt,50 Hz, CT Ratio 150 / 5 Amp, 5VA	1 No.
81.	Potential Transformer 415 Volt,50Hz, PT Ratio 11KV/ 110V, 10VA	1 No.
82.	Growler	1 No.
83.	Tong Tester / Clamp Meter 0 – 100 amp. AC	1 No.
84.	Megger 500 volts	1 No.
85.	Contactors & auxiliary contacts 3 phase, 440volt, 16amp (Raw Material)	1 No. each
86.	Contactors & auxiliary contacts 3 phase, 440 volt, 32 amp. (Raw Material)	1 No. each
87.	Limit Switch (Raw Material)	1 No.
88.	Rotary Switch 16 A (Raw Material)	1 No.
89.	Load Bank 5 KW(Lamp / heater Type)	1 No.
90.	Brake Test arrangement with two spring balance 0 to 25 kg rating	1 No.
91.	Knife Switch DPDT fitted with fuse terminals 16 amp (Raw Material)	4 Nos.
92.	Knife Switch TPDT fitted with fuse terminals 16 amp (Raw Material)	4 Nos.
93.	Voltage Stabiliser Input: 150 – 230 volt AC Output: 220 volt AC	1 No.
94.	Motor-Generator (AC to DC) consisting of : Squirrel Cage Induction Motor with star delta starter and directly coupled to DC shunt generator and switch board mounted with regulator, air breaker, ammeter, voltmeter, knife blade switches and fuses, set complete with case iron and plate, fixing bolts, foundation bolts and flexible coupling. Induction Motor rating: 7 HP, 400V, 50 cycles, 3 phase DC Shunt Generator rating: 5 KW, 440V	1 No.

95.	Used DC Generators-series, shunt and compound type for overhauling practice	1 No. each
96.	D.C. Shunt Generator with control panel, 2.5 KW, 220V	1 No.
97.	D.C. Compound Generator with control panel including fitted rheostat, voltmeter, ammeter and breaker, 2.5 KW, 220 V	1 No.
98.	Diesel Generator Set with change over switch, over current breaker and water-cooled with armature, star-delta connections AC 3 phase, 5 KVA, 240 volt	1 No.
99.	DC Series Motor coupled with mechanical load 0.5 to 2 KW, 220 Volts	1 No.
100.	DC Shunt Motor 2 to 2.5 KW, 220 volts	1 No.
101.	DC compound Motor with starter and switch 2 to 2.5 KW, 220 volts	1 No.
102.	Single phase Transformer, core type, air cooled 1 KVA , 240/415 V, 50 Hz	1 No.
103.	Three phase transformer, shell type oil cooled with all mounting 3 KVA , 415/240 V, 50 Hz , (Delta/Star)	1 No.
104.	Oil Testing Kit	1 No.
105.	Hygrometer	1 set
106.	a. Cut out relays b. Reverse current c. Over current d. Under voltage	1 No. each
107.	Starters for 2 to 5 H.P. A.C Motors a. Resistance type starter b. Direct on line Starter c. Star Delta Starter- manual, semi-automatic and automatic d. Auto Transformer type	1 No. each
108.	Motor Generator(DC to AC) set consisting of - Shunt Motor with starting compensator and switch directly coupled to AC generator with exciter and switch board mounted with regulator, breaker, ammeter, voltmeter frequency meter, knife blade switch and fuses etc. Set complete with cast iron bed plate, fixing bolts, foundation bolts and flexible coupling. Shunt Motor rating : 5 HP, 440V AC Generator rating : 3-Phase, 4 wire, 3.5 KVA, 400/230 Volts, 0.8 pf, 50 cycles	1 No.
109.	AC Squirrel Cage Motor with star delta starter and triple pole iron clad switch fuse. 2 to 3 HP, 3-phase ,400 volts, 50 cycles	1 No.
110.	AC phase-wound slip ring Motor with starter and switch 5 HP, 400 volts, 3-phase, 50 cycles	1 No.
111.	A.C. Series type Motor with mechanical load ¼ HP, 230V, 50 Hz	1 No.
112.	Single Phase Capacitor Motor with starter switch 1 HP 230 volt 50 cycles	1 No.
113.	Universal Motor with starter/switch 230 volt, 50 cycles ¼ HP	1 No.
114.	Bath Impregnating	1 No.
115.	Oven Stove	1 No.
116.	Synchronous motor 3 Phase, 3 HP, 415V, 50Hz, 4 Pole, with accessories.	1 no.

117.	Lux meter	1 no.
118.	Inverter- 1 KVA with 12 V Battery Input- 12 volt DC, Output- 220 volt AC	1 No.
119.	Domestic Appliances – a. Electric Hot Plate 1500 watt b. Electric Kettle, 1500 watts c. Electric Iron 1500 watts d. Immersion Heater 1500 watt e. A.C. Fan f. Geyser (Storage type) 15 ltr minimum g. Mixture & Grinder	1 No. 1 No. 1 No. 1 No. 1 No. 1 No. 1 No.
120.	Washing Machine	1 No.
121.	Motor Pump set 1 HP, 1 Phase, 240 V	1 No.
122.	Pin Type, shackle type & suspension type insulators (Raw Material)	2 Nos. each

7.2 LIST OF CONSUMABLES

1.	Different types of electrical wires and cables	As required
2.	Different types of MCBs and ELCBs	As required
3.	Different types of resistors	As required
4.	Different types of capacitors	As required
5.	Different types of inductors	As required
6.	Different types of transformers	As required
7.	Different types of connectors	As required
8.	Different types of plugs and sockets	As required
9.	Solder wire	As required
10.	Conduit pipes of various sizes	As required
11.	Junction box	As required
12.	Distribution box	As required
13.	Wooden boards/PVC boards	As required

7.3 LIST OF RECOMMENDED BOOKS

1. Electrician Trade Practical, Sem-I (2 Years), Published by NIMI, Guindy, Chennai.
2. Electrician Trade Practical, Sem-II (2 Years), Published by NIMI, Guindy, Chennai.
3. Electrician Trade Theory, Sem-I (2 Years), Published by NIMI, Guindy, Chennai.
4. Electrician Trade Theory, Sem-II (2 Years), Published by NIMI, Guindy, Chennai.
5. Electrician Trade Theory, 2nd Year, Available in Hindi, Published by NIMI, Guindy, Chennai.
6. Electrician Trade Theory, 1st Year, Available in Hindi, Published by NIMI, Guindy, Chennai.
7. Electrician Trade Practicals, 1st Year, Published by NIMI, Guindy, Chennai.
8. Electrician Trade Practicals, 2nd Year, Published by NIMI, Guindy, Chennai.
9. Basic Shop Practicals in Electrical Engineering (1st and 2nd Year) by M.L. Anwani, Published by Dhanpat Rai & Co. Pvt. Ltd., Delhi.
10. Basic Shop Practical by Mehta and Gupta, Published by Dhanpat Rai Publishing Company, Noida.
11. Basic Electrical Engineering (as per NIMI pattern) by M.L. Anwani, Published by Dhanpat Rai & Co. Pvt. Ltd., Delhi.
12. Basic Electrical Engineering by Mehta and Gupta, Published by Dhanpat Rai Publishing Company, Noida.
13. Elementary Electrical Engineering (as per NIMI pattern) by G.L. Marwaha, Published by Royal Book Depot (Regd.), Jalandhar City.

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.
2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.
3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.
4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.
5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.
6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

9. LIST OF CONTRIBUTORS/EXPERTS

- a) Following experts participated in the workshop to design curriculum of certificate programme in 'Electrician' with NSQF alignment for MRSPTU, Bathinda on 29-30 August, 2016 at NITTTR, Chandigarh.

1.	Dr. Ashok Kumar Goel, Professor & Head, Electronics and Communication Engineering Department and Director, College Development Council, MRSPTU Campus, Dabwali Road, Bathinda, Punjab
2.	Kanwar H.S. Dhindsa, Vice President, Mohali Industries Association, Mohali
3.	Shri Parmod Kumar Verma, Prop. M/S Pee Kay Trading Co., Manimajra
4.	Shri Anil Rana, M/S Rana & Rana Electrical Works, Sector 28, Chandigarh
5.	Shri Sukhvir Singh, Electrician Instructor, Govt. Industrial Training Institute, Patiala, Punjab
6.	Shri Sarabjeet Singh, Electrician Instructor, Govt. Industrial Training Institute, Patiala, Punjab
7.	Shri Ravinder Kaushal, Electrician Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
8.	Shri ML Rana, HOD, Electrical Engineering Department, CCET (Diploma Wing), Sector-26, Chandigarh
9.	Shri Mukesh Kumar, Electrical Instructor, CCET (Diploma Wing), Sector-26, Chandigarh
10.	Mrs. Poonam Syal, Associate Professor, Electrical Engineering Department, NITTTR, Chandigarh
11.	Shri Hans Raj Sharma, Electrical Engineering Department, NITTTR, Chandigarh
12.	Shri Vinod Kumar Sharma, Electrical Engineering Department, NITTTR, Chandigarh
13.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
14.	Prof. SK Gupta, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

- b) Following experts participated in the workshop to review the curriculum of certificate programme in 'Electrician' for MRSPTU, Bathinda on 20 January, 2017 at NITTTR, Chandigarh:

1.	Dr. MM Malhotra, Ex-Principal, TTTI, Chandigarh
2.	Shri Arvind Dixit, Advance Technology, Sector 24, Chandigarh
3.	Dr. Ashok Kumar Goel, Director, College Development Council, MRSPTU, Bathinda, Punjab
4.	Shri Kulmohan Singh, Ex-HOD, Electrical Engg., CCET (Diploma Wing), Sector 26, Chandigarh
5.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
6.	Shri Rakesh Goel, Estate Officer, NITTTR, Chandigarh
7.	Shri Pritpal Singh Aulakh, GZSCCET, Bathinda
8.	Shri Naib Singh, Sr. Technician, GZSCCET, Bathinda
9.	Shri Jagdip Singh, , Sr. Technician, GZSCCET, Bathinda
10.	Prof. PK Singla, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh
11.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

Curriculum
for
Certificate Programme
in
FARM EQUIPMENT TECHNICIAN
for
**Maharaja Ranjit Singh Punjab Technical
University, Bathinda (Punjab)**



Prepared By:

Curriculum Development Centre
National Institute of
Technical Teachers Training and Research
Sector 26, Chandigarh - 160 019

January, 2017

FOREWORD

Rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In order to cope with the challenges of handling new materials, machines and technologies, we have to develop human resources having appropriate competencies. There is an increasing demand of skilled workforce in India in particular and the world over in general. Under the new circumstances, India faces a challenging task of meeting the technical manpower requirement, especially in the area of skilled workforce to cater to industrial needs. Efforts have to be made so that passouts from our technical institutions are acceptable at global level.

Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Technical institutions play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab to start the skill oriented integrated courses at certificate, diploma and degree level, as per the needs of the industry, are laudable.

In order to meet the future requirements of technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of technical programmes at various levels. The curricula for various programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of programme and various courses.

The success of any technical programme depends upon its effective implementation. However best the curriculum document is designed, if it is not implemented properly, the output will not be as per expectations. In addition to acquisition of appropriate physical resources, availability of motivated, competent and qualified faculty is equally essential for effective implementation of the curricula.

It is expected that MRSPTU will carry out curriculum evaluation on a continuous basis to identify the new skill requirements. At the same time, it is expected that innovative methods of course offering will be used to develop desired skills and infuse the much needed dynamism in the system.

Dr. M.P. Poonia
Director
National Institute of
Technical Teachers Training & Research
Chandigarh

PREFACE

Curriculum document is a comprehensive plan of an educational programme. It is through the curriculum that the educational objectives of a programme are achieved. It has to be ensured that the curriculum is dynamic, articulated, balanced, data based, feasible, and as per industrial needs. Curriculum Development Centre at NITTTR, Chandigarh has been extending services to technical education system of the states in northern region in developing and updating their curriculum on regular basis.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab assigned the project for developing the curriculum of some integrated programmes to this institute in the month of May 2016. A series of curriculum workshops were held during the months of June-July, 2016. This curriculum document is an outcome of the extensive discussions held with the representatives from various organizations, technical institutions and industry during the curriculum workshops. While developing the study and evaluation scheme and detailed contents, the following aspects have been kept in mind :

- Employment Opportunities of Certificate holders
- Job role of certificate holders
- Learning outcome of the Programme
- Mobility of students for their professional growth

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Industrial Training in the curriculum. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which units on Communication Skills have been introduced in both the semesters of the certificate course.

We hope that this curriculum document will prove useful in producing skilled manpower at desired level in the state of Punjab. The success of this outcome-based curriculum depends upon its effective implementation and it is expected that MRSPTU will make all efforts to create better facilities, develop linkages with the world-of-work and foster conducive and requisite learning environment as prescribed in the curriculum document.

Professor and Head
Curriculum Development Centre
NITTTR, Chandigarh

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance and guidance received from the following persons:

- i) Vice Chancellor, Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bhatinda, Punjab for entrusting this project of curriculum design to NITTTR, Chandigarh.
- ii) Director, College Development Council MRSPTU for his support and active involvement in curriculum development.
- iii) Director, National Institute of Technical Teachers' Training and Research, Chandigarh for his support and academic freedom provided to Curriculum Development Centre.
- iv) All the experts from industry/field organizations, universities, ITIs and other technical institutions for their professional inputs during curriculum workshops.
- v) Faculty from different departments of NITTTR, Chandigarh for content updation.
- vi) Shri Yogendra Kaushal, Stenographer, Curriculum Development Centre, NITTTR, Chandigarh for processing the document.
- vii) Shri Mohan Lal Bindal, Assistant, Curriculum Development Centre for his support and secretarial assistance in the conduct of curriculum design workshops.

Coordinator

1. SALIENT FEATURES OF THE PROGRAMME

1.	Sector	:	Mechanical
2.	Name of the Certificate Programme	:	Farm Equipment Technician
3.	Entry Qualification	:	Matriculation or equivalent NSQF Level as prescribed by MRSPTU, Bathinda
4.	Duration of the Programme	:	One Year
5.	Intake	:	30
6.	Pattern of the Programme	:	Semester Pattern
7.	NSQF Level	:	Level - III

2. **JOB ROLE AND JOB OPPORTUNITIES OF FARM EQUIPMENT TECHNICIAN**

a) **Job Role**

“Farm Equipment Technician” Certificate holders service, maintain, and repair farm equipment as well as tractors. What typically was a general repairer’s job around the farm in the past has evolved into a specialized technical career.

Farmers have increasingly turned to farm equipment dealers to service and repair their equipment because the machinery has become far more complex. Modern equipment uses more electronics and hydraulics making it difficult to perform repairs without some specialized training.

The certificate holders in “Farm Equipment Technician” work mostly on equipment brought into the shop for repair and adjustment. During planting and harvesting seasons, they may travel to farms to make emergency repairs to minimize delays in farm operations. They repair and maintain engines and hydraulic, transmission, and electrical systems of farm equipment. They also perform routine maintenance checks on fuel, brake, and transmission systems to ensure peak performance, safety, and longevity of the equipment. Maintenance checks and comments from equipment operators usually make them alert to problems.

After locating the problem, they rely on their training and experience to use the best possible technique to solve the problem. If necessary, they may partially dismantle the components to examine parts for damage or excessive wear. Then, using tools, they repair, replace, clean, and lubricate parts, as necessary.

Some types of farm equipment use hydraulics to raise and lower movable parts, such as scoops or plows. When hydraulic components malfunction, they examine them for leaks, ruptured hoses, or worn gaskets on fluid reservoirs. Occasionally, the equipment requires extensive repairs, such as replacing a defective hydraulic pump.

They perform a variety of other repairs, diagnosing electrical problems and replacing defective components, or repairing undercarriages and track assemblies. Occasionally, they weld broken equipment frames and structural parts, using electric or gas welders.

When farm equipment breaks down at the farm, it may be too difficult or expensive to bring it into a repair shop, a certificate holder in “Farm Equipment Technician” visits the site. More experienced ones specialize in field service and often work outdoors spending much of their time away from the shop.

b) Job Opportunities

A certificate holder in “Farm Equipment Technician” may specialize in a particular area such as fuel injection pumps, engine overhaul, hydraulic systems or in specific types of equipment. Employers who may hire them include:

- Agricultural Equipment Dealers
- Rental and Service companies
- Agricultural equipment Operators
- Agricultural equipment Manufacturers
- Self-employed

3. LEARNING OUTCOMES OF CERTIFICATE PROGRAMME IN FARM EQUIPMENT TECHNICIAN

At the end of the programme, the students will be able to:

- Diagnose and repair failures in mechanical, electrical and hydraulic systems of farm equipment.
- Inspect and test farm equipment and its sub systems as per manufacturer's specifications.
- Use latest diagnostic tools
- Perform scheduled maintenance
- Read and interpret drawings, circuits and catalogues.
- Prepare time and cost estimates.
- Prepare and interpret work orders
- Communicate effectively.
- Apply concepts of mathematics and science for problem solving

CONTENTS

Sr. No	Particulars	Page No.
-	Foreword	(i)
-	Preface	(ii)
-	Acknowledgements	(iii)
1.	Salient Features of the Programme	1
2.	Job Role and Job Opportunities	2
3.	Learning Outcomes of the Programme	4
4.	Study and Evaluation Scheme	5
5.	Guidelines for Assessment of Student Centred Activities	7
6.	Detailed Contents of Various Units	8-33

FIRST SEMESTER

1.1	Communication Skills	8
1.2	General Engineering	10
1.3	Farm Equipment - I	12
1.4	Basic Technical Drawing	17
1.5	Workshop Practice	19
-	4 Weeks Industrial Training (during vacation)	22

SECOND SEMESTER

2.1	Basic Sciences	23
2.2	Farm Equipment - II	25
2.3	Testing, Repair and Maintenance of Farm Equipment	28
2.4	Work Order Process and Costing	31
-	4 Weeks Industrial Training	33

7.	Resource Requirements	34-44
7.1	List of Tools/Equipment	34
7.2	List of Consumables	42
7.3	List of Recommended Books	43
8.	Recommendations for Effective Curriculum Implementation and Evaluation	45
9.	List of Contributors/Experts	46

**4. STUDY AND EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN
FARM EQUIPMENT TECHNICIAN**

FIRST SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1		*Communication Skills	8	24	1	25	25	50	25	1	50	3	75	125
1.2		General Engineering	48	32	4	25	50	75	25	2	75	3	100	175
1.3		Farm Equipment - I	48	128	6	25	75	100	50	2	100	4	150	250
1.4		Basic Technical Drawing	-	48	2	-	50	50	75	3	-	-	75	125
1.5		Workshop Practice	48	128	7	25	75	100	50	2	100	4	150	250
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training (during vacation)			-	-	4	-	-	-	-	-	100	3	100	100
Total			152	408	26	100	300	400	225	-	425	-	650	1050

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment, energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ **Industrial Training**

After examination of 1st Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

Total weeks per semester = 16, Total working days per week = 5, Total hours/day = 7

Total hours in a semester = 16 x 5 x 7 = 560

One credit is defined as one hour of lecture per week or two hours of practicals per week for one semester. Fractions in credits have been rounded to nearest integer.

SECOND SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1		*Basic Sciences	48	-	3	25	-	25	75	2	-	-	75	100
2.2		Farm Equipment - II	48	160	8	25	100	125	50	2	100	4	150	275
2.3		Testing, Repair and Maintenance of Farm Equipment	48	160	8	25	100	125	50	2	100	4	150	275
2.4		Work Order Process and Costing	48	-	3	25	-	25	75	2	-	-	75	100
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training			-	-	4	-	-	-	-	-	100	3	100	100
Total			192	368	28	100	225	325	250	-	300	-	550	875

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment, energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ **Industrial Training**

After examination of 2nd Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

5. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 25 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- i. 5 Marks for general behavior and discipline
(by Principal in consultation with all the trainers)
- ii. 5 Marks for attendance as per following:
(by the trainers of the department)
 - a) 75% Nil
 - b) 75 - 80% 2 Marks
 - c) 80 - 85% 3 Marks
 - d) Above 85% 5 Marks
- iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 15 - National Level participation or inter-University competition
 - b) 10 - Participation in two of above activities
 - c) 5 - Participation in internal sports of the University

Note: There should be no marks for attendance in the internal sessional of different subjects.

UNIT – 1.1 : COMMUNICATION SKILLS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Speak confidently.
- Overcome communication barriers.
- Write legibly and effectively.
- Listen in proper prospective.
- Read various genres adopting different reading techniques.
- Respond to telephone calls effectively.

Practical (24 Hours)	Theory (08 Hours)
	Basics of Communication <ul style="list-style-type: none"> • Process of communication • Types of communication - formal and informal, oral and written, verbal and non-verbal • Objectives of communication • Essentials of communication • Barriers to communication <p style="text-align: right;">(1 hour)</p>
<ul style="list-style-type: none"> • Looking up words in a dictionary (meaning and pronunciation) <p style="text-align: right;">(2 hours)</p>	Functional Grammar and Vocabulary <ul style="list-style-type: none"> • Parts of speech • Tenses • Correction of incorrect sentences <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Self and peer introduction • Greetings for different occasions <p style="text-align: right;">(1 hour)</p>	Listening <ul style="list-style-type: none"> • Meaning and process of listening • Importance of listening • Methods to improve listening skills Speaking <ul style="list-style-type: none"> • Importance • Methods to improve speaking • Manners and etiquettes <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Newspaper reading <p style="text-align: right;">(1 hour)</p>	Reading <ul style="list-style-type: none"> • Meaning • Techniques of reading: skimming, scanning, intensive and extensive reading <p style="text-align: right;">(1 hour)</p>

<ul style="list-style-type: none"> • Vocabulary enrichment and grammar exercises • Exercises on sentence framing accurately (6 hours) 	<p>Functional Vocabulary</p> <ul style="list-style-type: none"> - One word substitution - Commonly used words which are often misspelt - Punctuation - Idioms and phrases <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Reading aloud articles and essays on current and social issues • Comprehension of short paragraph (5 hours) 	
<ul style="list-style-type: none"> • Write a short technical report • Letter writing (3 hours) 	
<ul style="list-style-type: none"> • Participate in oral discussion • Respond to telephonic calls effectively • Mock interview (6 hours) 	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 1.2 : GENERAL ENGINEERING

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Explain concept of electricity, electronics, computer, materials and mechanics.
- Identify and utilize various electrical accessories.
- Explain the working of cylinder and hydraulic valves
- Define basic terms related to electronics.
- Identify the material on the basis of its properties.
- Calculate forces, stress, acting on components.
- Operate computer system.

Practical	(32 hours)	Theory	(48 hours)
<ul style="list-style-type: none"> • Practice in joining wires • Practice continuity test for fuse, jumper wire, circuit breaker. • Checking electrical circuits with test lamp. • Measuring current flow using multimeter <p align="right">(8 hrs)</p>		<ul style="list-style-type: none"> • Introduction to basic electricity, its principles, ground connections, Ohm's law, voltage, current, resistance, capacitor, power energy, frequency.. • Study of conductor, insulators, capacitors, wires, shielding, length Vs resistance. • Resistance rating, fuse and circuit breaker, batteries and cells, sealed maintenance batteries(SMF) • Study of magnetic effects, heating effects, thermistors, relays, solenoid and transformers. <p align="right">(10 hrs)</p>	
<ul style="list-style-type: none"> • To measure the values of different resistors by using colour coding chart. • To observe semiconductor diodes in bias. • To familiarize with the microprocessors <p align="right">(6 hrs)</p>		<ul style="list-style-type: none"> • Basic electronics • Introduction of semi conductors, solid state devices-diodes, transistors, binary system, rectification • Introduction to microprocessor, sensors and remote control <p align="right">(4 hrs)</p>	
<ul style="list-style-type: none"> • Identify the parts of hydraulic/pneumatic servomotor from cut section/models • To study the working of single acting and double acting cylinder • To study the use of hydraulic valves • Practice making simple circuits <p align="right">(6 hrs)</p>		<ul style="list-style-type: none"> • Introduction to hydraulic and pneumatic system, Pascal law, pressure force, viscosity, different hydraulic fluids, gear pump, cylinder – single and double acting, directional control valves, relief valve, non return valve, flow control valve, hydraulic steering unit, reciprocating air compressor, FRL unit (Filter, regular and lubricator) <p align="right">(10 hrs)</p>	

<ul style="list-style-type: none"> • To verify parallelogram law of forces • To draw stress-strain curve of ductile and brittle materials using UTM • To compare the hardness of various materials • Demonstrate different types of gears <p style="text-align: right;">(8 hrs)</p>	<ul style="list-style-type: none"> • General mechanics – Force definition, type of forces, effect of angle on forces. • Power, torque, stress, strain, torsional stress, tensile and compressive stress, shear stress, factor of safety. • Introduction to gear system, type of gears, gear ratio. • Properties of material, ductility, brittleness, elasticity, malleability, hardness, toughness, conductivity, adhesive, cohesive. • Type of material- Ferrous and non ferrous material, mild steel, cast iron, steel, aluminum, alloys, copper, rubber, insulating material and sealing material. <p style="text-align: right;">(16 hrs)</p>
<ul style="list-style-type: none"> • Identify components of PC • To operate window operating system • To search the material related to farm equipment using internet • To communicate through email <p style="text-align: right;">(4 hrs)</p>	<ul style="list-style-type: none"> • Introduction to computer, input devices, output devices, display unit, CPU, hardware, software, operation system, MS office, use of internet and email. <p style="text-align: right;">(8 hrs)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report writing

UNIT - 1.3 : FARM EQUIPMENT - I

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Identify different parts of a tractor.
- Carry out schedule maintenance as per maintenance manual.
- Conduct ring job, top overhaul and complete overhaul of engine.
- Repair transmission, steering, hydraulic, electrical and brake systems.
- Diagnose and repair defects of tractor.

Practical (128 hours)	Theory (48 hours)
<ul style="list-style-type: none"> • Demonstration of tractor specification data; Identification of different major assemblies of tractor. • Cleaning and general maintenance of tractors. <p style="text-align: right;">(6 hrs)</p>	<ul style="list-style-type: none"> • Tractor Industry in India - leading manufacturers, trends, new product. • Study of tractors and different make (indigenous). • Maintenance schedule of tractor. <p>Engine Basics:</p> <ul style="list-style-type: none"> • Classification of engines, Principle and working of 2 and 4-stroke diesel engine (Compression ignition Engine, Engine output, compression pressure, Compression ratio. <p style="text-align: right;">(4 hrs)</p>
<p>Piston and Ring Job</p> <ul style="list-style-type: none"> • Measurement of cylinder liner for ovality and taperness. • Practice and measurement of piston rings, piston and liner. <p style="text-align: right;">(8 hrs)</p>	<p>Engine Components –</p> <ul style="list-style-type: none"> • working principle and construction of cylinder heads and its parts • Description of Cylinder block, Cylinder block construction, types of cylinder blocks and cylinder liners. Description and functions of different types of pistons, piston rings and piston pins and materials used. Recommended clearances for the rings and its necessity precautions while fitting rings, common troubles and remedy. <p style="text-align: right;">(5 hrs)</p>
<p>Top overhaul</p> <ul style="list-style-type: none"> • Remove cylinder head from engine. • Overhauling of cylinder head assembly with use of service manual for clearance and other parameters. • Overhauling of connecting rod assembly Practice on removing oil sump and oil pump <p style="text-align: right;">(10 hrs)</p>	<ul style="list-style-type: none"> • Description and function of connecting rod, importance of big-end split obliquity, Materials used for connecting rods big end and main bearings. • Shells piston pins and locking methods of piston pins. Recommended clearances for the cylinder liners and rings. Bearing failure and its causes-care and maintenance. <p style="text-align: right;">(3 hrs)</p>

<p>Complete overhaul</p> <ul style="list-style-type: none"> • Measure the clearance between crank pin and the connecting rod, main journal and main bearing. Assembling crank shaft, main bearings, connecting rods big end in the engine, fitting cylinder head. Setting valve timing. <p style="text-align: right;">(10 hrs)</p>	<ul style="list-style-type: none"> • Description of crankshaft and Camshafts. Types of their drives. Description of Overhead camshaft, importance of Cam lobes. Crankcase ventilation . Camshaft, Crank-shaft balancing, Firing order of the engine. • Description and function of the fly wheel and vibration damper. Timing mark. <p style="text-align: right;">(3 hrs)</p>
<ul style="list-style-type: none"> • Checking cooling system for overheating / under-cooling. Dismantling, cleaning, assembling and testing of water pumps, reverse flushing the system. • Checking of thermostat valve, pressure cap. • Adjusting the fan belt tension. <p style="text-align: right;">(6 hrs)</p>	<ul style="list-style-type: none"> • Cooling systems:- Purpose, types, Heat transfer method, effect of boiling point and pressure, coolant properties, preparation and recommended change of interval, use of antifreezer. • Cooling system components, water pump, function of thermostat, pressure cap, Recovery system and Thermo-switch. Function and types of Radiator. <p style="text-align: right;">(3 hrs)</p>
<ul style="list-style-type: none"> • Identification of lubrication oil flow circuit in an engine. • Overhauling oil pump, servicing of oil cooler and centrifugal oil filter. • Testing oil pressure. <p style="text-align: right;">(6 hrs)</p>	<ul style="list-style-type: none"> • Lubrication system: - purposes and characteristics of oil, type of lubricants, grade as per SAE, and their application, oil additives, type of lubrication system. • Lubrication system components- different type of Oil pump, Oil filters and oil cooler. Probable reasons for low / high oil pressure, high oil consumption and their remedies. <p style="text-align: right;">(3 hrs)</p>
<ul style="list-style-type: none"> • Servicing of air cleaner (Oil bath and dry type) • Checking and changing an air filter • Inspection of turbocharger • Checking of Exhaust Gas Recirculation and Exhaust system, <p style="text-align: right;">(6 hrs)</p>	<ul style="list-style-type: none"> • Intake and exhaust systems – Description of Diesel induction and Exhaust systems. Description and function of air compressor, Intercoolers, turbo charger. • Intake system components- Description and function of Air cleaners, Different type air cleaner, Description of Intake manifolds and material. • Exhaust system components- Description and function of Exhaust manifold, Exhaust pipe, Mufflers, Catalytic converters, Back-pressure, Exhaust Gas Recirculation (EGR). <p style="text-align: right;">(3 hrs)</p>

<ul style="list-style-type: none"> Practice in engine tune up in a vehicle – testing vacuum and compression of engine, adjusting tappets and setting injection timing in inline and rotary pumps. Repairing fuel leaks in pipe line and unions, Servicing and testing of fuel feed pump, fuel filters, checking operation of C.R.D.I. system. Overhauling and Testing of injectors. Bleeding fuel lines for Air locks, Checking idle speed, Obtaining and interpreting scan tool data. Fault finding and remedy, care and maintenance <p style="text-align: right;">(10 hrs)</p>	<p>Diesel Fuel Systems:</p> <ul style="list-style-type: none"> Diesel fuel characteristics, concept of Quiet diesel technology and Clean diesel technology, Fuel feed system used in Tractor’s description and layout. Diesel fuel system components, Description and function of Diesel fuel injection system, types of fuel injection pumps, type of drive, injectors-types and function. Governor and their types. Distributor-type injection pump, Glow plugs, Cummins and Detroit Diesel injection Diesel electronic control- Diesel electronic control systems (DEC), Common rail diesel injection system. Method of bleeding fuel supply system <p style="text-align: right;">(4 hrs)</p>
<ul style="list-style-type: none"> Dismantle clutch assembly. Inspect the parts of clutch. Relining of clutch plate and assemble. Coupling the clutch with flywheel and join the engine with gear box. Adjust clutch pedal free play. Dismantle different types of gear boxes and inspect the parts. Assemble the gear box. Overhauling transfer case and auxiliary gear box. <p style="text-align: right;">(16 hrs)</p>	<ul style="list-style-type: none"> Clutch:-types, construction and function. Components of clutch -driver and driven plates, torsion spring, cushion springs, operating fingers, clutch shaft, Slave cylinder and oil seal. Clutch release bearing and linkages. <p>Manual transmissions:</p> <ul style="list-style-type: none"> Function, description, types and their application. Gearbox layout. Components of tractor gear box. Principle of epicyclical gear box. Necessity of torque convertor, need of 4 x 4 wheel drive / Front wheel drive, Low and high gear ratio, universal joint and propeller shaft. <p style="text-align: right;">(3 hrs)</p>
<ul style="list-style-type: none"> Overhauling of differential. Servicing of reduction gear, rear axle wheel hub. Servicing of PTO (Power Take Off). Measure rpm of PTO shaft and speed of belt pulley. <p style="text-align: right;">(10 hrs)</p>	<p>Final Drive and Drive Shafts:</p> <ul style="list-style-type: none"> Differential carriers double reduction gearing, differential lock, crown wheel and pinion adjustments, function and types of power take off (PTO) mechanism. Types of front and rear axles. Common trouble and their remedies, care and maintenance. <p style="text-align: right;">(3 hrs)</p>

<ul style="list-style-type: none"> • Checking, Layout of Mechanical steering system, Overhauling of steering gear box of tractor. Remove front axle and spindle hub and steering linkage. Reassembling steering assembly and Test for correct function. Checking, inspect layout of different parts of Hydraulic steering system • Practice on visual Inspection of chassis frame for crack, bent and twists. Greasing of steering system parts. <p style="text-align: right;">(10 hrs)</p>	<p>Steering and Suspension Systems:</p> <ul style="list-style-type: none"> • Function and types of steering system. Description, construction and function of mechanical steering system. Their movement and adjustment. Description, working and principle of hydraulic steering system. Different parts such as pump, distributor valves, pipe line and hoses etc. <p style="text-align: right;">(3 hrs)</p>
<ul style="list-style-type: none"> • Remove wheels from tractor. Dismantle wheel for checking rims, tyres for wear and tubes for leaks. Repairing, derusting, painting. • Fitting of tyres and tubes on rim and inflate to correct pressure. Balancing of Tractor wheels. Practice of tyre rotation. • Fitting wheels on tractors. Tightening of wheel in correct sequence. Checking and adjusting tire pressure by use of air. <p style="text-align: right;">(10 hrs)</p>	<p>Wheels and Tyres:</p> <ul style="list-style-type: none"> • Description, construction and function of Wheel. Rim sizes. Types and sizes of tyres. Solid, pneumatic and Radial. Ply rating. • Tyre materials, Hysteresis and designations, Tyre information, Tyre tread designs, Tyre ratings for temperature and traction. Importance of in-Flatting tyres to correct pressure. Repair and maintenance of tyres and tubes. Storage of tyres. • Descriptions Tirewear Patterns and causes. Nitrogen vs atmospheric air in tyres <p style="text-align: right;">(3 hrs)</p>
<ul style="list-style-type: none"> • Overhauling brakes including cleaning and inspection of all components, relining shoes, setting and actuating shoe clearance. Inspection spring of both shoe and lever. Inspecting and setting parking brakes. Inspecting and setting hydraulic main brake including replacement of washer and oil seals. Overhauling serve mechanism (as applicable) inspecting piston and valves. Bleeding and adjustment of brakes. Fault tracing and remedy. Skimming of brake drum and disc plate. <p style="text-align: right;">(10 hrs)</p>	<ul style="list-style-type: none"> • Braking Systems - Braking fundamentals Principles of braking, Drum and disc brakes, Lever/mechanical advantage, Hydraulic pressure and force, Brake fade. • Braking systems - Brake type used on tractor - principles, Air brakes, • Braking system components-Park brake system, Brake pedal, Brake lines, Brake fluid, Bleeding, Master cylinder, Divided systems, Tandem master cylinder, Power booster or brake unit, Hydraulic brake booster, Applying brakes, Brake force, Brake light switch • Drum brakes and components -Drum brake system, Drum brake operation, Brake linings and shoes, Backing plate, Wheel cylinders

	<ul style="list-style-type: none"> • Disc brakes and components -Disc brake system, Disc brake operation, Disc brake rotors, Disc brake pads, Disc brake calipers, Proportioning valves, Proportioning valve operation, Brake friction materials. • Wet Brake system and its parts. <p style="text-align: right;">(4 hrs)</p>
<ul style="list-style-type: none"> • Practice on removing alternator from vehicle dismantling, cleaning checking for defects, assembling and testing for motoring action of alternator and fitting to vehicles. • Practice on removing starter motor vehicle and overhauling the starter motor, testing of starter motor. Servicing storage batteries and alternators, Tracing lighting circuit fault rectification. <p style="text-align: right;">(10 hrs)</p>	<p>Tractor Electrical Maintenance:</p> <ul style="list-style-type: none"> • Lighting arrangement in tractors (As applicable). • Description of charging circuit. Operation of alternator, regulator unit ignition warning lamp troubles and remedy in charging system. Fault finding in electrical system. • Description of starter motor circuit, common troubles and remedy in starter circuit. Description of lighting circuit. Charging and discharging of lead acid battery. <p style="text-align: right;">(4 hrs)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report writing
- Viva-voce
- Workshop job
- Assembly and disassembly

UNIT 1.4 : BASIC TECHNICAL DRAWING

LEARNING OUTCOMES:

After undergoing this unit, students will be able to:

- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Read technical drawings for cost estimation and manufacturing/fabrication purpose.
- Read hydraulic and electrical circuits for diagnosing problems in farm machinery.

Practical	(48 hrs)	Theory
<ul style="list-style-type: none"> • Practical demonstration with the help of blue prints/computer prints. <p style="text-align: right;">(3 hrs)</p>		Engineering drawing and its importance
<ul style="list-style-type: none"> • Drawing board, T-square, mini-drafter, set squares, protractor, drawing instrument box, pencils of different grades, erasing shield • Learn methods of folding of blue print/drawing prints as per BIS SP : 16-2003 • Size of drawing sheets and designation of sheets. • Preparation of A3/A2 sheet for preparing drawings. <p style="text-align: right;">(3 hrs)</p>		Introduction to drawing instruments
<ul style="list-style-type: none"> • Practice construction of different types of lines (horizontal and vertical) <p style="text-align: right;">(3hrs)</p>		<ul style="list-style-type: none"> • Fundamentals of engineering drawings • Types of lines
<ul style="list-style-type: none"> • Practice construction of elements dimensioning with the help of a view of an object. • Practice dimensioning of a diameter, radius, angles, holes, chamfers, undercut, functional dimensions, non functional dimensions. <p style="text-align: right;">(6 hrs)</p>		<ul style="list-style-type: none"> • Dimensioning Definition, size dimension, location dimensions, dimensioning line, extension line, leader line, termination of dimension line unidirectional and aligned dimensioning systems.

<ul style="list-style-type: none"> Practice of free hand sketch of an object in orthographic and isometric views. (6 hrs) 	<ul style="list-style-type: none"> Introduction of isometric and orthographic views.
<ul style="list-style-type: none"> Free hand sketching of cone, pentagonal prism and hexagonal pyramid, piston, connecting rod, gears (6 hrs) 	<ul style="list-style-type: none"> Introduction to solids: cube cone, cylinder, prism and pyramid, piston, connecting rod, gears
<ul style="list-style-type: none"> Practice the construction of views of the nuts, bolts and washers (9 hrs) 	<ul style="list-style-type: none"> Types of threads, nuts, bolts and washers. Study of other fasteners used in farm equipment machinery
<ul style="list-style-type: none"> Practice of sign convention of D.C. A.C. Positive, Negative, Single Phase, Three Phase, AC/DC, 3-Phase, Neutral line, earthing, fuse. Reading, drawing and identifying electric circuit parts (6 hrs) 	<ul style="list-style-type: none"> Conventions used for Electrical and electronic components.
<ul style="list-style-type: none"> Reading, drawing and identifying hydraulic circuit parts like brake system and steering system etc. (6 hrs) 	<ul style="list-style-type: none"> Conventions used for hydraulic and hydraulic components

Note : Theory part should be covered along with drawing practicals.

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Sketching
- Drawing

UNIT – 1.5 : WORKSHOP PRACTICE

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Follow general workshop safety rules and environment precautions
- Identify, select and use appropriate hand cutting tools and carry out simple fitting operations like filing, chipping, hacksawing, threading, tapping, grinding, drilling, turning and boring operations
- Identify, select and use appropriate electrical tools and instruments, measure electrical parameters (like voltage, current, resistance, earth resistance, insulation, continuity)
- Identify electronic components like transistors, resistors, capacitors, diodes, solenoid, relays and sensors.
- Identify, select and use appropriate tools, equipment, consumables and carry out soldering, arc and gas welding operations.
- Identify and use specialised tools like torque wrench, pneumatic tools, hydraulic jack and measuring instruments.

Practical	(128 Hours)	Theory	(48 Hours)
<p>Safety</p> <ul style="list-style-type: none"> • Finalization with safety precautions and safety equipment that may be used in mechanical workshop • Identification of common engineering materials. • Demonstration of physical properties of material viz. hardness, ductility, surface finish, toughness etc. <p style="text-align: right;">(20 hours)</p>		<p>Safety</p> <ul style="list-style-type: none"> • Importance of safety precautions in a workshop • Introduction to SI units, common workshop hand tools. Spanners, socket set, allen head keys, wrenches, pliers, pipe and chain wrenches, screw drivers. • Properties and application of materials used in agri-equipment. <p style="text-align: right;">(6 hours)</p>	

<p>Fitting</p> <ul style="list-style-type: none"> • Familiarization with tools, equipment and measuring instruments used in fitting. Practice marking / layout as per specifications used in filing, chipping, hacksawing, threading, tapping, grinding, drilling, turning and boring operations. • Practice filing, chipping, hacksawing, threading, tapping, grinding, drilling, turning and boring operations. <p>(40 hours)</p>	<p>Fitting</p> <ul style="list-style-type: none"> • Study different types of tools, equipment and measuring instruments used in filing, chipping, hacksawing, threading, tapping, grinding, drilling, turning and boring operations. Their specifications, functions, working and uses; care and maintenance. <p>(12 hours)</p>
<p>Electrical</p> <ul style="list-style-type: none"> • Familiarization with electrical tools; practice wire joint, verification of Ohm's law, identification of phase and neutral of AC supply, measurement of voltage, current, resistance, power, frequency and energy consumed in an electrical circuit, selection of wires and cables as per load, measurement of earth resistance. insulation and continuity test, detection of current leakage, short circuit. • Identification and usage of different types of cables for A.C. and D.C. circuits <p>(16 hours)</p>	<p>Electrical</p> <ul style="list-style-type: none"> • Study electrical terms such as AC and DC supply. Series and parallel circuits, Concept of single phase and three phase supply, Safety precautions to be observed while working on electricity. Study of measuring Instruments such as voltmeter, ammeter, ohm meter, watt meter, energy meter and frequency meter. Earthing and its importance, insulation and continuity test. • Battery charging, study different types of cables for A.C. and D.C. circuits. <p>(8 hours)</p>
<p>Welding</p> <ul style="list-style-type: none"> • Familiarization with tools, equipment, instruments and consumables used for soldering, arc welding and gas welding. • Practice soldering operations. • Practice for arc and gas welding to join different types of weld joints. <p>(24 hours)</p>	<p>Welding</p> <ul style="list-style-type: none"> • Introduction to soldering, arc welding and gas welding techniques. Advantages and applications of these welding operations. Equipment and tools used in soldering, arc welding and gas welding. Consumables used, safety precautions, care and maintenance of equipment and tools used in welding shop. <p>(12 hours)</p>

<p>Diagnostic Tools</p> <ul style="list-style-type: none"> • Identification and usage of different types of diagnostic tools: Dial Gauge and Magnetic Stand, Torque Wrench, Tachometers, IR Thermometer, Piston Topping Gauge, Cylinder Liner Bore Gauge, Micrometer, Vernier Calliper, Engine Compression Tester, Soundscope, Multimeter and Battery Hygrometer. <p style="text-align: right;">(28 hours)</p>	<p>Diagnostic Tools</p> <ul style="list-style-type: none"> • Study of different types of diagnostic tools: Dial Gauge and Magnetic Stand, Torque Wrench, Tachometers, IR Thermometer, Piston Topping Gauge, Cylinder Liner Bore Gauge, Micrometer, Vernier Calliper, Engine Compression Tester, Soundscope, Multimeter and Battery Hygrometer. <p style="text-align: right;">(10 hours)</p>
---	--

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report writing
- Viva-voce
- Workshop job

INDUSTRIAL TRAINING – I (140 hrs)

4 weeks on- the- job training in some industrial unit .

The purpose of the industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform industrial activities.
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks has been provided in the study and evaluation scheme of 1st semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | | |
|----|----------------------------|-----|
| a) | Punctuality and regularity | 20% |
| b) | Industrial training report | 50% |
| c) | Presentation and viva-voce | 30% |

UNIT – 2.1 : BASIC SCIENCES

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Apply the basic principles of maths in solving the basic problems of the trade.
- Apply the basic principles of physics in solving the basic problems of the trade.

Practical	Theory (48 Hours)
	<p>Mathematics</p> <ul style="list-style-type: none"> • Basic Algebra – algebraic formula. Simultaneous equation – quadratic equations (4 hours) • Simultaneous linear equation in two variables (3 hours) • Arithmetic and geometric progression, sum of n-terms, simple calculations. (3 hours) • Mensuration – Find the area of regular objects like triangle, rectangle, square and circle; volumes of cube, cuboid, sphere cylinder (6 hours) • Trigonometry - Concept of angle, measurement of angle in degrees, grades and radians and their conversions, T-Ratios of Allied angles (3 hours) • Co-ordinate Geometry - Cartesian and polar coordinates, conversion from cartesian to polar coordinates (2 hours) • Concept of Differentiation and Integration (3 hours)
	<p>Physics</p> <ul style="list-style-type: none"> • FPS, CGS, SI units, dimensions and conversions (2 hours) • Force, speed, velocity and acceleration – Definition, units and simple problems (3 hours)

	<ul style="list-style-type: none"> • Stress and strain, modulus of elasticity (2 hours) • Heat and temperature, its units and specific heat of solids, liquids and gases (4 hours) • Electricity and its uses, basic electricity terms and their units, D.C. and A.C., positive and negative terminals, use of switches and fuses, conductors and insulators (5 hours) • Work, Power and Energy-Defination, units and simple problems (4 hours) • Concept of force, Inertia, Newton's First law of motion; momentum and Newton's second law of motion; Impulse; Newton's third law of motion. (2 hours) • Friction and Lubrication (1 hour) • Law of conservation of energy (1 hour)
--	---

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

UNIT - 2.2 : FARM EQUIPMENT - II

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Recommend farm equipment based upon operation requirement.
- Repair of tillage, leveling, planting, seeding, harvesting, processing and threshing equipment's.
- Repair and overhaul of centrifugal and submersible pumps.

Practical	(160 hours)	Theory	(48 hours)
<ul style="list-style-type: none"> • Introduction to the different farm equipment's available in the lab and their practical applications . <p style="text-align: right;">(6 hours)</p>		<p>Introduction</p> <ul style="list-style-type: none"> • Status of farm power in India, sources of farm power, Farm mechanization and its importance in the advancement of agriculture engineering/ technology, Categorization of farm machinery and equipment. <p style="text-align: right;">(3 hours)</p>	
<ul style="list-style-type: none"> • Operation and maintenance of scraper, leveler and post hole digger. <p style="text-align: right;">(12 hours)</p>		<p>Shaping and Leveling Equipments:</p> <ul style="list-style-type: none"> • Introduction, types, working principle, construction, material adjustment, mode of operation, specifications of scraper, riddger, leveller, bund former, post hole digger. <p style="text-align: right;">(4 hours)</p>	
<ul style="list-style-type: none"> • Operation and maintenance of Mould Board Plough, Disc Plough, Cultivator, Disc Harrow, rotary power tillers and their repair. <p style="text-align: right;">(24 hours)</p>		<p>Ploughing and Tillage Equipments:</p> <ul style="list-style-type: none"> • Primary tillage: Introduction, types, working, principle, construction, mode of operation, specifications of mould board plough, disc plough. • Secondary tillage: Introduction, types, working principle, construction, mode of operation, specifications of Cultivator, disc harrow, rotary power tillers. <p style="text-align: right;">(6 hours)</p>	
<ul style="list-style-type: none"> • Operation and maintenance of front loader and laser leveler. <p style="text-align: right;">(6 hours)</p>		<p>Equipments for Land Development</p> <ul style="list-style-type: none"> • Mechanical working of soil, mechanical methods land grading, shaping & leveling, planning of operation, earth moving equipment's like front loader, computerized land leveler and laser lever. <p style="text-align: right;">(3 hours)</p>	

<ul style="list-style-type: none"> • Operation and maintenance of seed cum fertilizer drill. Performing the different measurements using metering devices (16 hours) 	<p>Seeding Equipments</p> <ul style="list-style-type: none"> • Introduction, types, working principle, construction, material adjustment, mode of operation, specifications of Indigenous plough, furrow opener, calibration of seed cum fertilizer drill, specification of different types of metering devices. (4 hours)
<ul style="list-style-type: none"> • Operation and maintenance of Potato planters (semi auto and automatic), Sugarcane planter and Paddy trans-planter (16 hours) 	<p>Planting Equipment</p> <ul style="list-style-type: none"> • Introduction, types, working, construction, material adjustment, operation, maintenance, specifications of: Potato planters (semi auto and automatic), Sugarcane planter, Multi-crop planter, Paddy trans-planter. Safety precautions in handling these equipments. (4 hours)
<ul style="list-style-type: none"> • Operation and maintenance of Reaper and Harvesting Combine, Self operated combine & tractor operated. (24 hours) 	<p>Harvesting Equipment:</p> <ul style="list-style-type: none"> • Introduction, types, working, construction, material adjustment, operation, maintenance, repair & specifications of Reaper and Harvesting Combine: Self operated combine & tractor operated, track combine. (8 hours)
<ul style="list-style-type: none"> • Operation and maintenance of wheat thresher. (16 hours) 	<p>Threshing Equipment:</p> <ul style="list-style-type: none"> • Introduction, types, working, construction, material adjustment, operation, and specifications of: wheat thresher, groundnut decorticator. (4 hours)
<ul style="list-style-type: none"> • Operation and maintenance of sugarcane crusher, and rice huller. (16 hours) 	<p>Processing Equipment</p> <ul style="list-style-type: none"> • Introduction, type, working, construction, material adjustment, and operation, specification of: chaff cutter, hammer mill, sugarcane crusher, and rice huller. (5 hours)
<ul style="list-style-type: none"> • Operate and maintain centrifugal, submersible pump, sprinkler and drip irrigation. (24 hours) 	<p>Pumps:</p> <ul style="list-style-type: none"> • Introduction, types, working, construction, operation, installation (Location, foundation, grouting), power requirement, troubleshooting, piping. Specifications of: Reciprocating (single and double acting), Centrifugal, Submersible pump, Introduction to Sprinkler and Drip irrigation. (7 hours)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report writing
- Viva-voce
- Workshop job

UNIT: 2.3 TESTING, REPAIR AND MAINTENANCE OF FARM EQUIPMENT

LEARNING OUTCOMES

After undergoing this unit, the students will be able to:

- Drive Tractor and related farm equipment
- Diagnose and repair various faults in tractor and other farm equipment
- Know and recommend how to match PTO driven implement with tractor
- Test and Evaluate performance of tractor and other farm equipment as per manufacturer specifications

Practical (160 hours)	Theory (48 hours)
<ul style="list-style-type: none"> • Driving Combine Harvester • Identification of various parts and aggregates. • Common faults and remedies. • Maintenance procedures (Demonstration) (20 hours) 	<ul style="list-style-type: none"> • Function of various aggregates of combine harvester. Types of harvester. Common complaints and remedies. Safety and Environmental aspects (6 hours)
<ul style="list-style-type: none"> • Common faults and remedies • Attaching with Tractor Safely • Driving Practice (12 hours) 	<ul style="list-style-type: none"> • Rotavator – function and usage. Parts and aggregates. Blade Shaft RPM calculation. Selection criteria (2 hours)
<ul style="list-style-type: none"> • Identification of various parts. • RPM calculation • Common faults and remedies • Attaching with Tractor Safely • Driving Practice (10 hours) 	<ul style="list-style-type: none"> • Potato Planter/Potato Digger – function and aggregates (4 hours)
<ul style="list-style-type: none"> • Identification of various parts. • Common faults and remedies • Attaching with Tractor Safely • Driving Practice (10 hours) 	<ul style="list-style-type: none"> • Tiller, Harrow, MB Plough – Function and usage (4 hours)
<ul style="list-style-type: none"> • Identification of various parts. • Common faults and remedies • Attaching with Tractor Safely • Driving Practice (12 hours) 	<ul style="list-style-type: none"> • Seeding Equipment – function and usage • PTO RPM calculation (4 hours)
<ul style="list-style-type: none"> • Installation in Field with Motor/Tractor – Ensure matching for optimum performance • Identification of various parts. • Common faults and remedies • Attaching with Tractor Safely (12 hours) 	<ul style="list-style-type: none"> • Irrigation Pumps: Types of Pumps, Performance parameters, Testing and Evaluation, testing parameters and procedure (6 hours)

<ul style="list-style-type: none"> • Identification of various parts. • Common faults and remedies • Attaching with Tractor Safely • Driving Practice <p style="text-align: right;">(16 hours)</p>	<ul style="list-style-type: none"> • Thresher/Straw Reaper – function and usage, PTO RPM calculation, Pulley size calculation <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Identification of various parts. • Common faults and remedies • Attaching with Tractor Safely • Driving and Usage Practice <p style="text-align: right;">(10hours)</p>	<ul style="list-style-type: none"> • Sprinklers, Sprayers and Drip Irrigation <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Identification of various parts. • Common faults and remedies • Attaching with Tractor Safely (Demonstration) <p style="text-align: right;">(8 hours)</p>	<ul style="list-style-type: none"> • Dozer and Loader – function and usage. <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Measuring Voltage/Current, use multimeter, fixing and joining wires, fixing two pin, three pin shoes, making extension wires, use of insulation tape <p style="text-align: right;">(14 hours)</p>	<ul style="list-style-type: none"> • Farm Electrical Basics – Types of Motors and their repair, Troubleshooting electrical breakdown. How to work safely with electricity <p style="text-align: right;">(6 hours)</p>
<ul style="list-style-type: none"> • Illustration of Working principle of hydraulic jack. Identification of various parts of air compressor, hydraulic pump. Joining hydraulic and pneumatic pipes without leak – use of Teflon tape and sealant <p style="text-align: right;">(16 hours)</p>	<ul style="list-style-type: none"> • Common Defects in Hydraulics and Pneumatics – Causes and Remedies <p style="text-align: right;">(4 hours)</p>
<ul style="list-style-type: none"> • Broken stud removal, use of anti rust fluid, dismantling of rusted and seized parts <p style="text-align: right;">(10 hours)</p>	<ul style="list-style-type: none"> • Fixing rusted and seized parts <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Use of thread lock and gasket sealant <p style="text-align: right;">(2 hours)</p>	<ul style="list-style-type: none"> • Use of thread lock and sealing fluids <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Required RPM calculation, Voltage and Ampere output checking using Clamp meter <p style="text-align: right;">(8 hours)</p>	<ul style="list-style-type: none"> • Tractor operated genset – specifications, function and usage. RPM calculation. <p style="text-align: right;">(2 hours)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report writing
- Viva-voce
- Assembly and disassembly

UNIT - 2.4 : WORK ORDER PROCESS AND COSTING

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Prepare cost and time estimate for various job works related to farm equipment's.
- Prepare work orders related to repair of farm equipment's.
- Use various techniques to improve the service business.

Practical	Theory (48 hours)
	<p>Introduction</p> <ul style="list-style-type: none"> • Definition of estimation, cost accounting, purpose of estimating and costing, advantages of costing, difference between costing and cost accounting, methods of costing, functions of cost estimating, estimating procedures. Case study on costing. <p style="text-align: right;">(6 hours)</p>
	<p>Estimation of Material cost</p> <ul style="list-style-type: none"> • Review of basic formulae for computation of area and volume of standard 3-d objects, Estimation of volume, weight and cost of materials for various products <p style="text-align: right;">(8 hours)</p>
	<p>Estimation of Machine Shop Processes</p> <ul style="list-style-type: none"> • Set up time, operation time, handling time, machining time, tear down time, allowances: personal, fatigue and tool allowances. Various machining operations- turning, milling, drilling, boring, tapping, shaping, grinding and planning <p style="text-align: right;">(8 hours)</p>
	<p>Estimation of Other Shops</p> <ul style="list-style-type: none"> • Estimation of cost of different products produced in foundry, forging and welding shops <p style="text-align: right;">(2 hours)</p>

	<p>Work Order Process</p> <ul style="list-style-type: none"> • Standard time for various jobs, labour value as per standard time. • Prepare, interpret work orders and their cost and time estimate: complaint reports, observation, action taken, parts, lubricant required. <p>(8 hours)</p>
	<p>Post Repair Process</p> <ul style="list-style-type: none"> • Explanation of jobs done and repair charges. Inspect the machinery and suggest other repairs along with their cost and time estimate <p>(6 hours)</p>
	<p>Service marketing</p> <ul style="list-style-type: none"> • Different ways to improve service business: post repair follow-ups, service camps and customer data base analysis, spare parts business promotion <p>(6 hours)</p>
	<p>Profit and Loss Calculation</p> <ul style="list-style-type: none"> • Calculate profit percentage, taxes, fixed and variable cost, profit loss of setting a repairing workshop. Government incentives for farm marketing. <p>(4 hours)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests

INDUSTRIAL TRAINING – II (140 hrs)

The purpose of the industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform industrial activities.
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks has been provided in the study and evaluation scheme of 2nd semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | | |
|----|----------------------------|-----|
| a) | Punctuality and regularity | 20% |
| b) | Industrial training report | 50% |
| c) | Presentation and viva-voce | 30% |

7. RESOURCE REQUIREMENTS

7.1 LIST OF TOOLS AND EQUIPMENT

A) TRAINEES TOOL KIT PER 4 TRAINEES FOR 30 TRAINEES +1 INSTRUCTOR

Sr. No.	Name of Item	Quantity(Nos.)
1.	Allen Key set of 12 pieces (2mm to 14mm)	8
2.	Caliper inside 15 cm Spring	8
3.	Calipers outside 15 cm spring	8
4.	Center Punch 10 mm. Dia. X 100 mm.	8
5.	Dividers 15 cm Spring	8
6.	Electrician Screw Driver 250mm	8
7.	Hammer ball peen 0.5 kg with handle	8
8.	Hands file 20 cm. Second cut flat	8
9.	Philips Screw Driver set of 5 pieces (100 mm to 300 mm)	8
10.	Pliers combination 20 cm.	8
11.	Screw driver 20cm.X 9mm. Blade	8
12.	Screw driver 30 cm. X 9 mm. Blade	8
13.	Scriber 15 cm	8
14.	Spanner D.E. set of 12 pieces (6mm to 32mm)	8
15.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	8
16.	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with box	8
17.	Steel rule 30 cm inch and metric	8
18.	Steel tool box with lock and key (folding type) 400x200x150 mm	8
19.	Wire cutter and stripper	8
20.	Digital Multimeter	8

B) TOOLS INSTRUMENTS AND GENERAL SHOP OUTFITS

Sr. No.	Name of Item	Quantity(Nos.)
1.	AC alternator slip ring puller	1
2.	Adjustable spanner (pipe wrench 350 mm)	2
3.	Air blow gun with standard accessories	2
4.	Air impact wrench with standard accessories	4
5.	Air ratchet with standard accessories	4
6.	Allen Key set of 12 pieces (2mm to 14mm)	2
7.	Alternator for tractor – different type	2
8.	Ammeter 300A/ 60A DC with external shunt	4
9.	Angle plate adjustable 250x150x175	1
10.	Angle plate size 200x100x200mm	2
11.	Anvil 50 Kgs with Stand	1
12.	Arbor press hand operated 2 ton capacity	1

13.	Auto Electrical test bench	1
14.	Battery –charger 12 Amp.	2
15.	Belt Tensioner gauge	1
16.	Blow Lamp 1 litre	2
17.	Caliper inside 15 cm Spring	4
18.	Calipers outside 15 cm spring	4
19.	Car Jet washer with standard accessories	1
20.	Chain Pulley Block-3 ton capacity with tripod stand	1
21.	Chaser hard W/V 9 to 40 T.P.I. set of 11 external.	1 set
22.	Chaser, hand W/W 9 to 40 T.P.I. set of 11 internal.	1 set
23.	Chisel 10 cm flat	4
24.	Chisels cross cut 200 mm X 6mm	4
25.	Circlip pliers Expanding and contracting type 15cm and 20cm each	4
26.	Clamps C 100mm	2
27.	Clamps C 150mm	2
28.	Clamps C 200mm	2
29.	Cleaning tray 45x30 cm.(S.S.)	4
30.	Clutches, different types such as cone type, disc type	1 each
31.	Compression testing gauge suitable for diesel Engine	2
32.	Connecting rod alignment fixture	1
33.	Copper bit soldering iron 0.25 Kg	4
34.	Cut section model of fuel filter	1
35.	Cylinder bore gauge capacity 20 to 160 mm	4
36.	Cylinder liner- Dry & wet liner, press fit & slidefit liner	1 each
37.	Depth micrometer 0-25mm	4
38.	Dial gauge type 1 Gr. A (complete with clamping devices and stand)	4
39.	Different type of Engine Bearing model	1 set
40.	Different type of piston model	1each
41.	Dividers 15 cm Spring	4
42.	Drift Punch Copper 15 Cm	4
43.	Drift, copper 10 x 15 1/2 mm	2
44.	Drill point angle gauge	1
45.	Drill twist 1.5 mm to 15 mm (various sizes) by 0.5 mm	4
46.	Electric Soldering Iron 230 V 60 watts 230 V 25 watts	2 each
47.	Electric testing screw driver	2
48.	Engineer's square 15 cm. Blade	2
49.	Engineers stethoscope	1
50.	Equipment puncture, in box,	1
51.	Feeler gauge 20 blades (metric)	2
52.	File flat 20 cm bastard	4
53.	File, half round 20 cm second cut	4
54.	File, Square 20 cm second cut	4
55.	File, Square 30 cm round	4

56.	File, triangular 15 cm second cut	4
57.	Files assorted sizes and types including safe edge file (20 Nos)	2 set
58.	Flat File 25 cm second cut	4
59.	Flat File 35 cm bastard	4
60.	Fuel feed pump for diesel	2
61.	Fuel injection pump (Diesel) inline	1
62.	Glow plug tester	2
63.	CI surface plate 1600 x 1000 mm with stand and cover (CI/Granite)	1
64.	Grease Gun	2
65.	Grover – 3, 4, 6mm.	1 Each
66.	Growler	2
67.	Hacksaw frame adjustable 20-30 cm	10
68.	Hammer Ball Peen 0.75 Kg	4
69.	Hammer Chipping 0.25 Kg	4
70.	Hammer copper 1 Kg with handle	4
71.	Hammer Mallet	4
72.	Hammer Plastic	4
73.	Hand operated crimping tool (i) for crimping up to 4mm and (ii) for crimping up to 10mm	2
74.	Hand reamers adjustable 10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 to 14.25 mm and 14.25 to 15.75 mm	2sets
75.	Hand Shear Universal 250mm	2
76.	Hand vice – 37 mm	2
77.	High rate discharge tester (cell tester)	1
78.	Hollow Punch set of seven pieces 6mm to 15mm	2 sets each
79.	Hydraulic jack HI-LIFT type -3 ton capacity,	1
80.	Injector – Multi hole type, Pintle type	4 each
81.	Injector cleaning unit	1
82.	Injector testing set (Hand tester)	1
83.	Insulated Screw driver 20 cm x 9mm blade	4
84.	Insulated Screw driver 30 cm x 9mm blade	4
85.	Left cut snips 250mm	4
86.	Lifting jack screw type 3 ton, 5ton	1 each
87.	Magneto spanner set with 8 spanners	1 set
88.	Magnifying glass 75mm	2
89.	Marking out table 90X60X90 cm.	1
90.	Multimeter digital 3.5” display	4
91.	Oil can 0.5/0.25 liter capacity	2
92.	Oil pump for dismantling and assembling.	2
93.	Oil Stone 15 cm x 5 cm x 2.5 cm	1
94.	Outside micrometer 0 to 25 mm	4
95.	Outside micrometer 25 to 50 mm	4
96.	Outside micrometer 50 to 75 mm	1

97.	Outside micrometer 75 to 100 mm	1
98.	Outside micrometer 100 to 125 mm	2
99.	Pipe cutting tool	2
100.	Pipe flaring tool	2
101.	Piston ring compressor	2
102.	Piston Ring expander and remover.	2
103.	Piston Ring groove cleaner.	1
104.	Pliers combination 20 cm.	2
105.	Pliers flat nose 15 cm	2
106.	Pliers round nose 15 cm	2
107.	Pliers side cutting 15 cm	2
108.	Poker	2
109.	Portable electric drill Machine 12 mm	1
110.	Power Supply 0-12 V, lamp	1
111.	Prick Punch 15 cm	4
112.	Punch Letter 4mm	2 set
113.	Radiator cut section-cross flow	1
114.	Radiator cut section-down flow	1
115.	Radiator pressure cap	2
116.	Rear axle assembly-gear box steering box assembly of the diesel engine tractor	2 set
117.	Ridger.	2
118.	Right cut snips 250mm	4
119.	Rivet sets snap and Dolly combined 3mm, 4mm, 6mm	4
120.	Scraper flat 25 cm	2
121.	Scraper half round 25 cm	2
122.	Scraper Triangular 25 cm	2
123.	Scriber 15 cm	2
124.	Scriber with scribing black universal	2
125.	Set of stock and dies - Metric	2 sets
126.	Shear Tin Man's 450 mm x 600mm	4
127.	Sheet Metal Gauge	2
128.	Shear Tinmans 300mm	4
129.	Shovel	2
130.	Soldering Copper Hatchet type 500gms	4
131.	Solid Parallels in pairs (Different size) in Metric	2
132.	Spanner Clyburn 15 cm	1
133.	Spanner D.E. set of 12 pieces (6mm to 32mm)	4
134.	Spanner T. flocks for screwing up and up-screwing inaccessible positions	2
135.	Spanner, adjustable 15cm.	2
136.	Spanner, ring set of 12 metric sizes 6 to 32 mm.	2
137.	Spanners socket with speed handle, T-bar, ratchet and universal upto 32 mm set of 28 pieces with box	2
138.	Spark lighter	2

139.	Spirit level 2V 250, 05 metre	2
140.	Spring tension tester	1
141.	Stake grooving.	2
142.	Stake, hatchet.	2
143.	Starter motor for tractor –different type	2
144.	Steel measuring tape 10 meter in a case	4
145.	Steel rule 15 cm inch and metric	4
146.	Steel rule 30 cm inch and metric	4
147.	Steel wire Brush 50mmx150mm	5
148.	Stone, carborandum 15 x 5 x 4 cm smooth and rough.	1each
149.	Straight edge gauge 2 ft.	2
150.	Straight edge gauge 4 ft.	2
151.	Stud extractor set of 3	2 sets
152.	Stud remover with socket handle	1
153.	Surface gauge with dial test indicator plunger type i.e. 0.01 mm	2
154.	Tachometer (Counting type) 6000 rpm	2
155.	Taps and Dies complete sets (5 types)	1 set
156.	Taps and wrenches -Metric	2 sets
157.	Telescope gauge	4
158.	Temperature gauge 0-100 deg c	2
159.	Thermostat	2
160.	Thread pitch gauge metric, BSW	1
161.	Torque wrenches 5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
162.	Trammel 30 cm	2
163.	Turbocharger cut sectional view	1
164.	Tyre pressure gauge with holding nipple	2
165.	Universal puller for removing pulleys, bearings	1
166.	V' Block 75 x 38 mm pair with Clamps	2
167.	Vacuum gauge to read 0 to 760 mm of Hg.	2
168.	Valve Lifter	1
169.	Valve spring compressor universal.	1
170.	Vernier caliper 0-300 mm with least count 0.01mm (digital)	4
171.	Vice grip pliers	2
172.	Water pump for dismantling and assembling	2
173.	Wing compass 25 cm	2
174.	Wire Gauge (metric)	4
175.	Work bench 250 x 120 x 60 cm with 4 vices 12cm Jaw	4

C) GENERAL INSTALLATION / MACHINERIES

Sr. No.	Name of Item	Quantity
1.	3 furrow disc plough with scrapersyk	1
2.	9 tine cultivator-spring loaded mounted type	1
3.	Arbor press hand operated 2 ton capacity	1
4.	Automotive exhaust 5 gas analyzer (petrol & Diesel) or Diesel Smoke meter	1
5.	Wheat thresher	1
6.	Bench lever shears 250mm Blade x 3mm Capacity	1
7.	Centrifugal Pump with electric motor	1
8.	Chisel Plough- 5/7 tone	1
9.	Disc Harrow (14 Mounted type) off set	1
10.	Disc Harrow 8x8 trailed type	1
11.	Disc Plough 2 Bottom reversible l	1
12.	Discrete Component Trainer / Basic Electronics Trainer	1
13.	Drilling machine bench to drill up to 12mm dia along with accessories	1
14.	Electric motor 3 Phase 10 H.P.	1
15.	Gas Welding Table 1220mm x760mm	2
16.	Grinding machine (general purpose) D.E. pedestal with 300 mm dia wheels rough and smooth	1
17.	High capacity multi crop thresher	1
18.	Knapsack /foot sprayer	1 each
19.	Laser Leveler complete with transmitter, receiver, control box, survey equipment, 700 meter range	1
20.	Leveler/spike Leveler 3 meter width	1
21.	Liquid penetrant Inspection kit	1 set
22.	Mould Board Plough-Augur type	1
23.	P.T.O. operated rotary lawn mower	1
24.	Pneumatic rivet gun	2
25.	Lathe Machine	1
26.	Prime movers Engine (Stationery type)	2.
27.	Rotavator – 5.5’ cutting Width	1
28.	Spring tension tester	1
29.	Straw reaper	1
30.	Submersible Pump complete unit	1
31.	Tractor PTO operated aero blast spray	1
32.	Tractor 60 HP power steering	1
33.	Tractor Diesel Engine 4 stroke for Dismantling and assembling with swiveling stand	2
34.	Tractor operated potato digger	1
35.	Tractor operated two rows Semi /automatic potato planter	1
36.	Tractor operator Front mounted dozer with Hydraulic single cylinder	1

37.	<p>Sprinkler type and drip irrigation systems complete sets. Pipes(Different materiel & Sizes) Such as :- PVC, HDPE, QRC & Poly Tubing Dripper(Different materiel & Sizes) Jets, Foggers & Mister * Sprinkler(Mini, Micro, angular and circular type) * Lawn sprinkler and garden pop-ups * Accessories and fitting for spray pop-ups * Low volume & High volume rain gun range 15 to 30 meter die * Accessories and fitting for rain gun * Compression Fittings (Elbow, Elbow Treaded, Joiner, Tee, End Cap, adopter Male.) * HDPE fittings (Elbow, Elbow Treaded, Joiner, Tee, End Cap, adopter Male.) * PVC Fittings (Elbow, Elbow Treaded, Joiner, Tee, End Cap, adopter Male.) * PVC Control valve different sizes * Air Release Valve different sizes * Butterfly / G.M. Gate Valves different sizes * Fertigation Tank 30 to 160 Litres * Fertigation Equipment Pump 30 to 160 Litres * Filters (Primary filter) Sand, Hydro cyclone, Screen, Plastic/metal & Disc and Drip line * Poly joiner , reducer, Tee, Elbow ,End stop different sizes * Grommet hole plug different sizes * Pressure gauge * Three way cock for gauge * PVC valve box different sizes * Water meter, Brase pressure regulator and irrigation drum * Jain spanner repair tool kit & Drip line binder * Single phase electric motor 3 HP high speed (Booster)</p>	As desired
38.	Tractor Operator post hole digger	1
39.	Tractor Operator Seed cum fertilizer drill cum planter	1
40.	Tractor trailer with hydraulic system	1
41.	Trolley type portable air compressor single cylinder with 45 liters capacity Air tank, along with accessories & with working pressure 6.5 kg/sq cm	1
42.	Potable Weighing machine 10 Kg.	1
43.	Welding plant Oxy-Acetylene complete (high pressure)	1
44.	Welding Transformer (150-300 Amps)	1
45.	Infrared thermometer	1
46.	AC/DC clampmeter (1000 Amp)	1
47.	Electric feed pump	1
48.	Tractor splitting kit (one rail and roller jack)	1
49.	Telescoping magnet (1 Kg)	1
50.	Seal pusher	1
51.	Multipurpose bearing pusher and remover	1 each

D) WORKSHOP FURNITURE

Sr. No.	Name of Item	Quantity
1.	Book shelf (glass panel) 6½ ‘ x 3’ x 1½’	As required
2.	Computer Chair	1+1
3.	Computer Table	1+1
4.	Desktop computer and related MS office software	1+1
5.	Discussion Table 8’ x 4’ x 2½ ‘	2
6.	Fire Extinguishers, first- aid box	As required
7.	Internet connection with all accessories	As required
8.	Laser printer	1
9.	LCD projector/ LED /LCD TV (42”)	1
10.	Multimedia DVD for Automotive application/subjects	As required
11.	Online UPS 2KVA	1
12.	Stools	31
13.	Storage Rack 6½ ‘ x 3’ x 1½’	As required
14.	Storage shelf 6½ ‘ x 3’ x 1½’	As required.
15.	Suitable class room furniture	As required
16.	Suitable Work Tables with vices	As required
17.	Tool Cabinet - 6½ ‘ x 3’ x 1½’	4
18.	Trainees locker 6½ ‘ x 3’ x 1½’ (to accommodate 30 Lockers)	2 Nos.

E) BASIC TECHNICAL DRAWING

Sr. No.	Name of Item	Quantity
1.	Draughtsman drawing instrument box	30+1 Set
2.	Set square celluloid 45 ⁰ (250 X 1.5 mm)	30+1 Set
3.	Set square celluloid 30 ⁰ -60 ⁰ (250 X 1.5 mm)	30+1 Set
4.	Mini drafter	30+1 Set
5.	Drawing board (700mm x500 mm) IS: 1444	30+1 Set

F) GENERAL MACHINERY SHOP OUTFIT

Sr. No.	Name of Item	Quantity
1.	Draughtsman table	30 Nos.
2.	Draughtsman stool	30 Nos.
3.	Computer Latest version compatible for running Auto CAD software, preloaded with windows and 20” colour Monitor.	15 Nos.
4.	Plotter (Max. A3 size) (Max. A0 size)	1 No.
5.	Laser Jet printer latest model	1 No.
6.	UPS - 5 KVA	2 Nos.
7.	Computer table	15 Nos.
8.	Computer chairs	30 Nos.

7.2 LIST OF CONSUMABLES

Sr. No.	Name of Item	Quantity
1.	Automatic Transmission oils	As required
2.	Battery- Lead Acid (Automotive)	As required
3.	Brake fluids	As required
4.	Chalk, Prussian blue.	As required
5.	Chemical compound for fasteners (Loctite)	As required
6.	Diesel	As required
7.	Different type gasket material and sealant	As required
8.	Different type of oil seal	As required
9.	Drill Twist (assorted)	As required
10.	Emery paper - 36-60 grit , 80-120	As required
11.	Engine coolant	As required
12.	Engine oil	As required
13.	Gear oils	As required
14.	Hacksaw blade (consumable)	As required
15.	Hand rubber gloves tested for 5000 V	5 pair
16.	Holdings, lamp teakwood boards, plug sockets, solders, flux wires and cables batteries round consumable blocks, thimble and other consumables	As required
17.	Hydrometer	8
18.	Lapping abrasives	As required
19.	Leather Apron	5
20.	Petrol	As required
21.	Power steering oil	As required
22.	Radiator Coolants	As required
23.	Safety glasses	As required
24.	Steel wire Brush 50mmx150mm	5
25.	Engine Spare Parts	As per req.
26.	Field crops like wheat, Soya bean, paddy etc.	As desired
27.	Gloves for Welding (Leather and Asbestos)	5 sets
28.	Cotton Jute	As required
29.	Electrodes	As required
30.	Safety goggles	8

7.3 LIST OF RECOMMENDED BOOKS

1. Farm Power, Machinery and Surveying by Ali Irshad; Kitab Mahal, Allahabad.
2. Pesticide Application Equipment by Bindra D.S. and Harcharan Singh; Oxford and I.B.H. Publication Co.
3. Centrifugal Pumps by Church, A and Jagdish Lal
4. Farm Machinery by Culpin C.; Crosley Rockwood and Sons Hd. London.
5. Pump Operation and Maintenance by Hicks; Mc-Graw -Hills, New Delhi.
6. Tractor Engine Maintenance and Repair by Jain, S.C. and Rai C.R.; Tata Mc-Graw-Hills Publishing Co. Ltd., New Delhi.
7. Farm Machines and Equipments by Nakra C.P.; Dhanpat Rai and Sons, 1682 Nai Sarak, Delhi.
8. Royal Tractor Mechanic by Ramesh; Royal Book Depot (Regd.) Mairhran Gate; Jullunder.
9. Guide to Tractor Operations and Maintenance by Rao, E.G.K; Asia Publishing house, Bombay-1964.
10. Fundamental of Agricultural Tractors by Sharma AP; Metropolitan, Delh.
16. Farm Machinery and equipment by Smith P.H.; Mc-Graw-Hill Book Co., Inc. New York.
17. Farm Machinery by Stone and Gulvin; John Willey and Sons, Inc. London.
18. Fundamentals of Machine Operation (FMO) Tractors by John Deere Service Training Deptt. F.John Dade Road, Moline, Illinois 61265.
19. Shakti Chalit Thresheron Ka Prachalan Aur Rakh-Rakhav (Hindi) by Verma M.R., Bhardwaj, K.C. Patra, S.L.; CIAE, Bhopal.
20. Tractor Tantral Auam Anurakshan (Hindi) by Bhardwaj K.C. Verma M.R., Patra S.K.; CIAE, Bhopal.
21. Tractor Prachalan, Anurakshan Auam Utapnna Hone Wale Desh Tatna Nirakram (Hindi) by Saxena B.B. Sidduque S.Z.; CIAE, Bhopal.
22. Power Tiller Prachalan Anurakshan Auam chalit Yantra (Hindi) by Varshney A.C. Nargang; CIAE, Bhopal.
23. Power Tillers and Matching Implements by Pandey, M.M. Bohra C.P. Maheshwari, R.C. & Tomar, S.S. ; CIAE, Bhopal.
24. Motorcycle Scooter Thntra Ani Mantri (Marathi) by Apte M.S.; Yantra Vigyan Prakashan, 264/3, Shaniwar Peth, Pune.
25. Elements of Agricultural Engineering by Jagdishwar Sahay; Standard Publishes-Distributors-Delhi
30. Principal of Agricultural Engg. Vol-I by A.M. Michel and T.P Ojha; Jain Brothers, New Delhi
31. Principal of Agricultural Engg. Vol-II by A.M. Michel and T.P Ojha; Jain Brothers, New Delhi

32. Farm Machinery Design (Principles and Problems by D N Sharma and S. Mukesh; Jain Brothers, New Delhi.
33. Objectives and Solved Problems in Farm Power and Machinery Engineering by R Suresh; Standard Publishers Distributors
34. Farm Tractor : Maintenance and Repair – 2012 by Jain S.C. and C.R. Rai; Standard Publishers Distributors (2012)
35. Farm Machinery An Approach by S. C. Jain
36. Principles of Farm Machinery by Kepner; C.B.S.
37. Hydraulic Machinery by Abdullah; Dhanpat Rai and Sons, Delhi.
38. Farm mechanism and Farm Machinery and Power by O.P. Singhal; Orient Offset Printers
39. Mechanical Estimating and Costing by B.P.Sinha; Tata McGraw Hill, New Delhi
40. Mechanical Estimating and Costing by TTTI, Madras; Tata McGraw Hill, New Delhi
41. Production Engineering, Estimating and Costing by M Adithan and BS Pabla; Konark Publishers, New Delhi
42. Agricultural Engineering Question Bank by Jain Brothers
43. Tractor Engines: Maintenance and Repair by Jain S.C. and C.R. Rai; McGraw Hill Publishing Co. Ltd.
44. MES – Agriculture – Repair, Maintenance and Field Operation of Tillage Equipment, NIMI, Chennai
45. MES – Agriculture – Repair, Maintenance of Spraying and Dusting Equipment, NIMI, Chennai
46. MES – Agriculture – Repair, Maintenance of Combine Harvester, NIMI, Chennai
47. MES – Agriculture – Repair, Maintenance of Harvesting Equipment, NIMI, Chennai
48. MES – Agriculture – Repair, Maintenance of Soil Forming Equipment, NIMI, Chennai
49. MES – Agriculture – Repair, Maintenance of Irrigation Equipment, NIMI, Chennai
50. MES – Agriculture – Repair, Maintenance of Full Operation of Seed Drill, NIMI, Chennai
51. Teaching Aids:
 - Cutway section charts and flow diagram charts of engine, Tractors, power tiller, combine mopeds, sprayer, dusters and electric motor.
 - Cut way section model of engine starter, electric motor, sprayer, mopeds, power tiller and tractor.
 - Video Films and slides.

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.
2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.
3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.
4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.
5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.
6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

9. LIST OF CONTRIBUTORS/EXPERTS

- a) Following experts participated in the workshop to design curriculum of certificate programme in “Farm Equipment Technician” with NSQF alignment for MRSPTU, Bathinda on 1-2 September, 2016 at NITTTR, Chandigarh.

1.	Prof. Saurabh Prakash, Professor & Head, Department of Engineering and Technology, PSSCIVE, Bhopal
2.	Prof. Pardeep Gupta, Professor, Mechanical Engineering Department, SLIET, Longowal, Punjab
3.	Prof. Anuj Bansal, Associate Professor, Mechanical Engineering Department, SLIET, Longowal, Punjab
4.	Prof. Sunil Kumar, Associate Professor, Mechanical Engineering Department, SLIET, Longowal, Punjab
5.	Shri Sandeep Singh, Regional Manager, TAFE Limited, Ludhiana, Punjab
6.	Shri HS Kalra, Ex-Principal, Govt. ITI, Sector-28, Chandigarh
7.	Shri PS Viridi, Consultant, H.No. 398, Phase-1, Mohali, Punjab
8.	Dr. BS Pabla, Professor & Head, IMCO, NITTTR, Chandigarh
9.	Prof. Rama Chhabra, Associate Professor, IMCO, NITTTR, Chandigarh
10.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

- b) Following experts participated in the workshop to review curriculum of certificate programme in “Farm Equipment Technician” for MRSPTU, Bathinda held on 6 January, 2017 at NITTTR, Chandigarh.

1.	Dr. Ashok Kumar Goel, Director, College Development Council, MRSPTU Campus, Bathinda, Punjab
2.	Dr. Balraj Singh, Director, PIT, Rajpura
3.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
4.	Shri GS Sethi, Consultant, IndiaCan, A-301, Rishi App, Sector 70, Mohali
5.	Shri Asheesh Kumar Saini, Centre Head, IL&FS, IIS, Ropar
6.	Shri Jasvir Singh Tiwana, Associate Professor, GZSCCET, Bathinda
7.	Shri Sikander Singh Sidhu, Assistant Professor, GZSCCET, Bathinda
8.	Shri J Ghosh Roy, Aryabhat Polytechnic, Delhi
9.	Shri Jagdeep Singh, Central Tool Room, A-5, Phase-5, Focal Point, Ludhiana
10.	Shri Rakesh Goel, Estate Officer, NITTTR, Chandigarh
11.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

Curriculum for Certificate Programme in FOOD PROCESSING

**For
Maharaja Ranjit Singh Punjab Technical
University, Bathinda (Punjab)**



Prepared By:

Curriculum Development Centre
**National Institute of
Technical Teachers Training and Research
Sector 26, Chandigarh - 160 019**

January, 2017

FOREWORD

Rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In order to cope with the challenges of handling new materials, machines and technologies, we have to develop human resources having appropriate competencies. There is an increasing demand of skilled workforce in India in particular and the world over in general. Under the new circumstances, India faces a challenging task of meeting the technical manpower requirement, especially in the area of skilled workforce to cater to industrial needs. Efforts have to be made so that passouts from our technical institutions are acceptable at global level.

Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Technical institutions play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab to start the skill oriented integrated courses at certificate, diploma and degree level, as per the needs of the industry, are laudable.

In order to meet the future requirements of technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of technical programmes at various levels. The curricula for various programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of programme and various courses.

The success of any technical programme depends upon its effective implementation. However best the curriculum document is designed, if it is not implemented properly, the output will not be as per expectations. In addition to acquisition of appropriate physical resources, availability of motivated, competent and qualified faculty is equally essential for effective implementation of the curricula.

It is expected that MRSPTU will carry out curriculum evaluation on a continuous basis to identify the new skill requirements. At the same time, it is expected that innovative methods of course offering will be used to develop desired skills and infuse the much needed dynamism in the system.

Dr. M.P. Poonia
Director
National Institute of
Technical Teachers Training & Research
Chandigarh

PREFACE

Curriculum document is a comprehensive plan of an educational programme. It is through the curriculum that the educational objectives of a programme are achieved. It has to be ensured that the curriculum is dynamic, articulated, balanced, data based, feasible, and as per industrial needs. Curriculum Development Centre at NITTTR, Chandigarh has been extending services to technical education system of the states in northern region in developing and updating their curriculum on regular basis.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab assigned the project for developing the curriculum of some integrated programmes to this institute in the month of May 2016. A series of curriculum workshops were held during the months of June-July, 2016. This curriculum document is an outcome of the extensive discussions held with the representatives from various organizations, technical institutions and industry during the curriculum workshops. While developing the study and evaluation scheme and detailed contents, the following aspects have been kept in mind :

- Employment Opportunities of Certificate holders
- Job role of certificate holders
- Learning outcome of the Programme
- Mobility of students for their professional growth

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Industrial Training in the curriculum. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which units on Communication Skills have been introduced in both the semesters of the certificate course.

We hope that this curriculum document will prove useful in producing skilled manpower at desired level in the state of Punjab. The success of this outcome-based curriculum depends upon its effective implementation and it is expected that MRSPTU will make all efforts to create better facilities, develop linkages with the world-of-work and foster conducive and requisite learning environment as prescribed in the curriculum document.

Professor and Head
Curriculum Development Centre
NITTTR, Chandigarh

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance and guidance received from the following persons:

- i) Vice Chancellor, Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bhatinda, Punjab for entrusting this project of curriculum design to NITTTR, Chandigarh.
- ii) Director, College Development Council MRSPTU for his support and active involvement in the curriculum development.
- iii) Director, National Institute of Technical Teachers' Training and Research, Chandigarh for his support and academic freedom provided to Curriculum Development Centre.
- iv) All the experts from industry/field organizations, universities, ITIs and other technical institutions for their professional inputs during curriculum workshops.
- v) Faculty from different departments of NITTTR, Chandigarh for content updation.
- vi) Shri Yogendra Kaushal, Stenographer, Curriculum Development Centre, NITTTR, Chandigarh for processing the document.
- vii) Shri Mohan Lal Bindal, Assistant, Curriculum Development Centre for his support and secretarial assistance in the conduct of curriculum design workshops.

Coordinator

SALIENT FEATURES OF THE PROGRAMME

1.	Sector	:	Food Processing Industries
2.	Name of the Certificate Programme	:	Food Processing
3.	Entry Qualification	:	Matriculation or equivalent NSQF Level as prescribed by MRSPTU, Bathinda
4.	Duration of the Programme	:	One Year
5.	Intake	:	30
6.	Pattern of the Programme	:	Semester Pattern
7.	NSQF Level	:	Level - III
8.	Ratio between theory and Practice	:	20 : 80 (Approx.)

2. JOB ROLE AND JOB OPPORTUNITIES

The Indian food industry is poised for huge growth, increasing its contribution to world food trade every year. In India, the food sector has emerged as a high-growth and high-profit sector due to its immense potential for value addition, particularly within the food processing industry. Accounting for about 32 per cent of the country's total food market, the Government of India has been instrumental in the growth and development of the food processing industry. The government through the Ministry of Food Processing Industries (MoFPI) is making all efforts to encourage investments in the business. It has approved proposals for joint ventures (JV), foreign collaborations, industrial licenses and 100 per cent export oriented units. Availability of skilled manpower has been identified as one of the major challenges of Indian Food Processing Industry. The Ministry of Food Processing Industries (MoFPI) is working in close collaboration with Food Industry Capacity and Skill Initiative (FICSI), the Sector Skill Council (SSC) in food processing and regularly guiding and assisting it in achieving its mandate. The food processing sector in the country is mainly handled by the unorganized sectors. About, 42% of the output comes from the unorganized sector, 25% comes from the organized sector and the rest of it comes from the small scale players. The small-scale food processing sector is a major source of employment and adds value to crops by processing.

i) Job Roles

Food processing operations includes many methods that are used to add value to the raw food materials (including marine products, poultry and meat) which can be consumed by human beings or animals. Raw food materials are transformed into edible products processing and value addition. The processed food industry is divided into the following broad segments, in which the certificate holders in Food Processing have a major role to play in processing:

- Primary processed food - which includes products such as fruits and vegetables, packed milk, unbranded edible oil, milled rice, flour, tea, coffee, pulses, spices, and salt, sold in packed or non-packed forms.
- Secondary and tertiary processing (Value-added processed food) - which includes products such as processed fruits and vegetables, juices, jams, pickles, squashes, processed dairy products (ghee, paneer, cheese, and butter), processed meat, fish and poultry, and processed marine products, confectionary, chocolates, and alcoholic beverages.

ii) Job Opportunities

On successful completion of this course, students should be able to find gainful job opportunities in the industries like those listed below besides exploring

possibilities of being an entrepreneur and be self-employed. The list given below is only indicative and not comprehensive.

(a) Wage employment

- Fruit and vegetable processing
- Bakery and confectionery
- Dairy
- Meat, fish and poultry
- Grain milling
- Quality control
- Educational institutions
- KVIC etc

(b) Self employment

- Fruit and vegetable processing
- Bakery and confectionery
- Dairy
- Milling of grains and spices
- Snacks
- Service units to larger industry/ ancillary units etc.

3. LEARNING OUTCOMES OF THE PROGRAMME

After successful completion of this programme, the students will be able to:

- Prepare different bakery products as per standards, analyse their quality, troubleshoot defects in them.
- Prepare different meat, fish and poultry products hygienically, analyse their quality and troubleshoot defects in them.
- Prepare different fruits and vegetable products hygienically, analyse their quality and troubleshoot defects in them.
- Prepare different types of milk and milk products hygienically, analyse their quality.

CONTENTS

Sr. No	Particulars	Page No.
-	Foreword	(i)
-	Preface	(ii)
-	Acknowledgements	(iii)
1.	Salient Features of the Programme	1
2.	Job Role and Job Opportunities	2
3.	Learning Outcomes of the Programme	4
4.	Study and Evaluation Scheme	5
5.	Guidelines for Assessment of Student Centred Activities	7
6.	Detailed Contents of Various Units	8-31

FIRST SEMESTER

1.1	Communication Skills	8
1.2	Bakery Products	10
1.3	Meat, Fish and Poultry Products	14
-	Industrial Training – I (4 Weeks)	18

SECOND SEMESTER

2.1	Basic Sciences	19
2.2	Fruits and Vegetable Processing	21
2.3	Milk and Milk Products	26
2.4	Project Work	29
-	Industrial Training – II (4 Weeks)	31

7.	Resource Requirements	32-41
7.1	List of Tools/Equipment	33
7.2	List of Consumables	38
7.3	List of Recommended Books	39
8.	Recommendations for Effective Curriculum Implementation and Evaluation	41
9.	List of Contributors/Experts	42

4. STUDY AND EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN FOOD PROCESSING

FIRST SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1		*Communication Skills	8	24	1	25	50	75	25	1	75	3	100	175
1.2		Bakery Products	32	256	10	25	100	125	50	2	100	4	150	275
1.3		Meat, Fish and Poultry Products	32	160	7	25	100	125	25	1	100	4	125	250
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training (during vacation)			-	-	4	-	-	-	-	-	100	4	100	100
Total			72	488	24	75	275	350	100	-	375	-	475	825

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ Industrial Training

After examination of 1st Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

Total weeks per Semester = 16 Total working days per week = 5 Total hours per day = 7

Total hours in a Semester = 16 x 5 x 7 = 560

One credit is defined as one hour of lecture per week or two hours of practicals per week for one semester. Fractions in credits have been rounded to nearest integer.

SECOND SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1		*Basic Sciences	48	-	3	25	-	25	50	2	-	-	50	75
2.2		Fruits and Vegetable Processing	32	192	8	25	100	125	50	2	100	4	150	275
2.3		Milk and Milk Products	32	160	7	25	100	125	50	2	100	4	150	275
2.4		Project Work	-	48	2	-	50	50	-	-	75	2	75	125
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training			-	-	4	-	-	-	-	-	100	4	100	100
Total			112	448	26	75	275	350	150	-	375	-	525	875

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ Industrial Training

After examination of 2nd Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

5. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 25 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- i. 5 Marks for general behavior and discipline
(by Principal in consultation with all the trainers)
- ii. 5 Marks for attendance as per following:
(by the trainers of the department)
 - a) 75% Nil
 - b) 75 - 80% 2 Marks
 - c) 80 - 85% 3 Marks
 - d) Above 85% 5 Marks
- iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 15 - National Level participation or inter-University competition
 - b) 10 - Participation in two of above activities
 - c) 5 - Participation in internal sports of the University

Note: There should be no marks for attendance in the internal sessional of different subjects.

UNIT – 1.1 : COMMUNICATION SKILLS	
LEARNING OUTCOMES:	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Speak confidently. • Overcome communication barriers. • Write legibly and effectively. • Listen in proper prospective. • Read various genres adopting different reading techniques. • Respond to telephone calls effectively. 	
Practical	Theory
(24 Hours)	(08 Hours)
	Basics of Communication <ul style="list-style-type: none"> • Process of communication • Types of communication - formal and informal, oral and written, verbal and non-verbal • Objectives of communication • Essentials of communication • Barriers to communication <p style="text-align: right;">(1 hour)</p>
<ul style="list-style-type: none"> • Looking up words in a dictionary (meaning and pronunciation) <p style="text-align: right;">(2 hours)</p>	Functional Grammar and Vocabulary <ul style="list-style-type: none"> • Parts of speech • Tenses • Correction of incorrect sentences <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Self and peer introduction • Greetings for different occasions <p style="text-align: right;">(1 hour)</p>	Listening <ul style="list-style-type: none"> • Meaning and process of listening • Importance of listening • Methods to improve listening skills Speaking <ul style="list-style-type: none"> • Importance • Methods to improve speaking • Manners and etiquettes <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Newspaper reading <p style="text-align: right;">(1 hour)</p>	Reading <ul style="list-style-type: none"> • Meaning • Techniques of reading: skimming, scanning, intensive and extensive reading <p style="text-align: right;">(1 hour)</p>

<ul style="list-style-type: none"> • Vocabulary enrichment and grammar exercises • Exercises on sentence framing accurately (6 hours) 	<p>Functional Vocabulary</p> <ul style="list-style-type: none"> - One word substitution - Commonly used words which are often misspelt - Punctuation - Idioms and phrases <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Reading aloud articles and essays on current and social issues • Comprehension of short paragraph (5 hours) 	
<ul style="list-style-type: none"> • Write a short technical report • Letter writing (3 hours) 	
<ul style="list-style-type: none"> • Participate in oral discussion • Respond to telephonic calls effectively • Mock interview (6 hours) 	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT – 1.2 : BAKERY PRODUCTS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Mill different types of wheat in different types of mills
- Prepare different bakery products
- Analyse the quality of different bakery products
- Perform CIP, COP and maintenance of utensils, equipments and machines associated with bakery industry
- Package and store processed bakery products appropriately
- Identify and troubleshoot defects/spoilage in prepared/stored products

Practical	(256 Hours)	Theory	(32 Hours)
<ul style="list-style-type: none"> • Identification of different food products and their names in Hindi/ Punjabi and English • Identifications of different food additives (preservatives, emulsifiers, thickeners, colours, flavours, sweeteners, etc.) used in food processing • Practice of general rules of safety, occupational health, personal hygiene and sanitation • Demonstration and perform cleanliness and maintenance exercises of workstation, equipment and instruments <p style="text-align: right;">(6 hrs)</p>		<ul style="list-style-type: none"> • Introduction to food processing • Importance of food processing • Historical development of food industry • Food Industry Scenario - Global, Indian and North Indian • Importance and sources of nutrients (Carbohydrates, Proteins, Fats, Vitamins and Minerals) • General methods and principles of food processing and preservation • Significance and general rules of safety, occupational health, personal hygiene and sanitation • Significance of cleanliness (Clean In Place-CIP and Clean Out of Place -COP) and maintenance of workstation, equipments and instruments <p style="text-align: right;">(4 hrs)</p>	
<ul style="list-style-type: none"> • Determination of physical characteristics of wheat (hardness, softness) • Milling of wheat by different methods • Estimation of flour quality (moisture, ash, fat, protein, carbohydrates) • Estimation of gluten content • Determination of water absorption power of flour <p style="text-align: right;">(40 hrs)</p>		<ul style="list-style-type: none"> • Different types of Indian wheat, structure and composition of wheat • Wheat milling by roller mill (break system and reduction system) • Types of flour • Suitability of flours for different bakery products • Importance of gluten in bakery products <p style="text-align: right;">(8 hrs)</p>	

<ul style="list-style-type: none"> • Identification of bakery equipment • Bread making by straight dough and sponge dough method. • Bun making (Fruit bun) • Preparation of bread rolls (soft and hard) • Preparation of bread sticks • Preparation of French bread • Preparation of two different variants of bread • Quality evaluation of bread (loaf volume, softness/hardness, crumb structure) • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipments and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(68 hrs)</p>	<ul style="list-style-type: none"> • Role of raw materials used in bakery industry (water, flour, leavening agents, salt, sugar, shortening and their standards) • Theory of bread making • Different methods for making bread (straight dough, sponge dough method) • Bread faults and remedies • Quality parameters of bread <p style="text-align: right;">(8 hrs)</p>
<ul style="list-style-type: none"> • Preparation of biscuit making (plain, nut, melting moments, chocolate, ginger) • Preparation of cookies • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipments and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(36 hrs)</p>	<ul style="list-style-type: none"> • Theory of biscuit making • Types of biscuits • Defects in biscuits and their remedial actions <p style="text-align: right;">(4 hrs)</p>

<ul style="list-style-type: none"> • Preparation of Khatai • Quality evaluation of biscuits (color, spread factor, hardness/softness) • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(30 hrs)</p>	
<ul style="list-style-type: none"> • Preparation of cake (basic sponge, plain cakes, fruit cake, icing of cake) • Preparation of pastry • Preparation of pasta • Quality evaluation of pasta (moisture, hardness of raw and cooked pasta) • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/stored products <p style="text-align: right;">(36 hrs)</p>	<ul style="list-style-type: none"> • Theory of cake and pastry making • Types of cakes • Cake faults and their remedies • Theory of icing • Different shapes of pasta <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> • Preparation of noodles • Quality evaluation of noodles (moisture, hardness of raw and cooked noodles) • Preparation of various puffs • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments 	<ul style="list-style-type: none"> • Introduction to noodle making • Types of noodles • Puff pastry <p style="text-align: right;">(4 hrs)</p>

<ul style="list-style-type: none"> • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/stored products <p style="text-align: right;">(30 hrs)</p>	
<ul style="list-style-type: none"> • Visit to different bakery industries • Virtual tour of different bakery industries using audio-visual aids (relevant movies, documentaries, etc.) <p style="text-align: right;">(10 hrs)</p>	<ul style="list-style-type: none"> • Etiquettes, professional ethics and discipline during visits to different industries • Tips on tour report writing and flow diagram preparation of the industry as well as individual products <p style="text-align: right;">(2 hrs)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Sketching

UNIT – 1.3 : MEAT, FISH AND POULTRY PRODUCTS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Identify different animals for meat production and different cuts of meat
- Prepare different meat, fish and poultry products
- Analyse the quality of meat, fish and poultry products
- Perform CIP, COP and maintenance of utensils, equipment and machines associated with meat, fish and poultry processing
- Package and store processed meat, fish and poultry products appropriately
- Identify and troubleshoot defects/spoilage in prepared/ stored products

Practical	(160 Hours)	Theory	(32 Hours)
<ul style="list-style-type: none"> • Identification of different animals for meat production and different cuts of meat. • Visit to slaughter houses • Ante-mortem and post-mortem examination and judgment of animal/slaughtered animal • Quality evaluation of meat 	(15 hrs)	<ul style="list-style-type: none"> • Introduction: scope and development of meat, fish and poultry Industries in India. • Importance of hygiene and sanitation during inspection, handling, slaughtering, preparation of the egg, poultry, meat and fish products • Common terms used in meat industry 	(6 hrs)
<ul style="list-style-type: none"> • Carcass cutting • Estimation and determination of pH of meat. • Product formulation. • Preparation of meat based convenience food (meat balls, patties, meat loaf) • Preparation of cured meat. • Preparation of different type of sausages (semi cooked, cooked) • Preparation of canned meat. • Preparation of meat pickles • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material 		<ul style="list-style-type: none"> • Introduction to meat and different types of meat products • Composition and nutritive value of muscle • Different types of slaughtering methods for different meat animals • Factors affecting the quality of meat • Abattoir – definition and construction; basic preparatory procedures (commutation, emulsification, pre-blending) 	(6 hrs)

<ul style="list-style-type: none"> • Identification and troubleshooting (Symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(35 hrs)</p>	
<ul style="list-style-type: none"> • Evaluation of carcass quality of poultry. • Preparation of ready to cook poultry • Retail cuts of dressed chicken • Preparation of tandoori chicken • Preparation of chicken sausage. • preparation of chicken patties. • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (Symptoms, causes and changes to make) of defects/spoilage in prepared/stored products <p style="text-align: right;">(35 hrs)</p>	<ul style="list-style-type: none"> • Introduction to poultry processing • Inspection of poultry birds • Composition and nutritive value of poultry meat, • Pre-slaughter care, handling, factors affecting the quality, dressing of a poultry bird and Indian Standards of dressed chicken • Preservation of poultry meat by Chilling, Freezing, Curing, Smoking, Dehydration, Canning and Radiation <p style="text-align: right;">(6 hrs)</p>
<ul style="list-style-type: none"> • Candling and grading of eggs (Indian and US grading) • Measurement of air cells of egg. • Determination of Haugh's unit. • Formation of Iron sulphide in cooked eggs • Calculation of shape and size index of egg. • Determination of specific gravity of eggs • Preservation of whole egg (egg cleaning, cold storage, oil Treatment, cold storage, thermo stabilization, immersion in liquids). • Preparation of egg pickle. • Preparation of egg powder • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment 	<ul style="list-style-type: none"> • Introduction to egg and egg products • structure, chemical composition and nutritive value • Spoilage of eggs and preservation by different methods • Packaging of whole egg. <p style="text-align: right;">(4 hrs)</p>

<p>and instruments</p> <ul style="list-style-type: none"> • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (Symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p>(30 hrs)</p>	
<ul style="list-style-type: none"> • Judging the freshness of fish • Grading of Fish • Filtering & staking of fish • Salting of fish by different methods. • Preparation of fish pickle. • Cooking of fish by different methods • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (Symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p>(30 hrs)</p>	<ul style="list-style-type: none"> • Fish and fish Products • Types of fish, composition and nutritive value • Different preservation and cooking methods for fish and processed fish products <p>(4 hrs)</p>
<ul style="list-style-type: none"> • Visit to industries for demonstration of by-products and waste disposal <p>(5 hrs)</p>	<ul style="list-style-type: none"> • Safety standards in meat industry • By-products of meat, fish, poultry and egg industry <p>(4 hrs)</p>
<ul style="list-style-type: none"> • Visit to different meat, fish and poultry processing industries • Virtual tour of different meat, fish and poultry processing industries using audio-visual aids (relevant movies, documentaries, etc.) <p>(10 hrs)</p>	<ul style="list-style-type: none"> • Etiquettes, professional ethics and discipline during visits to different industries • Tips on tour report writing and flow diagram preparation of the industry as well as individual products in the industry <p>(2 hrs)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Sketching

INDUSTRIAL TRAINING – I (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 1st Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

UNIT – 2.1 : BASIC SCIENCES

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Apply the basic principles of maths in solving the basic problems of the trade.
- Apply the basic principles of physics in solving the basic problems of the trade.

Practical	Theory (48 Hours)
	<p>Mathematics</p> <ul style="list-style-type: none"> • Basic Algebra – algebraic formula. Simultaneous equation – quadratic equations (4 hours) • Simultaneous linear equation in two variables (3 hours) • Arithmetic and geometric progression, sum of n-terms, simple calculations. (3 hours) • Mensuration – Find the area of regular objects like triangle, rectangle, square and circle; volumes of cube, cuboid, sphere cylinder (6 hours) • Trigonometry - Concept of angle, measurement of angle in degrees, grades and radians and their conversions, T-Ratios of Allied angles (3 hrs) • Co-ordinate Geometry - Cartesian and polar coordinates, conversion from cartesian to polar coordinates (2 hrs) • Concept of Differentiation and Integration (3 hrs)
	<p>Physics</p> <ul style="list-style-type: none"> • FPS, CGS, SI units, dimensions and conversions (2 hours) • Force, speed, velocity and acceleration – Definition, units and simple problems (3 hours)

	<ul style="list-style-type: none"> • Stress and strain, modulus of elasticity (2 hours) • Heat and temperature, its units and specific heat of solids, liquids and gases (4 hours) • Electricity and its uses, basic electricity terms and their units, D.C. and A.C., positive and negative terminals, use of switches and fuses, conductors and insulators (5 hours) • Work, Power and Energy-Defination, units and simple problems (4 hours) • Concept of force, Inertia, Newton's First law of motion; momentum and Newton's second law of motion; Impulse; Newton's third law of motion. (2 hrs) • Friction and Lubrication (1 hour) • Law of conservation of energy (1 hour)
--	---

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

UNIT – 2.2 : FRUITS AND VEGETABLE PROCESSING

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Identify and use different fruits and vegetables and additives for making different products
- Prepare different fruits and vegetable products at cottage/small scale industrial level
- Perform CIP, COP and maintenance of utensils, equipment and machines associated with fruits and vegetable processing
- Package and store processed fruits and vegetable appropriately
- Identify and troubleshoot defects/spoilage in prepared/stored products

Practical	(192 Hours)	Theory	(32 Hours)
<ul style="list-style-type: none"> • Identification of different fruits and vegetables and their names in Hindi/ Punjabi and English • Identification of different food additives (preservatives, emulsifiers, thickeners, colours, flavours, sweeteners, etc.) used in fruits and vegetable processing • Identification and working of different fruits and vegetables processing utensils (kettles, ladles, measuring cups, etc.), instruments (refractometer, hydrometer, pH meter, vacuum gauge, seam checking gauge, digital balance, thermometer, etc.) and machines (sorter, grader, washers, peelers, cutters, homogeniser, corking, sealing machines, etc.). • Practice of general rules of safety, occupational health, personal hygiene and sanitation • Cleanliness and maintenance of workstation, equipment and instruments <p align="right">(40 hrs)</p>		<ul style="list-style-type: none"> • Introduction and importance of fruits & vegetable processing • Historical development of fruits & vegetable processing and preservation industries • Fruits and vegetable Industry scenario- Global, Indian and North Indian • General methods and principles of preservation <p align="right">(4 hrs)</p>	
<ul style="list-style-type: none"> • Preparation of Jam, Jelly and Marmalade • Preparation of Preserves (Murraba) • Preparation of different chutneys and pickles 		<ul style="list-style-type: none"> • Principle and procedure of preparation of product under study • Specifications and quality of raw materials and additives used in the 	

<ul style="list-style-type: none"> • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(32 hrs)</p>	<p>preparation of products undertaken</p> <ul style="list-style-type: none"> • Specification of product as per BIS (Bureau of Indian Standards)/ FSSAI (Food Safety and Standards Authority of India)/ CAC (Codex Alimentarius Commission) • Batch wise formulation • Yield calculation • Quality evaluation and sensory analysis of products • Nutritional benefits and nutritional changes during fruits and vegetable processing/ preservation • Packaging specifications, proper packaging and ambient storage of prepared material • Waste utilisation • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(4 hrs)</p>
<ul style="list-style-type: none"> • Preparation of different wines • Preparation of vinegar • Preparation of fruit leather (mango, etc.) • Preparation of fruit candy, fruit toffees, fruit cheese and fruit bars • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/spoilage in prepared/stored products <p style="text-align: right;">(30 hrs)</p>	<ul style="list-style-type: none"> • Principle and procedure of preparation of product under study • Specifications and quality of raw materials and additives used in the preparation of products undertaken • Specification of product as per BIS (Bureau of Indian Standards)/ FSSAI (Food Safety and Standards Authority of India)/ CAC (Codex Alimentarius Commission) • Batch wise formulation • Yield calculation • Quality evaluation and sensory analysis of products • Nutritional benefits and nutritional changes during fruits and vegetable processing/ preservation • Packaging specifications, proper packaging and ambient storage of prepared material

	<ul style="list-style-type: none"> • Waste utilisation • Introduction to troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(4 hrs)</p>
<ul style="list-style-type: none"> • Preparation of ketchup, sauces, puree and pastes • Preparation of frozen fruits and vegetables • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(30 hours)</p>	<ul style="list-style-type: none"> • Principle and procedure of preparation of product under study • Specifications and quality of raw materials and additives used in the preparation of products undertaken • Specification of product as per BIS (Bureau of Indian Standards)/ FSSAI (Food Safety and Standards Authority of India)/ CAC (Codex Alimentarius Commission) • Batch wise formulation • Yield calculation • Quality evaluation and sensory analysis of products • Nutritional benefits and nutritional changes during fruit and vegetable processing/ preservation • Packaging specifications, proper packaging and ambient storage of prepared material • Waste utilisation • Introduction to troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(6 hrs)</p>
<ul style="list-style-type: none"> • Preparation of RTS (Ready to Serve) beverages (Juices), Squashes, Syrups, Fruit Cocktail Syrup, Crushes, Nectars and fruit based carbonated beverages • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments 	<ul style="list-style-type: none"> • Principle and procedure of preparation of product under study • Specifications and quality of raw materials and additives used in the preparation of products undertaken • Specification of product as per BIS (Bureau of Indian Standards)/ FSSAI (Food Safety and Standards Authority of India)/ CAC (Codex Alimentarius Commission)

<ul style="list-style-type: none"> • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(30 hrs)</p>	<ul style="list-style-type: none"> • Batch wise formulation • Yield calculation • Quality evaluation and sensory analysis of products • Nutritional benefits and nutritional changes during fruits and vegetable processing/ preservation • Packaging specifications, proper packaging and ambient storage of prepared material • Waste utilisation • Introduction to troubleshooting (Symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(6 hrs)</p>
<ul style="list-style-type: none"> • Preparation of Ready to Eat (RTE) chips • Preparation of different dehydrated and dried fruits and vegetable products • Canning of fruits and vegetables • Cut out analysis of canned food products • Preparation of different fruits and vegetable powders • Practice of CIP (Clean in Place) and COP (Clean out of Place), SPS (Sanitary and Phyto- Sanitary) measures and maintenance of workstation, equipment and instruments • Practice of proper packaging and ambient storage of prepared material • Identification and troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(20 hrs)</p>	<ul style="list-style-type: none"> • Principle and procedure of preparation of product under study • Specifications and quality of raw materials and additives used in the preparation of products undertaken • Specification of product as per BIS (Bureau of Indian Standards)/ FSSAI (Food Safety and Standards Authority of India)/ CAC (Codex Alimentarius Commission) • Batch wise formulation • Yield calculation • Quality evaluation and sensory analysis of products • Nutritional benefits and nutritional changes during fruits and vegetable processing/ preservation • Packaging specifications, proper packaging and ambient storage of prepared material • Waste utilisation • Introduction to troubleshooting (symptoms, causes and changes to make) of defects/ spoilage in prepared/ stored products <p style="text-align: right;">(5 hrs)</p>

<ul style="list-style-type: none"> • Visit to different fruits and vegetable processing industries • Virtual tour of different fruits and vegetable processing industries using audio-visual aids (relevant movies, Documentaries, etc.) <p style="text-align: right;">(10 hrs)</p>	<ul style="list-style-type: none"> • Introduction to etiquettes, professional ethics and discipline during visits to different industries • Tips on tour report writing and flow diagram preparation of the industry as well as individual products in the industry. <p style="text-align: right;">(2 hrs)</p>
---	--

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Sketching

UNIT – 2.3 : MILK AND MILK PRODUCTS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Identify different types of milk and milk products
- Prepare different milk products
- Analyse the quality of different types of milk and milk products
- Perform CIP, COP and maintenance of utensils, equipment and machines associated with types of milk and milk products in the industry
- Package and store processed different types of milk and milk products appropriately
- Identify and troubleshoot defects/spoilage in prepared/stored products

Practical	(160 Hours)	Theory	(32 Hours)
<ul style="list-style-type: none"> • Identification of machines, glassware, and utensils in dairy industries • Cleaning of utensils, glassware used in dairy industry and their handling • Practice of pipeting and measurement of sample <p style="text-align: right;">(6 hrs)</p>		<ul style="list-style-type: none"> • Introduction: status and scope of dairy industries in India • White revolution • Opportunities of employment • Importance of hygiene and sanitation from milking to milk and milk products handling <p style="text-align: right;">(4 hrs)</p>	
<ul style="list-style-type: none"> • Sampling of milk • Perform physical examination of milk. • Perform platform tests of milk (organoleptic test, clot on boiling test, alcohol test, and acidity) • Estimation of fat by Gerber method • Estimation of specific gravity of milk <p style="text-align: right;">(14 hrs)</p>		<ul style="list-style-type: none"> • Milk definition, types of milk, composition, physico-chemical properties of milk. Nutritive value of milk. • Collection of milk • Principles and methods used for milk processing. • Study of working of equipment used i.e. homogenizer, pasteurizer, cream separator, deep freezer, softy making machine, ice-cream, freezer, jacketed kettles etc. <p style="text-align: right;">(6 hrs)</p>	
<ul style="list-style-type: none"> • Estimation of SNF content of milk • Detection of various adulterants in milk. • Microbiological quality testing of milk by (MBRT, SPC) • Milk standardization by Pearson square method <p style="text-align: right;">(16 hrs)</p>			

<ul style="list-style-type: none"> • Perform homogenization of milk • Perform batch, flash, and continuous pasteurization. • Maintenance, cleaning of equipments and their handling • Corrective and preventive action for safe operation <p style="text-align: right;">(12 hrs)</p>	<ul style="list-style-type: none"> • Standards for milk and milk products. <p style="text-align: right;">(4 hrs)</p>
<ul style="list-style-type: none"> • Preparation of different types of milk (Standard milk, toned milk, double toned milk, flavored milk, condensed milk) • Practical demonstration on filling and sealing machine <p style="text-align: right;">(20 hrs)</p>	
<ul style="list-style-type: none"> • Identification of different parts of cream separator and it's working. • Preparation of cream • Testing of fat, SNF and acidity • Storage of cream and shelf life study. • Identification of butter churner, its parts, cleaning and handling • Preparation of butter • Testing of butter fat. • Estimation of overrun in butter cost calculation. • Estimation of fat, SNF and acidity in butter milk. • Utilization and preparation of different types of butter milk. • Demonstration of kettles, handling and safety during preparation. • Preparation of ghee and its quality analysis (moisture, ghee residue,) • Preparation of different products from ghee residue i.e. Pinni, Sweets, and use as filler <p style="text-align: right;">(32 hrs)</p>	<ul style="list-style-type: none"> • Cream: composition, types of cream, and their production methods, effects of temperature in cream production, • Butter: composition, theory of churning, production methods, and defects • Ghee: composition, different methods of production, and defects • Preparation of coagulated/fermented products. • Basics of fermentation and coagulation. <p style="text-align: right;">(6 hrs)</p>

<ul style="list-style-type: none"> • Preparation of: <ul style="list-style-type: none"> - Paneer - Channa - Channa based product - Processed cheese - Mawa/khoa - Dahi - Srikhand - Different sweets - Khoa • Determination of lactose in whey. • Preparation of whey Ready to Serve (RTS) • Preparation of whey powder. • Study of packing material for above products <p style="text-align: right;">(30 hrs)</p>	<ul style="list-style-type: none"> • Preparation methods, compositions and classification of following: <ul style="list-style-type: none"> - Paneer - Channa - Processed cheese - Mawa/khoa - Dahi - Srikhand - Different sweets <p style="text-align: right;">(4 hrs)</p>
<ul style="list-style-type: none"> • Demonstration of ice-cream freezer, its parts, working, cleaning and handling • Preparation of Ice-cream, softy, kulfi. • Demonstration of spray, drum driers and its parts and handling. • Determination of Moisture, fat, SNF of dried product. • Determination of solubility index • Reconstitution of skim milk • Determination of overrun in ice-creams <p style="text-align: right;">(20 hrs)</p>	<ul style="list-style-type: none"> • Frozen products: • Ice-cream: definition, composition, role of ingredients used, technology and principles, methods of production and prevention of defects in ice-cream. • Kulfi and softy: Composition and method of production • Dry milk products • Types of milk powder, baby foods and their composition, principles of drying (drum drying, spray drying and defects) <p style="text-align: right;">(6 hrs)</p>
<ul style="list-style-type: none"> • Visit to different milk processing industries • Virtual tour of different milk processing industries using audio-visual aids (Relevant movies, Documentaries, etc.) <p style="text-align: right;">(10 hrs)</p>	<ul style="list-style-type: none"> • Introduction to etiquettes, professional ethics and discipline during visits to different industries • Tips on tour report writing and flow diagram preparation of the industry as well as individual products in the industry <p style="text-align: right;">(2 hrs)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Sketching

UNIT – 2.4 : PROJECT WORK (48 Hours)

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Implement the theoretical and practical knowledge and skills gained through various units into an application suitable for a real practical working environment, preferably in an industrial environment.
- Explain the working of industrial environment and its work ethics.
- Identify and contrast gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge and skills, as required.
- Work in collaboration and prepares project report.
Troubleshoot of hardware and software problems.

Project work aims at developing innovative skills in the students whereby they apply in totality the knowledge and skills gained through various units in a solution of particular problem or by undertaking a project. The individual students have different aptitudes and strengths. Project work, therefore, should match the strengths of students.

For this purpose, students should be asked to identify a project execute the same. It is also essential that the trainer/instructor/faculty of the trade conducts a brainstorming session to identify suitable project assignments for the students.

The project assignment can be individual assignment or a group assignment. There should not be more than 3 students, if the project work is given to a group.

The students should identify themselves or accept the given project assignment at least two to three months in advance. The project work identified in collaboration with industry should be preferred. Trainer/instructor/faculty is expected to guide the project work of all the students.

The project assignments may consist of preparation of at least 7 unique products choosing at least one from the following categories:

- Bakery
- Meat
- Fish
- Eggs
- Fruits
- Vegetable
- Milk

The following organizations may be considered for arranging the project based professional training:

- Bakeries
- Meat, Fish, and Poultry products industries
- Fruits and Vegetables products industries
- Dairy and Milk product industries

Means of Assessment

- Viva-voce
- Report writing
- Presentation

INDUSTRIAL TRAINING – II (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 2nd semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

7. RESOURCE REQUIREMENTS

7.1 LIST OF TOOLS/EQUIPMENT

Sr. No.	Description	Quantity
1.	Rolling Pin 12"	2 Nos.
2.	Table Spoons	20 Nos.
3.	Tea Spoons	20 Nos.
4.	Forks	20 Nos.
5.	Cutting Knives	2 Nos.
6.	Wooden Spoons	10 Nos.
7.	Rolling Pins 22"	2 Nos.
8.	Sandwich Pins 7"	2 Nos.
9.	Cake Pan	2 Nos.
10.	Pastry Cutters	2 Nos.
11.	Measuring Jug	2 Nos.
12.	Palette Knives	2 Nos.
13.	Egg Beater	2 Nos.
14.	Cup Enamel or Glass	2 Nos.
15.	Swiss Roll Tins	2 Nos.
16.	Petty Tins in Sheet of Six	2 Nos.
17.	Small Flan Tins	2 Nos.
18.	Large Flan Tins	2 Nos.
19.	Enamel Bowls (5 Pins)	2 Nos.
20.	Degachis (Small)(Stainless Steel)	2 Nos.
21.	Flour Sieves 7"	6 Nos.
22.	Rubbish Bowl (Basin)	1 No.
23.	Measuring Spoons	1 Set
24.	Cake Tins 6"Loose Bottom	2 Nos.
25.	Trays for Ingredients	2 Nos.
26.	Graters	6 Nos.
27.	Lime Squeezer	2 Nos.
28.	Small Scale	1 No.
29.	Large Scale	1 No.
30.	Palette Knife 18" Blade for Icing	1 No.
31.	Large Cutting Knives	2 Nos.
32.	Biscuit cutter	24 Nos.
33.	Boat Tins	8 Nos.
34.	Madeline Tins	12 Nos.
35.	Icing Gun	3 Nos.
36.	Cream Horn Tins	2 Nos.
37.	Large Egg Beater(wire stings)	4 Nos.
38.	Moulds and Nozzles with star Shape	6 Nos.
39.	Moulds and Nozzles for Royal Icing Roses	2 Nos.
40.	All Types of Nozzles with star shape	6 Nos.
41.	Scissors	1 No.
42.	Tin Opener	1 No.
43.	Pastry Brushes (Different Sizes)	6 Nos.
44.	Piping Bags	6 Nos.

45.	Scoopers	6 Nos.
46.	Pastry Tongs	6 Nos.
47.	Cake cotters	2 Nos.
48.	Strip cutters	6 Nos.
49.	Turn Tables	3 Nos.
50.	Thermometers	3 Nos.
51.	Set of Cake Tins: - <ul style="list-style-type: none"> • 3' loose Bottom • 6 "Loose Bottom • 8 "Loose Bottom • 10" Loose Bottom • 12" Loose Bottom 	1 Set
52.	Bread Tins	100 Nos.
53.	Slab Cake Tins: - <ul style="list-style-type: none"> • 15 x 11 • 10x 10 • 9 x 7 • 11 x9 	2 each
54.	Peelers	2 Nos.
55.	Large Enamel-Bowl s	2 Nos.
56.	Large Sugar Sieve	1 No.
57.	Large Flour Sieve	1 No.
58.	Small Nut Grinder	1 No.
59.	Vacuum Gauge for checking of vacuum of can	01 No.
60.	Pressure Gauge or checking of pressure of can	01 No.
61.	Refracto-meter (Pocket) 0-32, 28-62, 58-92 ⁰ B Sugar Scale	02 Nos.
62.	Brine meter (Salincimeter)	02 Nos.
63.	Hydrometers of different ranges 0-30, 30-60, 60-90, Brixhydrometer	01 Nos.
64.	pH Meter	01 No.
65.	Working table with 6-3x21/2 Aluminum tops	2+2 Nos.
66.	Fruit Trays	6+2 Nos.
67.	Enamel mugs	8 Nos.
68.	Enamel bowls	8 Nos.
69.	Pulper Electric 1/4 Tonne capacity per 8 hrs with 1 HP Motor and two S.S: Seives (1/16 mesh. 1/32 mesh)	01 No.
70.	Thermometer upto 300°C	06 Nos.
71.	Pressure Cooker	02 Nos.
72.	Sealing Machine plastic	01 No.
73.	Vegetable grader	01 No.
74.	Sandashi (Tongs)	01 No.
75.	Perforated spoons S.S.12" length 4" dia	06 Nos.
76.	Slicing Machine/slicer electrically operated	01 No.
77.	Coring knives	06 Nos.
78.	Pitting knives	06 Nos.
79.	Cutting knives	06 Nos.
80.	Juice Extractor (Screw type) 1 HP motor	01 No.

81.	Lime Juice Extractor & orange juice halving & Burring	01 No.
82.	Bottle filling machine-Electrically operated with 1 HP motor	01 No.
83.	Crown corking machine hand operated	01 No.
84.	Pilfer proof capping machine	01 No.
85.	Platform Weighing balance (digital) 20 Kg.	04 Nos.
86.	Stainless steel knives	6 pcs +16 pcs
87.	Spoons of assorted large size	16 pcs
88.	Stainless steel degdhes	6 pcs
89.	Can and cork opener	6 pcs
90.	Jelemeters	6 Nos.
91.	Jelly Filter bags	4 Nos.
92.	Glass Funnels of assorted sizes	12 Nos.
93.	Enamelled trays of assorted sizes	16 Nos.
94.	Enamelled buckets or stainless buckets	06 Nos.
95.	Gas burner with cylinder.	06 Nos.
96.	Aluminium container 50 litres capacity	2+2 Nos.
97.	2 Industrial burner with cylinders	2 Nos.
98.	4 Double burners with cylinders	2 Nos.
99.	Electric Mixer	1 No.
100.	Spoons, Wooden Ladles	16 Nos.
101.	Cooking range electric	01 No.
102.	Rubber Gloves	12 pair for each trainee
103.	Aprons	01 for each trainee
104.	Refrigerator 310 Ltr.	01 No.
105.	Food Processor	02 Nos.
106.	Vegetable Cutter	01 No.
107.	Potato Peeler	01 No.
108.	Tray dryer	01 No.
109.	Fruit mill	01 No.
110.	Auto claves 20 lit cap	02 Nos.
111.	S.S.Vessels with lids 10 lit cap.	05 Nos.
112.	S.S. Vessels with lids 5 lit cap.	05 Nos.
113.	S.S.Vessels with lids 2 lit cap.	10 Nos.
114.	Wooden Basket press (For pineapple juice extraction) 10 kgs capacity	01 No.
115.	Kipps Apparatus	03 Nos.
116.	Seperating Funnels 500ml & 100ml.	12 Nos.
117.	Test Tube – 25 ml, 50 ml	100 each
118.	Micrometer Seam Checking guage'	01 No.
119.	Water Bath	02 Nos.
120.	Retorts	01 No.
121.	Food Processor	01 No.
122.	Hot air oven	01 No.
123.	Homogenizer (two stage)	01 No.
124.	Decanter	01 No.

125.	Four door refrigerator	01 No.
126.	Meat mincer	1 No.
127.	Pulverizer	1 NO.
128.	Meat cutting knives, heavy duty Stainless steel	As required
129.	Cooking stoves	4 Nos.
130.	Water purifier	1 No.
131.	Seed germinator	1 No.
132.	Cutting machine	2 Nos.
133.	Canning unit	1 No.
134.	Heat sealing machine	1 No.
135.	Lug cap bottle sealing machine	1 No.
136.	Cabinet dryer	1 No.
137.	Pressure cookers	4 Nos.
138.	Working tables :Stainless Steel	1 No.
139.	Platform weighing balance	3 Nos.
140.	Stainless Steel Spoon of various sizes	As required
141.	Egg illumination chamber	1 No.
142.	Sausage forming machine	1 No.
143.	Mini dairy plant: Complete Mini- processing unit for milk.	1
144.	Milk Chiller : For chilling milk up to a temperature of about -10 °C	1
145.	Milk cans : Made of steel/ Aluminium, 40 lit capacity	2
146.	Cream separator : Motor operated, Centrifugal, capacity up to 1-2 Kg/ cream per min.	2
147.	Cheese vat : Made of heavy Stainless steel (306), size approx. 4'X 2.5'X 1' with proper outlet and taps	1
148.	Plate pasteurizer (Lab model)	1
149.	Butter churner	1
150.	Boiler (Lab scale)/Baby Electric Boiler	1
151.	Deep fridge	1
152.	Steam jacketed kettle with scrapper	1
153.	Mawa making machine	1
154.	Crown corking machine	5
155.	Ice cream plant	1
156.	Garber Centrifuge : For Fat estimation in milk,	4
157.	Milk Butyrometer for fat estimation	100
158.	Electric oven/Hot air oven	4
159.	Desicator (Glass)	5
160.	Weighing balance Digital (min 0.1 gm to max 5 kg)	2
161.	Steam Jacketed Kettle	1
162.	Can body reformer and can flanger	1
163.	Can seamer	1
164.	Exhaust box.	1
165.	Cup sealer	1
166.	Vernier caliper : 15 cm. 0.01 mm LC	2

167.	Screw Gauge : Micrometer, 0.001 mm LC,10 cm cap	4
168.	Steel scale : 12 “ standard steel	2
169.	Steel Measuring tape : Scales 1 meter, and of 50 ft.	2
170.	Weight balances Digital(min 0.01gm to max 1kg)	1
171.	Hot plate : Electrical 2 KW	1
172.	Spray drier (Lab Scale)	1
173.	Sealing machine : Hand / pedal operated	1
174.	Syrup tanks : 20, 50 lit capacity SS	1
175.	Pressure cooker : 5 Kg and 10 Kg SS	1
176.	Vacuum filling machine : For filling liquid in bottles, 200 ml, 500 ml, 1000 ml. Manual	As required
177.	SS filter : Sieve type cloth filter, hydraulic,	1
178.	Sugar Coating pan : SS, Revolving type with speed control	1
179.	Bottle opener : Stainless Steel	4
180.	Burette with stand : 50 ml ordinary glass	50
181.	Pipette : 0.1 to 1ml, 2ml, 5ml, 10ml, 10.75ml	As required
182.	Lab glassware's : Different sizes and types	As required
183.	Working tables : Stainless Steel Size 6' X 3'	1
184.	Improved stoves : Made of MS with proper safety measures, valves etc	1
185.	Stainless steel / Aluminium pots : Different capacities	As required
186.	Milko Tester (for fat testing of milk)	1
187.	Lactometer	20
188.	Lactometer Jar	20
189.	Solubility Index Mixer	1
190.	Solubility Index Centrifuge	1
191.	Softy Making Machine	1
192.	Butter Mould	2
193.	Butter Worker	1
194.	Beaker - 50, 100, 250 ml, 500 ml	12 Nos. each
195.	Conical flask -50, 100, 250 ml, 500 ml	12 Nos. Each
196.	Measuring cylinder 100ml, 200 ml, 500ml,	12 Nos. Each
197.	Measuring flask 250 ml	12 Nos.
198.	Burette with stands 50 cc	50 Nos.
199.	Pipettes 25cc & 10 cc, 5 cc	20 Nos. Each
200.	Thermo motor (10°C to 110°C)	30 PCS
201.	Digital thermometer (0-250°)	04 Nos.
202.	Egg Yolk Quality Tester	01 No.
203.	Bostwick Consistometer	01 No.
204.	Microscope	01 No.
205.	Mini Milk Processing Plant	01 No.

BASIC EQUIPMENT FOR SETTING UP OF BAKERY

Sr. No.	Description	Quantity
1.	Heavy Duty Electric Oven	2 Nos.
2.	Set of Scales (Avery Big One)	2 Nos.
3.	Small Bakery Oven	2 Nos.
4.	Refrigerator	1 No.
5.	Deep Fridge	1 No.
6.	Dry Powder	1 No.
7.	Standing Shelving Racks with Trays	4 Nos.
8.	Bin Containers	4 Nos.
9.	Weighing Scale (Small)	1 No.
10.	Cup Boards	2 Nos.
11.	Wash Basins	2 Nos.
12.	Swill Bins(Big)	2 Nos.
13.	Dough Mixer with variable speed	2 Nos.
14.	Demonstration Table with Marble Top	3 Nos.
15.	Grinding Machine	1 No.
16.	Cooling Racks with Trays	1 No.
17.	Kneading Table	1 No.
18.	Stock Pots	3 Nos.
19.	Mixer grinder	2 Nos.

FURNITURE

Sr. No.	Description	Quantity
1.	Working Table with 6-3x21/2 Aluminum tops	01 No.
2.	Cup Board (large)	04 Nos.
3.	Laboratory table with rack (8'x2'-6" -6") and sinks	04 Nos.
4.	Instructor's table and chairs	1 Set
5.	Racks for keeping books etc.	01 Set
6.	Wooden show case for keeping the samples & display of the products.	02 Nos.
7.	Instructor Chair & Table	01 Nos.
8.	Dual Desk	10 Nos.
9.	White Board	01 Nos.
10.	Suitable Work tables (Wooden)	05 Nos.
11.	Stools (high)	20 Nos.
12.	Discussion Table	01 No.
13.	Tool Cabinet	01 No.
14.	Trainees Locker with space for 20	01 No.
15.	First Aid Box	01 No.
16.	Book Shelf (glass panel)	01 No.
17.	Storage rack	01 No.
18.	Book Shelf (glass panel)	1
19.	Storage rack	1

7.2 LIST OF CONSUMABLES (Quantity : As per Requirement)

1.	Wheat
2.	Maida
3.	Semolina (Suji/Rawa)
4.	All purpose flour
5.	Bread flour
6.	Protective gloves, hats, hairnets, coats, boots
7.	Sanitizers, Dishwashing Chemicals, Bleach, Chlorine
8.	Sugar
9.	Salt
10.	Bakery shortening
11.	Additives (Sugar, salt, colours etc.)
12.	Different types of pasta
13.	Cream
14.	Noodles
15.	Video camera for recording the visit
16.	Different types and varieties of fruits and vegetables
17.	Protective gloves, hats, hairnets, coats, boots
18.	Sanitizers, Dishwashing Chemicals, Bleach, Chlorine
19.	Fruits and vegetables - different types, varieties and at different levels of ripening
20.	Carbon-di-oxide gas cylinders- filled
21.	Oil
22.	Spices and condiments
23.	Different meat samples
24.	Different cuts of meat samples
25.	Carcass of big animal
26.	Woods for smoking, liquid smoke
27.	Spices and condiments
28.	Sausage casings
29.	Eggs- different varieties and colours
30.	Different types of fish
31.	Milk
32.	Rennet enzyme
33.	Different strains of Microbial Culture (Lactococcus, Lactobacillus, Streptococcus, Propionibacter, etc.) families

7.3 LIST OF RECOMMENDED BOOKS

1. Essentials of Food and Nutrition by Swaminathan Vol. I and II, Health Kalyani publishers, New Delhi
2. Hand book of Analysis of Fruits and Vegetables by S. Ranganna, Tata Me Graw- Hill. Publishing Company, New Delhi
3. Food Chemistry by FANNEMA,
4. Hand Book of Food & Nutrition by Swaminathan, Narosa Publishing House, New Delhi
5. Nutrition & Dietetics by Joshi, Tata McGraw-Hill Education, New Delhi
6. Fundamentals of Food & Nutrition by Sumati R. Mudambi, Published by New Age International (P) Ltd.,
7. Food Science by Sri Laxmi, New Age International Publishers, New Delhi
8. Foods: Facts and Principles by Shakuntala Maney
9. Food Science by NN Potter, CBS publishers, New Delhi
10. Principles of Food Science Vol. – I by Fennema, Karrel, McGraw-Hill Book Company, New York
11. Preservation of Fruits and Vegetables by Girdhari Lal, Sidhapa and Tandon, CBS Publishers, Delhi
12. Hand book of Analysis of Fruits and Vegetables by S Ranganna, Tata Me Graw- Hill. Publishing Company, New Delhi
13. Food Composition & Preservation by Bhawna Sabarwal, Commonwealth Publishers 1999, New Delhi.
14. Food Preservation by S.K. Kulshrestha, vikas publishing house Pvt. Ltd., New Delhi
15. Handling, Transportation and Storage of Fruits and Vegetables by A Lloyd, Ryall Penizer (AVI Publications)
16. Food Storage Part of a system by Sinha and Muir (AVI)
17. Drying and Storage of Grains and Oilseeds by Brooker & Hall, CBS
18. Milk and Milk Products by Eckles and Eckles, Tata McGraw-Hill Education Pvt. Limited;
19. Outlines of Dairy Technology by Sukmar De, Oxford University Press, India
20. Dairy Plant System and Layout by Tufail Ashmed, McGraw-Hill Education (India) Pvt Ltd.
21. Chemistry & Testing of Dairy Products by Atherton Newlander, John Alvin Newlander Publisher: Westport
22. Preservation of Fruits and Vegetable by Vijaya Khader; Kalyani Publication
23. Post Harvest Technology of Fruits and Vegetables – Handling, Processing, Fermentation and Waste Management y LR Verma and VK Joshi
24. Processing Fruits: Science & Technology vol 1-2 by Somogyi
25. Processing Vegetables: Science & Technology vol 1-2 by Somogyi
26. Meat Science by Lawrie, Heinemann Educational Books Ltd., London
27. Egg Science and Technology by PC Pande, Vikas Publishing House (P) Ltd, New Delhi
28. Fish Processing and Preservation by CL Cutting (Agro Botanical Publisher)
29. Poultry, Meat and Egg Products by Parkursh and Mountney (CBS Publishers)
30. Fish Processing Technology by GM Hall (Blackie Publishers)
31. Bakery Engineering and Technology, Vol. I and II by Matz; CBS
32. Bakery Products Published by SIRI
33. Cereal Technology by Kent; CBS

34. Basic Baking by SC Dubey
35. Practical Handbook of Bakery by US Wheat Associates
36. Handbook of Packaging by Paine and Paine; Morgan-Grampian Publishing Co., New York (1976).
37. Manual of Analyzing for Fruits and Vegetables Products by S Ranganna; CBS Publishers & Distributor, New Delhi.
38. Food Analysis by Suzzane Nielsen
39. ISI Handbook of Food Analysis- (18 Volumes in 5 parts)- BIS
40. AOAC- 18th Edition- (CD ROM Edition)
41. Quality Control for the Food Industry (Vol. I and II) by Kramer and Twigg (AVI)
42. Laboratory Methods of Sensory Evaluation by Larmond
43. Sensory Analysis by Piggot
44. Hand Book of Food Analysis by S.N. Mahindru
45. The Chemical Analysis of Food and Food Products by Jacobs

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.
2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.
3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.
4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.
5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.
6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

9. LIST OF CONTRIBUTORS/EXPERTS

- a) Following experts participated in the workshop to design curriculum of certificate programme in 'Food Processing' with NSQF alignment for MRSPTU, Bathinda on 6-7 July, 2016 at NITTTR, Chandigarh.

1.	Dr. D C Saxena, Professor & Head, Deptt. of Food Engineering and Technology, Sant Longowal Institute of Engineering and Technology, Longowal-148106, District Sangrur, Punjab
2.	Dr. Kawaljit Singh Sandhu, Ch. Devi Lal University, Sirsa, Haryana
3.	Mr. Bhupinder Singh, Assistant Professor, Deptt. of Food Technology, Ch. Devi Lal State Institute of Engineering and Technology, Panniwala Mota, Sirsa, Haryana
4.	Mrs. Damandeep, Retd. Principal, Govt. Home Science College, House No. 1066, First Floor, Sector 15-B, Chandigarh
5.	Mrs. Madhu Nanda, Retd. Principal, Govt. Home Science College, House No. 578, Sector 16-D, Chandigarh
6.	Dr. Nirupa Marwaha, Professor, Deptt. of Food & Nutrition, Govt. Home Science College, Sector 10, Chandigarh 160 010
7.	Mr. Vedpal Yadav, Department of Food Technology, Govt. Polytechnic, Mandi Adampur, Hisar, Haryana
8.	Mr. Mohit Jindal, Department of Food Technology, Govt. Polytechnic, Mandi Adampur, Hisar, Haryana
9.	Mr. Vishal Kalia, Sr. Lecturer, Chandigarh Institute of Hotel Management & Catering Technology, Sector-42, Chandigarh
10	Mr. Manoj Kumar Pandey, Senior Technician, Deptt. of Food Engineering and Technology, Sant Longowal Institute of Engineering and Technology, Longowal-148106, District Sangrur, Punjab
11	Mrs. Baljit Kaur, Govt. Industrial Training Institute, Patiala, Punjab
12	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
13	Prof. PK Singla, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

- b) Following experts participated in the workshop to design curriculum of certificate programme in 'Food Processing' with NSQF alignment for MRSPTU, Bathinda on 29 July, 2016 at NITTTR, Chandigarh.

1.	Dr. D C Saxena, Professor & Head, Deptt. of Food Engineering and Technology, Sant Longowal Institute of Engineering and Technology, Longowal-148106, District Sangrur, Punjab
2.	Mr. Vedpal Yadav, Department of Food Technology, Govt. Polytechnic, Mandi Adampur, Hisar, Haryana
3.	Mr. Mohit Jindal, Department of Food Technology, Govt. Polytechnic, Mandi Adampur, Hisar, Haryana
4.	Mr. Manoj Kumar Pandey, Senior Technician, Deptt. of Food Engineering and Technology, Sant Longowal Institute of Engineering and Technology, Longowal-148106, District Sangrur, Punjab.

- c) Following experts participated in the workshop to review the curriculum of certificate programme in 'Food Processing' for MRSPTU, Bathinda on 20 January, 2017 at NITTTR, Chandigarh:

1.	Dr. MM Malhotra, Ex-Principal, TTTI, Chandigarh
2.	Shri Arvind Dixit, Advance Technology, Sector 24, Chandigarh
3.	Dr. Ashok Kumar Goel, Director, College Development Council, MRSPTU, Bathinda, Punjab
4.	Shri Kulmohan Singh, Ex-HOD, Electrical Engg., CCET (Diploma Wingh), Sector 26, Chandigarh
5.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
6.	Shri Rakesh Goel, Estate Officer, NITTTR, Chandigarh
7.	Shri Pritpal Singh Aulakh, GZSCCET, Bathinda
8.	Shri Naib Singh, Sr. Technician, GZSCCET, Bathinda
9.	Shri Jagdip Singh, , Sr. Technician, GZSCCET, Bathinda
10.	Prof. PK Singla, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh
11.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.
2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.
3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.
4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.
5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.
6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

Curriculum
for
Certificate Programme
In
Servicing and Maintenance of
Electronic Instruments
for
Maharaja Ranjit Singh Punjab Technical
University, Bathinda (Punjab)



Prepared By:

Curriculum Development Centre
National Institute of
Technical Teachers Training and Research
Sector 26, Chandigarh - 160 019

January, 2017

FOREWORD

Rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In order to cope with the challenges of handling new materials, machines and technologies, we have to develop human resources having appropriate competencies. There is an increasing demand of skilled workforce in India in particular and the world over in general. Under the new circumstances, India faces a challenging task of meeting the technical manpower requirement, especially in the area of skilled workforce to cater to industrial needs. Efforts have to be made so that passouts from our technical institutions are acceptable at global level.

Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Technical institutions play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab to start the skill oriented integrated courses at certificate, diploma and degree level, as per the needs of the industry, are laudable.

In order to meet the future requirements of technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of technical programmes at various levels. The curricula for various programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of programme and various courses.

The success of any technical programme depends upon its effective implementation. However best the curriculum document is designed, if it is not implemented properly, the output will not be as per expectations. In addition to acquisition of appropriate physical resources, availability of motivated, competent and qualified faculty is equally essential for effective implementation of the curricula.

It is expected that MRSPTU will carry out curriculum evaluation on a continuous basis to identify the new skill requirements. At the same time, it is expected that innovative methods of course offering will be used to develop desired skills and infuse the much needed dynamism in the system.

Dr. M.P. Poonia
Director
National Institute of
Technical Teachers Training & Research
Chandigarh

PREFACE

Curriculum document is a comprehensive plan of an educational programme. It is through the curriculum that the educational objectives of a programme are achieved. It has to be ensured that the curriculum is dynamic, articulated, balanced, data based, feasible, and as per industrial needs. Curriculum Development Centre at NITTTR, Chandigarh has been extending services to technical education system of the states in northern region in developing and updating their curriculum on regular basis.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab assigned the project for developing the curriculum of some integrated programmes to this institute in the month of May 2016. A series of curriculum workshops were held during the months of June-July, 2016. This curriculum document is an outcome of the extensive discussions held with the representatives from various organizations, technical institutions and industry during the curriculum workshops. While developing the study and evaluation scheme and detailed contents, the following aspects have been kept in mind :

- Employment Opportunities of Certificate holders
- Job role of certificate holders
- Learning outcome of the Programme
- Mobility of students for their professional growth

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Industrial Training in the curriculum. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which units on Communication Skills have been introduced in both the semesters of the certificate course.

We hope that this curriculum document will prove useful in producing skilled manpower at desired level in the state of Punjab. The success of this outcome-based curriculum depends upon its effective implementation and it is expected that MRSPTU will make all efforts to create better facilities, develop linkages with the world-of-work and foster conducive and requisite learning environment as prescribed in the curriculum document.

Professor and Head
Curriculum Development Centre
NITTTR, Chandigarh

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance and guidance received from the following persons:

- i) Vice Chancellor, Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bhatinda, Punjab for entrusting this project of curriculum design to NITTTR, Chandigarh.
- ii) Director, College Development Council MRSPTU for his support and active involvement in the curriculum development.
- iii) Director, National Institute of Technical Teachers' Training and Research, Chandigarh for his support and academic freedom provided to Curriculum Development Centre.
- iv) All the experts from industry/field organizations, universities, ITIs and other technical institutions for their professional inputs during curriculum workshops.
- v) Faculty from different departments of NITTTR, Chandigarh for content updation.
- vi) Shri Yogendra Kaushal, Stenographer, Curriculum Development Centre, NITTTR, Chandigarh for processing the document.
- vii) Shri Mohan Lal Bindal, Assistant, Curriculum Development Centre for his support and secretarial assistance in the conduct of curriculum design workshops.

Coordinator

1. SALIENT FEATURES OF THE PROGRAMME

1.	Sector	:	Electronics
2.	Name of the Certificate Programme	:	Servicing and Maintenance of Electronic Instruments
3.	Entry Qualification	:	Matriculation or equivalent NSQF Level as prescribed by MRSPTU, Bathinda
4.	Duration of the Programme	:	One Year
5.	Intake	:	30
6.	Pattern of the Programme	:	Semester Pattern
7.	NSQF Level	:	Level - III
8.	Ratio between theory and Practice	:	20 : 80 (Approx.)

2. **JOB ROLE AND JOB OPPORTUNITIES**

a) Job Role

A certificate holder in Servicing and Maintenance of Electronic Instruments is responsible for servicing, repair and maintenance of various electronic instruments by discovering faulty parts and also use proper tools to repair them.

b) Job Opportunities

On successful completion of this course, the candidates shall be gain fully employed in the following industries:

1. Various Consumer/Domestic Electronics appliance Manufacturing Industry.
2. Service industries like BSNL, MTNL, Home appliances manufacturing company, Railways, ISRO, Naval dockyard, RCF, BPCL etc.
3. Manufacturers of Audio and Video Equipment
4. In public sector industries like BHEL, BEML, NTPC, AIR INDIA etc and private industries in India & abroad.
5. Various Consumer electronics company like Videocon, Samsung, LG, Onida, Akai, Panasonic, Sony, IFB, Godrej, , Whirlpool etc
6. Self employment

3. LEARNING OUTCOMES OF THE PROGRAMME

After undergoing the programme, students will be able to:

1. Identify various active and passive components and their applications.
2. Handle different types of Electronic measuring Instruments
3. Identify and rectify different types of faults in electronics equipments.
4. Repair, and maintenance of SMPS, UPS, Inverter, solar power system and various analog and digital circuits.
5. Repair, maintenance and installation of LED/ LCD TV.
6. Repair, maintenance and installation of Consumer electronics equipments like Washing Machine, Microwave oven, Induction cook top etc.
7. Repair, maintenance and Installation of DTH systems
8. Repair, maintenance and Installation of CCTV
9. Apply basic principles of math and physics in solving trade problems.
10. Communicate effectively in English with others.

CONTENTS

Sr. No	Particulars	Page No.
-	Foreword	(i)
-	Preface	(ii)
-	Acknowledgements	(iii)
1.	Salient Features of the Programme	1
2.	Job Role and Job Opportunities	2
3.	Learning Outcomes of the Programme	3
4.	Study and Evaluation Scheme	4
5.	Guidelines for Assessment of Student Centred Activities	6
6.	Detailed Contents of Various Units	7-28

FIRST SEMESTER

1.1	Communication Skills	7
1.2	Engineering Drawing (S&MEI)	9
1.3	Basics of Electronics	11
1.4	Measuring Instruments	14
1.5	Power Supply	16
-	Industrial Training - I (4 Weeks)	17

SECOND SEMESTER

2.1	Basic Sciences	18
2.2	Introduction to Digital Electronics	20
2.3	Amplifier and Oscillators	21
2.4	Power Electronics	22
2.5	Consumer Electronics	24
-	Industrial Training - II (4 Weeks)	28

7.	Resource Requirements	29-31
7.1	List of Tools/Equipment	29
7.2	List of Consumables	30
7.3	List of Recommended Books	31
8.	Recommendations for Effective Curriculum Implementation and Evaluation	32
9.	List of Contributors/Experts	33

4. STUDY AND EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN SERVICING AND MAINTENANCE OF ELECTRONICS INSTRUMENTS

FIRST SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1		*Communication Skills	8	24	1	25	50	75	25	1	75	3	100	175
1.2		Engineering Drawing **(S&MEI)	-	32	1	-	50	50	75	3	-	-	75	125
1.3		Basics of Electronics	32	144	7	25	100	125	50	2	100	4	150	275
1.4		Measuring Instruments	16	80	4	25	50	75	50	2	100	4	150	225
1.5		Power Supply	32	144	7	25	100	125	50	2	100	4	150	275
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training (during vacation)			-	-	4	-	-	-	-	-	100	3	100	100
Total			88	472	26	100	375	475	250	-	475	-	725	1200

* Common with other certificate programmes

** Servicing and Maintenance of Electronic Instruments

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ Industrial Training

After examination of 1st Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

Total weeks per semester = 16 Total working days per week = 5 Total hours per day = 7

Total Hours in a semester = 16 x 5 x 7 = 560

One credit is defined as one hour of lecture per week or two hours of practicals per week for one semester. Fractions in credits have been rounded to nearest integer.

SECOND SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1		*Basic Sciences	48	-	3	25	-	25	50	2	-	-	50	75
2.2		Introduction to Digital Electronics	16	80	4	25	50	75	50	2	100	4	150	225
2.3		Amplifier and Oscillators	16	112	4	25	50	75	50	2	100	4	150	225
2.4		Power Electronics	16	96	4	25	50	75	50	2	100	4	150	225
2.5		Consumer Electronics	16	112	5	25	75	100	50	2	100	4	150	250
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training			-	-	4	-	-	-	-	-	100	3	100	100
Total			112	448	26	125	250	375	250	-	500	-	750	1125

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ Industrial Training

After examination of 2nd Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

5. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 25 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- i. 5 Marks for general behavior and discipline
(by Principal in consultation with all the trainers)
- ii. 5 Marks for attendance as per following:
(by the trainers of the department)
 - a) 75% Nil
 - b) 75 - 80% 2 Marks
 - c) 80 - 85% 3 Marks
 - d) Above 85% 5 Marks
- iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/
NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 15 - National Level participation or inter-
University competition
 - b) 10 - Participation in two of above activities
 - c) 5 - Participation in internal sports of the
University

Note: There should be no marks for attendance in the internal sessional of different subjects.

UNIT – 1.1 : COMMUNICATION SKILLS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Speak confidently.
- Overcome communication barriers.
- Write legibly and effectively.
- Listen in proper prospective.
- Read various genres adopting different reading techniques.
- Respond to telephone calls effectively.

Practical	(24 Hours)	Theory	(08 Hours)
		Basics of Communication <ul style="list-style-type: none"> • Process of communication • Types of communication - formal and informal, oral and written, verbal and non-verbal • Objectives of communication • Essentials of communication • Barriers to communication 	(1 hour)
<ul style="list-style-type: none"> • Looking up words in a dictionary (meaning and pronunciation) 	(2 hours)	Functional Grammar and Vocabulary <ul style="list-style-type: none"> • Parts of speech • Tenses • Correction of incorrect sentences 	(2 hours)
<ul style="list-style-type: none"> • Self and peer introduction • Greetings for different occasions 	(1 hour)	Listening <ul style="list-style-type: none"> • Meaning and process of listening • Importance of listening • Methods to improve listening skills Speaking <ul style="list-style-type: none"> • Importance • Methods to improve speaking • Manners and etiquettes 	(2 hours)
<ul style="list-style-type: none"> • Newspaper reading 	(1 hour)	Reading <ul style="list-style-type: none"> • Meaning • Techniques of reading: skimming, scanning, intensive and extensive reading 	(1 hour)

<ul style="list-style-type: none"> • Vocabulary enrichment and grammar exercises • Exercises on sentence framing accurately (6 hours) 	<p>Functional Vocabulary</p> <ul style="list-style-type: none"> - One word substitution - Commonly used words which are often misspelt - Punctuation - Idioms and phrases <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Reading aloud articles and essays on current and social issues • Comprehension of short paragraph (5 hours) 	
<ul style="list-style-type: none"> • Write a short technical report • Letter writing (3 hours) 	
<ul style="list-style-type: none"> • Participate in oral discussion • Respond to telephonic calls effectively • Mock interview (6 hours) 	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT – 1.2 : ENGINEERING DRAWING (S&MEI)

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Draw symbol and free hand sketches of various components
- Prepare and interpret drawings (block diagram/circuit diagram) of electronics instruments.

Practical	(32 hours)	Theory
<ul style="list-style-type: none"> • Free hand sketches of straight line, square, rectangle, circle, polygon etc. (2 hours) • Free hand sketches of hand tools (2 hours) • Types of lines (2 hours) • Dimensions and its type. Use of drawing instruments, T square, set square etc. Lettering practice (2 hours) • Types of scaling of drawings. Electrical symbols (3 hours) • Symbols of electronic components (4 hours) • Schematic diagram of digital multimeter (4 hours) • Draw half wave, full wave and bridge rectifier circuits with and without filters (6 hours) • Block diagram/schematic diagram of regulated power supplies (4 hours) • Orthographic 1st angle projection (3 hours) 		

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Presentation
- Sketching
- Drawing
- Model/prototype making

UNIT - 1.3 : BASICS OF ELECTRONICS

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Use safety measures
- Identify and use different hand tools
- Define basic terms related to electricity
- Perform soldering and de-soldering of various types of electronic components
- Describe working principle of a transformer
- Solder and de-solder SMD components from given PCB
- Identify and use solar cell

Practical	(144 hours)	Theory	(32 hours)
<ul style="list-style-type: none"> • Care and safe working habits, safety precautions to be demonstrated to the trainees <p style="text-align: right;">(3 hrs)</p>		<ul style="list-style-type: none"> • Introduction to safety, safety signs and measures to be taken to maintain the standards of safety of personal working and the equipment <p style="text-align: right;">(4 hrs)</p>	
<ul style="list-style-type: none"> • Demonstration and use of hand tools – screw drivers, pliers, tweezer, tester, wire stripper, electrician knife, steel rule, scribe, punches, hack-saw, hammers, files and drilling machines • Simple fitting practice and drilling practice <p style="text-align: right;">(10 hrs)</p>		<ul style="list-style-type: none"> • Identification, specifications, uses and maintenance of commonly used hand tools <p style="text-align: right;">(4 hrs)</p>	
<ul style="list-style-type: none"> • Identify the phase/line, neutral and earth on power socket • Construct a test lamp and use it to check mains healthiness • Use a tester to check AC power • Measure the voltage between phase and ground, neutral and ground, and rectify earthing • Identify and test different AC mains cables • Skin the electrical wires/cables using the wire stripper and cutter 		<ul style="list-style-type: none"> • Basic terms such as electric charges, potential difference, voltage, current, resistance. Basics of AC and DC. Terms such as +ve cycle, -ve cycle, frequency, time period. RMS, peak, P-P, instantaneous value. Single phase and three phase supply. Terms like line and phase, voltage and currents. Insulator, conductor and semi-conductor properties. Types of wires and cables, standard wire gauge (SWG) <p style="text-align: right;">(7 hrs)</p>	

<ul style="list-style-type: none"> • Measure the gauge of the wire using SWG • Measure AC and DC voltages using multimeter <p style="text-align: right;">(50 hrs)</p>	
<ul style="list-style-type: none"> • Practice of soldering and de-soldering <p style="text-align: right;">(7 hrs)</p>	<ul style="list-style-type: none"> • Types of soldering guns related to temperature and wattages, solder and de-solder materials, use of flux <p style="text-align: right;">(1 hr)</p>
<ul style="list-style-type: none"> • Identify the different types of resistors • Measure the resistor values using colour code and verify the reading by measuring using multimeter • Identify the power rating according to size • Identify the different capacitors and measure capacitance of various capacitors using LCR meter/multimeter • Identify different inductors • Identify the different parts of a relay • Identify different types of mains transformers and test them • Identify the primary and secondary transformer windings • Measure the primary and secondary voltage of different transformer • Identify and use SPST, SPDT, DPST, DPDT, tumbler, push button, toggle, piano switches used in electronic industries <p style="text-align: right;">(50 hrs)</p>	<ul style="list-style-type: none"> • Ohms Law, resistor – definition, types of resistors, specific use, colour coding, power rating. • Types of capacitors, specifications and applications • Types of inductors, specification and applications • Electromagnetic relays, types, construction, specifications – coil voltage and contact current capacity • Working principle of a transformer, specification of a transformer, step-up, step-down and isolation transformers • Fuse – types, use of fuses and its rating • Different switches and their specifications and uses <p style="text-align: right;">(10 hrs)</p>

<ul style="list-style-type: none"> • Identification of 2,3,4 terminal SMD components • De-solder the SMD components from the given PCB • Solder the SMD components in the same PCB • Re-work of SMD/BGA • Check for cold continuity of PCB • Identification of loose/dry solder, broken tracks on printed wired assemblies <p style="text-align: right;">(20 hrs)</p>	<ul style="list-style-type: none"> • Introduction to SMD and BGA technology. Identification of 2,3,4 terminal SMD components, Advantages over conventional lead components • Introduction to solder paste and machine • Soldering/de-soldering of SM assemblies • Tips for selection and inspection of hardware, inspection of SM <p style="text-align: right;">(4 hrs)</p>
<ul style="list-style-type: none"> • Construction of solar panel and its applications i.e. solar light oven, traffic lights, mobile chargers etc. <p style="text-align: right;">(4 hrs)</p>	<ul style="list-style-type: none"> • Define components like solar cell, module, panel and array <p style="text-align: right;">(2 hrs)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Workshop job

UNIT- 1.4 : MEASURING INSTRUMENTS	
LEARNING OUTCOME:	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Identify and use digital multimeter • Use CRO • Use Function Generator 	
Practical	Theory
(80 hours)	(16 hours)
<ul style="list-style-type: none"> • Measure and test the voltage of given cell and battery using digital multimeter (10 hours) • Use of multimeter to measure various functions (ACV, DCV, DCI, ACI, R) (18 hours) • Replace the fuse, battery for the given multimeter (8 hours) • Checking of open, close, short series and parallel circuits with multimeter (12 hours) 	<ul style="list-style-type: none"> • Multimeter – Principle of digital multimeter, study of different controls, precautions to be taken in handling digital multimeter, frequently occurring problems in digital multimeter and the remedial measures (8 hours)
<ul style="list-style-type: none"> • Identify the different controls on the CRO front panel and observe the function of each control (18 hours) • Measure DC voltage, AC voltage, time period using CRO (10 hours) 	<ul style="list-style-type: none"> • Working principle of CRO and its use (6 hours)
<ul style="list-style-type: none"> • Function generator, its use, generation and measurement of frequency and amplitude of various signals (4 hours) 	<ul style="list-style-type: none"> • Basic principles of function generator (2 hours)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Workshop job

UNIT - 1.5 : POWER SUPPLY	
LEARNING OUTCOME:	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Identify and test P-N diode and zener diode • Construct and test diode as a half wave, full wave and bridge rectifier • Identify and select transistors 	
Practical	Theory
(144 hours)	(32 hours)
<ul style="list-style-type: none"> • Testing of diodes (15 hours) • Assemble and test – half wave, full wave and bridge rectifier circuits with and without filter (42 hours) 	<ul style="list-style-type: none"> • Basic electronic components such as P-N diode, Zener diode (5 hours) • Working of half wave, full wave and bridge rectifier circuits (5 hours) • Types of filters (4 hours)
<ul style="list-style-type: none"> • Construct a fixed voltage regulator using 78XX/79XX series ICs (32 hours) • Construct a variable voltage regulator using LM 723 (30 hours) 	<ul style="list-style-type: none"> • Voltage regulator circuit (3 hours) • Introduction to transistor and its application (10 hours)
<ul style="list-style-type: none"> • Observe the output voltage of different IC regulators by varying the input voltage (25 hours) 	<ul style="list-style-type: none"> • Identify the pins of voltage regulator ICs (5 hours)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Presentation
- Viva-voce
- Assembly and disassembly

INDUSTRIAL TRAINING – I (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 1st semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

UNIT – 2.1 : BASIC SCIENCES	
LEARNING OUTCOMES:	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Apply the basic principles of maths in solving the basic problems of the trade. • Apply the basic principles of physics in solving the basic problems of the trade. 	
Practical	Theory (48 Hours)
	<p>Mathematics</p> <ul style="list-style-type: none"> • Basic Algebra – algebraic formula. Simultaneous equation – quadratic equations (4 hours) • Simultaneous linear equation in two variables (3 hours) • Arithmetic and geometric progression, sum of n-terms, simple calculations. (3 hours) • Mensuration – Find the area of regular objects like triangle, rectangle, square and circle; volumes of cube, cuboid, sphere cylinder (6 hours) • Trigonometry - Concept of angle, measurement of angle in degrees, grades and radians and their conversions, T-Ratios of Allied angles (3 hrs) • Co-ordinate Geometry - Cartesian and polar coordinates, conversion from cartesian to polar coordinates (2 hrs) • Concept of Differentiation and Integration (3 hrs)
	<p>Physics</p> <ul style="list-style-type: none"> • FPS, CGS, SI units, dimensions and conversions (2 hours) • Force, speed, velocity and acceleration – Definition, units and simple problems (3 hours)

	<ul style="list-style-type: none"> • Stress and strain, modulus of elasticity (2 hours) • Heat and temperature, its units and specific heat of solids, liquids and gases (4 hours) • Electricity and its uses, basic electricity terms and their units, D.C. and A.C., positive and negative terminals, use of switches and fuses, conductors and insulators (5 hours) • Work, Power and Energy-Defination, units and simple problems (4 hours) • Concept of force, Inertia, Newton's First law of motion; momentum and Newton's second law of motion; Impulse; Newton's third law of motion. (2 hrs) • Friction and Lubrication (1 hour) • Law of conservation of energy (1 hour)
--	---

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

UNIT - 2.2 : INTRODUCTION TO DIGITAL ELECTRONICS

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Identify different logic gates by number printed on them
- Describe different logic levels of TTL & CMOS
- Construct truth tables using NAND and NOR gates

Practical	(80 hours)	Theory	(16 hours)
<ul style="list-style-type: none"> • Identify different logic gates (AND, OR, NAND, NOR, X-OR, X-NOR, NOT ICs) by the number printed on them and draw I/O pin-out numbers (16 hrs) • Verify the truth tables of all logic gate ICs by connecting switches and LEDs (16 hrs) • Construct and verify the truth table of all the gates using NAND and NOR gates (24 hrs) • Use digital IC tester to test various digital ICs (TTL and CMOS) (24 hrs) 		<ul style="list-style-type: none"> • Introduction to digital electronics. Difference between analog and digital signals. (5 hrs) • Logic families and their comparison, logic levels of TTL and CMOS (5 hrs) • Logic gates and truth tables. (6 hrs) 	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Sketching

UNIT - 2.3 : AMPLIFIERS AND OSCILLATORS

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Describe various transistor configurations and their characteristics
- Identify type of biasing done
- Construct and test RC-coupled and Class A, B and C amplifiers

Practical	(112 hours)	Theory	(16 hours)
<ul style="list-style-type: none"> • Construct Transistor CB, CE, CC configuration circuits and test input and output characteristics (32 hours) • Construct and test RC coupled amplifier (20 hours) • Construct and test a Class A, B and C amplifier (40 hours) 		<ul style="list-style-type: none"> • Transistor (CB, CE and CC) configurations and their characteristics and applications, transistor's biasing. (5 hours) • RC coupled amplifier, push-pull amplifier, voltage gain, concept of dB, dBm (7 hours) 	
<ul style="list-style-type: none"> • Construct and test a RC phase shift oscillator and a crystal oscillator (20 hours) 		<ul style="list-style-type: none"> • Study of crystal and RC oscillators (4 hours) 	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 2.4 : POWER ELECTRONICS

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Install UPS system and perform routine maintenance of batteries
- Identify various components of SMPS
- Diagnose and rectify faults in SMPS

Practical	(96 hours)	Theory	(16 hours)
<ul style="list-style-type: none"> • Identify and test MOSFET, IGBT, DIAC, SCR, TRIAC 	(28 hours)	<ul style="list-style-type: none"> • MOSFET – precautions while handling. • IGBT, DIAC, SCR, TRIAC – applications 	(6 hrs)
<ul style="list-style-type: none"> • Installation of UPS and inverters • Dismantle the UPS and identify the major parts of UPS and inverter • Testing of major components • Charging, discharging and testing of batteries 	(32 hours)	<ul style="list-style-type: none"> • Types of batteries used in UPS and inverters and their maintenance • Different types of inverters, UPS, working principle, specifications, explanation with the help of block diagram 	(4 hours)
<ul style="list-style-type: none"> • Use SMPS used in TVs and PCs for practice • Dismantle the given SMPS and find major sections/ICs components • Identify various input and output sockets/connections of the given SMPS • Identifying various faults in given SMPS and rectifying it 	(36 hours)	<ul style="list-style-type: none"> • Block diagram of switch mode power supplies in TVs and PCs, their working principles and briefly explain its circuit diagram 	(6 hours)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 2.5 : CONSUMER ELECTRONICS

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Install, operate and maintain semi and fully automatic washing machines
- Diagnose faults in microwave oven and repair them
- Install DTH system and use SAT meter for mounting, tracking for azimuth and elevation angles
- Install, operate and maintain CCTV systems
- Operate LCD/LED projectors
- Identify and operate different controls on LED/LCD TV
- Repair of TV remote control

Practical	(112 hours)	Theory	(16 hours)
<p>Washing Machine:</p> <ul style="list-style-type: none"> • Installation of front load and top load washing machine • Identify the internal and external parts of semi-auto washing machine, fully automatic washing machine • Operate semi-auto and fully automatic washing machine • Repair and maintenance of semi and fully automatic washing machine 	(20 hours)	<ul style="list-style-type: none"> • Washing machine – different types of machines, washing techniques, parts of manual, semi-automatic and fully automatic machines, basic working principle of manual, semi-automatic and fully automatic machines, study the working of motors, different types of timers, power supply circuits 	(4 hours)
<p>Microwave Oven:</p> <ul style="list-style-type: none"> • Identify the internal and external parts of microwave oven • Identify the different touch pad controls and their functions • Testing of high voltage diode 	(14 hours)	<ul style="list-style-type: none"> • Different types of oven. Study various functions of oven, electrical wiring diagram of microwave oven, working of power supply 	(2 hours)

<ul style="list-style-type: none"> • Identify the HV capacitor and discharge it • Diagnosis of all types of faults 	
<p>Induction Cook-top: (14 hours)</p> <ul style="list-style-type: none"> • Identify the faults in induction cook-top and rectify it • Dismantle and identification of various parts, wiring and tracing of various controls, electrical and electronics circuit in induction cook top • Replacing the induction tube (coil) in induction cook top 	<ul style="list-style-type: none"> • Working principle of induction cook-top (heater), study of different features of machine. Types of induction tubes, study of different components of induction cook-top, fault identification, heat sinking in induction cook-top <p style="text-align: right;">(2 hours)</p>
<p>DTH System: (20 hours)</p> <ul style="list-style-type: none"> • Identification and use of DTH system assembly • Identification and use of different tools and equipments used in DTH installation procedure and cabling procedure • Identification of various types of connectors, cables and wiring procedure. • Install a DTH system and get a TV station • Site selection, installation, mounting and tracking for azimuth and elevation angles using SAT meter. • Identify the faults in DTH system and rectify • Identification and use of various I/O ports of STB (Set Top Box). • STB connection and first installation • Identify the faults in STB & rectify. 	<ul style="list-style-type: none"> • Basic components of DTH system: PDA, LNBC, Satellite receiver terminal, dish installation aspects, Azimuth & elevation settings of dish/ DTH receiver. Types of cables used in DTH system, impedance and specification, Set top box features, block diagram of set top box, I/O ports <p style="text-align: right;">(2 hours)</p>

<p>CCTV: (14 hours)</p> <ul style="list-style-type: none"> • Identification of different CCTV components • Draw, Trace or follow the CCTV setup of any commercial installation. • Identify the strategic locations for the installation of cameras. • Operate and learn the procedure for switching of cameras to have different views. • Identification of connectors and sockets used on DVRs • Test the healthiness cables and connectors. • Connect CCTV Cameras to DVR, Record and Replay. • Dismantle DVR and identify major functional blocks and test for the healthiness. 	<ul style="list-style-type: none"> • Types of cameras and their specifications used in CCTV systems • CCTV Setup and its components Working of Digital Video Recorders and types of DVRs • Block diagram of DVRs <p>(2 hours)</p>
<p>LCD and LED TV : (16 hours)</p> <ul style="list-style-type: none"> • Identification and operate different Controls on LCD, LED TV • Identify various connectors provided on a LCD TV and test the healthiness. • Dismantling the panel of LCD/LED TV • Identification of components and different sector of LCD and LED TV • Dismantle and identify the parts of the remote control • Trace and rectify the faults of a various remote controls • Identify various connectors and connect the cable operator's external decoder (set top box) to the TV. 	<ul style="list-style-type: none"> • Difference between a conventional CTV with LCD & LED TVs • Principle of LCD and LED TV and function of its different section. Basic principle and working of 3D TV • IPS panels and their features • Different types of interfaces like HDMI, USB, RGB etc with latest TVs. • TV Remote Control –Types, parts and functions, IR Code transmitter and IR Code Receiver, Working principle, operation of remote control. Different adjustments, general faults in Remote Control. <p>(2 hours)</p>

<p>LCD/LED Projector (14 hours)</p> <ul style="list-style-type: none"> • Identify various front panel controls on the given LCD/LED Projector and operate the projector using them • Identify rear connectors and terminate them using proper cables to the desktop computer • Make necessary adjustment of the display using remote 	<ul style="list-style-type: none"> • Differentiate LCD and LED projectors • Specifications of LED Projector • Working principle of LED Projector • Most frequently occurring faults in a LED projector and their remedies <p style="text-align: right;">(2 hours)</p>
--	---

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Workshop job
- Assembly and disassembly

INDUSTRIAL TRAINING – II (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 2nd semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

7. RESOURCE REQUIREMENT

7.1 LIST OF TOOLS/EQUIPMENT

a) TRAINEES TOOL KIT FOR 30 TRAINEES +1 INSTRUCTOR

Sr. No.	Names of the Items	Quantity
1.	Connecting screwdriver 100 mm	31
2.	Neon tester 500 V.	31
3.	Screw driver set (set of 5)	31
4.	Insulated combination pliers 150 mm	31
5.	Insulated side cutting pliers 150 mm	31
6.	Long nose pliers 150 mm	31
7.	Soldering iron 25 W. 240 V.	31
8.	Electrician knife	31
9.	Tweezers 100mm	31
10.	Digital Multimeter (3 ½ digit)	31
11.	Soldering Iron Changeable bits 10 W	31
12.	De- soldering pump	31

b) GENERAL MACHINERY SHOP OUTFIT

Sr. No.	Names of the Items	Quantity
1.	Steel rule 300mm	4
2.	File flat 200mm bastard	2
3.	File flat 200mm second cut	2
4.	File flat 200mm smooth	2
5.	100mm flat pliers	4
6.	100mm round Nose pliers	4
7.	Scriber straight 150mm	2
8.	Hammer ball pen 0.5Kg	1
9.	Allen key set (set of 9)	1
10.	Tubular box spanner (set of 6Nos)	1 set
11.	Magnifying lenses 75mm	2
12.	Hacksaw frame adjustable	2
13.	Scissors 200mm	1
14.	Handsaw 450mm	1
15.	Electric Drill Machine	2
16.	First aid kit	1
17.	Fire Extinguisher	2
18.	Bench Vice	1
19.	Dual DC regulated power supply 30-0-30 V, 2 Amps	4
20.	DC regulated variable power supply 0-24 V, 1Amp	2
21.	LCR meter (Digital)	1
22.	CRO Dual Trace 20 MHz (component testing facilities)	2
23.	Digital IC Tester	1
24.	Digital and Analog Bread Board Trainer	6

25.	Power Electronics Trainer with at least 6 no's of onboard applications	4
26.	Electronic circuit simulation software with 6 user licenses	1
27.	Soldering and de-soldering station	6
28.	SMD soldering and de-soldering station with necessary accessories	6
29.	MPS of different make	6
30.	UPS trainer	6
31.	LCD TV (Trainer Kit)	1
32.	LCD TV (21")	2
33.	LED TV (Trainer Kit)	1
34.	LED TV (21")	2
35.	Solar Power Inverter 500 VA	1
36.	LED/LED Projector	1
37.	Washing Machine (Semi-automatic machine)	1
38.	Washing Machine (Fully-automatic machine)	1
39.	Microwave Oven	1
40.	CCTV Cameras	3
41.	Digital Video Recorders	2
42.	Induction Cook-top	6
43.	DTH System	2
44.	SAT Meter	2
45.	Digital IC Tester	1
46.	Digital and Analog Bread Board Trainer	6

7.2 LIST OF CONSUMABLES

1.	Different types of electronic and electrical cables, connectors, sockets, terminations.	As required
2.	Different types of Analog electronic components, digital ICs, power electronic components, general purpose PCBs, bread board, MCB, ELCB	As required
3.	Different types of resistors	As required
4.	Different types of capacitors	As required
5.	Different types of inductors	As required
6.	Different types of transformers	As required
7.	Different types of transistors	As required
8.	Different types of diodes	As required
9.	Different types of FET	As required
10.	Different types of MOSFET	As required
11.	Different types of SCR	As required
12.	Different types of TIAC	As required
13.	Different types of TRIAC	As required

7.3 RECOMMENDED BOOKS

1. Principle of Electronics by V.K. Mehta; S Chand Publishers, Delhi..
2. Electronic Mechanic – NCVT Approved (Semester-wise) National Instructional Media Institute (NIMI), Chennai.
3. Electronic Mechanic by A.K. Mittal; Asian Publishers, Delhi.
4. Electronics Engineering by P.S. Jakhar; Dhanpat Rai Publishers, Delhi.
5. Fundamentals of Electrical Engineering and Electronics by B.L. Theraja; S Chand Publishers, Delhi.

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.
2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.
3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.
4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.
5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.
6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

9. LIST OF CONTRIBUTORS/EXPERTS

- a) Following experts participated in the workshop to design curriculum of certificate programme in 'Servicing and Maintenance of Electronic Instruments' with NSQF alignment for MRSPTU, Bathinda on 27-28 June, 2016 at NITTTR, Chandigarh.

1.	Dr. Ashok Kumar Goel, Professor & Head, Electronics and Communication Engineering Department and Director, College Development Council, MRSPTU Campus, Dabwali Road, Bathinda, Punjab
2.	Dr. Arun Kumar Singh, Associate Professor, PEC University of Technology, Sector-12, Chandigarh
3.	Shri Sanjeev Sharma, Hospital Engineer, Biomedical Division, PGIMER, Sector-14, Chandigarh
4.	Shri Jagdev Singh, HOD, ECE, Govt. Polytechnic College for Girls, Patiala
5.	Shri Manjit Singh Bhullar, HOD, ECE, Govt. Polytechnic College, Bathinda
6.	Shri Upendra Kumar, Sr. Technical officer, ISTE, CSIO, Sector-30, Chandigarh
7.	Shri Bhupesh Kumar, J.E. PGIMER, Sector-14, Chandigarh
8.	Mrs. Pankaj, Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
9.	Shri Satnam Singh, Govt. Industrial Training Institute, Patiala, Punjab
10.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
11.	Shri Anil Kumar, Electronics Engineer, Electronics Service Centre, NITTTR, Chandigarh
12.	Prof. SK Gupta, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh Coordinator

- b) Following experts participated in the workshop to design curriculum of certificate programme in 'Servicing and Maintenance of Electronic Instruments' with NSQF alignment for MRSPTU, Bathinda on 28 July, 2016 at NITTTR, Chandigarh.

1.	Mrs. Pankaj, Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
2.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
3.	Shri Anil Kumar, Electronics Engineer, Electronics Service Centre, NITTTR, Chandigarh
4.	Prof. SK Gupta, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh Coordinator

- c) Following experts participated in the workshop to review the curriculum of certificate programme in ‘Servicing and Maintenance of Electronic Instruments’ for MRSPTU, Bathinda on 20 January, 2017 at NITTTR, Chandigarh:

1.	Dr. MM Malhotra, Ex-Principal, TTTI, Chandigarh
2.	Shri Arvind Dixit, Advance Technology, Sector 24, Chandigarh
3.	Dr. Ashok Kumar Goel, Director, College Development Council, MRSPTU, Bathinda, Punjab
4.	Shri Kulmohan Singh, Ex-HOD, Electrical Engg., CCET (Diploma Wing), Sector 26, Chandigarh
5.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
6.	Shri Rakesh Goel, Estate Officer, NITTTR, Chandigarh
7.	Shri Pritpal Singh Aulakh, GZSCCET, Bathinda
8.	Shri Naib Singh, Sr. Technician, GZSCCET, Bathinda
9.	Shri Jagdip Singh, , Sr. Technician, GZSCCET, Bathinda
10.	Prof. PK Singla, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh
11.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.
2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.
3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.
4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.
5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.
6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

Curriculum
for
Certificate Programme
In
TOOL AND DIE MAKER
for
**Maharaja Ranjit Singh Punjab Technical
University, Bathinda (Punjab)**



Prepared By:

Curriculum Development Centre
**National Institute of
Technical Teachers Training and Research
Sector 26, Chandigarh - 160 019**

January, 2017

FOREWORD

Rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In order to cope with the challenges of handling new materials, machines and technologies, we have to develop human resources having appropriate competencies. There is an increasing demand of skilled workforce in India in particular and the world over in general. Under the new circumstances, India faces a challenging task of meeting the technical manpower requirement, especially in the area of skilled workforce to cater to industrial needs. Efforts have to be made so that passouts from our technical institutions are acceptable at global level.

Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Technical institutions play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab to start the skill oriented integrated courses at certificate, diploma and degree level, as per the needs of the industry, are laudable.

In order to meet the future requirements of technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of technical programmes at various levels. The curricula for various programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of programme and various courses.

The success of any technical programme depends upon its effective implementation. However best the curriculum document is designed, if it is not implemented properly, the output will not be as per expectations. In addition to acquisition of appropriate physical resources, availability of motivated, competent and qualified faculty is equally essential for effective implementation of the curricula.

It is expected that MRSPTU will carry out curriculum evaluation on a continuous basis to identify the new skill requirements. At the same time, it is expected that innovative methods of course offering will be used to develop desired skills and infuse the much needed dynamism in the system.

Dr. M.P. Poonia
Director
National Institute of
Technical Teachers Training & Research
Chandigarh

PREFACE

Curriculum document is a comprehensive plan of an educational programme. It is through the curriculum that the educational objectives of a programme are achieved. It has to be ensured that the curriculum is dynamic, articulated, balanced, data based, feasible, and as per industrial needs. Curriculum Development Centre at NITTTR, Chandigarh has been extending services to technical education system of the states in northern region in developing and updating their curriculum on regular basis.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab assigned the project for developing the curriculum of some integrated programmes to this institute in the month of May 2016. A series of curriculum workshops were held during the months of June-July, 2016. This curriculum document is an outcome of the extensive discussions held with the representatives from various organizations, technical institutions and industry during the curriculum workshops. While developing the study and evaluation scheme and detailed contents, the following aspects have been kept in mind :

- Employment Opportunities of Certificate holders
- Job role of certificate holders
- Learning outcome of the Programme
- Mobility of students for their professional growth

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Industrial Training in the curriculum. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which units on Communication Skills have been introduced in both the semesters of the certificate course.

We hope that this curriculum document will prove useful in producing skilled manpower at desired level in the state of Punjab. The success of this outcome-based curriculum depends upon its effective implementation and it is expected that MRSPTU will make all efforts to create better facilities, develop linkages with the world-of-work and foster conducive and requisite learning environment as prescribed in the curriculum document.

Professor and Head
Curriculum Development Centre
NITTTR, Chandigarh

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance and guidance received from the following persons:

- i) Vice Chancellor, Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bhatinda, Punjab for entrusting this project of curriculum design to NITTTR, Chandigarh.
- ii) Director, College Development Council MRSPTU for his support and active involvement in the curriculum development.
- iii) Director, National Institute of Technical Teachers' Training and Research, Chandigarh for his support and academic freedom provided to Curriculum Development Centre.
- iv) All the experts from industry/field organizations, universities, ITIs and other technical institutions for their professional inputs during curriculum workshops.
- v) Faculty from different departments of NITTTR, Chandigarh for content updation.
- vi) Shri Yogendra Kaushal, Stenographer, Curriculum Development Centre, NITTTR, Chandigarh for processing the document.
- vii) Shri Mohan Lal Bindal, Assistant, Curriculum Development Centre for his support and secretarial assistance in the conduct of curriculum design workshops.

Coordinator

1. SALIENT FEATURES OF THE PROGRAMME

1.	Sector	:	Capital Goods
2.	Name of the Certificate Programme	:	Tool and Die Maker
3.	Entry Qualification	:	Matriculation or equivalent NSQF Level as prescribed by MRSPTU, Bathinda
4.	Duration of the Programme	:	One Year
5.	Intake	:	30
6.	Pattern of the Programme	:	Semester Pattern
7.	NSQF Level	:	Level - III

2. JOB ROLE AND JOB OPPORTUNITIES

a) Job Role

A certificate holder in Tool and Die Maker is responsible for manufacturing, repair and maintenance of various types of press tools, jigs and fixtures and plastic moulds.

b) Job Opportunities

On successful completion of this course, the students will be gainfully employed in the following areas:

- i) Various production and manufacturing industry.
- ii) Maintenance sections of Govt. organizations/private/public sector.
- iii) Automobile ancillary units
- iv) Plastic process industry
- v) Tool rooms
- vi) Self employed.

3. LEARNING OUTCOMES OF THE PROGRAMME

After undergoing the programme, students will be able to:

1. Prepare and interpret drawings related to press tools, jigs and fixtures and plastic moulds.
2. Identify and handle different types of tools and instruments
3. Identify and use appropriate engineering materials
4. Follow safety precautions while working
5. Measure different parameters using various measuring instruments
6. Perform various types of bench works and fitting operations
7. Operate various machines like lathe, drilling, milling and grinding machine
8. Manufacture press tools, jigs & fixtures and plastic moulds
9. Repair and maintain various types of press tools, jigs & fixtures and plastic moulds
10. Apply basic principles of maths and physics in solving trade problems
11. Communicate effectively in English with others

CONTENTS

Sr. No	Particulars	Page No.
-	Foreword	(i)
-	Preface	(ii)
-	Acknowledgements	(iii)
1.	Salient Features of the Programme	1
2.	Job Role and Job Opportunities	2
3.	Learning Outcomes of the Programme	3
4.	Study and Evaluation Scheme	4
5.	Guidelines for Assessment of Student Centred Activities	6
6.	Detailed Contents of Various Units	7-30

FIRST SEMESTER

1.1	Communication Skills	7
1.2	Engineering Drawing (Tool and Die Maker)	9
1.3	Engineering Materials and Heat Treatment	11
1.4	Press Tools – I	13
1.5	Tool Room Practice - I	15
-	Industrial Training - I (4 Weeks)	18

SECOND SEMESTER

2.1	Basic Sciences	19
2.2	Press Tools – II	21
2.3	Jigs and Fixtures	23
2.4	Plastic Moulds	25
2.5	Tool Room Practice - II	28
-	Industrial Training - II (4 Weeks)	30

7.	Resource Requirements	31-36
7.1	List of Tools/Equipment	31
7.2	List of Consumables	35
7.3	List of Recommended Books	36
8.	Recommendations for Effective Curriculum Implementation and Evaluation	37
9.	List of Experts/Contributors	38

4. STUDY AND EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN TOOL AND DIE MAKER

FIRST SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1		*Communication Skills	8	24	1	25	25	50	25	1	50	3	75	125
1.2		Engineering Drawing (Tool and Die Maker)	-	64	2	-	50	50	75	3	-	-	75	125
1.3		Engineering Materials and Heat Treatment	16	16	2	25	50	75	50	2	100	4	150	225
1.4		Press Tools – I	32	64	4	25	50	75	50	2	100	4	150	225
1.5		Tool Room Practice - I	32	256	10	25	100	125	50	2	100	4	150	275
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training (during vacation)			-	-	4	-	-	-	-	-	100	3	100	100
Total			88	472	25	100	300	400	250	-	450	-	700	1100

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ Industrial Training

After examination of 1st Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

Total weeks per semester = 16 Total working days per week = 5 Total hours per day = 7

Total Hours in a semester = 16 x 5 x 7 = 560

One credit is defined as one hour of lecture per week or two hours of practicals per week for one semester. Fractions in credits have been rounded to nearest integer.

SECOND SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1		*Basic Sciences	48	-	3	25	-	25	50	2	-	-	50	75
2.2		Press Tools – II	24	40	4	25	50	75	50	2	100	4	150	225
2.3		Jigs and Fixtures	16	32	2	25	50	75	50	2	100	4	150	225
2.4		Plastic Moulds	16	32	2	25	50	75	50	2	100	4	150	225
2.5		Tool Room Practice - II	16	288	10	25	100	125	50	2	100	4	150	275
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training			-	-	4	-	-	-	-	-	100	3	100	100
Total			120	440	27	125	275	400	250	-	500	-	750	1150

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ **Industrial Training**

After examination of 2nd Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

5. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 25 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- i. 5 Marks for general behavior and discipline
(by Principal in consultation with all the trainers)
- ii. 5 Marks for attendance as per following:
(by the trainers of the department)
 - a) 75% Nil
 - b) 75 - 80% 2 Marks
 - c) 80 - 85% 3 Marks
 - d) Above 85% 5 Marks
- iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 15 - National Level participation or inter-University competition
 - b) 10 - Participation in two of above activities
 - c) 5 - Participation in internal sports of the University

Note: There should be no marks for attendance in the internal sessional of different subjects.

UNIT – 1.1 : COMMUNICATION SKILLS			
LEARNING OUTCOMES:			
After undergoing this unit, the students will be able to:			
<ul style="list-style-type: none"> • Speak confidently. • Overcome communication barriers. • Write legibly and effectively. • Listen in proper prospective. • Read various genres adopting different reading techniques. • Respond to telephone calls effectively. 			
Practical	(24 Hours)	Theory	(08 Hours)
		Basics of Communication <ul style="list-style-type: none"> • Process of communication • Types of communication - formal and informal, oral and written, verbal and non-verbal • Objectives of communication • Essentials of communication • Barriers to communication <p style="text-align: right;">(1 hour)</p>	
	<ul style="list-style-type: none"> • Looking up words in a dictionary (meaning and pronunciation) <p style="text-align: right;">(2 hours)</p>	Functional Grammar and Vocabulary <ul style="list-style-type: none"> • Parts of speech • Tenses • Correction of incorrect sentences <p style="text-align: right;">(2 hours)</p>	
	<ul style="list-style-type: none"> • Self and peer introduction • Greetings for different occasions <p style="text-align: right;">(1 hour)</p>	Listening <ul style="list-style-type: none"> • Meaning and process of listening • Importance of listening • Methods to improve listening skills Speaking <ul style="list-style-type: none"> • Importance • Methods to improve speaking • Manners and etiquettes <p style="text-align: right;">(2 hours)</p>	
	<ul style="list-style-type: none"> • Newspaper reading <p style="text-align: right;">(1 hour)</p>	Reading <ul style="list-style-type: none"> • Meaning • Techniques of reading: skimming, scanning, intensive and extensive reading <p style="text-align: right;">(1 hour)</p>	

<ul style="list-style-type: none"> • Vocabulary enrichment and grammar exercises • Exercises on sentence framing accurately (6 hours) 	<p>Functional Vocabulary</p> <ul style="list-style-type: none"> - One word substitution - Commonly used words which are often misspelt - Punctuation - Idioms and phrases <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Reading aloud articles and essays on current and social issues • Comprehension of short paragraph (5 hours) 	
<ul style="list-style-type: none"> • Write a short technical report • Letter writing (3 hours) 	
<ul style="list-style-type: none"> • Participate in oral discussion • Respond to telephonic calls effectively • Mock interview (6 hours) 	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT 1.2 : ENGINEERING DRAWING (TOOL AND DIE MAKER)	
<p>LEARNING OUTCOMES:</p> <p>After undergoing this unit, students will be able to:</p> <ul style="list-style-type: none"> • Draw free hand sketches of various objects. • Read and apply different dimensioning methods on drawing of objects. • Prepare and read assembly drawings of various tools. 	
Practical (64 hrs)	Theory (Theory part should be covered along with drawing exercises)
<ul style="list-style-type: none"> • Practical demonstration with the help of blue prints/computer prints. <p style="text-align: right;">(3 hrs)</p>	Engineering drawing and its importance
<ul style="list-style-type: none"> • Demonstration of Drawing board, T-square, mini-drafter, set squares, protractor, drawing instrument box, pencils of different grades, erasing shield • Practice on folding of blue print/drawing prints • Identification of various sizes of drawing sheets • Preparation of A2/A1 sheet for preparing drawings. <p style="text-align: right;">(4 hrs)</p>	Introduction to drawing instruments
<ul style="list-style-type: none"> • Practice on different types of lines <p style="text-align: right;">(6 hrs)</p>	<ul style="list-style-type: none"> • Introduction to various lines
<ul style="list-style-type: none"> • Practice on writing alphabets and numerals in capital/lower case as per IS: 9609 in vertical and inclined style: <p style="text-align: right;">(3 hrs)</p>	<ul style="list-style-type: none"> • Lettering and numbering: Study styles of lettering, spacing of letters, standard heights and widths.

<ul style="list-style-type: none"> Practice of free hand sketch of an object in orthographic and isometric views. (6 hrs) 	<ul style="list-style-type: none"> Introduction to isometric and orthographic views.
<ul style="list-style-type: none"> Study and practice of 1st and 3rd angle projections Practice on drawing of isometric views (6 hrs) 	<ul style="list-style-type: none"> Introduction to 1st and 3rd angle projections
<ul style="list-style-type: none"> Representation of tolerances on engineering drawing (6 hrs) 	<ul style="list-style-type: none"> Concept of limits, fits and tolerances
<ul style="list-style-type: none"> Preparation of fully dimensioned and toleranced drawings (10 hrs) 	
<ul style="list-style-type: none"> Preparation of detailed drawings and assembly drawings of various tools (10 hrs) 	
<ul style="list-style-type: none"> Practice on reading drawings of various assemblies of tools (10 hrs) 	

Note : There will not be any Theory Examination.

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Sketching
- Drawing

UNIT - 1.3 : ENGINEERING MATERIALS AND HEAT TREATMENT	
<p>LEARNING OUTCOMES:</p> <p>After undergoing this unit, the students will be able to:</p> <ul style="list-style-type: none"> • Select materials as per use/requirement of component. • Perform various tests of heat treatment. • Use hardness testing machine. 	
Practical	Theory
(16 hours)	(16 hours)
	<ul style="list-style-type: none"> • Basic concept and importance of Engineering materials (1 hr)
<ul style="list-style-type: none"> • Visual identification of various specimens of metals and alloys (1 hr) 	<ul style="list-style-type: none"> • Properties of materials: Physical and mechanical properties like colour, weight, strength, elasticity, plasticity, ductility, brittleness, hardness, toughness etc. (2 hrs)
<ul style="list-style-type: none"> • Identification of materials into: <ul style="list-style-type: none"> ▪ Metal – Non metals ▪ Ferrous – Non Ferrous Metals ▪ Ferrous – Non Ferrous Alloys <p style="text-align: right;">(1 hrs)</p>	<ul style="list-style-type: none"> • Types of metals : Ferrous and non ferrous metals, difference between ferrous and non metals, difference between metal and non metal, ferrous and non-ferrous alloys (2 hrs)
<ul style="list-style-type: none"> • Study of composition of various types of steels used for tool and die • Market survey on availability of different materials (1 hr) 	<ul style="list-style-type: none"> • Tool and die materials: Introduction to tool and die materials, classification, properties, colour coding and applications (3 hrs)
	<ul style="list-style-type: none"> • Iron carbon diagram: Introduction, heating and cooling of various phases and their constituents, classifications of iron, steel and cast iron into groups, different structure of steels (4 hrs)
<ul style="list-style-type: none"> • Hardening of pillars and bushes of die set and their hardness checking • Annealing of die steel (8 hrs) 	<ul style="list-style-type: none"> • Heat Treatment Processes: Annealing, normalizing, hardening, tempering, case hardening and its methods (2 hrs)

	<ul style="list-style-type: none"> • Furnaces and equipment: Common furnaces used in heat treatment; defects during heat treatment, their causes and prevention <p style="text-align: right;">(1 hr)</p>
<ul style="list-style-type: none"> • Hardness testing of various specimens of heat-treated materials <p style="text-align: right;">(5 hrs)</p>	<ul style="list-style-type: none"> • Working principle and applications of Rockwell hardness testing machine and different hardness scales <p style="text-align: right;">(1 hr)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 1.4 : PRESS TOOLS - I

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Prepare and read drawings of different operations done in press tools
- Identify different components of press tool
- Explain the functions of different parts of press tool

Practical	(64 hours)	Theory	(32 hours)
<ul style="list-style-type: none"> • Study and demonstrate functions of different types of components used in press tool 	(4 hours)	Introduction to tooling: <ul style="list-style-type: none"> • Press tools • Moulds for plastics • Die casting dies • Jigs • Fixtures 	(3 hours)
<ul style="list-style-type: none"> • Sketching of press tool operations i.e. blanking, piercing, cutting off, parting off, perforating 	(24 hours)	<ul style="list-style-type: none"> • Types of press tools: progressive tool and compound tool; Press tool operations: blanking, piercing, cutting off, parting off, perforating, trimming, notching, shaving, lancing 	(5 hours)
<ul style="list-style-type: none"> • Study and demonstrate the functions of embossing, coining, bending, forming drawing, curling, combination tool, bulging, swaging, flaring 	(12 hours)	<ul style="list-style-type: none"> • Introduction to embossing, coining, bending, forming drawing, curling, combination tool, bulging, swaging, flaring 	(3 hours)
<ul style="list-style-type: none"> • Preparation of drawings showing the alignment of punch and die 	(12 hours)	Cutting clearance: <ul style="list-style-type: none"> • Optimum cutting clearance • Excessive cutting clearance • Insufficient cutting clearance • Misalignment between punch and die • Burr side 	(3 hours)

<ul style="list-style-type: none"> • Draw and indicate the angular clearance of the die part (4 hours) 	<p>Relation of blank size with respect to punch and die:</p> <ul style="list-style-type: none"> • Worked out examples <p>Land and angular clearance:</p> <ul style="list-style-type: none"> • Land • Angular clearance • Die with ejector • Grid plate tool (parts and function) <p>(6 hours)</p>
<ul style="list-style-type: none"> • Draw strip layout and stock of material (4 hours) 	<p>Cutting forces:</p> <ul style="list-style-type: none"> • Methods of reducing cutting forces • Cutting forces worked out examples <p>Stock material:</p> <ul style="list-style-type: none"> • Strip lay out • Punches • Dies <p>(6 hours)</p>
<ul style="list-style-type: none"> • Draw various types of stoppers and stripper plates (4 hours) 	<p>Stoppers:</p> <ul style="list-style-type: none"> • Function of stoppers • Classification of stoppers • Stop position • Registry position • Types of stops <p>Strippers:</p> <ul style="list-style-type: none"> • Types of strippers • Stripping force • Stock material • Surface condition of side walls <p>(6 hours)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT - 1.5 : TOOL ROOM PRACTICE - I	
LEARNING OUTCOMES:	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Use lathe machine for turning, taper turning and drilling • Use tap and die to cut threads • Use pedestal grinder for grinding angular part • Use single point cutting tool and twist drill • Prepare assembly by fitting 	
Practical	Theory
(256 hours)	(32 hours)
Workshop Safety <ul style="list-style-type: none"> • Demonstration of safety of equipments and use of fire extinguishers, first aid kit and operation of electrical mains • Practice on use of scale, vernier caliper, micrometer, depth gauge, height gauge, surface plate, angular plate • Practice on use of plug gauge, ring gauge, thread gauge etc. <p style="text-align: right;">(8 hours)</p>	<ul style="list-style-type: none"> • Importance of workshop safety and safe procedures • Disposal of workshop waste such as chips, coolant etc. • Introduction to various measuring instruments and tools <p style="text-align: right;">(2 hours)</p>
Bench Work <ul style="list-style-type: none"> • Setting of vice height, fixing of the job • Practice on use of aluminium jaws for soft material of work pieces • Practice on use of different files and chisels • Holding of different shapes in bench vice-filing flat surfaces and edges for maintaining 90⁰ angle • Checking the dimensions and angles using scale, tri-square, vernier calliper • Use of surface plate, surface gauge, scribes, punches, hammer • Marking out of parallel lines using odd leg calliper and use of centre punch • Filing within accuracy of ± 0.2 mm • Filing 45⁰ chamfer on all edges of work piece • Filing external radius and checking with radius gauge <p style="text-align: right;">(30 hours)</p>	<ul style="list-style-type: none"> • Bench vices - introduction of bench-vices, types and their uses • Hacksaw – type and use of hacksaw frame and blades • Types of hammers and their applications • Files – types of files, material of files, use of various files <p style="text-align: right;">(5 hours)</p>

<p>Drilling Machine</p> <ul style="list-style-type: none"> • Marking on rectangular work pieces • Centre punching • Centre drilling • Through drilling • Counter drilling • Counter sinking • Tapping and reaming <p style="text-align: right;">(20 hours)</p>	<ul style="list-style-type: none"> • Types of drilling machines • Selection of cutting parameters for different material and calculation of machining time. • Drills – types, twist drill and its nomenclature <p style="text-align: right;">(3 hours)</p>
<p>Step Filing</p> <ul style="list-style-type: none"> • Marking for chiseling • V-shape chiseling • Step filing with specified dimensions and tolerances • Radius filing • Assemble by filing of triangular and square filing <p style="text-align: right;">(40 hours)</p>	<ul style="list-style-type: none"> • Types of files and specifications of files • Types of gauges and their applications • Different types of chisels and their uses <p style="text-align: right;">(5 hours)</p>
<p>Pedestal Grinder</p> <ul style="list-style-type: none"> • Wheel balancing and mounting • Dressing of grinding wheel • Centre punch grinding • Square shape workpiece grinding to demonstrate different tool angles <p style="text-align: right;">(20 hours)</p>	<ul style="list-style-type: none"> • Description of pedestal grinder • Balancing and mounting of grinding wheel • Introduction to dressing of grinding wheel • Loading and glazing of grinding wheel <p style="text-align: right;">(3 hours)</p>
<p>Lathe</p> <ul style="list-style-type: none"> • Holding of job in three jaw chuck and collets • Holding in 4 jaw chuck and turning • Centering of cutting tool • Step turning • Grooving • Shouldering • Facing • Parting and chamfering • Knurling • Drilling and boring threading • Taper turning • Lathe tool grinding by hand <p style="text-align: right;">(108 hours)</p>	<ul style="list-style-type: none"> • Introduction to lathe and its types • Description of different parts of lathe • Selection of RPM, feed, depth of cut and calculation of machining time. • Different types of tool posts • Introduction to single point cutting tool and its geometry • Tool materials • Recommended cutting parameters for different materials • Introduction to threading on lathe • Introduction to taper turning and method for taper turning • Concept of lubrication, lubricant and coolant types and its application. <p style="text-align: right;">(12 hours)</p>

<p>MILLING:</p> <p>Practice on:</p> <ul style="list-style-type: none"> • Holding of rectangular job on vice • Holding of cutter i.e. shell and mill • Six sides milling to shape rectangular • Step milling <p style="text-align: right;">(30 hours)</p>	<ul style="list-style-type: none"> • Introduction to milling machine and its types • Types of milling cutters and its material • Different types of work holding devices • Holding technique of cutters • Different types of milling processes i.e. Up milling and down milling • Calculation of cutting speed and feed <p style="text-align: right;">(2 hours)</p>
---	---

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

INDUSTRIAL TRAINING – I (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 1st semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

UNIT – 2.1 : BASIC SCIENCES	
LEARNING OUTCOMES:	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Apply the basic principles of maths in solving the basic problems of the trade. • Apply the basic principles of physics in solving the basic problems of the trade. 	
Practical	Theory (48 Hours)
	<p>Mathematics</p> <ul style="list-style-type: none"> • Basic Algebra – algebraic formula. Simultaneous equation – quadratic equations (4 hours) • Simultaneous linear equation in two variables (3 hours) • Arithmetic and geometric progression, sum of n-terms, simple calculations. (3 hours) • Mensuration – Find the area of regular objects like triangle, rectangle, square and circle; volumes of cube, cuboid, sphere cylinder (6 hours) • Trigonometry - Concept of angle, measurement of angle in degrees, grades and radians and their conversions, T-Ratios of Allied angles (3 hrs) • Co-ordinate Geometry - Cartesian and polar coordinates, conversion from cartesian to polar coordinates (2 hrs) • Concept of Differentiation and Integration (3 hrs)
	<p>Physics</p> <ul style="list-style-type: none"> • FPS, CGS, SI units, dimensions and conversions (2 hours) • Force, speed, velocity and acceleration – Definition, units and simple problems (3 hours)

	<ul style="list-style-type: none"> • Stress and strain, modulus of elasticity (2 hours) • Heat and temperature, its units and specific heat of solids, liquids and gases (4 hours) • Electricity and its uses, basic electricity terms and their units, D.C. and A.C., positive and negative terminals, use of switches and fuses, conductors and insulators (5 hours) • Work, Power and Energy-Defination, units and simple problems (4 hours) • Concept of force, Inertia, Newton's First law of motion; momentum and Newton's second law of motion; Impulse; Newton's third law of motion. (2 hrs) • Friction and Lubrication (1 hour) • Law of conservation of energy (1 hour)
--	---

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

UNIT - 2.2 : PRESS TOOLS – II	
LEARNING OUTCOME:	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Prepare and read drawings of different operations done in press tools • Identify different components of press tools like bending and progressive tool • Explain the functions of different components used in press tool 	
Practical	Theory
(40 hours)	(24 hours)
<ul style="list-style-type: none"> • Preparation of drawings of various pilot profiles (3 hours) 	Pilots: <ul style="list-style-type: none"> • Purpose of pilots, size of pilots, length of pilots, pilot opening in the bottom plate, pilot nose profiles, pilots in punches, types of pilots, methods of piloting, direct and indirect piloting (4 hours)
	Side Cutter: <ul style="list-style-type: none"> • Purpose, advantages of using side cutters (2 hours)
<ul style="list-style-type: none"> • Preparation of sketches of shanks (2 hours) 	Shanks: <ul style="list-style-type: none"> • Types, location of shank on a tool, calculation method and graphical method (polygon systems) (3 hours)
<ul style="list-style-type: none"> • Preparation of drawings of top plate, bottom plate, guide plate, stripper plate, guide bushes • Position of pillar (10 hours) 	Die Sets: <ul style="list-style-type: none"> • Classification material, parts (top and bottom plate, guide pillar and guide bushes), types of die set, standard and non-standard, shut height (3 hours)
<ul style="list-style-type: none"> • Preparation of sketches of blanking tool and piercing tool (10 hours) 	Blanking Tool: <ul style="list-style-type: none"> • Parts and function Piercing Tools: <ul style="list-style-type: none"> • Parts and function (3 hours)
<ul style="list-style-type: none"> • Preparation of drawings of ejectors and shedders (5 hours) 	Ejectors and shedders: <ul style="list-style-type: none"> • Types of shedders, types of ejectors, direct and indirect knock outs (2 hours)

<ul style="list-style-type: none"> Preparation of drawings of compound dies (6 hours) 	<p>Compound Dies:</p> <ul style="list-style-type: none"> Construction, parts and their function (2 hours)
	<p>Principles of Bending:</p> <ul style="list-style-type: none"> Various elements of bend angles, blank length calculation, plastic deformation and various stress bending formulae Radius of bend, radius minimum formula and calculation constant and worked examples (3 hours)
<ul style="list-style-type: none"> Preparation of drawing of V-bending tool (4 hours) 	<p>V-Bending Tool:</p> <ul style="list-style-type: none"> Construction, parts, bending formula, worked examples (2 hours)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT - 2.3 : JIGS AND FIXTURES	
LEARNING OUTCOMES	
After undergoing this unit , student will be able to:	
<ul style="list-style-type: none"> • Identify different parts of drill jig • Prepare, read and interpret drawings related to simple plate type drill jig • Select appropriate material for jigs and fixtures • Select clamps, locators and ejectors for given applications 	
Practical	Theory
(32 hrs)	(16 hrs)
<ul style="list-style-type: none"> • Partwise drawings of drilling jig • Demonstration of drilling jig <p style="text-align: right;">(4 hrs)</p>	<ul style="list-style-type: none"> • Jigs and Fixtures - Introduction, types, difference, advantages and disadvantages, economy and cost <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> • Drawing of clamping and tool guiding elements • Demonstration of clamps and tool guiding <p style="text-align: right;">(4 hrs)</p>	<ul style="list-style-type: none"> • Jigs and fixtures construction, elements of jigs and fixtures and its material. Locating elements, clamping elements, tool guiding element [jigs] and cutter setting element [fixture] <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> • Draw detailed drawing of milling fixture <p style="text-align: right;">(4 hrs)</p>	<ul style="list-style-type: none"> • Indexing and rotary elements, body, base or frame, fastening parts <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> • Preparation of drawing of direction of movements • Preparation of drawing of indexing fixtures <p style="text-align: right;">(4 hrs)</p>	<ul style="list-style-type: none"> • Method of restricting the possible movements [principle of 3-2-1 pin method, locating method. Direction of movement <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> • Draw drawing of different types of locators <p style="text-align: right;">(4 hrs)</p>	<ul style="list-style-type: none"> • Locating devices, its material, types of locator, locator for flat surface <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> • Demonstration of various types of ejectors and clamps. <p style="text-align: right;">(4 hrs)</p>	<ul style="list-style-type: none"> • Ejectors, clamping devices, types of clamps for jigs and fixtures. Quick clamping, material for ejector and clamps. <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> • Drawing of different types of bushes <p style="text-align: right;">(4 hrs)</p>	<ul style="list-style-type: none"> • Method of removing chip from jigs and fixture. Drill bushes such as fixed bush, liner bush, slip bush. Bush material and its heat treatment. <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> • Drawing of different types of jigs and fixture <p style="text-align: right;">(4 hrs)</p>	<ul style="list-style-type: none"> • Types of fixtures. Functions and types of cutter guide in a fixture <p style="text-align: right;">(2 hrs)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT - 2.4 : PLASTIC MOULDS

LEARNING OUTCOME:

After undergoing this unit, students will be able to:

- Read and interpret drawings related to plastic moulds
- Identify different components of injection moulding machine
- Differentiate between working mechanism of different moulding processes
- Select appropriate material for different parts of moulds

Practical (32 hrs)	Theory (16 hrs)
<ul style="list-style-type: none"> • Identification and testing of different types of plastic materials (1 hr) 	Introduction to different plastic materials and their properties: <ul style="list-style-type: none"> • Thermosetting materials and their types • Thermoplastic materials and their types (1 hr)
<ul style="list-style-type: none"> • Demonstration of various moulding processes on different moulding machines as per availability of machines (2 hrs) 	Introduction to moulding processes: <ul style="list-style-type: none"> • Injection moulding • Blow moulding • Compression moulding • Transfer moulding • Extrusion moulding • Thermoforming process (2 hrs)
Demonstration of “Injection Moulding Machine” i.e. <ul style="list-style-type: none"> • Working • Parts • Mechanism • Setting of parameters • Moulding cycle (2 hrs) 	<ul style="list-style-type: none"> • Introduction to injection moulding machine, its working, mechanism and specifications • Parts and their functions (1hr)
Hands on practice on “Injection Moulding Machine” i.e. <ul style="list-style-type: none"> • Moulding cycle • Draw parts of injection moulds (core, cavity, bush, pillars) (6 hrs) 	Injection Moulding Process: <ul style="list-style-type: none"> • Parts of injection mould, material and heat treatment • Principle of injection mould • Moulding defects • Types of injection moulds (single and multi cavity moulds) (3 hrs)

<ul style="list-style-type: none"> • Draw register ring, sprue bush and ejection system (6 hrs) 	<ul style="list-style-type: none"> • Introduction and function of feeding system • Sprue, register, ring, runner and gate • Ejection system of injection moulding and its types • Pin ejection • Sleeve ejection • Blade ejection • Air ejection <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> • Drawing of different types of runners system (4 hrs) 	<p>Types of runner and its design and construction:</p> <ul style="list-style-type: none"> • Main runner • Sub runner • Cold slug • Runner geometry (full round, half round, trapezoid) <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> • Drawing of different types of gates (4 hrs) 	<p>Types of gates in Injection Moulding:</p> <ul style="list-style-type: none"> • Tab gate • Fan gate • Pin gate • Sub gate • Film gate • Edge gate • Submarine gate <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> • Draw two plate moulds for simple components (6 hrs) 	<p>Introduction to two plate and three plate moulds:</p> <ul style="list-style-type: none"> • Single cavity moulds • Multi cavity moulds <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> • Demonstration on maintenance and restoration of injection moulds (1 hr) 	<ul style="list-style-type: none"> • Maintenance and restoration of injection moulds • Storage, safety and transportation of moulds <p style="text-align: right;">(1 hr)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT - 2.5 : TOOL ROOM PRACTICE – II

LEARNING OUTCOME:

After undergoing this unit, the students will be able to:

- Use milling and grinding machines to produce components for press tool, injection moulds, jigs and fixtures
- Use different types of accessories in milling and grinding operations
- Apply various manufacturing techniques of press tools, hand injection moulds, jigs and fixtures
- Measure precise components by tool maker microscope

Practical (288 hours)	Theory (16 hours)
<p>Milling</p> <p>Practice on:</p> <ul style="list-style-type: none"> • Angular milling • Dovetail milling • Fixing of rotary table • Radius milling outside and inside • Fixing • Drilling on milling machine techniques • Indexing <p align="right">(72 hours)</p>	<ul style="list-style-type: none"> • Different types of milling attachment i.e. Vertical milling attachment, rotary table, dividing head (simple and universal) • Indexing methods – direct and compound indexing <p align="right">(2 hours)</p>
<p>Grinding</p> <ul style="list-style-type: none"> • Procedure for using magnetic table for surface grinding • Procedure for holding job in cylindrical grinding <ul style="list-style-type: none"> - by collet - by 3-jaw chuck - holding in between centres • Surface grinding of parallel and perpendicular sides of a plate • Setting for external and internal grinding • Uses of universal vice for angular grinding • Achieving interference and sliding fit between pillar & plate and pillar & bush <p align="right">(80 hours)</p>	<ul style="list-style-type: none"> • Introduction of grinding process • Types of grinder <ul style="list-style-type: none"> - surface - cylindrical - tool and cutter grinder • Types of grinding wheel, shape and materials • Identification of grinding wheel • Grinding wheels abrasive, bond and its grade • Introduction to wheel balancing, mounting and tracing of it • Glazing and trucing in grinding wheel • Selection of grinding wheel w.r.t. materials <p align="right">(2 hours)</p>
<p>Die Set Manufacturing</p> <ul style="list-style-type: none"> • Manufacturing of top and bottom plate • Thrust plate, stripper plate • Pillar and bush • Assembly of die set <p align="right">(20 hours)</p>	<ul style="list-style-type: none"> • Introduction of die set and its types • Different elements used in die set • Introduction of duel pin and its purpose • Type of fitting allowance in pillar and bush <p align="right">(2 hours)</p>

<p>Jigs and Fixtures</p> <ul style="list-style-type: none"> • Manufacturing of simple plate type drilling jig • Manufacturing of simple milling fixture (32 hours) 	<ul style="list-style-type: none"> • Introduction of jigs and fixtures • Elements of jigs and fixtures • Types of jigs and fixtures • Introduction and uses of elements such as clamping, locating, tool guiding (jigs), cutter setting (fixtures), base plate, body of jigs and fixtures, fastening • Degree of freedom • Uses of ejectors • Different types of drilling bushes (i.e. fixed type, linear type, slip type etc) (4 hours)
<p>Press Tool</p> <ul style="list-style-type: none"> • Manufacturing of blanking tool or piercing tools (48 hours) 	<ul style="list-style-type: none"> • Introduction of metal cutting and its types i.e. shearing by press tools and shearing machine • Effect of shearing pressure • Effect of burrs and its direction • Introduction of shearing machine and its types • Working principle of shearing machine • Difference between cutting and shearing • Description of blaring tool, compound tool and progressive tool • Strip size calculation • Strip layout • Selection of material for press tool • Importance of clearances and its calculation (3 hours)
<p>Plastic Mould</p> <ul style="list-style-type: none"> • Manufacturing of hand injection mould (36 hours) 	<ul style="list-style-type: none"> • Introduction of different types of moulds i.e. injection, compression and transfer mould • Different parts of moulds • Effects of runners and gate • Types of runners • Types of gates • Effects of runners on gate (3 hours)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

INDUSTRIAL TRAINING – II (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 2nd semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

7. RESOURCE REQUIREMENT

7.1 LIST OF TOOLS/EQUIPMENT

a) TRAINEES TOOL KIT FOR 30 TRAINEES +1 INSTRUCTOR

Sr. No.	Names of the Items	Quantity
1.	Steel Rule 150 mm English and Metric combined	31 Nos.
2.	Engineer's Square 150 mm with knife edge	31 Nos.
3.	Hacksaw frame for 200-300 mm blade	31 Nos.
4.	Centre punch 100 mm	31 Nos.
5.	Prick punch 150 mm	31 Nos.
6.	File flat bastard 300 mm	31 Nos.
7.	File flat 2 nd cut 250 mm	31 Nos.
8.	File flat safe edge 200 mm	31 Nos.
9.	File triangular smooth 200 mm	31 Nos.
10.	File card	31 Nos.

b) TOOLS AND EQUIPMENTS

Sr. No.	Names of the Items	Quantity
1.	Calliper inside spring type-150 mm	6 Nos.
2.	Calliper outside spring type-150 mm	6 Nos.
3.	Divider spring type – 150 mm	6 Nos.
4.	Odd leg calliper firm joint 0- 150 mm	3 Nos.
5.	Screw driver – 150 mm	4 Nos.
6.	Screw driver – 200 mm	5 Nos.
7.	Centre gauge 55°and 60°	3 Nos.
8.	Oil can 250 ml	6 Nos.
9.	File flat smooth 200 mm	6 Nos.
10.	File flat smooth with safe edge 200 mm	6 Nos.
11.	File half round bastard 300 mm	6 Nos.
12.	File half round smooth 250 mm	6 Nos.
13.	File triangular bastard 250 mm	6 Nos.
14.	File triangular smooth 200 mm	6 Nos.
15.	File round bastard 250 mm	6 Nos.
16.	File square bastard 300 mm	6 Nos.
17.	File square smooth 250 mm	6 Nos.
18.	Knife edge file 150 mm	6 Nos.
19.	Needle file assorted (12 nos.) 150 mm	6 Nos.
20.	Scraper flat 250 mm	6 Nos.
21.	Hammer Ball Peen 0.5 kg with handle	10 Nos.
22.	Hammer Cross Peen 0.75 kg with handle	10 Nos.
23.	Chisel cold flat 18 x 150 mm	10 Nos.
24.	Calliper inside spring type-150 mm	6 Nos.
25.	Chisel Cross Cut 10 x 3 x 200 mm	6 Nos.
26.	Chisel Half Round 10 x 250 mm	6 Nos.
27.	Chisel diamond point 10 x 200 mm	6 Nos.

28.	Scribing block universal 300 mm	6 Nos.
29.	Cast Iron Surface plate 600 x600 mm	1 No.
30.	Granite Surface plate 600 x 600 x 80 mm	1 No.
31.	Tap extractor 3 mm to 12 mm x 1.5 mm (ezzy out)	1 Set
32.	Screw extractor sizes 1 to 8	1 Set
33.	Taps and dies metric 5 mm to 12 mm complete set in a box	4 Sets
34.	Twist Drill with St. Shank Ø 5 to Ø 12 mm in steps of 0.5 mm	4 Sets
35.	Twist Drill St. Shank Ø 8 mm to Ø 12 mm in steps of 1 mm	4 Sets
36.	Taper shank drills Ø 6 mm to Ø 20 mm in steps of 1 mm	2 Sets
37.	D.E spanners 3-4 , 6-8, 10-12, 13-14, 15-16, 18-19, 20-22, 24-26 (8 spanners)	4 Sets
38.	Letter punch 5 mm set	2 Sets
39.	Number punch 5 mm set	2 Sets
40.	Drill chuck 12 mm capacity with key	6 Nos.
41.	Allen key metric 3 to 12 mm set	6 Sets
42.	Centre drills 3, 4,5 mm	6 Each
43.	Parallel hand reamer 6 mm to 12 mm in steps of 1 mm	3 Sets
44.	Star dresser	4 Nos.
45.	Diamond dresser with holder	4 Nos.
46.	Safety goggles (Personal Protective Equipments)	6 Nos.
47.	Demagnetizer	2 Nos.
48.	Snips 200 mm blade	2 Nos.
49.	Workbench 240 cm x 120 cm x 75 cm with 150 mm vice(Each bench fitted with 4 vices)	6 Nos.
50.	Bench Vice 200 mm	4 Nos.
51.	Steel lockers for 31 trainees (Pigeon Cup Board)	2 Nos.
52.	Steel cupboard 180 cm x 60 cm x 45 cm	6 Nos.
53.	Metal rack 180 cm x 60 cm x 45 cm	2 Nos.
54.	Fire extinguisher	2 Nos.
55.	Fire buckets with stand	4 Nos.
56.	Feeler gauge 0.05 mm to 0.3 mm by 0.05 and 0.4 mm to 1 mm by 0.1 mm (13 leaves)	2 Sets
57.	Metric Screw pitch gauge-Range 0.4 -6 mm pitch 60° (21 leaves)	2 Sets
58.	Radius gauge 1 - 3 mm by 0. 25 mm and 3.5-7mm by 0.5 mm (34 leaves)	2 Nos.
59.	Vernier height gauge - Range 300 mm, with 0.02 mm least count	2 Nos.
60.	Universal vernier calliper-Range 200 mm, with 0.02 mm least count	2 Nos.
61.	Dial vernier calliper 0-200 mm, with 0.02 mm least count	10 Nos.
62.	Vernier calliper-Range 300 mm Vernier scale 0.02 mm	6 Nos.
63.	Vernier bevel protractor-Blade range 150 and 300 mm, dial 1°, least count 5' (min.) with head, Acute Angle attachment	6 Nos.
64.	Outside micrometer 0-25 mm, with 0.01 mm least count	2 Nos.
65.	Outside micrometer 25-50 mm, with 0.01 mm least count	4 Nos.
66.	Outside micrometer 50-75mm, with 0.01 mm least count	2 Nos.
67.	Combination square sets-300 mm blade with square head, centre head, protractor head	2 Nos.
68.	Telescopic gauge range 8 -150 mm (6 pcs/set)	2 Nos.

69.	Sine bar 150 mm with stopper plate	2 Nos.
70.	Sine table 200 mm length with magnetic bed	2 Nos.
71.	Slip Gauge Box (workshop grade) -87 pieces per set	2 Nos.
72.	Gauge block accessories consisting holders, half round jaws, scriber point, centre point , triangular straight edge (14 pcs/set)	2 Nos.
73.	Central square – Size 400 x 250 mm blade	2 Nos.
74.	V-Block-Approx. 32 x 32 x 41 mm with clamping capacity of 25 mm with clamps	6 Pairs
75.	V-Block-Approx 65x65x80 mm with clamping capacity of 50 mm with clamps	4 Pairs
76.	Magnetic V-Block 100x100x125 mm	4 Pairs
77.	Angle plate 150 x 150 x 200 mm	2 Nos.
78.	Angle plate-adjustable 250x250x300 mm	2 Nos.
79.	Inside micrometer – Range 50-75mm with std extension rods upto 200mm..	1 Set
80.	Depth micrometer – Range 0-25 mm, accuracy 0.01 mm with std set of extension rods.	1 Set
81.	Magnetic stand with magnetic base 60 x 47.5 mm and with universal swivel clamp, dial holding rod (150 mm) scriber	4 Nos.
82.	Dial test indicator-Lever type- Range 0-0.8 mm –Graduation 0.01mm, reading 0-50-0 with accessories	2 Nos.
83.	Dial test indicator – Plunger type-Range 0-10 mm , Graduation 0.01 mm, Reading 0-100 with revolution counter	2 Nos.
84.	Bore gauge with dial indicator (1 mm range, 0-0.01 mm graduation)-Range of bore gauge 18-150 mm	2 Sets
85.	Straight edge-Single beveled-Size 150 mm and 250 mm	2 each
86.	Tool makers clamp 50 mm & 75 mm	4 Nos. each
87.	C – clamp- 50 mm & 75 mm	10 Nos.each

c) CUTTING TOOLS

Sr. No.	Names of the Items	Quantity
1.	Side and face milling cutter Ø 100 x 10 X Ø 27 mm	4 Nos.
2.	Side and face cutter Ø 80 x 10 X Ø 27 mm	4 Nos.
3.	Cylindrical milling cutter Ø 63 x 70 x Ø 27 mm	4 Nos.
4.	Slitting Saw cutter Ø 75 x 3 X Ø 27 mm	3 Nos.
5.	Slitting Saw cutter Ø 100 x 6 X Ø 27 mm	3 Nos.
6.	Single angle cutter Ø 75 x 16 x Ø 27mm - 60°	4 Nos.
7.	Single angle cutter Ø 75 x 20 x Ø 27 - 45°	4 Nos.
8.	Equal angle cutter Ø75x 30 x Ø 27 - 90°	4 Nos.
9.	Shell End Mill Ø 50 x 36 x Ø 22 (preferably inserted tip type)	6 Nos.
10.	Shell End Mill Ø 75 mm x 50 x Ø 22 (preferably inserted tip type)	6 Nos.
11.	Parallel shank end mills Ø6, Ø10 and Ø 16 are (double fluted), Ø 20 mm & Ø25mm (four fluted)	10 Nos.each
12.	'T' slot cutter with parallel shank- Ø 17.5 x 8 mm width x dia. of shank 8 mm	3 Nos.
13.	Concave Milling cutter Ø 63 x 6 radius x Ø 27 mm	2 Nos.
14.	Convex Milling cutter Ø 63 x 6 radius x Ø 27 mm	2 Nos.

15.	Disc type form milling cutter (involute form -2 module, 20° pressure angle)	2 Sets
16.	Tool holder (straight) to suit 6, 8 mm sq. bit size	2 Nos.each
17.	Parting tool holders to suit 3 and 4 mm thick tool blade.	3 Nos.
18.	Boring bars with holders to accommodate 4, 6 and 8 mm HSS tool bits	6 Nos.each
19.	Knurling tool (straight & diamond)	4 Nos.each
20.	Tool bits, inserts, carbide tool bits, reamers, special counter bore, counter sink tools(CNC tooling setup)	as reqd.

d) GENERAL MACHINERY AND INSTALLATION

Sr. No.	Names of the Items	Quantity
1.	Sensitive drilling machine - capacity 12 mm Motorized –with drill chuck and key etc.	2 Nos.
2.	Pillar/column type Drilling machine – 25 mm capacity- motorized with drill chuck & key etc.	2 Nos.
3.	Radial Drill machine to drill up to 32 mm diameter.	1 No.
4.	Power hacksaw machine to accommodate 21” or more length blade.	1 No.
5.	Double ended Pedestal Grinder with 178 mm wheels(one fine and one rough wheel)	2 Nos.
6.	SS and SC centre lathe (all geared) with minimum specification as: Centre height 150 mm and centre distance 1500 mm along with 3 & 4 jaw chucks, auto feed system, safety guard, taper turning attachment, motorized coolant system, lighting arrangement & standard accessories.	5 Sets
7.	Shearing machine (lever type)hand operated complete with 300 mm blade length	1 No.
8.	<u>Universal Milling Machine</u> Longitudinal traverse 700 - 800 mm Cross traverse 300 - 400 mm Vertical traverse 200 - 350 mm Swivel of table on either side 45° Speed range rpm 30 to 1800 With universal dividing head, circular table, long arbors, slab arbor, slotting attachment, vertical indexing head, etc.	2 Nos.
9.	<u>Horizontal and Vertical milling machine</u> Table Length x width 1350x310 mm Longitudinal traverse 700 - 800 mm Cross traverse 200 - 265 mm Vertical traverse 300 - 400 mm Speed range rpm 20 to 1800	Vertical Horizontal 2 Nos. 1 No.

10.	<u>Hydraulic Surface Grinding Machine</u> Table Clamping area 600 x 178 mm Grinding area 400 x 200 mm Distance table-centre of spindle 400 - 500 mm Table speed 1-25 m/min. With standard accessories like dust extractor with water separator, balancing device, table-mounted Radius-tangent wheel dresser, wheel flanges, etc.	3 Nos.
11.	<u>Tool and Cutter Grinder</u> Largest diameter of cutter that can be ground 10-100 mm Max. admit between centers 230 mm Max. length of cutting edges ground 120 mm With standard equipment like adaptor bushes, cutter head holder assembly, adaptors, extension spindle, flanges fro grinding wheel, etc.	1 No.
12.	<u>Universal cylindrical Grinding Machine</u> Max. dia ground (effective) 250 mm Max. grinding length 300 mm Height of centre 130 mm Max. distance between centers 340 mm With special accessories like face plate, steady, radius and face dressers, find hand feed attachment etc.	1 No.
13.	Fly press 5 ton capacity	1 No.
14.	Muffle furnace – heating chamber 300 x 300 x 450 mm for 1050°C Quenching tank-600 x600 x 600 mm	1 No.
15.	Rockwell hardness testing machine with standard accessories	1 No.
16.	Hydraulic press 16T with all safety measures	1 No.

7.2 LIST OF CONSUMABLES

1.	Different types of die steel	As required
2.	Differnt types of blanks	As required
3.	Different types of punches	As required
4.	Different types of milling cutters	As required
5.	Different types of die blocks	As required
6.	Different types of punch plates	As required
7.	Different types of blank punches	As required
8.	Different types of pierce punches	As required
9.	Different types of stripper plates	As required
10.	Hydraulic oil	As required

7.3 LIST OF RECOMMENDED BOOKS

1. Engineering Drawing by N.D. Bhatt; Charotar Publishing House Pvt. Ltd., Anand
2. Engineering Drawing by P.S. Gill; SK Kataria and Sons, Delhi
3. Material Science by V.K. Manechanda; India Publishing House, Jalandhar
4. Introduction to Material Science by A.R. Gupta; Satya Prakashan, New Delhi
5. Material Science by G.K. Narula and K.S. Narula; Tata McGraw Hill, New Delhi
6. Material Science by R.K. Rajput; Katson Publishers, Ludhiana
7. Manufacturing Processes (Metal Forming and Machinery) by Dr. Rupinder Gupta; Dhanpat Rai & Co. Pvt. Ltd., Delhi
8. Production Engineering by P.C. Sharma; S Chand and Company Ltd.
9. Tool and Die Maker by Karan Singh; Dhanpat Rai & Co. Pvt. Ltd., Delhi.
10. Tool and Die Maker (Press Tools, Jigs & Fixture) published by National Instructional Media Institute (NIMI), Chennai
11. Basic Tool Die Maker by Karan Singh; Dhanpat Rai & Co. Pvt. Ltd., Delhi.
12. Injection Moulds Design by R.G.W. Pye; Godwin Books
13. Injection Moulding by R.C. Batra; CBS Publishers, Delhi
14. Fundamentals of Tool Design by A. Kumar; Dhanpat Rai & Co. Pvt. Ltd., Delhi.

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.
2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.
3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.
4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.
5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.
6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

9. LIST OF EXPERTS/CONTRIBUTORS

- a) Following experts participated in the workshop to design curriculum of certificate programme in 'Tool and Die Maker' for MRSPTU, Bathinda on 8-9 September, 2016 at NITTTR, Chandigarh.

1.	Dr. Ashok Kumar Goel, Professor & Head, Electronics and Communication Engineering Department and Director, College Development Council, MRSPTU Campus, Dabwali Road, Bathinda, Punjab
2.	Dr. RK Gupta, Ex-Principal, ISTC-CSIO, Sector 30-C, Chandigarh
3.	Dr. KD Chattopadhyay, Chitkara Institute of Engineering and Technology, Village Jhansla, Rajpura
4.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
5.	Shri Jagdeep Singh, Central Tool Room (CTR), A-5, Phase-5, Focal Point, Ludhiana
6.	Shri Sunil Kumar Jain, Manager, ESSEN DEINKI, Industrial Area, Phase-II, Chandigarh
7.	Shri Pirthi Raj, Principal Technical Officer, ISTC-CSIO, Sector 30-C, Chandigarh
8.	Shri Mange Ram, Senior Technical Officer, ISTC-CSIO, Sector 30, Chandigarh
9.	Shri Rahul Kirti, Engineer, Central Tool Room (CTR), A-5, Phase-5, Focal Point, Ludhiana
10.	Shri Inderpreet Singh, Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
11.	Shri Rakesh Kumar, Instructor, Tool & Die, Govt. Industrial Training Institute, Patiala
12.	Shri Desh Raj Sharma, Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
13.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
14.	Dr. BS Pabla, Professor & Head, IMCO, NITTTR, Chandigarh
15.	Dr. SS Dhama, Professor, Mechanical Engineering, NITTTR, Chandigarh
16.	Shri P Sudhakar Rao, Assistant Professor, Mech. Engg., NITTTR, Chandigarh
17.	Prof. SK Gupta, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

- b) Following experts participated in the workshop to review curriculum of certificate programme in 'Tool and Die Maker' for MRSPTU, Bathinda on 26 December, 2016 at NITTTR, Chandigarh.

1.	Dr. Ashok Kumar Goel, Director, College Development Council, MRSPTU Campus, Bathinda, Punjab
2.	Dr. Balraj Singh, Director, PIT, Rajpura
3.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
4.	Shri GS Sethi, Consultant, IndiaCan, A-301, Rishi App, Sector 70, Mohali
5.	Shri Jagdeep Singh, Central Tool Room, A-5, Phase-5, Focal Point, Ludhiana
6.	Shri Sikander Singh Sidhu, Asstt. Professor, CZSCCET, Bathinda
7.	Shri Bhanu Goel, M.D., Apna Mistri, Patiala
8.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

Curriculum
for
Certificate Programme
in
PLUMBER
for
**Maharaja Ranjit Singh Punjab Technical
University, Bathinda (Punjab)**



Prepared By:

Curriculum Development Centre
National Institute of
Technical Teachers Training and Research
Sector 26, Chandigarh - 160 019

January, 2017

FOREWORD

Rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In order to cope with the challenges of handling new materials, machines and technologies, we have to develop human resources having appropriate competencies. There is an increasing demand of skilled workforce in India in particular and the world over in general. Under the new circumstances, India faces a challenging task of meeting the technical manpower requirement, especially in the area of skilled workforce to cater to industrial needs. Efforts have to be made so that passouts from our technical institutions are acceptable at global level.

Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Technical institutions play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab to start the skill oriented integrated courses at certificate, diploma and degree level, as per the needs of the industry, are laudable.

In order to meet the future requirements of technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of technical programmes at various levels. The curricula for various programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of programme and various courses.

The success of any technical programme depends upon its effective implementation. However best the curriculum document is designed, if it is not implemented properly, the output will not be as per expectations. In addition to acquisition of appropriate physical resources, availability of motivated, competent and qualified faculty is equally essential for effective implementation of the curricula.

It is expected that MRSPTU will carry out curriculum evaluation on a continuous basis to identify the new skill requirements. At the same time, it is expected that innovative methods of course offering will be used to develop desired skills and infuse the much needed dynamism in the system.

Dr. M.P. Poonia
Director
National Institute of
Technical Teachers Training & Research
Chandigarh

PREFACE

Curriculum document is a comprehensive plan of an educational programme. It is through the curriculum that the educational objectives of a programme are achieved. It has to be ensured that the curriculum is dynamic, articulated, balanced, data based, feasible, and as per industrial needs. Curriculum Development Centre at NITTTR, Chandigarh has been extending services to technical education system of the states in northern region in developing and updating their curriculum on regular basis.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab assigned the project for developing the curriculum of some integrated programmes to this institute in the month of May 2016. A series of curriculum workshops were held during the months of June-July, 2016. This curriculum document is an outcome of the extensive discussions held with the representatives from various organizations, technical institutions and industry during the curriculum workshops. While developing the study and evaluation scheme and detailed contents, the following aspects have been kept in mind :

- Employment Opportunities of Certificate holders
- Job role of certificate holders
- Learning outcome of the Programme
- Mobility of students for their professional growth

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Industrial Training in the curriculum. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which units on Communication Skills have been introduced in both the semesters of the certificate course.

We hope that this curriculum document will prove useful in producing skilled manpower at desired level in the state of Punjab. The success of this outcome-based curriculum depends upon its effective implementation and it is expected that MRSPTU will make all efforts to create better facilities, develop linkages with the world-of-work and foster conducive and requisite learning environment as prescribed in the curriculum document.

Professor and Head
Curriculum Development Centre
NITTTR, Chandigarh

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance and guidance received from the following persons:

- i) Vice Chancellor, Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bhatinda, Punjab for entrusting this project of curriculum design to NITTTR, Chandigarh.
- ii) Director, College Development Council MRSPTU for his support and active involvement in the curriculum development.
- iii) Director, National Institute of Technical Teachers' Training and Research, Chandigarh for his support and academic freedom provided to Curriculum Development Centre.
- iv) All the experts from industry/field organizations, universities, ITIs and other technical institutions for their professional inputs during curriculum workshops.
- v) Faculty from different departments of NITTTR, Chandigarh for content updation.
- vi) Shri Yogendra Kaushal, Stenographer, Curriculum Development Centre, NITTTR, Chandigarh for processing the document.
- vii) Shri Mohan Lal Bindal, Assistant, Curriculum Development Centre for his support and secretarial assistance in the conduct of curriculum design workshops.

Coordinator

1. SALIENT FEATURES OF THE PROGRAMME

1.	Sector	:	Construction
2.	Name of the Certificate Programme	:	Plumber
3.	Entry Qualification	:	Matriculation or equivalent NSQF Level as prescribed by MRSPTU, Bathinda
4.	Duration of the Programme	:	One Year
5.	Intake	:	30
6.	Pattern of the Programme	:	Semester Pattern
7.	NSQF Level	:	Level - III
8.	Ratio between theory and Practice	:	20 : 80 (Approx.)

2. JOB ROLE AND JOB OPPORTUNITIES

a) Job Role

A plumber is responsible for installing, repairing and maintaining pipes, fixtures and other plumbing used for water distribution and waste water disposal in domestic and commercial buildings.

b) Job Opportunities

Following job opportunities are visualized for Plumber certificate holders:

1. Maintenance Section of Government organization/Public sector
2. Construction Industries
3. Civil Contractors and Builders
4. Establishment of own enterprise by opening a repair/service centre/shop
5. Establishment of own shop of sanitary, water supply and hardware items/materials
6. Work as licensed Plumber for water supply and sanitary installations as desired by various Municipal authorities.

3. LEARNING OUTCOMES OF THE PROGRAMME

After undergoing the programme, students will be able to:

1. Identify and select latest materials related to plumbing
2. Perform cutting, threading, bending and jointing of GI/PPR/PVC/MDP/HDP pipes etc.
3. Lay CI pipes and perform lead filling and caulking horizontally and vertically with alignment and grade
4. Laying and joining SW/SWR/PVC pipes with alignment and grade for sewerage and rain water harvesting
5. Fix sanitary fittings and fixtures
6. Install water pumps and connect to supply lines
7. Assess the requirement of materials for a specific work and calculate the quantum of material and costing/billing
8. Work as a licensed plumber as per provisions of various laws of local Municipal authorities for release of water connection, and sewerage connection
9. Apply basic principles of mathematics and physics in solving the trade problems
10. Communicate effectively in English with others.

CONTENTS

Sr. No	Particulars	Page No.
-	Foreword	(i)
-	Preface	(ii)
-	Acknowledgements	(iii)
1.	Salient Features of the Programme	1
2.	Job Role and Job Opportunities	2
3.	Learning Outcomes of the Programme	3
4.	Study and Evaluation Scheme	4
5.	Guidelines for Assessment of Student Centred Activities	6
6.	Detailed Contents of Various Units	7-27

FIRST SEMESTER

1.1	Communication Skills	7
1.2	Engineering Drawing – I (Plumber)	9
1.3	Introduction to Plumbing	10
1.4	Plumbing Materials and Accessories	12
1.5	Chase Cutting and Operation on Walls	14
1.6	Taps and Valves	15
-	Industrial Training – I (4 Weeks)	16

SECOND SEMESTER

2.1	Basic Sciences	17
2.2	Engineering Drawing – II (Plumber)	19
2.3	Operations on Plumbing Pipes	21
2.4	Installation and Maintenance of Sanitary Fixtures	23
2.5	Plumbing Systems	25
2.6	Estimating and Costing	26
-	Industrial Training – II (4 Weeks)	27

7.	Resource Requirements	28-31
7.1	List of Tools/Equipment	28
7.2	List of Consumables	29
7.3	List of Recommended Books	30
8.	Recommendations for Effective Curriculum Implementation and Evaluation	32
9.	List of Contributors/Experts	33

4. STUDY AND EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN PLUMBER

FIRST SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1		*Communication Skills	8	24	1	25	25	50	25	1	50	3	75	125
1.2		Engineering Drawing – I (Plumber)	-	32	1	-	50	50	75	3	-	-	75	125
1.3		Introduction to Plumbing	16	96	4	25	50	75	50	2	100	4	150	225
1.4		Plumbing Materials and Accessories	16	112	5	25	50	75	50	2	100	4	150	225
1.5		Chase Cutting and Operation on Walls	16	80	4	25	50	75	50	2	75	4	125	200
1.6		Taps and Valves	16	96	4	25	50	75	50	2	100	4	150	225
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training (during vacation)			-	-	4	-	-	-	-	-	100	3	100	100
Total			72	488	25	125	300	425	300	-	525	-	825	1250

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ **Industrial Training**

After examination of 1st Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

Total weeks per Semester = 16 Total working days per week = 5 Total hours per day = 7

Total hours in a Semester = 16 x 5 x 7 = 560

One credit is defined as one hour of lecture per week or two hours of practicals per week for one semester. Fractions in credits have been rounded to nearest integer.

SECOND SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1		*Basic Sciences	48	-	3	25	-	25	75	2	-	-	75	100
2.2		Engineering Drawing – II (Plumber)	-	32	1	-	50	50	75	3	-	-	75	125
2.3		Operations on Plumbing Pipes	16	96	4	25	50	75	50	2	100	4	150	225
2.4		Installation and Maintenance of Sanitary Fixtures	32	96	5	25	50	75	50	2	100	4	150	225
2.5		Plumbing Systems	16	96	4	25	50	75	50	2	100	4	150	225
2.6		Estimating and Costing	16	64	3	25	50	75	50	2	75	4	125	200
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training			-	-	4	-	-	-	-	-	100	3	100	100
Total			128	432	26	125	275	400	350	-	475	-	825	1225

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ **Industrial Training**

After examination of 2nd Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

5. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 25 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- i. 5 Marks for general behavior and discipline
(by Principal in consultation with all the trainers)
- ii. 5 Marks for attendance as per following:
(by the trainers of the department)
 - a) 75% Nil
 - b) 75 - 80% 2 Marks
 - c) 80 - 85% 3 Marks
 - d) Above 85% 5 Marks
- iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 15 - National Level participation or inter-University competition
 - b) 10 - Participation in two of above activities
 - c) 5 - Participation in internal sports of the University

Note: There should be no marks for attendance in the internal sessional of different subjects.

UNIT – 1.1 : COMMUNICATION SKILLS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Speak confidently.
- Overcome communication barriers.
- Write legibly and effectively.
- Listen in proper prospective.
- Read various genres adopting different reading techniques.
- Respond to telephone calls effectively.

Practical	(24 Hours)	Theory	(08 Hours)
		Basics of Communication <ul style="list-style-type: none"> • Process of communication • Types of communication - formal and informal, oral and written, verbal and non-verbal • Objectives of communication • Essentials of communication • Barriers to communication 	(1 hour)
<ul style="list-style-type: none"> • Looking up words in a dictionary (meaning and pronunciation) 	(2 hours)	Functional Grammar and Vocabulary <ul style="list-style-type: none"> • Parts of speech • Tenses • Correction of incorrect sentences 	(2 hours)
<ul style="list-style-type: none"> • Self and peer introduction • Greetings for different occasions 	(1 hour)	Listening <ul style="list-style-type: none"> • Meaning and process of listening • Importance of listening • Methods to improve listening skills Speaking <ul style="list-style-type: none"> • Importance • Methods to improve speaking • Manners and etiquettes 	(2 hours)
<ul style="list-style-type: none"> • Newspaper reading 	(1 hour)	Reading <ul style="list-style-type: none"> • Meaning • Techniques of reading: skimming, scanning, intensive and extensive reading 	(1 hour)

<ul style="list-style-type: none"> • Vocabulary enrichment and grammar exercises • Exercises on sentence framing accurately (6 hours) 	<p>Functional Vocabulary</p> <ul style="list-style-type: none"> • One word substitution • Commonly used words which are often misspelt • Punctuation • Idioms and phrases <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Reading aloud articles and essays on current and social issues • Comprehension of short paragraph (5 hours) 	
<ul style="list-style-type: none"> • Write a short technical report • Letter writing (3 hours) 	
<ul style="list-style-type: none"> • Participate in oral discussion • Respond to telephonic calls effectively • Mock interview (6 hours) 	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT: 1.2 : ENGINEERING DRAWING – I (PLUMBER)		
LEARNING OUTCOME:		
After undergoing this unit, the students shall be able to:		
<ul style="list-style-type: none"> • Draw free hand sketches of simple objects • Prepare and interpret drawings of various fixtures of plumbing. 		
Practical	(32 hours)	Theory
<ul style="list-style-type: none"> • Lettering – Number and alphabets (2 hours) • Free hand sketches in isometric of simple objects (2 hours) • Drawing a plan and elevation of different types of bars (2 hours) • Prepare layout plan for showing the water line for a residential building (6 hours) • Studying of building plan for marking the position of the sanitary fittings (6 hours) • Preparation of simple working drawing (8 hours) • Drawing a longitudinal section of the house drainage (6 hours) 		

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Sketching
- Drawing

UNIT - 1.3 : INTRODUCTION TO PLUMBING

LEARNING OUTCOMES:

After undergoing the unit, students will be able to:

- Use various types of tools and equipment required in plumbing.
- Define the specifications and conventions.
- Identify and select various types of plumbing materials.
- Use good house-keeping practices and safety measures

Practical (96 hrs)	Theory (16 hrs)
<ul style="list-style-type: none"> • Identification of basic tools and equipments used in plumbing works and their sketches (10 hrs) • Demonstration of plumbing tools and equipment. (22 hrs) • Use of protective clothing, boots, goggles and equipment as applicable to plumbing related task. (15 hrs) • Demonstration of good house keeping practices, proper handling of materials and waste disposal. (18 hrs) • Demonstration of safety precautions, use of safety belts and helmets while working at site (20 hrs) • Exposure to methods for storage/laying plumbing materials at work in safe manner (8 hrs) • Water supply – direct/overhead (2 hrs) • Sanitary (1 hr) 	<ul style="list-style-type: none"> • Introduction to plumbing (1 hrs) • Safety precautions: <ul style="list-style-type: none"> • While using different hand tools • While using raw materials • With co-workers • On the machines & equipment (3 hrs) • Different types of basic tools and equipment used in plumbing such as Cutter, Vices, Ratchet Type, Pipe Threading Die, Electric Hand Drilling Machine, Socket, Fusion device for PPR pipe etc. (4 hrs) • Various types of plumbing materials such as Galvanized Iron(GI), Cast Iron(CI), Poly Vinyl Chloride (PVC), PPR, C-PVC, Stoneware(SW), Stainless Steel pipe, Wrought Iron (WI), Lead, Chinaware(CW), Chrome plated (CP) fittings etc. (8 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce

UNIT - 1.4 : PLUMBING MATERIALS AND ACCESSORIES	
LEARNING OUTCOMES:	
After undergoing the unit, students will be able to:	
<ul style="list-style-type: none"> • Identify and select various types of pipes available in the market. • Identify and select various types of specials. 	
Practical	Theory
(112 hrs)	(16 hrs)
<ul style="list-style-type: none"> • Identification of different types of pipes and specials used in plumbing work. (15 hrs) • Demonstration of various types of pipes like G.I., C.I., PVC, PPR, SWR and SW pipes etc. (15 hrs) • Demonstration of various types of specials like: (36 hrs) <ul style="list-style-type: none"> – G.I. Specials: Elbow, Tee, reducing elbow, union, sockets, reducing socket, plugs – C.I. Specials: Collars, bends, door bends, door pieces, Various types of junctions, offsets, floor trap, traps, cowl etc.. – PVC/PPR Specials: Elbow, Tee, reducing elbow, Union, socket, cap plug, clamps, coupler, Cross-Tee etc. – SWR Specials: Gully Trap, intercepting trap etc. 	<ul style="list-style-type: none"> • Description of various pipes like Galvanized Iron (G.I), Cast Iron (C.I), Poly Vinyl Chloride(PVC), Poly Propylene Random (PPR), Soil Waste Rain(SWR) and Stoneware (SW) with their specific uses, availability, specification and cost. (5 hrs) • Description and sketch of various types of specials like junctions, elbow, traps etc. their application, availability, specifications and cost. (6 hrs)
<ul style="list-style-type: none"> • Practice on fixing of chinaware fittings such as water closet (Orissa pan/European pan) wash basin, bath tub, urinal pots and their partitions and kitchen sink etc. Mixtures/shower/geysers/solar water heating system. (30 hrs) 	<ul style="list-style-type: none"> • Description of various standards for fixing sanitary fittings such as standard height, orientation and location. • Basic knowledge (5 hrs)

<ul style="list-style-type: none">• Practice on fixing C.P. fittings, like bib cock, angle cock, shower, towel ring/rail, soap dish etc <p>(16 hrs)</p>	
---	--

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce
- Sketching
- Workshop job

UNIT - 1.5 : CHASE CUTTING AND OPERATION ON WALLS	
LEARNING OUTCOMES:	
After undergoing the unit, students will be able to:	
<ul style="list-style-type: none"> • Use various mason tools • Use construction materials in masonry work. • Execute small masonry work. 	
Practical	Theory
(80hrs)	(16 hrs)
<ul style="list-style-type: none"> • Demonstration of various mason tools and materials. (12 hrs) • Practice of chase cutting for various sizes of pipes (24 hrs) • Practice of operations on walls such as drilling, nailing, clipping, finishing and hammering/cutters (26 hrs) • Practice of preparing cement mortar (1:4) and concrete mortar (1:2:4) and its application for filling chase and hole cutting (18 hrs) 	<ul style="list-style-type: none"> • Introduction to mason tools and materials used in masonry work-their use, availability and cost (5 hrs) • Description of various sizes of Chase cutting required for various sizes of pipes (6 hrs) • Mixing of cement mortar and its use (5 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT - 1.6 : TAPS & VALVES	
LEARNING OUTCOMES:	
After undergoing the unit, students will be able to:	
<ul style="list-style-type: none"> • Explain working principles of taps and valves • Identify and select various types of taps and valves • Repair the taps and valves 	
Practical	Theory
(96 hrs)	(16 hrs)
<ul style="list-style-type: none"> • Selection of taps and valves followed by demonstration by instructor, the trainee will dismantle taps & Valves, inspect packing glands and washers, replace packing gland and washers, adjust locking nuts ensuring no leaks when tested. (54 hrs) • Fixing of latest/ advanced mixer, bib cocks, angle valves, push cocks, pillar cock etc. (42 hrs) 	<ul style="list-style-type: none"> • Working principles of taps and valves and their methods of testing and use of basic tools and bench vice. (6 hrs) • Safe handling of tools and fittings (2 hrs) • Types of gland packing. (2 hrs) • Various types of valves; sluice valve, air relief valve, drain valve, foot valve, check valve, (6 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job
- Assembly and disassembly

INDUSTRIAL TRAINING – I (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 1st Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

UNIT – 2.1 : BASIC SCIENCES	
LEARNING OUTCOMES:	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Apply the basic principles of maths in solving the basic problems of the trade. • Apply the basic principles of physics in solving the basic problems of the trade. 	
Practical	Theory (48 Hours)
	<p>Mathematics</p> <ul style="list-style-type: none"> • Basic Algebra – algebraic formula. Simultaneous equation – quadratic equations (4 hours) • Simultaneous linear equation in two variables (3 hours) • Arithmetic and geometric progression, sum of n-terms, simple calculations. (3 hours) • Mensuration – Find the area of regular objects like triangle, rectangle, square and circle; volumes of cube, cuboid, sphere cylinder (6 hours) • Trigonometry - Concept of angle, measurement of angle in degrees, grades and radians and their conversions, T-Ratios of Allied angles (3 hrs) • Co-ordinate Geometry - Cartesian and polar coordinates, conversion from cartesian to polar coordinates (2 hrs) • Concept of Differentiation and Integration (3 hrs)
	<p>Physics</p> <ul style="list-style-type: none"> • FPS, CGS, SI units, dimensions and conversions (2 hours) • Force, speed, velocity and acceleration – Definition, units and simple problems (3 hours)

	<ul style="list-style-type: none"> • Stress and strain, modulus of elasticity (2 hours) • Heat and temperature, its units and specific heat of solids, liquids and gases (4 hours) • Electricity and its uses, basic electricity terms and their units, D.C. and A.C., positive and negative terminals, use of switches and fuses, conductors and insulators (5 hours) • Work, Power and Energy-Defination, units and simple problems (4 hours) • Concept of force, Inertia, Newton's First law of motion; momentum and Newton's second law of motion; Impulse; Newton's third law of motion. (2 hrs) • Friction and Lubrication (1 hour) • Law of conservation of energy (1 hour)
--	---

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

UNIT - 2.2 : ENGINEERING DRAWING – II (PLUMBER)		
LEARNING OUTCOME:		
After undergoing this unit, the students will be able to:		
<ul style="list-style-type: none"> • Draw free hand sketches of simple objects • Prepare and interpret drawings of various fixtures of plumbing. 		
Practical	(32 hours)	Theory
<ul style="list-style-type: none"> • Construction of simple figures and solids, such as cubes, rectangular blocks, cylinders etc., with dimensions and title. Use of different types of scales in inches and millimetres. (3 hrs) 		
<ul style="list-style-type: none"> • Freehand isometric sketching of simple objects with dimensions. (3hrs) 		
<ul style="list-style-type: none"> • Line diagram of the water service line. Free hand isometric sketching of simple objects with dimensions. (4 hrs) 		
<ul style="list-style-type: none"> • Free hand sketching plan and elevation of simple objects like hexagonal bar, square bar, circular bar, tapered bar, hollow bar. Views of simple solid and hollow bodies cut by section plane. (4 hrs) 		
<ul style="list-style-type: none"> • Layout plan of a small village or town and mark the water line with valves of all types & the position of the reservoir. (6 hrs) 		
<ul style="list-style-type: none"> • Study of building plan & mark the position of the sanitary fittings, water supply line, drainage line connection to sewage line. (4 hrs) 		
<ul style="list-style-type: none"> • Free hand sketching of simple objects related to the plumbing and preparation of simple working drawings from the sketches. (4 hrs) 		

<ul style="list-style-type: none">• Longitudinal section of the house drain. Drainage arrangements of workshop of an institution. <p style="text-align: right;">(4 hrs)</p>	
---	--

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Sketching
- Drawing

UNIT - 2.3 : OPERATIONS ON PLUMBING PIPES	
LEARNING OUTCOME:	
After undergoing the subject, students will be able to:	
<ul style="list-style-type: none"> • Define various types of jointing materials. • Perform different operations such as cutting, bending, threading and jointing. 	
Practical	Theory
(96 hrs)	(16 hrs)
<ul style="list-style-type: none"> • Carry out cutting, threading & tightening operations on GI pipes (10 hrs) • Practice on cutting of various types of pipes (10 hrs) • Practice on making threads in pipes (6 hrs) • Practice on making bends in pipes at different angles (6 hrs) • Practice on jointing for various types of pipes such as socket and spigot joint, thread joint, expansion joint, underhand joint, detachable joint etc. (10 hrs) 	<ul style="list-style-type: none"> • Description of various types of pipe cutters such as soil pipe cutter, PPR/PVC Pipe cutter, Electric cutting machine etc. (1 hr) • Knowledge about various type of threads, pitch etc. such as British Standard Practice (BSP) threads. (1 hr) • Description of various types of joints with sketches, joint materials (1 hr)
<ul style="list-style-type: none"> • Cutting/Threading/Bending of GI/PPR Pipes from a given Layout plan, calculate and measure length of pipe required. Mark out and cut to size. Threading and Bending of pipes to within given tolerances:- Marking out & Cutting to $\pm 1\text{mm}$. Bending/off Setting to the following Quality & Tolerances:- Free from throating, rippling and abnormal marks. Pipe diameter to be maintained, no distortion. Angle of bends and off sets, accurate to $\pm 1^\circ$. (24 hrs) 	<ul style="list-style-type: none"> • Reading and Interpreting basic sketches & plumbing drawings. (1 hr) • Use of Hand tools. Measuring & Mark out tool. Cutting Tools, Bending Machine, Stock & Dies, Pipe Vice, lubrication. (1 hr)

<ul style="list-style-type: none"> Practice on jointing P.V.C. pipe with socket joints so that joint length is not less than 1.5 time pipe diameter. Assemble exercise and secure with solvent cement to tolerance of $\pm 2\text{mm}$ & square to $\pm 1^\circ$. (10 hrs) 	<ul style="list-style-type: none"> Use of hand tools, beveling reamer, applying heat with blow lamp. Preparation of Socket, Cleanliness. (1 hr) Application of solvent cement assembly methods. (1 hr) Testing method of water supply pipes with pipe testing machine. (1 hr)
<ul style="list-style-type: none"> Practice on fitting of various types of traps, Working with another trainee in his group, from a given sketch and with necessary tools, lay and join S.W. Pipes to correct fall and alignment. Remove surplus materials and test to meet local by-laws. (10 hrs) 	<ul style="list-style-type: none"> Leveling and joining methods. (1 hr) Drain gradients. (1 hr) Use of sight rails and boning rods. (1 hr) Testing methods i.e. smoke/air/colour/water tests (1 hr)
<ul style="list-style-type: none"> Practice on fitting of various types of traps, working with another trainee in his group and from a given sketch cut and Join Cast Iron pipe, Set up and secure to correct alignment. Seal using lead on one joint and cement or drip/seal/ putty on others. (10 hrs) 	<ul style="list-style-type: none"> Define traps and its types, water seals, Safety in handling lead. (1 hr) Methods of jointing cast iron pipes. Precautions in jointing, when and where to use. (1 hr) Use of melting pots, ladle, splash stick, caulking chisel (1 hr) Introduction to gasket (1 hr)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Sketching
- Workshop job
- Assembly and disassembly

UNIT - 2.4 : INSTALLATION AND MAINTENANCE OF SANITARY FIXTURES	
LEARNING OUTCOME:	
After undergoing the unit, students will be able to:	
<ul style="list-style-type: none"> • Define local by-laws for installation of sanitary fixtures. • Fix the latest sanitary fixtures. • Repair and maintain sanitary fixtures 	
Practical	Theory
(96 hrs)	(28 hrs)
<ul style="list-style-type: none"> • Fixing low level cistern with water closet and connect to inspection chamber, seal connections and test to meet the bylaws enforced by the local authority. (14 hrs) • Fixing European WC and connect to inspection chamber, seal connections and test to meet the bylaws enforced by the local authority. (14 hrs) • Lavatory suit with sensors and other latest sanitary fixtures such as double syphonic cistern, showers, bath tubs, jacuzzi urinals with automatic flushing sensors,, RO water purifying system, geysers etc. (10 hrs) • Practice on fixing of overhead PVC tank on roofs (10 hrs) • Practice of making water supply connection along with water meter fixing. (8 hrs) • Practice of making connection of house sewer to main sewer (8 hrs) • Tracing out leakage and its repairing (12 hrs) • Removal of Air lock in pipes (10 hrs) • Repair of taps and value (10 hrs) 	<ul style="list-style-type: none"> • Handling and fitting sanitary fixtures. (6 hrs) • Care in fitting & leveling. (6 hrs) • By-laws in local authority. (6 hrs) • Sanitary fixtures (6 hrs) • Method of tracing out leakages (4 hrs) • Air locks in pipe (4 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job
- Assembly and disassembly

UNIT - 2.5 : PLUMBING SYSTEMS	
LEARNING OUTCOME:	
After undergoing the unit, students will be able to:	
<ul style="list-style-type: none"> • Explain working principles of water pump, septic tank and soak pit, • Connect supply pipes to supply mains and sewerage connection. • Construct inspection chamber, manholes, septic tanks and soak pit. • Apply working principle of rain harvesting and solar system 	
Practical	Theory
(96 hrs)	(16 hrs)
Installing Water Pump and Connecting Supply Pipe <ul style="list-style-type: none"> • Demonstration followed by practice on Location, level, fix and secure pump to pump base. Connect supply pipes to supply mains and sewerage connection, foot valves etc to ensure air tight connections. Test to meet by-laws enforced by local authority <p style="text-align: right;">(36 hrs)</p>	<ul style="list-style-type: none"> • Types of pumps (2 hrs) • Handling and fitting sanitary fixtures. (2 hrs) • Care in fitting & leveling. (2 hrs) • By-laws in local authority. (2 hrs) • One pipe system and two pipe system (2 hrs)
Septic Tank & Soak Pit <ul style="list-style-type: none"> • Demonstration followed by practice on Construction of inspection chamber, manholes, septic tanks and soak pits etc. <p style="text-align: right;">(34 hrs)</p>	<ul style="list-style-type: none"> • Working principles of septic tank and soak pit and differentiate between them (2 hrs) • Importance of vent pipe in the septic tank (2 hrs)
Rain Harvesting and Solar System <ul style="list-style-type: none"> • Demonstration followed by practice in construction of rain harvesting systems and installation of solar systems. <p style="text-align: right;">(26 hrs)</p>	<ul style="list-style-type: none"> • Working principles of rain harvesting and solar systems (2 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job
- Assembly and disassembly

UNIT - 2.6 : ESTIMATING AND COSTING	
LEARNING OUTCOME:	
After undergoing the unit, students will be able to:	
<ul style="list-style-type: none"> • Read working drawings of plumbing • Work out the quantity of materials and prepare rough estimates. 	
Practical	Theory
(64 hrs)	(16 hrs)
<ul style="list-style-type: none"> • Practice on reading simple working drawings and sketches related to water supply and sanitary. (16 hrs) • Practice on calculation of various quantities of materials required for a particular job. (20 hrs) • Practice on working out cost of a particular job. (20 hrs) • Testing of water supply pipes – testing of all types of GI pipes, PPR pipes etc. (2 hrs) • Sewerage/Rainwater pipes – CI Pipes, HCI Pipes, PVC Pipes etc. (4 hrs) • Testing of GI and floor traps (2 hrs) 	<ul style="list-style-type: none"> • Study of various types of latest plumbing materials used in plumbing work such as Soil Waste Rain(SWR), Unplasticised Poly Vinyl Chloride(U-PVC), Poly Propylene Random (PPR) etc. (6 hrs) • Introduction to relevant BIS codes (4 hrs) • Methods of calculation of materials (3 hrs) • Units of measurement (3 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Report writing
- Viva-voce

INDUSTRIAL TRAINING – II (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 2nd semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

7. RESOSURCE REQUIREMENTS

7.1 LIST OF TOOLS/EQUIPMENT

A) TRAINEES TOOL KIT FOR 30 TRAINEES AND ONE INSTRUCTOR

Sr. No.	Name of items	Quantity
1.	Rule Steel 300 mm both in inch and mm	31
2.	Rule Wooden 4 fold, 600 mm	31
3.	Hacksaw Frame adjustable for 250 to 300 mm	31
4.	Centre punch 100 mm	31
5.	Chisel Cold, flat 20 mm	31
6.	Hammer ball pein 800 grams	31
7.	File flat rough 300 mm	31
8.	Level spirit wooden 300 mm	31
9.	Plumb bob 50 grams	31
10.	Trowel C-125-I S: 6013	31
11.	Stillson wrench 200 & 350 mm	31
12.	Screw Driver 250 mm	31
13.	Wooden Mallet small I S: 2022	31
14.	Cutting pliers 200mm I S : 3650	31
15.	Steel tape (5m)	31

B) LIST OF TOOLS

Sr. No.	Name of items	Quantity
1	Pipe Die Set - 1/2" to 1" & 1 1/4" to 2"	3 each
2	Pipe Wrench (Size No.8) & (Size No.12)	6 each
3	Pipe Vice (Size No.2) & (Size No.3)	4 each
4	Wooden Bench (3' x 6' height - 4')	3
5	Hammer Sledge (2 pound) & (1 pound)	4 each
6	Flat Chisel (1') & Point Chisel (1')	5 each
7	Flat Punch (1/2') & Point Punch (1/2')	5 each
8	Rawel Jumper Bit set (6 mm) & (8 mm)	5 each
9	Pipe Wheel Cutter (upto 2" cutting)	5
10	Spanner Set (Double End)	2
11	Tube Level (1/4" Hose White)	30m
12	Screw Spanner (Size No.12)	5
13	Grip Plier (266 - 10)	5
14	Pocker (Taparia 871)	10
15	Try Square (small)	4
16	Cocking Chisel (1" 1/4")	5 each
17	Blow lamp	5
18	Spade with handle	1
19	Mortar Pan	5 each
20	Hand Drilling Machine (Electric)	3
21	Cleaning Brush & Painting Brush (2")	2
22	Oil Can (Small)	3
23	Chain Wrench (upto 3")	2
24	Pipe Bending Machine (1/2" to 1") (Hydraulic)	1

25	Ladder (10 feet height)	2
26	Electric PPR Pipe Welding Machine	5
27	Spun Yarn	50 kg
28	Hydraulic Pressure Test Pump	1
29	Safety Belt	5
30	Safety Shoes & Safety Helmet	20 each
31	Cotton Hand Gloves	20
32	Plumber's Laddle	3
33	Plumber's Metal Melting Pot (10 Kg.)	3

7.2 LIST OF CONSUMABLES

Sr. No.	Name of items	Quantity
1	GI Pipe 1/2", 3/4", 1", 1 1/4", 1 1/2", 2" (i/d)	50m each
2	PVC Pipe 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"(e/d)	50m each
3	CI Pipes 4", 6" 2 M length (3",4") (i/d)	10
4	Lead and Spun Yarn	25 kg
5	Stone Ware Pipe 4",6",8" (i/d)	20
6	White Wash Basin	2
7	White I.W.C Cistern	2
8	White E.W.C (Normal)	2
9	White `p' Trap 4"	2
10	White `s' Trap 4'	2
11	White kitchen Sink	1
12	White Urinal (Flat)	1
13	White Urinal (magnon)	1
14	1/2" Bibcock (l) & (s)	5 each
15	1/2" Pillar cock & Angle Cock	5 each
16	1/2" Ball Valve	5
17	1" Gate Valve, Globe Valve & Check Valve	5 each
18	1" NRV	5
19	1" Foot Valve & 2" Foot Valve Pipe Fittings	3 each
20	1/2" G.I. Elbow	10
21	3/4" G.I Elbow	10
22	1" G.I Elbow	10
23	1/2 " 3/4" G.I. Tee	30
24	1"x 3/4", 1/4" x 1/2", 1"x 1/2"	30
25	G.I Reducer Elbow 1"x 3/4", 1" x 1/2"	10 each
26	G.I Reducer Elbow 3/4"x 1/2"	10
27	G.I Coupling 1/2" x 3/4" x 1"	30
28	G.I Straight Reducer 1" x 3/4" x 1 1/2"	30
29	G.I Bend 1/2", 3/4", 1"	30
30	G.I union 1/2", 3/4", 1"	30
31	Solvent Cement	2 litre
32	Shellac	20
33	Thread Ball	50
34	GI-Socket 1/2", 3/4", 1"	5 each
35	Hacksaw Blade	300
36	White Lead	1 Kg.
37	Water Meter	1

7.3 LIST OF RECOMMENDED BOOKS

a) BIS Codes

Sr.No.	Title	BIS Code
1	Pipe wrenches	IS : 4003
2	Pipe vices	IS : 2587
3	Pipe threads for fastening purposes dimensions for	IS : 2643
4	Horizontal centrifugal pumps for clear, cold and fresh water	IS : 1520
5	Gland packing asbestos	IS : 4487
6	Cork composition sheets (part I &II)	IS : 4253
7	Selection installation and maintenance of sanitary appliances, code of practices for	IS : 2064
8	Water meters (domestic type) code of practice for selection installation & maintenance	IS : 2001
9	Water supply in buildings, code of practice for	IS : 2065
10	Caulking lead	IS : 782
11	Enameled steel bath tubs	IS : 3489
12	Formulas for water services	IS : 3489
13	Flushing systems for water closets and urinals	IS : 774
14	Glazed earthen ware sanitary appliances	IS : 771
15	Pillar Taps	IS : 1795
16	Plug cocks for water supply purposes	IS : 3004
17	Sanitary appliances, enameled C.I. general requirements	IS : 772
18	Waste fittings for wash basins and sinks non-ferrous	IS : 2963
19	Water closets, enameled and C.I.	IS : 773
20	Vitreous sanitary appliances(Part –I) general requirements	IS : 2556
21	Bend pipes	IS : 404
22	Zinc	IS : 209
23	Soft Solder	IS : 198
24	Pipes & fittings C.I. rain water	IS : 1230
25	Pressure pipes for water gas and sewage C.I. fittings for	IS : 1538
26	Pipe lines, colour code for the identification of	IS : 2379
27	Lead and its compounds, code of safety for	IS : 4312
28	Excavation work, safety code for	IS : 3764
29	Scaffolds & carders (Part I & II) safety code for	IS : 3696
30	Manhole converse & Games intended for use in drainage work C.I.	IS : 1726
31	Laying C.I. pipes code of practice for	IS : 3114
32	Laying of concrete pipes code of practice for	IS : 783
33	Asbestor cement pressure pipes	IS : 1592
34	Glossary of terms relating to corrosion of metals	IS: 3531
35	Engineering drawing general code of practice for	IS: 696

b) RECOMMENDED BOOKS/CATALOGUE

1. Plumbing Technology Design and Installation by Lee Smith & Hary Slater.
2. Plumbing and Sanitation Engg. by Pritam Thakur published by Royal Book Depot, Jalandhar.
3. CPWD Specifications for Sanitary Installation, Water supply and drainage.
4. Product Catalogue of Finolex.
5. Product Catalogue of Vectus.
6. Product Catalogue of Excel.
7. Product Catalogue of Jaguar.
8. Plumbing and Sanitation Engineering by G.S. Birdi; Dhanpat Rai & Sons.
9. Plumber by National Instructional Media Institute (NIMI), Chennai.

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.
2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.
3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.
4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.
5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.
6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

9. LIST OF CONTRIBUTORS/EXPERTS

- a) Following experts participated in the workshop to design curriculum of certificate programme in 'Plumber' with NSQF alignment for MRSPTU, Bathinda on 4-5 July, 2016 at NITTTR, Chandigarh.

1.	Prof. SK Sharma, Department of Civil Engineering, PEC University of Technology, Sector-12, Chandigarh
2.	Shri VK Bansal, Principal, Govt. Industrial Training Institute, Patiala, Punjab
3.	Shri Parmod Kumar, SDE (Public Health), UT, Chandigarh
4.	Shri Dharam Pal, Instructor, Govt. Industrial Training Institute, Patiala, Punjab
5.	Shri Amarjit Singh, Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
6.	Shri Punitinder Singh, Plumber, PGIMER, Sector-14, Chandigarh
7.	Shri Iqbal Singh, Instructor, Govt. Industrial Training Institute, Patiala, Punjab
8.	Shri Karnail Singh, Foreman Instructor, CCET (Diploma Wing), Sector-26, Chandigarh
9.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
10.	Prof. SK Gupta, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh Coordinator

- b) Following experts participated in the workshop to design curriculum of certificate programme in 'Plumber' with NSQF alignment for MRSPTU, Bathinda on 28 July, 2016 at NITTTR, Chandigarh.

1.	Shri Amarjit Singh, Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
2.	Shri Karnail Singh, Foreman Instructor, CCET (Diploma Wing), Sector-26, Chandigarh
3.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
4.	Prof. SK Gupta, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh Coordinator

- c) Following experts participated in the workshop to review curriculum of certificate programme in “Plumber” for MRSPTU, Bathinda held on 6 January, 2017 at NITTTR, Chandigarh.

1.	Dr. Ashok Kumar Goel, Director, College Development Council, MRSPTU Campus, Bathinda, Punjab
2.	Dr. Balraj Singh, Director, PIT, Rajpura
3.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
4.	Shri GS Sethi, Consultant, IndiaCan, A-301, Rishi App, Sector 70, Mohali
5.	Shri Asheesh Kumar Saini, Centre Head, IL&FS, IIS, Ropar
6.	Shri Jasvir Singh Tiwana, Associate Professor, GZSCCET, Bathinda
7.	Shri Sikander Singh Sidhu, Assistant Professor, GZSCCET, Bathinda
8.	Shri J Ghosh Roy, Aryabhat Polytechnic, Delhi
9.	Shri Jagdeep Singh, Central Tool Room, A-5, Phase-5, Focal Point, Ludhiana
10.	Shri Rakesh Goel, Estate Officer, NITTTR, Chandigarh
11.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

Curriculum
for
Certificate Programme
in
**REFRIGERATION AND AIR
CONDITIONING MECHANIC
(RAC MECHANIC)**

For

**Maharaja Ranjit Singh Punjab Technical
University, Bathinda (Punjab)**



Prepared By:

Curriculum Development Centre
**National Institute of
Technical Teachers Training and Research
Sector 26, Chandigarh - 160 019**

January, 2017

FOREWORD

Rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In order to cope with the challenges of handling new materials, machines and technologies, we have to develop human resources having appropriate competencies. There is an increasing demand of skilled workforce in India in particular and the world over in general. Under the new circumstances, India faces a challenging task of meeting the technical manpower requirement, especially in the area of skilled workforce to cater to industrial needs. Efforts have to be made so that passouts from our technical institutions are acceptable at global level.

Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Technical institutions play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab to start the skill oriented integrated courses at certificate, diploma and degree level, as per the needs of the industry, are laudable.

In order to meet the future requirements of technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of technical programmes at various levels. The curricula for various programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of programme and various courses.

The success of any technical programme depends upon its effective implementation. However best the curriculum document is designed, if it is not implemented properly, the output will not be as per expectations. In addition to acquisition of appropriate physical resources, availability of motivated, competent and qualified faculty is equally essential for effective implementation of the curricula.

It is expected that MRSPTU will carry out curriculum evaluation on a continuous basis to identify the new skill requirements. At the same time, it is expected that innovative methods of course offering will be used to develop desired skills and infuse the much needed dynamism in the system.

Dr. M.P. Poonia
Director
National Institute of
Technical Teachers Training & Research
Chandigarh

PREFACE

Curriculum document is a comprehensive plan of an educational programme. It is through the curriculum that the educational objectives of a programme are achieved. It has to be ensured that the curriculum is dynamic, articulated, balanced, data based, feasible, and as per industrial needs. Curriculum Development Centre at NITTTR, Chandigarh has been extending services to technical education system of the states in northern region in developing and updating their curriculum on regular basis.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab assigned the project for developing the curriculum of some integrated programmes to this institute in the month of May 2016. A series of curriculum workshops were held during the months of June-July, 2016. This curriculum document is an outcome of the extensive discussions held with the representatives from various organizations, technical institutions and industry during the curriculum workshops. While developing the study and evaluation scheme and detailed contents, the following aspects have been kept in mind :

- Employment Opportunities of Certificate holders
- Job role of certificate holders
- Learning outcome of the Programme
- Mobility of students for their professional growth

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Industrial Training in the curriculum. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which units on Communication Skills have been introduced in both the semesters of the certificate course.

We hope that this curriculum document will prove useful in producing skilled manpower at desired level in the state of Punjab. The success of this outcome-based curriculum depends upon its effective implementation and it is expected that MRSPTU will make all efforts to create better facilities, develop linkages with the world-of-work and foster conducive and requisite learning environment as prescribed in the curriculum document.

Professor and Head
Curriculum Development Centre
NITTTR, Chandigarh

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance and guidance received from the following persons:

- i) Vice Chancellor, Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bhatinda, Punjab for entrusting this project of curriculum design to NITTTR, Chandigarh.
- ii) Director, College Development Council MRSPTU for his support and active involvement in the curriculum development.
- iii) Director, National Institute of Technical Teachers' Training and Research, Chandigarh for his support and academic freedom provided to Curriculum Development Centre.
- iv) All the experts from industry/field organizations, universities, ITIs and other technical institutions for their professional inputs during curriculum workshops.
- v) Faculty from different departments of NITTTR, Chandigarh for content updation.
- vi) Shri Yogendra Kaushal, Stenographer, Curriculum Development Centre, NITTTR, Chandigarh for processing the document.
- vii) Shri Mohan Lal Bindal, Assistant, Curriculum Development Centre for his support and secretarial assistance in the conduct of curriculum design workshops.

Coordinator

SALIENT FEATURES OF THE PROGRAMME

1.	Sector	:	Electronics
2.	Name of the Certificate Programme	:	Refrigeration and Air Conditioning (Mechanic)
3.	Entry Qualification	:	Matriculation or equivalent NSQF Level as prescribed by MRSPTU, Bathinda
4.	Duration of the Programme	:	One Year
5.	Intake	:	30
6.	Pattern of the Programme	:	Semester Pattern
7.	NSQF Level	:	Level - III
8.	Ratio between theory and Practice	:	20 : 80 (Approx.)

2. **JOB ROLE AND JOB OPPORTUNITIES**

There is a lot of scope for the wage and self employment for Refrigeration and Air Conditioning (RAC) Mechanic in various industries as well as individual customers. Although RAC Mechanics can learn the skills needed for their trade on-the-job, many employers prefer to hire those who have completed a formal training program. RAC Mechanic has to install refrigerator and air conditioner, decipher the symptoms and diagnose the problems in the refrigerator and air conditioner by carrying out basic volt-ampere test, earthing check and isolating electro-mechanical faults. The individual at work installs the refrigerator and air conditioner and interacts with customers to diagnose the problem and assess possible causes. Once the problem and causes have been identified, the individual rectifies minor problems or replaces faulty modules for failed parts or recommends factory repairs for bigger faults. The individual must be willing to work in the field and travel through the day from one customer's premise to another and often has to carry out various operations on elevated areas. Punctuality, amenable behaviour, patience, good interpersonal relationship building, trustworthiness, integrity, and critical thinking are important attributes for this job.

Job Roles

Following are major areas in which a RAC Mechanic has to play role in the installation, repair, maintenance and service of:

- Refrigerator
- Water cooler
- Bottle cooler
- Deep freezer
- Visi Cooler
- Walk in Cooler
- Ice candy plant
- Cold storage
- Ice plant
- Split Air Conditioner
- Package Air Conditioner
- Central Air Conditioner
- Automobile Air Conditioner
- Transport refrigeration
- Railway Air conditioning

In addition to above, the RAC Mechanic has following roles to play:

- Reviewing blueprints
- Installing air conditioning systems
- Testing systems for proper functioning
- Performing emergency repairs
- Maintaining tools
- Ordering supplies
- Making routine adjustments to maximize operational efficiency
- Record data when inspecting systems, such as temperature of equipment, fuel consumption and hours of operation
- Recover and properly dispose of refrigerants when servicing air conditioning equipment since refrigerants can be harmful to the environment
- Sell service contracts to clients in order to ensure long-term client relationships

Job Opportunities

On successful completion of this course, students should be able to find gainful job opportunities in the divisions of different industries like those listed below, besides exploring possibilities of being an entrepreneur and be self-employed. The list given below is only indicative and not comprehensive:

- Manufacturing/process/service industries in private and public sectors
- Service Sector like Railways; Military Engineering Services; Boards and Corporations; Construction Companies, Transportation; and Telecommunication;
- Industries involved in manufacturing of refrigerators and air conditioners e.g. Blue Star, Carriers, Voltas, Fedders Lloyd; Sidhwal; Godrej, LG, Kelvinator, Hitachi etc.
- Ancillary units involved in manufacturing of RAC equipment
- Automobile manufacturing
- Food processing industry
- Yarn manufacturing industry
- Chemical engineering and pharmaceutical industry
- Milk Plants
- Instruments manufacturers dealing with testing lab
- Educational institutions
- Self employed in Manufacturing and Service Sector

3. LEARNING OUTCOMES OF CERTIFICATE PROGRAMME IN RAC MECHANIC

At the end of the programme, the students will be able to:

- Handle tools, instruments and equipment used in installation, repair, maintenance and servicing of refrigerators and air conditioners.
- Identify various components of vapour compression cycle in Refrigeration and Air Conditioning (RAC) and join copper tubes using different gas sets.
- Sketch and interpret drawings related to RAC.
- Install, repair, maintain and service different types of refrigerators.
- Install, repair, maintain and service domestic air conditioner.
- Install, repair, maintain and service central air conditioning plant.
- Install, repair, maintain and service automobile air conditioners.
- Communicate effectively with others.
- Apply concepts of mathematics and science for problem solving.

CONTENTS

Sr. No	Particulars	Page No.
-	Foreword	(i)
-	Preface	(ii)
-	Acknowledgements	(iii)
1.	Salient Features of the Programme	1
2.	Job Role and Job Opportunities	2
3.	Learning Outcomes of the Programme	4
4.	Study and Evaluation Scheme	5
5.	Guidelines for Assessment of Student Centred Activities	7
6.	Detailed Contents of Various Units	8-27

FIRST SEMESTER

1.1	Communication Skills	8
1.2	Basics of Refrigeration and Air Conditioning	10
1.3	Refrigerants and Refrigerators	12
1.4	RAC Drawing	15
1.5	Basic Workshop Practice	17
-	Industrial Training – I (4 Weeks)	20

SECOND SEMESTER

2.1	Basic Sciences	21
2.2	Domestic Air Conditioning	23
2.3	Central Air Conditioning	24
2.4	Automobile Air Conditioning	26
-	Industrial Training – II (4 Weeks)	27

7.	Resource Requirements	28-40
7.1	List of Tools/Equipment	28
7.2	List of Consumables	37
7.3	List of Recommended Books	39
8.	Recommendations for Effective Curriculum Implementation and Evaluation	41
9.	List of Contributors/Experts	42

4. STUDY AND EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN REFRIGERATION AND AIR CONDITIONING MECHANIC (RAC MECHANIC)

FIRST SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME Total Hours		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Th	Pr		INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
						Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1		*Communication Skills	8	24	1	25	25	50	25	1	50	3	75	125
1.2		Basics of Refrigeration and Air Conditioning	32	96	5	25	50	75	50	2	100	4	150	225
1.3		Refrigerants and Refrigerators	32	80	5	25	50	75	50	2	100	4	150	225
1.4		RAC Drawing	-	64	2	-	50	50	75	3	-	-	75	125
1.5		Basic Workshop Practice	32	144	7	25	100	125	50	2	100	4	150	275
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training (during vacation)			-	-	4	-	-	-	-	-	100	3	100	100
Total			104	456	26	100	300	400	250	-	450	-	700	1100

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ **Industrial Training**

After examination of 1st Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

Total weeks per Semester = 16 Total working days per week = 5 Total hours per day = 7

Total hours in a Semester = 16 x 5 x 7 = 560

One credit is defined as one hour of lecture per week or two hours of practicals per week for one semester. Fractions in credits have been rounded to nearest integer.

SECOND SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME							Total Marks	
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs		Tot
2.1		*Basic Sciences	48	-	3	25	-	25	75	2	-	-	75	100
2.2		Domestic Air Conditioning	32	144	7	25	100	125	50	2	100	4	150	275
2.3		Central Air Conditioning	48	144	8	25	100	125	50	2	100	4	150	275
2.4		Automobile Air Conditioning	16	80	4	25	50	75	25	1	75	4	100	175
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training			-	-	4	-	-	-	-	-	100	3	100	100
Total			144	416	28	100	275	375	200	-	375	-	575	950

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment and energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ **Industrial Training**

After examination of 2nd Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

5. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 25 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- i. 5 Marks for general behavior and discipline
(by Principal in consultation with all the trainers)
- ii. 5 Marks for attendance as per following:
(by the trainers of the department)
 - a) 75% Nil
 - b) 75 - 80% 2 Marks
 - c) 80 - 85% 3 Marks
 - d) Above 85% 5 Marks
- iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 15 - National Level participation or inter-University competition
 - b) 10 - Participation in two of above activities
 - c) 5 - Participation in internal sports of the University

Note: There should be no marks for attendance in the internal sessional of different subjects.

UNIT – 1.1 : COMMUNICATION SKILLS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Speak confidently.
- Overcome communication barriers.
- Write legibly and effectively.
- Listen in proper prospective.
- Read various genres adopting different reading techniques.
- Respond to telephone calls effectively.

Practical	(24 Hours)	Theory	(08 Hours)
		Basics of Communication <ul style="list-style-type: none"> • Process of communication • Types of communication - formal and informal, oral and written, verbal and non-verbal • Objectives of communication • Essentials of communication • Barriers to communication 	(1 hour)
<ul style="list-style-type: none"> • Looking up words in a dictionary (meaning and pronunciation) 	(2 hours)	Functional Grammar and Vocabulary <ul style="list-style-type: none"> • Parts of speech • Tenses • Correction of incorrect sentences 	(2 hours)
<ul style="list-style-type: none"> • Self and peer introduction • Greetings for different occasions 	(1 hour)	Listening <ul style="list-style-type: none"> • Meaning and process of listening • Importance of listening • Methods to improve listening skills Speaking <ul style="list-style-type: none"> • Importance • Methods to improve speaking • Manners and etiquettes 	(2 hours)
<ul style="list-style-type: none"> • Newspaper reading 	(1 hour)	Reading <ul style="list-style-type: none"> • Meaning • Techniques of reading: skimming, scanning, intensive and extensive reading 	(1 hour)

<ul style="list-style-type: none"> • Vocabulary enrichment and grammar exercises • Exercises on sentence framing accurately (6 hours) 	<p>Functional Vocabulary</p> <ul style="list-style-type: none"> - One word substitution - Commonly used words which are often misspelt - Punctuation - Idioms and phrases <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Reading aloud articles and essays on current and social issues • Comprehension of short paragraph (5 hours) 	
<ul style="list-style-type: none"> • Write a short technical report • Letter writing (3 hours) 	
<ul style="list-style-type: none"> • Participate in oral discussion • Respond to telephonic calls effectively • Mock interview (6 hours) 	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT - 1.2 : BASICS OF REFRIGERATION AND AIR CONDITIONING	
LEARNING OUTCOME	
After undergoing this unit, the students will be able to:	
<ul style="list-style-type: none"> • Apply fundamental principles of refrigeration and air conditioning systems • Identify different components of refrigeration and air conditioners • Identify and use refrigeration tools/ instruments for different operations • Estimate the load for AC installation. 	
Practical (96 hrs)	Theory (32 hrs)
<ul style="list-style-type: none"> • Identification of refrigeration tools, instruments and equipment. Care and maintenance of these tools and instruments. Measurements of pressure and temperature. (20 hrs) 	<ul style="list-style-type: none"> • Definition and principle of refrigeration and air conditioning. Applications of refrigeration and air conditioning, units of refrigeration and their conversion, dry ice refrigeration and refrigeration by using liquid gases. Concept of HVAC. (6 hrs)
<ul style="list-style-type: none"> • Identification of components of vapour compression system like compressor, condenser, expansion valve evaporator etc. Dismantling and assembly of these equipments. (36 hrs) 	<ul style="list-style-type: none"> • Types of refrigeration systems: Vapour compression system, and vapour absorption system constructional details, working and applications of vapour compression cycle. COP of vapour compression refrigeration system. (10 hrs)
<ul style="list-style-type: none"> • Familiarization with different types of refrigeration tools and their use. Practice in operating these tools. (12 hrs) 	<ul style="list-style-type: none"> • Types of refrigeration tools, their use and specifications. General safety precautions to be adopted in refrigeration. (8 hrs)
<ul style="list-style-type: none"> • Calculation of Coefficient of Performance (COP) of air conditioner to determine the capacity of cooling coil. (14 hrs) 	<ul style="list-style-type: none"> • Concept of air conditioning and its applications • Introduction to psychrometry and psychrometry charts. • Types of air conditioning: window, split and central (6 hrs)
<ul style="list-style-type: none"> • Practical exercises on load estimation and preparation of load estimation sheet (14 hrs) 	<ul style="list-style-type: none"> • Load estimation (2 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report writing
- Viva-voce
- Sketching

UNIT - 1.3 : REFRIGERANTS AND REFRIGERATORS	
LEARNING OUTCOME	
After undergoing the subject, students will be able to:	
<ul style="list-style-type: none"> • Install and maintain different types of refrigerators such as frost free refrigerator, water cooler, deep freezer etc. • Repair electrical faults in different refrigerators and coolers. • Select and charge gas in refrigerators. • Transfer refrigerants from one cylinder to another cylinder. • Undertake retrofitting of refrigerator. 	
Practical (80 hrs)	Theory (32 hrs)
<p>Single door refrigerator</p> <ul style="list-style-type: none"> • Installation and maintenance of Single door refrigerator. (1 hr) • Familiarization of electrical and mechanical components of refrigerator. Disassembly and assembly exercises on refrigerators (4 hrs) • Check and test of electrical components like relay, overload protector, windings, thermostat etc. (6 hrs) • Testing of compressor, identification of motor terminals, starting of compressor without and with relay. (10 hrs) • Cleaning, flushing, and replacing capillary and drier. (4 hrs) • Leak test, evacuation, gas charging in refrigerators, checking wiring circuit of refrigerator. (6 hrs) • Fault diagnosis and remedies in refrigerators. (2 hrs) 	<p>Single door refrigerator</p> <ul style="list-style-type: none"> • Function, construction and working of Single door refrigerator and their specifications. (2 hrs) • Study the electrical components of refrigerator like relay, overload protector, thermostat switch, door switch and bulb holder etc. (2 hrs) • Functions and working of compressor, condenser and evaporator, capillary tube. (2 hrs) • Importance of flushing in evaporator and condenser. Necessity of replacing capillary tube and drier. (2 hrs) • Study the heat exchanger, door gaskets, function and types of heat insulating materials used in refrigerator. (2 hrs) • Care and maintenance, trouble shooting of refrigerators. (2 hrs)
<p>Frost Free (FF) refrigerator</p> <ul style="list-style-type: none"> • Installation and maintenance of FF refrigerator. (2 hrs) 	<p>Frost Free refrigerator</p> <ul style="list-style-type: none"> • Study the construction and working of frost free (2 or 3 door) Refrigerator parts (2 hrs)

<ul style="list-style-type: none"> • Tracing Electrical circuit, checking and testing of electrical accessories like thermostat, timer, defrost heaters, Bi-metal etc. (6 hrs) • Checking Air-distribution system of FF refrigerator. (4 hrs) • Test the performance of FF refrigerator. (6 hrs) 	<ul style="list-style-type: none"> • The forced Draft cooling (air duct), Temperature control in Freezer. (2 hr) • Study of electrical accessories and their functions (Timer, heater, Bi-metal, Relay, OLP, thermostat etc.), Refrigerator Cabinet volume calculation. (2 hrs)
<p>Water Cooler</p> <ul style="list-style-type: none"> • Identify parts, controls and accessories, electrical circuit. (1 hr) • Soldering of copper tube on stainless steel. (2 hrs) • Trouble shooting of commonly faced problems like condenser fan failure, corrosion etc. (3 hrs) • Installation, servicing and maintenance of different types of water coolers. (2 hrs) 	<p>Water Cooler</p> <ul style="list-style-type: none"> • Study the refrigeration cycle of water cooler, types, construction and working, capacity and its applications. (2 hrs) • Study the electrical and mechanical components of various storage type water coolers. Insulation material used in water coolers, refrigerants used in the system. (2 hrs)
<p>Deep Freezer</p> <ul style="list-style-type: none"> • Deep freezer checking and servicing, preventive maintenance and trouble shooting. (4 hrs) • Checking wiring circuit, testing components. (2 hrs) • Installation and testing performance of deep freezer. (4 hrs) 	<p>Deep Freezer</p> <ul style="list-style-type: none"> • Introduction to deep freezer and its construction, working, specifications, functions, Care and maintenance, Common faults and their remedies. (2 hrs)
<p>Refrigerants</p> <ul style="list-style-type: none"> • Identification of refrigerant cylinders with colour code. (1 hr) • Recovery and transfer of refrigerant. (2 hrs) • Safe handling of cylinders and valves and their leakage testing methods. (2 hrs) • Retrofitting of a Chlorofluoro Carbon (CFC) filled Domestic Refrigerator with hydrocarbons (HC) using sealed components. (6 hrs) 	<p>Refrigerants</p> <ul style="list-style-type: none"> • Classification of refrigerants, and their properties, chemical name and formulas. (2 hrs) • Refrigerant leak detection methods (1 hr) • Substitute of refrigerants in lieu of CFC and their properties and comparison with CFC,HFC,HC (2 hrs) • Changes of components and practices while Retrofitting CFC appliances with HC refrigerants and their properties. (4 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report writing
- Viva-voce
- Sketching
- Assembly and disassembly
- Model/prototype making

UNIT - 1.4 : RAC DRAWING	
LEARNING OUTCOME	
After undergoing this unit, students will be able to:	
<ul style="list-style-type: none"> • Draw free hand sketches of hand tools • Draw and interpret flow circuit showing various components and their location • Identify electrical components and their connections 	
Practical	(64 hrs)
Basic Drawing	
<ul style="list-style-type: none"> • Draw free hand sketch of drawing instruments (2 hrs) 	
<ul style="list-style-type: none"> • Draw different geometrical shapes i.e. line, circle, square rectangle etc. (4 hrs) 	
<ul style="list-style-type: none"> • Drawing of numbers and lettering (4 hrs) 	
<ul style="list-style-type: none"> • Orthographic projection from isometric views and vice-versa (14 hrs) 	
<ul style="list-style-type: none"> • Trade related electrical and mechanical symbols (4 hrs) 	
<ul style="list-style-type: none"> • Practice of reading blue print (4 hrs) 	
Technical Drawing	
<ul style="list-style-type: none"> • Draw free hand sketch of hand tools (6 hrs) 	
<ul style="list-style-type: none"> • Draw sketch of flow circuit showing location of evaporator, condenser, compressor, expansion valve and auxiliary devices i.e. drier, filter, OLP etc. (4 hrs) 	
<ul style="list-style-type: none"> • Draw circuit showing connection of electrical devices i.e. relay, thermostat OLP, capacitors for <ul style="list-style-type: none"> - Refrigerator - Window AC - Split AC - Central AC 	(4 hrs)

<ul style="list-style-type: none"> • Draw gas charges circuit <ul style="list-style-type: none"> - Recovery circuit - Refrigerant/gas charging circuit <p style="text-align: right;">(4 hrs)</p>	
<ul style="list-style-type: none"> • Draw sketch of compressor parts <ul style="list-style-type: none"> - Open type - Hermetic/sealed type <p style="text-align: right;">(8 hrs)</p>	
<ul style="list-style-type: none"> • Draw sketch of different types of rivets and riveted joints <ul style="list-style-type: none"> - Lap joint - Butt joint <p style="text-align: right;">(6 hrs)</p>	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Sketching
- Drawing

UNIT – 1.5 : BASIC WORKSHOP PRACTICE

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Observe general workshop safety precautions
- Identify, select and use appropriate hand tools and carry out simple fitting operations like filing, chipping, hacksawing, threading, taping, grinding, drilling
- Identify, select and use appropriate tools, equipment to carry out operations like cutting, bending, flaring, swaging, pinching, brazing of copper tubes
- Identify, select and use appropriate hand tools and carry out simple sheet metal operations like marking, cutting, bending, folding
- Identify, select and use appropriate electrical tools and instruments, measure electrical parameters (like voltage, current, resistance, earth resistance, insulation, continuity)
- Identify electronic components like transistors, resistors, capacitors, diodes, S.C.R, U.J.T, ICs used in refrigerators and air conditioners.
- Identify, select and use appropriate tools, equipment, consumables and carry out simple gas welding operations.
- Carry out brazing of copper-to-copper, copper to MS
- Identify, select and use appropriate hand tools and carry out simple carpentry operations like planing, sawing, chiselling and drilling.

Practical	(144 Hours)	Theory	(32 Hours)
Safety		Safety	
Familiarization with workshop machinery. Safety precautions.	(12 hours)	General safety precautions and first aids	(4 hours)
Fitting		Fitting	
Familiarization with tools, equipment and measuring instruments used in fitting. Practice marking / layout as per specifications, filing, chipping, hacksawing, threading, taping, grinding, drilling.	(20 hours)	Study different types of tools, equipment and measuring instruments used in fitting, their specifications, functions, working and uses; care and maintenance.	(4 hours)
Practice working on soft copper tubing like, cutting, bending, flaring, swaging, pinching.		Study of copper tubing, their sizes, specifications and different operations as	

(20 hours)	related to refrigeration and air conditioning. (4 hours)
Sheet Metal Working Familiarization with tools, measuring instruments used in sheet metal. Practice marking / layout / development as per specifications, cutting, bending, and folding. (20 hours)	Sheet Metal Working Study different types of tools, equipment and measuring instruments used in sheet metal working, their specifications, functions, working and uses; care and maintenance. (4 hours)
Electrical Familiarization with electrical tools; practice wire joint, verification of Ohm's law, identification of phase and neutral of AC supply, measurement of voltage, current, resistance, power, frequency and energy consumed in an electrical circuit, selection of wires and cables as per load, measurement of earth resistance. insulation and continuity test, detection of current leakage, short circuit. (20 hours)	Electrical Study electrical terms such as AC and DC supply, voltage, current, resistance, power, energy, frequency etc. Series and parallel circuits, Concept of single phase and three phase supply, Safety precautions to be observed while working on electricity, conductors and insulators. Study of measuring Instruments such as voltmeter, ammeter, ohm meter, watt meter, energy meter and frequency meter. Earthing and its importance, insulation and continuity test (4 hours)
Electronics Identification of electronic components, tools and instruments, colour coding of resistors, identification of transistors, resistors, capacitors, diodes, S.C.R, U.J.T, I.Cs. used in refrigeration and air conditioning, working of remote control. (20 hours)	Electronics Introduction to electronics, basic principles of semiconductors, application of diodes, rectification, Zener diode as voltage regulator – transistors parameters- CB, CE, CC, configuration, amplification. SCR. (4 hours)
Welding and Brazing Familiarization with tools, equipment, instruments and consumables for gas welding and brazing, practice simple gas	Welding and Brazing Introduction to gas welding, equipment (like cylinders, regulators, blowpipes, nozzles etc.) used, their specifications, working,

<p>welded joints, brazing copper-to-copper, copper to MS.</p> <p style="text-align: right;">(20 hours)</p>	<p>functions, types of flames, consumables used, safety precautions, care and maintenance, different welded joints.</p> <p>Introduction to brazing, equipment and consumables used, importance and use of brazing in refrigeration and air conditioning</p> <p style="text-align: right;">(4 hours)</p>
<p>Carpentry</p> <p>Familiarization with simple carpentry tools and practice operations like planning, sawing, chiselling and drilling.</p> <p style="text-align: right;">(12 hours)</p>	<p>Carpentry</p> <p>Introduction to simple carpentry tools, their types, specifications, working, functions, safety precautions, care and maintenance.</p> <p style="text-align: right;">(4 hours)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report writing
- Viva-voce
- Workshop job

INDUSTRIAL TRAINING – I (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 1st Semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

UNIT – 2.1 : BASIC SCIENCES

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Apply the basic principles of maths in solving the basic problems of the trade.
- Apply the basic principles of physics in solving the basic problems of the trade.

Practical	Theory (48 Hours)
	<p>Mathematics</p> <ul style="list-style-type: none"> • Basic Algebra – algebraic formula. Simultaneous equation – quadratic equations (4 hours) • Simultaneous linear equation in two variables (3 hours) • Arithmetic and geometric progression, sum of n-terms, simple calculations. (3 hours) • Mensuration – Find the area of regular objects like triangle, rectangle, square and circle; volumes of cube, cuboid, sphere cylinder (6 hours) • Trigonometry - Concept of angle, measurement of angle in degrees, grades and radians and their conversions, T-Ratios of Allied angles (3 hrs) • Co-ordinate Geometry - Cartesian and polar coordinates, conversion from cartesian to polar coordinates (2 hrs) • Concept of Differentiation and Integration (3 hrs)
	<p>Physics</p> <ul style="list-style-type: none"> • FPS, CGS, SI units, dimensions and conversions (2 hours) • Force, speed, velocity and acceleration – Definition, units and simple problems (3 hours)

	<ul style="list-style-type: none"> • Stress and strain, modulus of elasticity (2 hours) • Heat and temperature, its units and specific heat of solids, liquids and gases (4 hours) • Electricity and its uses, basic electricity terms and their units, D.C. and A.C., positive and negative terminals, use of switches and fuses, conductors and insulators (5 hours) • Work, Power and Energy-Defination, units and simple problems (4 hours) • Concept of force, Inertia, Newton's First law of motion; momentum and Newton's second law of motion; Impulse; Newton's third law of motion. (2 hrs) • Friction and Lubrication (1 hour) • Law of conservation of energy (1 hour)
--	---

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

UNIT - 2.2 : DOMESTIC AIR CONDITIONING	
LEARNING OUTCOME:	
After undergoing this unit, students will be able to:	
<ul style="list-style-type: none"> • Identify various components of window and split AC • Identify the electric circuit of different air conditioners • Undertake servicing of window and split type AC • Install different types of AC • Execute gas charging • Trouble shoot and rectify AC faults 	
Practical (144 hrs)	Theory (32 hrs)
Window Air conditioner <ul style="list-style-type: none"> • Identify the electrical and mechanical components, servicing and maintenance installation, tracing wiring circuit, leak testing and gas charging window AC Fault detection and rectification. • Installation, servicing and maintenance of window type AC <p style="text-align: right;">(72 hrs)</p>	Window Air conditioner <ul style="list-style-type: none"> • Types of window AC, Applications, construction working, care and maintenance, testing trouble shooting and rectification. <p style="text-align: right;">(16 hrs)</p>
Split AC <ul style="list-style-type: none"> • Identify various components, electrical circuits, testing components, fault detection and repair, lead testing, gas charging, installation, maintenance and servicing of split AC <p style="text-align: right;">(72 hrs)</p>	Split AC <ul style="list-style-type: none"> • Construction, working principle, description of electrical components used in split AC, study the wiring circuit, trouble shooting <p style="text-align: right;">(16 hrs)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report writing
- Viva-voce
- Assembly and disassembly

UNIT - 2.3 : CENTRAL AIR CONDITIONING

LEARNING OUTCOME:

After undergoing this unit, students will be able to:

- Read psychrometry charts
- Use sling psychrometer and anaemometer.
- Undertake servicing and maintenance operations of Air Handling Unit (AHU)
- Install pre fabricated ducts and execute refixing of filters.
- Identify direct and indirect various components of systems, including electrical circuits
- Test leakages, evacuation and execute gas charging.
- Descale condenser and cooling tower.

Practical (144 hrs)	Theory (48 hrs)
<ul style="list-style-type: none"> • Measure DBT, WBT, Rh% by using Psychrometry chart and Sling Psychrometer . (10 hrs) 	<ul style="list-style-type: none"> • Introduction to Dry Bulb Temp (DBT), Wet Bulb Temp (WBT), Specific Humidity, Heat Transfer, Temp Conversion etc. (04 hrs)
<ul style="list-style-type: none"> • Check the air flow by using Anaemometer. (06 hrs) 	<ul style="list-style-type: none"> • Introduction and working of Direct and Indirect type of Central Air Conditioning. Construction & Working of Components of Central Air Conditioning Plant. (08 hrs)
<ul style="list-style-type: none"> • Servicing of Fan, blower, motor etc. in AHU (Air Handling Unit.) (20 hrs) 	<ul style="list-style-type: none"> • Construction and working of Fan and Blower, types, velocity pressure measurement, lubrication of fan & blowers. (06 hrs)
<ul style="list-style-type: none"> • Installation of pre-fabricated ducts and grills. (10 hrs) 	<ul style="list-style-type: none"> • Function of ducts, types, material, use of SWG, sheet metal tools. Installation of ducting, damper controls and grills. (08 hrs)
<ul style="list-style-type: none"> • Servicing, cleaning and refixing of Air filters. (12 hrs) 	<ul style="list-style-type: none"> • Function of using air filters, types material and effects of choked air filter. (03 hrs)
<ul style="list-style-type: none"> • Identify various components, electrical circuits and testing, evacuation and refrigerant charging. (28 hrs) 	<ul style="list-style-type: none"> • Construction and Working principle of Direct & Indirect Central Air Conditioning plant. Maintenance and Overhauling of equipments such as Compressor, condenser, Refrigerant control devices, Chiller, cooling tower, AHU, humidification and dehumidification methods of AHU. (15 hrs)
<ul style="list-style-type: none"> • Servicing and installation of Compressor and motor. (16 hrs) 	

<ul style="list-style-type: none"> • Servicing and Installation of Condenser and cooling tower (18 hrs) 	
<ul style="list-style-type: none"> • Industrial visits to milk plant, meat plant, cold storage and shopping malls etc. (24 hrs) 	<ul style="list-style-type: none"> • To prepare cost estimate of all components and equipment, current prices and labour cost. (04 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report writing
- Viva-voce
- Assembly and disassembly

UNIT - 2.4 : AUTOMOBILE AIR CONDITIONING			
LEARNING OUTCOME:			
After undergoing the subject, students will be able to:			
<ul style="list-style-type: none"> • Install car A.C. • Execute charging of car A.C. • Test compressor pressure • Undertake regular maintenance and servicing of automobile A.C. 			
Practical	(80 hrs)	Knowledge	(16 hrs)
• Installation of various automobile ACs	(8 hrs)	• Introduction to Installation	(1 hr)
• Identifying various components of automobile AC	(8 hrs)	• Study the refrigeration cycle in automobile A.C.	(2 hrs)
• Electrical circuits of an automobile AC	(8 hrs)	• Construction of an automobile A.C.	(2 hrs)
• Testing components, fault detection.	(8 hrs)	• Introduction to testing components and fault detection	(2 hrs)
• Install gauge manifold in the system	(8 hrs)	• Introduction to compressor pressure testing	(1 hr)
• Testing of compressor pressure			
• Leak testing, evacuation, gas charging	(8 hrs)	• Introduction to leak testing, evacuation and gas charge	(2 hrs)
• Trouble shooting of automobile AC	(8 hrs)	• Steps involved in trouble shooting	(2 hrs)
• Testing magnetic clutch	(8 hrs)	• Introduction to magnetic clutch of operation	(1 hr)
• Overhauling of a compressor and de-scaling of condenser in an automobile AC	(8 hrs)	• Working details of car A.C.	(1 hr)
• Practice on repair and regular maintenance and servicing of automobile AC	(8 hrs)	• Introduction to care, maintenance and servicing of automobile A.C.	(2 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Report writing
- Viva-voce
- Assembly and disassembly

INDUSTRIAL TRAINING – II (4 Weeks)

The purpose of industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform field activities
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks have been provided in the study and evaluation scheme of 2nd semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | |
|-------------------------------|-----|
| a) Punctuality and regularity | 20% |
| b) Industrial training report | 50% |
| c) Presentation and viva-voce | 30% |

7. RESOURCE REQUIREMENTS

7.1 LIST OF TOOLS AND EQUIPMENT

A. TRAINEES TOOL KIT FOR 30 TRAINEES +1 INSTRUCTOR

Sr. No.	Name of Item	Broad Specifications	Quantity
1.	File flat rough double cut	200mm	30 nos.
2.	File, half round, fine double cut,	length 150mm	30 nos.
3.	File, round, fine double cut	length 150mm	30 nos.
4.	File flat, fine double cut,	length 150mm	30 nos.
5.	File square, fine double cut,	length 150mm	30 nos.
6.	File triangular fine double cut	length 150mm	30 nos.
7.	Scriber	150mm length	15 nos.
8.	Centre punch	length 100mm	10 nos.
9.	Try square	150 mm	30 nos.
10.	Divider spring joint	length 150mm	16 nos.
11.	Caliper spring joint in side	length 150mm	16 nos.
12.	Caliper, odd leg, spring joint	length 150mm	16 nos.
13.	Hammer ball pain	220 gms	16 nos.
14.	Cold Chisel flat and cross cut	length 150mm	16 nos.
15.	Engineers rule	300mm long	30 nos.
16.	Tape measuring	10m graduation in mm	08 nos.
17.	Pliers combination insulated	length 200mm	08 nos.
18.	Pliers long nose	200 mm	08 nos.
19.	Pliers flat nose	150mm	08 nos.
20.	Line tester	500 v heavy duty	30 nos.
21.	Tweezers	10 cm	16 nos.
22.	Plate	45 x45 cms	2 no.
23.	Oil can	500 ml	5 nos.

24.	Surface Gauge universal	150 mm	5 nos.
25.	Bench vice	300mm jaw	10 nos.
26.	Hack saw tubular metal frame adjustable	300mm	10 nos.
27.	Snip sheet metal straight nose	200 mm	10 nos.
28.	Snip sheet metal curved nose	200 mm	10 nos.
29.	Anvil	100X200mm	1no.
30.	Stakes [different Types]	100mm	1 no each
31.	Tin smith	400mm	2 No.
32.	Wooden mallet /Nylon mallet	500 gm good finish	10 Nos.
33.	Round Punch	3mm,4mm,6mm	5 Nos. each
34.	Grover set	4mm forming	1 set
35.	Electrical drill portable drill with chuck and key	capacity 6.4mm	4 nos.
36.	Tape measuring graduation in mm	2 m	4 5nos.
37.	Screw driver, plastic handle,	6mm tip length 100mm to 150mm	6 nos. each
38.	Screw driver, plastic handle, Flat tip	10mm tip length 200mm & 250mm	6 nos. each
39.	Philips screw driver –	complete set in leather case	6 nos.
40.	Screw driver, plastic handle, Flat tip	handle 3mm tip length 100mm to 150mm insulated	6 nos. each
41.	Soldering iron exchangeable copper tip	65 watts	4 nos.
42.	Knife folded stainless steel –	150mm	10 nos.
43.	Tong tester (clamp on multi meter)	0-10-30 amps 0-500 V	5 nos.
44.	Voltmeter, AC/DC portable precision grade Digital Panel board type	0 to 500 volt	5 nos.
45.	Ammeter, AC/DC portable precision grade Digital Panel board type	0 to 30 amp	5 nos.
46.	Megger	1000 V	2 nos.
47.	Wattmeter multi-range up	1 KW	1 no.
48.	Multi meter digital type	Digital	5 nos.
49.	Tenon saw	250 mm	5 nos.

50.	Firmer chisel	6,12,25mm	2 nos.
51.	Rawal plug tool	6 mm	2 nos.
52.	K.W. meter	0 -1 K W	4 nos.
53.	Fire extinguisher	ABC dry powder type 2 kg capacity	2 nos.
54.	Fire buckets with stand	10 Litre	4 nos.
55.	D.E spanner	6-32 mm	5 set
56.	Ring spanner	6 -32 mm	5 set
57.	Diagonal cutter	15 cm	5 nos.
58.	Service Oscillator	-	1 no.
59.	C.R.O Single beam	5 MHZ	1 no.
60.	C.R.O Dual trace/ Double beam	60 MHZ	2 nos.
61.	A.F.O Oscillators	-	2 nos.
62.	Tong, Close mouth and pick up	-	1 no.
63.	Welding table for gas	1200x760	2 nos.
64.	Flaring tool set, single type for tube.	4.7mm to 16mm O.D	5 nos.
65.	Swaging tool, punch type, set of size for tube.	4.7mm to 16mm O.D	5 sets
66.	Swaging tool, screw type with adaptor set of size for tube	4.7mm to 16mm O.D.	5 sets
67.	Bending spring external type, for copper tube	3mm to 16mm dia	5 sets
68.	Pipe cutter miniature for copper tube	3mm to 16mm dia	5 sets
69.	Pinch of tool, for copper tube,	6mm to 18mm dia	5 sets
70.	Ratchet spanner	6.4 sq.mm reversible	5 sets
71.	Capillary plug gauge	-	5 sets
72.	Piercing pliers & reversing valve with access fitting	6-18mm	5 sets
73.	Spanner double ended	4.7mm to 16mm	5 sets
74.	Ring spanner off set	4.7mm to 16mm	5 sets
75.	Wrench adjustable	length 150mm	5 sets
76.	Wrench adjustable	length 200mm	5 sets

77.	Wrench adjustable	length 250mm	5 sets
78.	Valve key handle	4.7mm & 6.4mm sq.	5 sets
79.	Pressure gauge Digital type	diameter 63mm with recalibration set	5 sets
80.	Compound gauge, Digital type	diameter 63mm, with recalibration set screw, scale vacuum 76mm. Pressure 15 Kg/sq.cm	5 sets
81.	Service man thermometer in metal case	- 30 C to +30 C	5 sets
82.	Scissor, gasket cutting stainless steel	length 25mm	5 sets
83.	L-Allen key	set size 1.5mm to 6.4mm	5 sets
84.	T-Allen key set	size 5/32" to 1/8"	5 sets
85.	Pipe cutter with built in reamer and space cutter, for copper tube	3mm to 32mm	sets
86.	Pipe /Tube bender lever type	3-16 mm	1 no each
87.	Pipe wrench	size 50mm to 150mm	5 nos.
88.	Gas leak detector for halogen gas	-	5 nos.
89.	Sling psychro meter mounted on aluminum back,	scale 50 C to +50 C	5 nos.
90.	Lapping plate	250mm x 200mm	2 nos.
91.	Hammer ball peen	450 gms	5 nos.
92.	Puller 3 legged with flexible arm	300mm	5 nos.
93.	Hand blower portable complete	1/10 HP	2 nos.
94.	Spirit level precision metallic	200mm	2 nos.
95.	Stop watch	-	2 nos.
96.	Tap set with matching drills	3 mm to 16mm	3 nos.
97.	Tap set with matching drills	¼" to 5/8"	3 nos.
98.	Refrigerant cylinder	2.5 Kg	3 nos.
99.	Vernier caliper	length 250mm	2 nos.
100.	Micrometer outside measurement	0 to 25mm	2 nos.

101.	Heating kit with infrared bulb	(200 W capacity)	2 nos.
102.	Plumbing hammer weight	200 gm	2 nos.
103.	Multi meter analogue type	-	5 nos.
104.	Tachometer digital, multi range	0 rpm to 3000 rpm Portable small size in leather case	2 nos.
105.	Micron vacuum gauge	capable of reading up to 20 microns	2 nos.
106.	Sensor thermometer (digital)	-50 degree Celsius to 150 degree Celsius	2 nos.
107.	Fin straightened/fin comb.	With strong steel wire based combing on wood	3 nos.
108.	Filler gauge	0.05 mm – 1 mm	3 nos.
109.	Wire gauge metric and with worth	Steel plate embossing converse of British & Metric	2 nos.
110.	Dial thermometer remote control, armored capillary dial	75mm – 50C to +50 C	3 nos.
111.	Anemometer	Digital type	1 no.
112.	Compressors testers for small hermetic compressors	Fixed with electrical input/ output indicating facilities	2 nos.
113.	Engineers square	150 mm	5 nos.
114.	Digital thermometer [Treated as consumable]	Graduated disc analogy type	1 no.
115.	Temperature & Humidity recorder	Capacity to record 24 hrs record	1 no.
116.	Instrumentation screw driver set	100mm	5 nos.
117.	Digital weighing machine	100 kg	1 no.
118.	Cylinder 134 a	5 kg	2 nos
119.	Computer latest version with lazer printer	Latest version	1 no.
120.	LCD Projector / LED / LCD TV	Big Size	1 no.
121.	Laptop	Latest version	1 no.

B. GENERAL MACHINERY SHOP OUTFIT

Sr. No.	Name of Item	Broad Specifications	Quantity
1.	Portable air – LPG brazing kit	2 kg. LPG cylinder, torches, houses, stand make	1 no.
2.	Oxy-acetylene welding set complete	cylinders, regulators welding torches with difference nozzles	1 no.
3.	Refrigerator	165L carrying with HFC-134a, & HC	2 Each
4.	Frost free refrigerator	200L carrying with HC blend	2 nos.
5.	Three/four door refrigerator	300L carrying with HC R-600a	2 nos.
6.	Bench Drilling machine	20 mm capacity,200-2500rpm	1 no.
7.	Grinding Machine	200mm,3000rpm,Double ended1/2 hp	1 no.
8.	<p>I) Evacuating and refrigerant charging station, consisting of</p> <p>a) Rotary two stage vacuum pump and motor (with gas ballast and anti such back)</p> <p>b) manifold with gauges and valves and capable of pulling vacuum up to 50 microns of Hg and with provision of connecting to a microns level vacuum gauge</p> <p>c) Graduated charging cylinder with provision for temperature correction and all necessary isolating valves</p> <p>II) Evacuating and charging station as above but fitted with weighing scale</p>	<p>(Capacity 2 kg. In lieu of (b) above and with accuracy of +/-1 g for charging hydrocarbons)</p>	<p>1 no.</p> <p>1 no.</p>
9.	Two stage rotary vacuum pump	capacity approx. 60-100 rpm capable of evacuating to 50 microns of Hg and fitted with gas blast, anti such back valve and single phase motor	1 no.

10.	Air compressor	two stage for oil – less dry air, with rush proof tank assembly, heater and controls max. pr. 10 kgs /sq.m Capacity 45 ltr. Motor 1 hp.	1 no.
11.	Reciprocating compressor	provision of capacity control etc. for demonstration. Capacity 2 ton open type.	1 no.
12.	Dry N2 in cylinder	2 stage regular or commercial N 2 in cylinder with drier unit and 2 stage regular 7meter cube	1 no.
13.	Window A.C	1 Ton with R-22 or HFC Blend reciprocating compressor	2 nos.
14.	Split A.C	1.5 Ton with R134a or R-22 reciprocating compressor	2 nos.
15.	Duct able split A.C 1.5 ton	1.5 Ton with R134a or R-22 reciprocating compressor	1 no.
16.	Recovery unit with cylinders	CFC & 134 a	1 each
17.	Cassette Air conditioner	4500 kcal/hr	1 no.
18.	De scaling pump set	with stainless steel impeller and housing complete with motor 1/2 hp and accessories	1 no.
19.	Fan coil unit	with water valves (2 & 3 way)	1 no.
20.	Shell and tube, DX chillers (small)	5 Ton with Cu tubing only	1 no.
21.	Circulating water pump (small)	0.5 H.P with stainless steel tank capacity 20 liters within let/ outlet provision	1 no.
22.	Shell and tube type condenser	5 Ton	1 no.
23.	Rotary hermetic compressor	2 Ton	1 no.

24.	Bottle cooler visible	200 L carrying with HFC-134a& reciprocating compressor	1 no.
25.	Deep freezer	200 L carrying with HFC-134a& reciprocating compressor	1 no.
26.	Water cooler storage type	200 L carrying with HFC-134a& reciprocating compressor	1 no.
27.	Ice candy plant	2 ton with capacity to make 32 ice candy at a time with Forma tray, stainless steel tank on trolley	1 no.
28.	Air-conditioning, direct and indirect system.	Complete with all controls including humidity control capacity 15000Kcal/hr	1 no.
29.	Package A/C	5 ton capacity, Air cooled type with open type compressor reciprocating type	1 no.
30.	Car A.C components(full kit) a) Wobble plate compressor with mounting brackets. b) Serpentine Evaporator c) Parallel Flow Condenser d) Hoses, tubes, Receiver, Ex. valve. e) Electrical components & wiring Harness	-	1 Set
31.	CAR AC tutorial model	-	1 Set

C. WORKSHOP FURNITURE

Sr. No.	Name of Item	Broad Specifications	Quantity
1.	Class room table	One table for each trainee size of 2.5 provisions with open rack. Frame square conduit of 1". top ½" sun mica ply board	30 nos.
2.	Work bench	2000 x 1000 x 700 mm with 2" pipe frame. Top with teak slab and fixing with ¾" good quality rubber sheet.	6 nos.
3.	Almirah	195 x 90 x 48 cm outer sheet 20 SWG inner partition with four selves of 22 Swg	8 nos.
4.	Lockers	195 x 90 x 48 set six locker in one structure	2 nos.
5.	White board portable	8' X 4' with stand	1 no.
6.	Instructor table	4' X 2' X 2.5' with steel tubular frame & sun mica top	1 no.
7.	Instructor chair	Standard revolving with wheel	1 no.
8.	Computer table	Standard with drawers & self to accommodate UPS & CPU	1 no.
9.	Computer chair	Revolving type metal based & metal wheel standard one	1 no.
10.	Chart stand	6' X 3' providing with hanging clip top & bottom plate	1 no.
11.	Stool	2' x 1.5'	30 nos.
12.	Book shelf with glass panel	6' x 3'	2 nos.
13.	Storage rack	6' x 3'	2 nos.
14.	Storage shelf	6' x 3'	2 nos.

7.2 LIST OF CONSUMABLES (As per requirement)

Sr. No.	Name of Item	Broad Specifications
1.	Copper tube	1/4", 5/16", 3/8", 7/16", 1/2", 5/8"
2.	Capillary tube	0.026 to 0.64"
3.	Flare nut	1/4", 5/16", 3/8", 7/16", 1/2", 5/8"
4.	Straight union	1/4", 5/16", 3/8", 7/16", 1/2", 5/8"
5.	Half union	1/4", 5/16", 3/8", 7/16", 1/2", 5/8"
6.	Elbow	1/4", 5/16", 3/8", 7/16", 1/2", 5/8"
7.	Tee	1/4", 5/16", 3/8", 7/16", 1/2", 5/8"
8.	Brazing rod	Cu to Cu
9.	Brazing flux	Borax
10.	Cotton waste	As required
11.	Baniyan waste	As required
12.	Nitrogen	As required
13.	L p g brazing kit	As required
14.	Lapping paste	Hard and Soft
15.	Refrigeration oil	Capilla – D- Oil
16.	Charging line	500 psi
17.	Door switch	5 amps
18.	Refrigerator Bulb	15 watts
19.	Box type relay	1/6, 1/8 HP
20.	Open type relay	1/6, 1/8 HP
21.	Thermal relay	1/6, 1/8 HP
22.	O L P	1/6, 1/8 HP
23.	Thermostat	-15degree Centigrade
24.	Door Gasket	15 mm
25.	Drier – pencil type	D N 50, 150 x 6 x 9
26.	De frost heater	As required

27.	Defrost timer	4 -6 Hr
28.	Bimetal thermo	As required
29.	Hand shut off valve	1/4 ”
30.	Solenoid valve	230 V, 1/4”
31.	L P Cut out	40 psi
32.	H P Cut out	240 psi
33.	Oil pressure cut out	40 psi
34.	Thread teflon tape	10 mm
35.	Starting capacitor	60-80 Mfd
36.	Running capacitor	40 Mfd
37.	Fan Capacitor	4 mfd
38.	Flexible Wire	1.5 mm
39.	Freon gas or any suitable gas	12
40.	HFC	134 a
41.	Match box	As required
42.	Washing soap	As required
43.	Incandescent lamp	500 W
44.	Cell	12 V
45.	L.M.S relay	1/4, 1/6, 1/8 HP
46.	Sand paper	As required
47.	Stove pin	As required
48.	Epoxy compound/ M seal	As required
49.	Gloves for welding[Treated as consumable]	As required
50.	Leather Apron [Treated as consumable]	As required

- Note:**
1. Consumables may procure according to skills requirements.
 2. Specification may change depends upon availability of market.
 3. Quantity depends up on number of trainees.

7.3 LIST OF RECOMMENDED BOOKS

1. Refrigeration and Air Conditioning Trade Theory and Assignment / Test (Solved), By G.S. Sethi, Available in English and Hindi medium, Published by Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
2. Refrigeration and Air Conditioning Trade Theory and Assignment / Test (Solved) (combined edition of 6 modules – Basic Workshop Practices; Basic Electricity, Electronics and Electro-Mechanics ; Basic Refrigeration-I ; II ; III; IV By G.S. Sethi & Balbir Singh, Available in English medium, Published by Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
3. Refrigeration and Air Conditioning Practical By A.K. Sharma, Available in Hindi medium, Published by Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
4. Workshop Calculation and Science and Engineering Drawing (For Mechanical Trades), By G.S. Sethi, Balbir Singh, Available in English, Published by Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
5. Workshop Calculation and Science (Common for all Engineering Trades – including Refrigeration & A.C.) By Kapil Dev, G.V. Ramana Murthy, Available in English and Hindi medium, Published by Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
6. Engineering Drawing (Common for all Engineering Trades – including Refrigeration & A.C.) By Kapil Dev, Available in English and Hindi medium, Published by Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
7. Engineering Drawing (For Mechanical and Electrical Trades – including Refrigeration & A.C.), By Kapil Dev, Available in English and Hindi medium, Published by Computech Publications Ltd. (Division – Asian Publishers, New Delhi)

8. Employability Skills (with MCQs) By ASIAN Core Editorial Team – C. Subhas, Kapil Dev, Singh, Available in English and Hindi medium, Published by Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
9. Q-Bank Employability Skills (Over 2250 MCQs) By Dr. V. Nagaradjane, Available in English, Published by Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
10. Q-Bank Refrigeration & A.C. By G.S. Sethi, Available in English, Published by Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
11. R & AC Mechanic 1st Year, Available in English, Hindi Medium; Published by NATIONAL INSTRUCTIONAL MEDIA INSTITUTE (NIMI), Directorate General of Training Government of India - Ministry of Skill Development and Entrepreneurship Post Box No.3142, CTI Campus, Guindy Industrial Estate, Guindy, Chennai - 600032.
12. R & AC Mechanic 2nd Year, Available in English; Published by NIMI, Guindy, Chennai.

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.
2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.
3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.
4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.
5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.
6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

9. LIST OF CONTRIBUTORS/EXPERTS

- a) Following experts participated in the workshop to design curriculum of certificate programme in 'Refrigeration and Air Conditioning Mechanic' for MRSPTU, Bathinda on 11-12 August, 2016 at NITTTR, Chandigarh.

1.	Dr. Ashok Kumar Goel, Professor & Head, Electronics and Communication Engineering Department and Director, College Development Council, MRSPTU Campus, Dabwali Road, Bathinda, Punjab
2.	Shri G.S. Sethi, A-301, Rishi Apartments, Sector-70, Mohali
3.	Prof. Pardeep Gupta, Professor, Mechanical Engineering Department, SLIET, Longowal, Punjab
4.	Shri Jonny Singla, Associate Professor, Mechanical Engineering Department, SLIET, Longowal, Punjab
5.	Shri HS Kalra, Ex-Principal, Govt. ITI, Sector-28, Chandigarh
6.	Shri RP Dhiman, Workshop Superintendent, CCET (Diploma Wing), Sector-26, Chandigarh
7.	Shri Upendra Kumar, Lecturer, Mechanical Engineering Department, CCET (Diploma Wing), Sector-26, Chandigarh
8.	Shri Balwant Singh, Incharge, RAC Lab, Mechanical Engineering Department, Giani Zail Singh Campus College of Engineering and Technology, Bathinda, Punjab
9.	Shri Deepak Kumar, RAC Instructor, Govt. Industrial Training Institute, Amritsar, Punjab
10.	Shri Ravinder Singh, RAC Instructor, Govt. Industrial Training Institute, Amritsar, Punjab
11.	Shri Harjinder Singh Cheema, RAC Instructor, Govt. Industrial Training Institute, Ropar, Punjab
12.	Shri Parmod Kumar, RAC Instructor, Govt. Industrial Training Institute, Ludhiana, Punjab
13.	Shri Shiv Kumar, RAC Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
14.	Shri Harbans Singh, RAC Instructor, Govt. Industrial Training Institute, Patiala, Punjab
15.	Shri Gagandeep Singh, RAC Instructor, Govt. Industrial Training Institute, Patiala, Punjab
16.	Shri Harjit Singh, Instructor, Govt. Industrial Training Institute, Lalru, Punjab
17.	Shri Bhanu Goel, Hira Nagar, Patiala, Punjab
18.	Dr. B.S. Pabla, Professor & Head, IMCO, NITTTR, Chandigarh
19.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
20.	Prof. PK Singla, Associate Professor, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

- b) Following experts participated in the workshop to review curriculum of certificate programme in “RAC (Mechanic)” for MRSPTU, Bathinda held on 6 January, 2017 at NITTTR, Chandigarh.

1.	Dr. Ashok Kumar Goel, Director, College Development Council, MRSPTU Campus, Bathinda, Punjab
2.	Dr. Balraj Singh, Director, PIT, Rajpura
3.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
4.	Shri GS Sethi, Consultant, IndiaCan, A-301, Rishi App, Sector 70, Mohali
5.	Shri Asheesh Kumar Saini, Centre Head, IL&FS, IIS, Ropar
6.	Shri Jasvir Singh Tiwana, Associate Professor, GZSCCET, Bathinda
7.	Shri Sikander Singh Sidhu, Assistant Professor, GZSCCET, Bathinda
8.	Shri J Ghosh Roy, Aryabhat Polytechnic, Delhi
9.	Shri Jagdeep Singh, Central Tool Room, A-5, Phase-5, Focal Point, Ludhiana
10.	Shri Rakesh Goel, Estate Officer, NITTTR, Chandigarh
11.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

Curriculum
for
Certificate Programme
in
WELDER
for
**Maharaja Ranjit Singh Punjab Technical
University, Bathinda (Punjab)**



Prepared By:

Curriculum Development Centre
National Institute of
Technical Teachers Training and Research
Sector 26, Chandigarh - 160 019

January, 2017

FOREWORD

Rapid industrialization and globalization has created an environment for free flow of information and technology through fast and efficient means. This has led to shrinking of the world, bringing people from different culture and environment together and giving rise to the concept of world turning into a global village. In order to cope with the challenges of handling new materials, machines and technologies, we have to develop human resources having appropriate competencies. There is an increasing demand of skilled workforce in India in particular and the world over in general. Under the new circumstances, India faces a challenging task of meeting the technical manpower requirement, especially in the area of skilled workforce to cater to industrial needs. Efforts have to be made so that passouts from our technical institutions are acceptable at global level.

Technical education system is one of the significant components of the human resource development and has grown phenomenally during all these years. Technical institutions play an important role in meeting the requirements of trained technical manpower for industries and field organizations. The initiatives being taken by Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab to start the skill oriented integrated courses at certificate, diploma and degree level, as per the needs of the industry, are laudable.

In order to meet the future requirements of technical manpower, we will have to revamp our existing technical education system and one of the most important requirements is to develop outcome-based curricula of technical programmes at various levels. The curricula for various programmes have been revised by adopting time-tested and nationally acclaimed scientific method, laying emphasis on the identification of learning outcomes of programme and various courses.

The success of any technical programme depends upon its effective implementation. However best the curriculum document is designed, if it is not implemented properly, the output will not be as per expectations. In addition to acquisition of appropriate physical resources, availability of motivated, competent and qualified faculty is equally essential for effective implementation of the curricula.

It is expected that MRSPTU will carry out curriculum evaluation on a continuous basis to identify the new skill requirements. At the same time, it is expected that innovative methods of course offering will be used to develop desired skills and infuse the much needed dynamism in the system.

Dr. M.P. Poonia
Director
National Institute of
Technical Teachers Training & Research
Chandigarh

PREFACE

Curriculum document is a comprehensive plan of an educational programme. It is through the curriculum that the educational objectives of a programme are achieved. It has to be ensured that the curriculum is dynamic, articulated, balanced, data based, feasible, and as per industrial needs. Curriculum Development Centre at NITTTR, Chandigarh has been extending services to technical education system of the states in northern region in developing and updating their curriculum on regular basis.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bathinda, Punjab assigned the project for developing the curriculum of some integrated programmes to this institute in the month of May 2016. A series of curriculum workshops were held during the months of June-July, 2016. This curriculum document is an outcome of the extensive discussions held with the representatives from various organizations, technical institutions and industry during the curriculum workshops. While developing the study and evaluation scheme and detailed contents, the following aspects have been kept in mind :

- Employment Opportunities of Certificate holders
- Job role of certificate holders
- Learning outcome of the Programme
- Mobility of students for their professional growth

We have taken cognizance of recommendation of experts both from industry and academic institutions and have adequately incorporated segments of Industrial Training in the curriculum. Time has specifically been allocated for undertaking extra-curricular activities. Emphasis has been laid on developing and improving communication skills in the students for which units on Communication Skills have been introduced in both the semesters of the certificate course.

We hope that this curriculum document will prove useful in producing skilled manpower at desired level in the state of Punjab. The success of this outcome-based curriculum depends upon its effective implementation and it is expected that MRSPTU will make all efforts to create better facilities, develop linkages with the world-of-work and foster conducive and requisite learning environment as prescribed in the curriculum document.

Professor and Head
Curriculum Development Centre
NITTTR, Chandigarh

ACKNOWLEDGEMENTS

We gratefully acknowledge the assistance and guidance received from the following persons:

- i) Vice Chancellor, Maharaja Ranjit Singh Punjab Technical University (MRSPTU), Bhatinda, Punjab for entrusting this project of curriculum design to NITTTR, Chandigarh.
- ii) Director, College Development Council MRSPTU for his support and active involvement in curriculum development.
- iii) Director, National Institute of Technical Teachers' Training and Research, Chandigarh for his support and academic freedom provided to Curriculum Development Centre.
- iv) All the experts from industry/field organizations, universities, ITIs and other technical institutions for their professional inputs during curriculum workshops.
- v) Faculty from different departments of NITTTR, Chandigarh for content updation.
- vi) Shri Yogendra Kaushal, Stenographer, Curriculum Development Centre, NITTTR, Chandigarh for processing the document.
- vii) Shri Mohan Lal Bindal, Assistant, Curriculum Development Centre for his support and secretarial assistance in the conduct of curriculum design workshops.

Coordinator

1. SALIENT FEATURES OF THE PROGRAMME

1.	Sector	:	Fabrication
2.	Name of the Certificate Programme	:	Welder
3.	Entry Qualification	:	Matriculation or equivalent NSQF Level as prescribed by MRSPTU, Bathinda
4.	Duration of the Programme	:	One Year
5.	Intake	:	30
6.	Pattern of the Programme	:	Semester Pattern
7.	NSQF Level	:	Level - III
8.	Ratio between theory and Practice	:	25 : 75 (Approx.)

2. JOB ROLE AND JOB OPPORTUNITIES OF WELDER

Job Role

A welder is expected to perform following job roles in the industry ::

- **Gas welding** – Check and prepare metal (ferrous and non-ferrous) sheets and pipes as per specifications for gas welding; set up oxy-fuel welding equipment and accessories; select and use appropriate filler metal and flux; weld sheets and pipes in different positions using correct and safe procedure and produce welds of acceptable quality standards.
- **Gas cutting** – Check and prepare jobs (M.S.) as per specifications for oxy-fuel gas cutting; set up oxy-fuel cutting equipment and accessories; carry out cutting (straight, circular, bevel) using correct and safe procedure to produce cuts of acceptable quality standards.
- **Brazing** – Check and prepare jobs for brazing as per specifications; set up equipment; select and use consumables and carry out brazing to produce brazed joints of acceptable quality standards; carry out necessary pre- and post welding checks and treatment.
- **Arc welding** – Select and set up different arc welding machines for given jobs; select, store, prepare and use electrodes of appropriate type and size; prepare jobs with appropriate edge preparations; weld jobs in different positions using correct procedure observing safety precautions and produce welds of acceptable quality standards; carry out necessary pre- and post welding checks and treatment.
- **TIG welding** – Set up TIG welding equipment and accessories and consumables including electrode and electrode holder, consumable wire, gas mixture for TIG welding M.S., aluminium, stainless sheets; prepare the jobs and complete TIG welding process using correct and safe procedure to produce welds of acceptable quality; carry out necessary pre- and post-weld checks and treatments.
- **MIG / MAG welding** - Set up MIG / MAG welding equipment and accessories and consumables including electrode holder, consumable wire, gas mixture for MIG / MAG welding M.S. plates; prepare the jobs as per specifications and complete MIG / MAG welding using correct and safe procedure to produce welds of acceptable quality; carry out necessary pre- and post-weld checks and treatments.
- **Testing and inspection** – Prepare post-weld test specimens for different types of destructive tests including tensile, hardness, impact tests; carry out destructive tests and identify defects and causes thereof; set up and use non-destructive test

equipment including visual, magnetic particle, dye penetrant and radiography tests, interpret results and identify defects in welds and causes thereof.

- **Communicate** effectively orally and in writing with colleagues and others.
- **Safety** - Select appropriate personal safety equipment and follow general safety practices as applicable to welding and cutting processes and welding shop environment.

Job Opportunities

The welding field is so diverse that it offers a vast array of options for employment and continuing personal development. There is a great demand for qualified and knowledgeable welders in fabrication and construction industries as well as for self employment in small scale enterprises. Aerospace, automobile, electronics are a few examples of many industries that use welding in a big way. Welding is what holds the majority of structures together--bridges, cars, tractors, cranes, buildings, etc.

On successful completion of this course, students should be able to find gainful job opportunities in industries like those listed below besides exploring possibilities of being an entrepreneur and be self-employed. The list given below is only indicative and not comprehensive.

- Structural fabrication including bridges, building construction, infrastructure, cranes.
- Automobiles and allied industries.
- Aerospace, power plants, electronics
- Ship building
- Railways
- Chemical industries
- Mining sector
- Structural repair and maintenance
- Oil and natural gas sector

3. LEARNING OUTCOMES OF CERTIFICATE PROGRAMME IN WELDER

At the end of the programme, the students will be able to:

- Set components for welding and allied operations.
- Set parameters like welding current / electrodes etc.
- Perform gas welding, gas cutting and brazing operations.
- Perform arc welding operations.
- Perform TIG welding and MIG/MAG welding operations.
- Perform post-welding operations.
- Perform quality checks on welding.
- Prepare and read engineering drawing
- Identify and select material for specific application.
- Communicate effectively with others.
- Follow safety practices, PPE (Personal Protective Equipment), environment regulation and housekeeping.
- Apply concepts of mathematics and science for problem solving.

CONTENTS

Sr. No	Particulars	Page No.
-	Foreword	(i)
-	Preface	(ii)
-	Acknowledgements	(iii)
1.	Salient Features of the Programme	1
2.	Job Role and Job Opportunities	2
3.	Learning Outcomes of the Programme	4
4.	Study and Evaluation Scheme	5
5.	Guidelines for Assessment of Student Centred Activities	7
6.	Detailed Contents of Various Units	8-31

FIRST SEMESTER

1.1	Communication Skills	8
1.2	Gas Welding, Gas Cutting and Brazing	10
1.3	Arc Welding	13
1.4	Engineering Drawing (Welder)	15
1.5	Engineering Materials	19
-	4 Weeks Industrial Training (during vacation)	21

SECOND SEMESTER

2.1	Basic Sciences	22
2.2	TIG Welding	24
2.3	MIG/MAG Welding	27
2.4	Inspection and Testing of Weldment	29
-	4 Weeks Industrial Training	31

7.	Resource Requirements	32-39
7.1	List of Tools/Equipment	32
7.2	List of Consumables	38
7.3	List of Recommended Books	39
8.	Recommendations for Effective Curriculum Implementation and Evaluation	40
9.	List of Contributors/Experts	41

4. STUDY AND EVALUATION SCHEME FOR CERTIFICATE PROGRAMME IN WELDER

FIRST SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
1.1		*Communication Skills	8	24	1	25	25	50	25	1	50	3	75	125
1.2		Gas Welding, Gas Cutting and Brazing	32	144	7	25	100	125	50	2	100	4	150	275
1.3		Arc Welding	32	144	7	25	100	125	50	2	100	4	150	275
1.4		Engineering Drawing (Welder)	-	64	2	-	50	50	75	3	-	-	75	125
1.5		Engineering Materials	32	32	3	25	50	75	25	1	50	3	75	150
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training (during vacation)			-	-	4	-	-	-	-	-	100	3	100	100
Total			104	456	26	100	350	450	225	-	400	-	625	1075

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment, energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ **Industrial Training**

After examination of 1st Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

Total weeks per semester = 16, Total working days per week = 5, Total hours/day = 7

Total hours in a semester = 16 x 5 x 7 = 560

One credit is defined as one hour of lecture per week or two hours of practicals per week for one semester. Fractions in credits have been rounded to nearest integer.

SECOND SEMESTER

Sr. No.	CODE	UNITS	STUDY SCHEME		CREDITS	MARKS IN EVALUATION SCHEME								Total Marks
			Total Hours			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT					
			Th	Pr		Th	Pr	Tot	Th	Hrs	Pr	Hrs	Tot	
2.1		*Basic Sciences	48	-	3	25	-	25	75	2	-	-	75	100
2.2		TIG Welding	32	160	7	25	100	125	50	2	100	4	150	275
2.3		MIG/MAG Welding	32	144	7	25	100	125	50	2	100	4	150	275
2.4		Inspection and Testing of Weldment	32	64	4	25	50	75	25	1	75	3	100	175
#Student Centred Activities (SCA)			-	48	2	-	25	25	-	-	-	-	-	25
+4 Weeks Industrial Training			-	-	4	-	-	-	-	-	100	3	100	100
Total			144	416	27	100	275	375	200	-	375	-	575	950

* Common with other certificate programmes

SCA will comprise of co-curricular activities like extension lectures on entrepreneurship, environment, energy conservation, sports, hobby clubs e.g. photography etc., seminars, declamation contests, educational field visits, N.C.C., NSS, Cultural Activities etc.

+ **Industrial Training**

After examination of 2nd Semester, the students will go for training during vacation in a relevant industry/field organization for a minimum period of 4 weeks and will prepare a diary. The students will prepare a report at the end of training and will present it in a seminar. This evaluation will be done by concerned instructor in the presence of one industrial representative from the related programme/trade.

5. GUIDELINES FOR ASSESSMENT OF STUDENT CENTRED ACTIVITIES (SCA)

It was discussed and decided that the maximum marks for SCA should be 25 as it involves a lot of subjectivity in the evaluation. The marks may be distributed as follows:

- i. 5 Marks for general behavior and discipline
(by Principal in consultation with all the trainers)
- ii. 5 Marks for attendance as per following:
(by the trainers of the department)
 - a) 75% Nil
 - b) 75 - 80% 2 Marks
 - c) 80 - 85% 3 Marks
 - d) Above 85% 5 Marks
- iii. 15 Marks maximum for Sports/NCC/Cultural/Co-curricular/ NSS activities as per following:
(by In-charge Sports/NCC/Cultural/Co-curricular/NSS)
 - a) 15 - National Level participation or inter-University competition
 - b) 10 - Participation in two of above activities
 - c) 5 - Participation in internal sports of the University

Note: There should be no marks for attendance in the internal sessional of different subjects.

UNIT – 1.1 : COMMUNICATION SKILLS

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Speak confidently.
- Overcome communication barriers.
- Write legibly and effectively.
- Listen in proper prospective.
- Read various genres adopting different reading techniques.
- Respond to telephone calls effectively.

Practical (24 Hours)	Theory (08 Hours)
	Basics of Communication <ul style="list-style-type: none"> • Process of communication • Types of communication - formal and informal, oral and written, verbal and non-verbal • Objectives of communication • Essentials of communication • Barriers to communication <p style="text-align: right;">(1 hour)</p>
<ul style="list-style-type: none"> • Looking up words in a dictionary (meaning and pronunciation) <p style="text-align: right;">(2 hours)</p>	Functional Grammar and Vocabulary <ul style="list-style-type: none"> • Parts of speech • Tenses • Correction of incorrect sentences <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Self and peer introduction • Greetings for different occasions <p style="text-align: right;">(1 hour)</p>	Listening <ul style="list-style-type: none"> • Meaning and process of listening • Importance of listening • Methods to improve listening skills Speaking <ul style="list-style-type: none"> • Importance • Methods to improve speaking • Manners and etiquettes <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Newspaper reading <p style="text-align: right;">(1 hour)</p>	Reading <ul style="list-style-type: none"> • Meaning • Techniques of reading: skimming, scanning, intensive and extensive reading <p style="text-align: right;">(1 hour)</p>

<ul style="list-style-type: none"> • Vocabulary enrichment and grammar exercises • Exercises on sentence framing accurately (6 hours) 	<p>Functional Vocabulary</p> <ul style="list-style-type: none"> - One word substitution - Commonly used words which are often misspelt - Punctuation - Idioms and phrases <p style="text-align: right;">(2 hours)</p>
<ul style="list-style-type: none"> • Reading aloud articles and essays on current and social issues • Comprehension of short paragraph (5 hours) 	
<ul style="list-style-type: none"> • Write a short technical report • Letter writing (3 hours) 	
<ul style="list-style-type: none"> • Participate in oral discussion • Respond to telephonic calls effectively • Mock interview (6 hours) 	

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

UNIT 1.2 : GAS WELDING, GAS CUTTING AND BRAZING

LEARNING OUTCOMES:

After undergoing this unit, students will be able to:

- Set components for welding and allied operations
- Carry out hacksawing, filing, punching and marking
- Perform gas welding, gas cutting and brazing

Practical (144 hrs)	Theory (32 hrs)
<ul style="list-style-type: none"> • Importance of Trade Training • Machinery used in trade • Hacksawing, filing square to dimension. • PPE, Safety Practices <p align="right">(12 hrs)</p>	<ul style="list-style-type: none"> • Discipline in institute and first aid • Safety precautions in gas welding and gas cutting • Introduction to gas welding, gas cutting and brazing <p align="right">(2hrs)</p>
<ul style="list-style-type: none"> • Marking and punching on M.S. Plate • Setting of oxyacetylene gas welding equipments • Lighting and setting of flame <p align="right">(12 hrs)</p>	<ul style="list-style-type: none"> • Gas welding and Gas cutting equipments tools and accessories • Marking practice using of steel rule and steel tape (metric and inches) • Introduction to gas welding tools <p align="right">(2 hrs)</p>
<ul style="list-style-type: none"> • Fusion run without filler rod on M.S. sheet 2mm thick in Flat position • Fusion Run with filler rod on M.S. sheet 2mm thick in Flat position <p align="right">(8 hrs)</p>	<ul style="list-style-type: none"> • Common gases used in gas welding and gas cutting. <p align="right">(2 hrs)</p>
<ul style="list-style-type: none"> • Flange edge joint without filler rod on M.S. sheet 2mm in Flat Position. • Square butt joint with filler rod on M.S. sheet 2mm in Flat Position. <p align="right">(8 hrs)</p>	<ul style="list-style-type: none"> • Types of oxyacetylene flames, their temperature and uses. <p align="right">(2 hrs)</p>

<ul style="list-style-type: none"> Lap joint on M.S. sheet 2mm in Flat Position. . <p style="text-align: right;">(8 hrs)</p>	<ul style="list-style-type: none"> Gas welding terms and definitions <p style="text-align: right;">(2hrs)</p>
<ul style="list-style-type: none"> Marking and straight line cutting on M.S. plate 10-mm thick by gas welding . <p style="text-align: right;">(8 hrs)</p>	<ul style="list-style-type: none"> Gas welding techniques (Leftward and Rightward) Identification of material for gas welding (by weight, colour and spark) <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> Fillet T-Joint on M.S. sheet 2mm in flat position Fusion Run without filler rod on M.S. sheet 2mm in Horizontal position. <p style="text-align: right;">(8 hrs)</p>	<ul style="list-style-type: none"> Welding symbols as per BIS and AWS Welding position. Flat, Horizontal vertical and overhead, slope and rotation. . <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> Bevelling of M.S. plate 10mm thick by gas cutting Square Butt joint on M.S. sheet 2mm in Horizontal position. . <p style="text-align: right;">(8 hrs)</p>	<ul style="list-style-type: none"> Types of welding joint and their edge preparation Principle of gas cutting <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> Fillet T-Joint on M.S. sheet 2mm in Horizontal position Fusion Run on M.S. sheet 2mm in Vertical position. <p style="text-align: right;">(8 hrs)</p>	<ul style="list-style-type: none"> Acetylene gas (D.A.) properties and generating methods. Acetylene gas purifier and flash back arrestor Acetylene gas cylinder, Colour code, pressure . <p style="text-align: right;">(2 hrs)</p>
<ul style="list-style-type: none"> Square Butt joint on M.S. sheet in vertical position <p style="text-align: right;">(8 hrs)</p>	<ul style="list-style-type: none"> Oxygen gas properties and generating methods. Oxygen gas Cylinder Colour code of oxygen cylinder and pressure <p style="text-align: right;">(2 hrs)</p>

<ul style="list-style-type: none"> • Outside corner joint on M.S. sheet 2mm in vertical position (8 hrs) 	<ul style="list-style-type: none"> • Acetylene gas regulator, types and uses. Gas welding torch and their types and nozzles. Oxyacetylene gas welding system. Cutting Torch. (Low pressure and High pressure) (2 hrs)
<ul style="list-style-type: none"> • Butt joint on M.S. pipe of 50mm dia and 3mm wall thickness in 1G position. (8 hrs) 	<ul style="list-style-type: none"> • Specification of pipes, various types of pipe joints, pipe welding positions. (1G,2G,5G,6G), manifold system (2 hrs)
<ul style="list-style-type: none"> • Pipe welding on 45° joint on M.S. pipe dia 50mm and 3mm wall thickness in 1G position. • Pipe flange joint on M.S. plate 3mm with M.S. pipe dia 50mm and 3mm wall thickness. (16 hrs) 	<ul style="list-style-type: none"> • Gas welding flux types and functions. Principle of brazing (Hard Brazing) and their uses. (2 hrs)
<ul style="list-style-type: none"> • Single V. Butt joint on M.S. sheet 4mm in Flat position (8 hrs) 	<ul style="list-style-type: none"> • Gas welding defects, causes and remedies. (2 hrs)
<ul style="list-style-type: none"> • Brazing on M.S. sheet 2mm in flat position • Square butt joint on brass sheet 2mm in Flat position. (8 hrs) 	<ul style="list-style-type: none"> • Distortion and types, methods of control. Importance of preheating, post heating. (2 hrs)
<ul style="list-style-type: none"> • Square butt joint on Aluminum sheet 3mm in Flat position. • Brazing on copper Tube of 10mm in 1G position. (8 hrs) 	<ul style="list-style-type: none"> • Gas welding of low carbon steel cast iron, Brass, Copper and aluminum. (2 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT 1.3 : ARC WELDING

LEARNING OUTCOMES :

After undergoing this unit, students will be able to:

- Understand basic knowledge of arc welding
- Perform welding operation in all positions on M.S. plate
- Select welding parameters like welding current/electrode etc.

Practical (144 hrs)	Theory (32 hrs)
<ul style="list-style-type: none"> • Hacksawing, filing, squaring, marking and punching (8 hrs) 	<ul style="list-style-type: none"> • Introduction to arc welding process, tools, equipment and accessories (4 hrs)
<ul style="list-style-type: none"> • Use of safety tools/equipment during arc welding (6 hrs) 	<ul style="list-style-type: none"> • Safety precautions during arc welding (2 hrs)
<ul style="list-style-type: none"> • Setting up of arc welding machine and accessories and striking an arc. (20 hrs) 	<ul style="list-style-type: none"> • Welding parameters and their effect on bead geometry • Effect of arc length, polarity on weld bead (4 hrs)
<ul style="list-style-type: none"> • Preparation of butt joint, lap joint, corner joint, T-joint, edge joint on M.S. Plate in flat Position. (36hrs) 	<ul style="list-style-type: none"> • Types of welded joint and their application, edge preparation and fit-up for different thickness (4 hrs)

<ul style="list-style-type: none"> • Study circuit diagram of a power source used in arc welding <p style="text-align: right;">(4 hrs)</p>	<ul style="list-style-type: none"> • Basic electricity applicable to welding, different terms used in arc welding <p style="text-align: right;">(4 hrs)</p>
<ul style="list-style-type: none"> • Demonstration of various types of power sources used in arc welding. <p style="text-align: right;">(4 hrs)</p>	<ul style="list-style-type: none"> • Introduction to different power sources used in arc welding like transformer, rectifier, motor generator and inverter <p style="text-align: right;">(5 hrs)</p>
<ul style="list-style-type: none"> • Preparation of butt, Lap, Tee, Corner joint in horizontal, vertical and overhead position. • Pipe Flange joint on M.S Plate • Pipe welding butt joint on M.S pipe in 1G position <p style="text-align: right;">(60 hrs)</p>	<ul style="list-style-type: none"> • Introduction to various welding positions. <p style="text-align: right;">(2 hrs)</p>
	<ul style="list-style-type: none"> • Electrode: types, functions of flux, coating factor, sizes of electrode, coding of electrode as per BIS, AWS. • Storage and drying of electrode <p style="text-align: right;">(4 hrs)</p>
<ul style="list-style-type: none"> • Identification of surface defects like under cut, over-lap, cracks, blow holes, slag inclusion, by visual inspection. <p style="text-align: right;">(6 hrs)</p>	<ul style="list-style-type: none"> • Distortion in arc welding and methods employed to minimize distortion • Various types of arc welding defects <p style="text-align: right;">(3 hrs)</p>

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT 1.4 : ENGINEERING DRAWING (WELDER)

LEARNING OUTCOMES:

After undergoing this unit, students will be able to:

- Draw free hand sketches of various kinds of objects.
- Utilize various types of lines used in engineering drawing.
- Read and apply different dimensioning methods on drawing of objects.
- Prepare simple engineering drawings used in current welding practice
- Read technical drawings for cost estimation and manufacturing/fabrication purpose.

Practical	(64 hrs)	Theory
<ul style="list-style-type: none"> • Practical demonstration with the help of blue prints/computer prints. <p align="right">(3 hrs)</p>		Engineering drawing and its importance
<ul style="list-style-type: none"> • Drawing board, T-square, mini-drafter, set squares, protractor, drawing instrument box, pencils of different grades, erasing shield • Learn methods of folding of blue print/drawing prints as per BIS SP : 16-2003 • Size of drawing sheets and designation of sheets. • Preparation of A3/A2 sheet for preparing drawings. <p align="right">(4 hrs)</p>		Introduction to drawing instruments

<ul style="list-style-type: none"> Practice construction of different types of lines (horizontal and vertical) <p style="text-align: right;">(3 hrs)</p>	<p>Fundamentals of engineering drawings:</p> <ul style="list-style-type: none"> Types of lines
<ul style="list-style-type: none"> Construction of triangle, rectangle, rhombus, parallelogram circle quadrilateral and ellipse. <p style="text-align: right;">(3 hrs)</p>	<p>Triangle and types of triangles, rectangle, rhombus, parallelogram , circle, quadrilateral and ellipse</p>
<ul style="list-style-type: none"> Practice writing alphabets and numerals in capital/lower case as per BIS: 9609 in vertical and inclined style: <p style="text-align: right;">(3 hrs)</p>	<ul style="list-style-type: none"> Lettering and numbering: Study styles of lettering, spacing of letters standard heights and widths.
<ul style="list-style-type: none"> Practice construction of elements dimensioning with the help of a view of an object. Practice dimensioning of a diameter, radius, angles, holes, chamfers, undercut, functional dimensions, non functional dimensions. <p style="text-align: right;">(3 hrs)</p>	<ul style="list-style-type: none"> Dimensioning Definition, size dimension, location dimensions, dimensioning line, extension line, leader line, termination of dimension line unidirectional and aligned dimensioning systems.
<ul style="list-style-type: none"> Practice of free hand sketch of an object in orthographic and isometric views. <p style="text-align: right;">(6 hrs)</p>	<ul style="list-style-type: none"> Introduction of isometric and orthographic views.
<ul style="list-style-type: none"> Free hand sketches of orthographic views of an object in first angle and third angle projections. <p style="text-align: right;">(6 hrs)</p>	<ul style="list-style-type: none"> Study first angle and third angle projection methods.

<ul style="list-style-type: none"> • Construction of different points existing in first/second/third and fourth quadrants. • Identification of the position of points w.r.t. their projection drawings. <p style="text-align: right;">(6 hrs)</p>	<ul style="list-style-type: none"> • Projections of points in all the four quadrants.
<ul style="list-style-type: none"> • Practice the construction of plan and elevation of lines w.r.t. their different positions such as a line parallel to both V.P. and H.P, line perpendicular to V.P. and parallel to H.P., line perpendicular to H.P. and parallel to V.P., line parallel to H.P. and inclined to V.P. , line parallel to V.P. and inclined to H.P. <p style="text-align: right;">(9 hrs)</p>	<ul style="list-style-type: none"> • Projections of lines in different quadrants
<ul style="list-style-type: none"> • Practice construction of cone, cylinder, pentagonal prism and hexagonal pyramid. <p style="text-align: right;">(6hrs)</p>	<ul style="list-style-type: none"> • Introduction to solids: cube cone, cylinder, prism and pyramid.
<ul style="list-style-type: none"> • Practice on the sheets showing all conventions as mentioned <p style="text-align: right;">(3 hrs)</p>	<ul style="list-style-type: none"> • Conventions as graphical symbols for materials and equipments/instruments/engineering components cast iron, aluminum audits alloys, steel, brass, bronze, copper etc. concrete, glass, plastic/rubber/insulating material/pack material (Marble, Slate, Porcelain and stone wares) Liquids, Woods

<ul style="list-style-type: none"> Practice on the sheets showing the different mild joints (3 hrs) 	<ul style="list-style-type: none"> Conventions used for welded joints as Butt, square butt, single V-Butt, single bevel butt weld, single U-Butt, single J-Butt, Backing run, fillet meld, plug meld, spot meld, seam weld.
<ul style="list-style-type: none"> Practice the construction of views of the riveted joints. (3 hrs) 	<ul style="list-style-type: none"> Riveted Joint Convention
<ul style="list-style-type: none"> Practice of sign convention of D.C. A.C. Positive, Negative, Single Phase, Three Phase, AC/DC, 3-Phase, Neutral line. (3 hrs) 	<ul style="list-style-type: none"> Conventions used for Electrical and electronic components.

Note : Theory part should be covered along with drawing practicals.

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Sketching
- Drawing

UNIT 1.5 : ENGINEERING MATERIALS

LEARNING OUTCOMES:

After undergoing this unit, students will be able to:

- Identify the materials on the basis of properties of materials
- Perform heat treatment of ferrous metals
- Estimate the cost of a given fabricated job

Practical (32 hrs)	Theory (32 hrs)
<ul style="list-style-type: none"> • To draw Stress-strain curve of ductile materials by using UTM (4 hrs) • To compare the hardness of various ferrous metals (8 hrs) 	<p>Introduction: Stress-strain curve, comparison of engineering properties of ceramics, plastics and metals.</p> <p>Ferrous metals: Carbon steel: low carbon, medium carbon, high carbon steel. Application and properties.</p> <ul style="list-style-type: none"> • Cast Iron: Types, applications and properties. • Stainless steel: Types, applications and properties • Comparison of weldability of various ferrous metals (10 hrs)
<ul style="list-style-type: none"> • Comparison of hardness of various non-ferrous metals (8 hrs) 	<p>Non-ferrous Metals:</p> <ul style="list-style-type: none"> • Aluminium, zinc, copper and its alloys: applications and properties. (6 hrs)
<ul style="list-style-type: none"> • Comparison of hardness before and after annealing, • Comparison of hardness before and after normalizing, 	<p>Heat treatment:</p> <ul style="list-style-type: none"> • Iron and iron-carbide diagram, principles of heat treatment, annealing, normalizing, hardening and tempering. • Stress-relieving of the weldment,

<ul style="list-style-type: none"> • Comparison of hardness before and after hardening (8 hrs) 	pre-weld and post-weld heating (10 hrs)
<ul style="list-style-type: none"> • Estimating the cost of the given fabricated job (4 hrs) 	Costing and Estimation: <ul style="list-style-type: none"> • Cost accounting, elements of cost, prime cost, factory cost, total cost, selling price. Estimation, maintenance and repair cost estimation of welded joints (6 hrs)

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce

INDUSTRIAL TRAINING – I (140 hrs)

4 weeks on- the- job training in some industrial unit .

The purpose of the industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform industrial activities.
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks has been provided in the study and evaluation scheme of 1st semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | | |
|----|----------------------------|-----|
| a) | Punctuality and regularity | 20% |
| b) | Industrial training report | 50% |
| c) | Presentation and viva-voce | 30% |

UNIT – 2.1 : BASIC SCIENCES

LEARNING OUTCOMES:

After undergoing this unit, the students will be able to:

- Apply the basic principles of maths in solving the basic problems of the trade.
- Apply the basic principles of physics in solving the basic problems of the trade.

Practical	Theory (48 Hours)
	<p>Mathematics</p> <ul style="list-style-type: none"> • Basic Algebra – algebraic formula. Simultaneous equation – quadratic equations (4 hours) • Simultaneous linear equation in two variables (3 hours) • Arithmetic and geometric progression, sum of n-terms, simple calculations. (3 hours) • Mensuration – Find the area of regular objects like triangle, rectangle, square and circle; volumes of cube, cuboid, sphere cylinder (6 hours) • Trigonometry - Concept of angle, measurement of angle in degrees, grades and radians and their conversions, T-Ratios of Allied angles (3 hrs) • Co-ordinate Geometry - Cartesian and polar coordinates, conversion from cartesian to polar coordinates (2 hrs) • Concept of Differentiation and Integration (3 hrs)
	<p>Physics</p> <ul style="list-style-type: none"> • FPS, CGS, SI units, dimensions and conversions (2 hours) • Force, speed, velocity and acceleration – Definition, units and simple problems (3 hours)

	<ul style="list-style-type: none"> • Stress and strain, modulus of elasticity (2 hours) • Heat and temperature, its units and specific heat of solids, liquids and gases (4 hours) • Electricity and its uses, basic electricity terms and their units, D.C. and A.C., positive and negative terminals, use of switches and fuses, conductors and insulators (5 hours) • Work, Power and Energy-Defination, units and simple problems (4 hours) • Concept of force, Inertia, Newton's First law of motion; momentum and Newton's second law of motion; Impulse; Newton's third law of motion. (2 hrs) • Friction and Lubrication (1 hour) • Law of conservation of energy (1 hour)
--	---

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making

UNIT 2.2 : TIG WELDING

LEARNING OUTCOMES:

After undergoing this unit, students will be able to:

- Perform TIG (Tungsten Inert Gas) welding operation on flat (horizontal) as well as pipe joints
- Select TIG welding process and process parameters for different materials and thicknesses
- Use different type of power sources and accessories of TIG welding
- Perform spot and seam welding
- Select parameters for spot and seam welding machine for different materials and thicknesses.
- Follow safety precautions for above welding processes, PPE (Personal Protective Equipment)

Practical (160 hrs)	Theory (32 hrs)
<ul style="list-style-type: none"> • Depositing bead on aluminium sheet 2mm thick in flat position (12 hrs) 	<ul style="list-style-type: none"> • Introduction to TIG (Tungsten Inert Gas) welding (2 hrs)
<ul style="list-style-type: none"> • Square butt joint on aluminium sheet 1.6 mm thick in flat position (18 hrs) 	<ul style="list-style-type: none"> • TIG welding components and process, different power sources, Types of TIG welding, Difference between AC and DC TIG welding (4 hrs)
<ul style="list-style-type: none"> • Fillet weld – T joint on aluminium sheet 1.6 mm thick in flat position (18 hrs) 	<ul style="list-style-type: none"> • Uses of oscillator in the TIG welding (pulsed TIG welding, Pulse parameter slope up and slope down) (2 hrs)
<ul style="list-style-type: none"> • Fillet weld – Outside corner joint on aluminium sheet 2 mm thick in flat position (18 hrs) 	<ul style="list-style-type: none"> • TIG welding torches and their uses (2 hrs)

<ul style="list-style-type: none"> • Butt weld – Square butt joint on stainless steel sheet 1.6 mm thick in flat position with purging gas (18 hrs) 	<ul style="list-style-type: none"> • Tungsten electrodes, types and uses and selection criterion. (2 hrs)
<ul style="list-style-type: none"> • Filter weld – T joint on stainless steel sheet 1.6 mm thick in flat position (18 hrs) 	<ul style="list-style-type: none"> • TIG welding parameters. Argon gas and Helium gas properties and uses. (4 hrs)
<ul style="list-style-type: none"> • Pipe but joint on aluminium pipe of 50mm x 3mm WT in flat position (18 hrs) 	<ul style="list-style-type: none"> • Selection of parameters for different materials and thickness (2 hrs) • Types of stainless steel, aluminium and its alloys for TIG welding
<ul style="list-style-type: none"> • Pipe butt joint on MS pipe of 5mm thickness (8 hrs) 	<ul style="list-style-type: none"> • Defects in TIG welding and remedies (2 hrs)
<ul style="list-style-type: none"> • T-joint on MS Pipe 50mm OD x 3 mm WT position – Flat (12 hrs) 	<ul style="list-style-type: none"> • Introduction to spot welding and its types (2 hrs)
<ul style="list-style-type: none"> • Lap joint on stainless steel sheet by resistance spot welding (8 hrs) 	<ul style="list-style-type: none"> • Components of spot welding and accessories, spot welding process and parameters. (4 hrs)
<ul style="list-style-type: none"> • MS sheet joining by resistance spot welding (6 hrs) 	<ul style="list-style-type: none"> • Introduction to seam butt welding and types (2 hrs)

<ul style="list-style-type: none"> MS sheet Joining by resistance seam welding (6 hrs) 	<ul style="list-style-type: none"> Equipment and accessories of seam butt welding. Seam butt welding process and its applications. (2 hrs)
--	---

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT 2.3 : MIG/MAG WELDING

LEARNING OUTCOMES:

After undergoing this unit, students will be able to:

- Perform MIG (Metal Inert Gas)/MAG (Metal Active Gas) Welding operation
- Carry out quality check of MIG weld

Practical (144) hrs)	Theory (32 hrs)
<ul style="list-style-type: none"> • Setting of MIG (Metal Inert Gas) / MAG (Metal Active Gas) plants (4 hrs) • Straight beading practice of MS plate in flat position (9 hrs) • Lap joint in MS flat by MIG/MAG welding in flat position (10 hrs) • Open corner joint in MS plate by MIG/MAG welding in flat position (10 hrs) • T-Joint in MS plate by MIG/MAG in flat position (10 hrs) • Butt joint in MS plate by MIG/MAG in flat position (10 hrs) • Straight beading practice in MS plate by MIG/MAG in horizontal position (9 hrs) • Close square but joint in MS plate by MIG/MAG in horizontal position (9 hrs) • T- joint in MS plate by MIG/MAG in horizontal position (10 hrs) • Lap- joint in MS sheet in horizontal position by MIG/MAG welding (9 hrs) • Straight beading practice in vertical position by MIG/MAG welding (down ward/up-ward) (9 hrs) • Single V butt joint on MS plate in vertical position by MIG/MAG (9 hrs) 	<ul style="list-style-type: none"> • Introduction of MIG/MAG welding tools and equipments (4 hrs) • Safety precaution used in MIG/MAG welding (2 hrs) • MIG/MAG welding- advantages and limitations (6 hrs) • Power source and accessories, wire feed units (4 hrs) • Types of shielding gases and advantages (4 hrs) • Welding wires, types and specifications (4 hrs) • Types of welding defects, causes and remedy in MIG/MAG welding (4 hrs) • Application of MIG/MAG welding (4 hrs)

<ul style="list-style-type: none"> • T- joint on MS plate in vertical position on MS plate by MIG/MAG welding (9 hrs) • Corner joint on MS plate in vertical position by MIG/MAG welding (9 hrs) • Straight beading practice in overhead position on MS plate by MIG/MAG welding (9 hrs) • Close square butt joint in overhead position by MIG/MAG welding (9 hrs) 	
--	--

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Viva-voce
- Workshop job

UNIT 2.4 : INSPECTION AND TESTING OF WELDMENT

LEARNING OUTCOMES:

After undergoing this unit, students will be able to:

- Identify welding defects
- Carry out visual inspection
- Perform destructive and non destructive tests

Practical (64 hrs)	Theory (32 hrs)
<ul style="list-style-type: none"> • Difference between discontinuity and defect, identification of various weld defects in welded jobs. <p style="text-align: right;">(12 hrs)</p>	<ul style="list-style-type: none"> • Study various surface defects like undercuts, blow holes, porosity, slag inclusion, cracks, overlap, lack of penetration, pattern of ripples etc. by visual inspection. Their causes and remedies. <p style="text-align: right;">(6 hrs)</p>
<ul style="list-style-type: none"> • Welding symbols and location of weld on engineering drawings. Preparation of drawing sheets on welding symbols. <p style="text-align: right;">(12 hrs)</p>	<ul style="list-style-type: none"> • Need for welding symbols, Basic welding symbols, dimensions of welds. <p style="text-align: right;">(6 hrs)</p>
<ul style="list-style-type: none"> • Preparation and interpretation of WPS • Preparation of a job in accordance with a given WPS. <p style="text-align: right;">(12 hrs)</p>	<ul style="list-style-type: none"> • Description and detail of WPS (welding procedure specification), WPS form, PQR etc. <p style="text-align: right;">(4 hrs)</p>
<ul style="list-style-type: none"> • To perform tensile test • To perform impact test • To perform bend test <p style="text-align: right;">(12 hrs)</p>	<ul style="list-style-type: none"> • Introduction and procedure for mechanical testing of welds like tensile test, impact test, hardness survey and bend test. <p style="text-align: right;">(6 hrs)</p>
<ul style="list-style-type: none"> • To perform visual inspection • To perform dye penetration test • To perform ultrasonic test • To perform Magnetic particle inspection <p style="text-align: right;">(16 hrs)</p>	<ul style="list-style-type: none"> • Introduction and description of NDT (non destructive tests) like visual inspection, dye penetration test, magnetic particle inspection, ultrasonic and radiography. <p style="text-align: right;">(6 hrs)</p>

-	<ul style="list-style-type: none">• Introduction to 5S and its importance. Study of methodology to implement 5S in industry <p style="text-align: right;">(4 hrs)</p>
---	--

Means of Assessment

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Laboratory and practical work
- Viva-voce

INDUSTRIAL TRAINING – II (140 hrs)

The purpose of the industrial training is to:

- Develop understanding regarding the size and scale of operations and nature of industrial/field work in which students are going to play their role after completing the courses of study.
- Develop confidence amongst the students through first hand experience to enable them to use and apply institute based knowledge and skills to perform industrial activities.
- Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

It is needless to emphasize further the importance of Industrial Training of students during their one year certificate programme. It is industrial training, which provides an opportunity to students to experience the environment and culture of world of work. It prepares students for their future role as skilled person in the world of work and enables them to integrate theory with practice.

An external assessment of 100 marks has been provided in the study and evaluation scheme of 2nd semester. Evaluation of professional industrial training report through viva-voce/presentation aims at assessing students understanding of materials, industrial process, practices in industry/field organization and their ability to engage in activities related to problem solving in industrial setup as well as understanding of application of knowledge and skills learnt in real life situations.

The instructor along with one industrial representative from the concerned trade will conduct performance assessment of students. The components of evaluation will include the following:

- | | | |
|----|----------------------------|-----|
| a) | Punctuality and regularity | 20% |
| b) | Industrial training report | 50% |
| c) | Presentation and viva-voce | 30% |

7. RESOURCE REQUIREMENTS

7.1 LIST OF TOOLS AND EQUIPMENT

TOOL KIT FOR TRAINEES

Sr. No.	Name of Item	Quantity	Price in ` (Approx)
1	Welding helmet fiber	16 nos.	800/Pcs
2	Welding hand shield fiber	16 nos.	450/pcs
3	Chipping hammer with metal handle 250 Grams	16 nos.	200/pcs
4	Chisel cold flat 19 mm x 150 mm	16 nos.	150/pcs
5	Centre punch 9 mm x 127 mm	8 nos.	100/pcs
6	Dividers 200 mm	8 nos.	280/pcs
7	Stainless steel rule 300mm	16 nos.	90/ps
8	Scriber 150 mm double point	8 nos.	40/pcs
9	Flat Tongs 350mm long	8 nos.	150/pcs
10	Hack saw frame fixed 300 mm	8 nos.	300/pcs
11	File half round bastard 300 mm	16 nos.	400/pcs
12	File flat 350 mm bastard	16 nos.	350/pcs
14	Tip Cleaner	8 nos.	150/pcs
15	Try square 6"	16 nos.	150/pcs
16.	Hammer ball peen 1 kg with handle	10 nos.	180/pcs
17	Neon tester	30 nos.	90/pcs

GENERAL MACHINES/EQUIPMENT

Sr. No.	Name of Item	Quantity	Price in ` (Approx)
1.	Spindle key	4	50/pcs
2.	Screw Driver 300mm blade and 250 mm blade	1 each	180/pcs
3.	Number punch 6 mm	2 set	400/pcs
4.	Letter punch 6 mm	2 set	750/pcs
5.	Magnifying glass 100 mm .dia	2 nos	300/pcs
6.	Universal Weld measuring gauge	2 nos	250/pcs
7.	Earth clamp 600A	6 nos	400/pcs
8.	Spanner D.E. 6 mm to 32mm	2 sets	600/set
9.	C-Clamps 10 cm and 15 cm	2 each	250/pcs
10.	Hammer sledge double faced 4 kg	1	450/pcs
11.	S.S tape 5 meters flexible in case	1	150/pcs
12.	Electrode holder 600 amps	6	250/pcs
13.	H.P. Welding torch with 5 nozzles	2 sets	6500/pcs
14.	Oxygen Gas Pressure regulator double stage	2	350/pcs
15.	Acetylene Gas Pressure regulator double stage	2	350/pcs
16.	CO2 Gas pressure regulator, with flow meter	2 set	500/pcs
17.	Argon Gas pressure regulator with flow meter	2 set	500/pcs
18.	Metal rack 182 cm x 152 cm x 45 cm	1	1500/pcs (Self made)
19.	First Aid box	1	1500/pcs
20.	Steel lockers with 8 Pigeon holes	4	6500/pcs
21.	Steel almirah / cupboard	3	8000/pcs
22.	Black board and easel with stand	1	1500/pcs
23.	Flash back arrester (torch mounted)	4 pairs	480/set
24.	Flash back arrester (cylinder mounted)	4 pairs	480/set

GENERAL INSTALLATION

Sr. No.	Name of Item	Quantity	Price in ` (Approx)
1	Welding Transformer with all accessories (400A, OCV 60–100 V, 60% duty cycle)	2 set	6500/nos
2	Portable arc welding transformer single phase 150 Amps	1 set	4000/nos
3	Welding Transformer (or) Inverter based welding machine with all accessories (300A , OCV 60 – 100 V, 60% duty cycle)	2 set	10500/pcs
4	D.C Arc welding rectifiers set with all accessories (400 A. OCV 60 – 100 V, 60% duty cycle)	1 set	60,000/nos
5	GMAW welding machine 400A capacity with air cooled torch, Regulator, Gas preheater, Gas hose and Standard accessories	2 set	147,000/nos
6	AC/DC GTAW welding machine with water cooled torch 300 A, Argon regulator, Gas hose, water circulating system and standard accessories.	2 set	120,000/nos
7	Air Plasma cutting equipment with all accessories, capacity to cut 12 mm clear cut	01 set	46,200/pcs
8	Air compressor suitable for above air plasma cutting system.	01 no	70,000/pcs
9	Auto Darkening Welding Helmet	2 nos.	14,000/pcs
10	Spot welding machine to 15 KVA with all accessories	01 set	18,000/pcs
11	Portable gas cutting machine capable of cutting Straight & Circular with all accessories	01 set	7000/pcs
12	Pedestal grinder fitted with coarse and medium grain size grinding wheels dia. 300 mm	1	15,000/pcs
13	Bench grinder fitted with fine grain size silicon carbide green grinding wheel dia. 150 mm	1	8000/pcs

14	AG 4 Grinder	2 nos.	3500/pcs
15	Universal testing machine (UTM)	1 set	25,000/pcs
16	Impact testing machine	1 set	9000/pcs
17	Hardness tester	1 set	12,000/pcs
18	Dye penetration set	1 set	1000/set
19	Magnetic testing machine (MPI)	1 set	8000/pcs
20	Ultra sonic testing machine	1 set	5500/pcs
21	Suitable gas welding table with fire bricks	2 Nos	1200/pcs
22	Suitable Arc welding table with positioner	5 Nos.	4500/pcs
23	Trolley for cylinder (H.P. Unit)	2 Nos.	3000/pcs
24	Hand shearing machine capacity to cut 6 mm sheets and flats	1 No.	6000/pcs
25	Power saw machine 14''	1 No.	7500/pcs
26	Portable drilling machine (Cap. 6 mm)	1 No.	6500/pcs
27	Oven, electrode drying 0 to 350°C, 10 kg capacity	1 No.	2500/pcs
28	Work bench 250x120x75 cm with 4 bench vices of 150 mm jaw opening	4 sets	20,000/set
29	Oxy Acetylene Gas cutting blow pipe	2 sets	3500/pcs
30	Oxygen, Acetylene Cylinders	2 each	As on Rental Basis
31	CO ₂ cylinder	2 Nos	As on Rental Basis
32	Argon gas cylinder	2 Nos	As on Rental Basis
33	Anvil minimum size 32 sq. inches with stand	2 Nos.	4000/pcs
34	Swage block	1 No.	2500/pcs
35	Die penetrant testing kit	1 set	1000/pcs
36	Magnetic particle testing Kit	1 set	1500/pcs
37	Fire extinguishers (foam type and CO ₂ type)	1	2500/pcs
38	Fire buckets with stand	4 nos	800/pcs

39	Portable abrasive cut-off machine	1 No	10,000/pcs
40	Suitable Gas cutting table	1 No	2000/pcs (Self made)
41	Welding Simulators for SMAW/GTAW/GMAW	1 each	1 Lac/pcs
42	Butt Seam welding machine	1 no.	-
43	Helium gas cylinder	1 no.	On rental basis
44	Water Buckets	2 nos.	200/pcs
45	Swage kit for copper tube (additional)	1 no.	-
46	Plier Insulated 150 mm	2 nos.	250/pcs
47	Electrical wire dia 4 mm with extension board	50 meter	300/pcs

ENGINEERING DRAWING

Sr. No.	Name of Item	Quantity	Price in ` (Approx)
1	Drawing Board 100 x 60 cms	30	500/pcs
2	Set Square 90°, 30°, 60°	30 set	400/set
3	Stand for drawing board	30	450/pcs
4	Stool for trainees	30	350/pcs
5.	T-square/Mini drafter	30	250/pcs
6	White Board 240 x 120 cm.	01	600/pcs
7	Trainer's Table	01	500/pcs
8	Trainer's Chair	01	800/pcs
9	Drafting machine	02	500/pcs

CLASSROOM FURNITURE

Sr. No.	Names of Item	Quantity	Price in ` (Approx)
1	Instructor's table and Chair (Steel)	1 set	1000/set
2	Students chairs with writing pads	16	700/pcs
3	White board size 1200 mm X 900 mm	1	1500/pcs
4	Instructors lap top with latest(vista & above) configuration pre-loaded with operating system. and MS Office package.	1	30,000/pcs
5	LCD projector with screen.	1	20,000/pcs
6	Welding Process, Inspection & codes DVD/ CDs	1 set each (optional)	300/pcs

7.2 LIST OF CONSUMABLES

Sr. No.	Name of Item	Quantity	Price in ` (Approx)
1	Electrodes (different size)	As required	400/pkt
2	Filler wire	As required	300/kg
3	Flux	As required	250/box
4	Gas (O ₂ , Dissolved acetylene., Argon, CO ₂)	As required	440/cyl
5	Leather Hand Gloves 14"	16 pairs	180/pcs
6	Cotton hand Gloves 8"	16 pairs	80/pcs
7	Leather Apron leather	16 nos.	200/pcs
8	S.S Wire brush 5 rows and 3 rows	16 nos. each	70/pcs
9	Leather hand sleeves 16"	16 pairs	80/pcs
10	Safety boots for welders	16 pairs	500/pcs
11	Leg guards leather	16 pairs	80/pcs
12	Rubber hose clips 1/2"	20 nos	1200
13	Rubber hose oxygen 8 mm dia X 10 Mts long as per BIS	2 nos	1200
14	Rubber hose acetylene 8 mm dia X 10 Mts long as per BIS	2 nos	1200
15	Arc welding cables multi cored copper 400/ 600 amp as per BIS	As required	150/ft
16	Arc welding single coloured glasses 108 mm x 82 mm x 3 mm.	34 nos.	90/pcs
17	Arc welding plain glass 108 mm x 82 mm x 3 mm.	68 nos	2/pcs
18	Gas welding Goggles with colour glass	34 nos	80/pcs
19	Safety goggles plain	34 nos	40/pcs
20	Spark lighter	6 nos	30/pcs
21	AG 4 Grinding wheels	As required	80/pcs

7.3 LIST OF RECOMMENDED BOOKS

1. Welder Fabrication, Trade Theory by National Instructional Media Institute, Chennai
2. Welder Fabrication, Trade Practical by National Instructional Media Institute, Chennai
3. Welder Trade Theory And Assignment / Test (Solved) by G.S. Sethi; Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
4. Welding Technology by OP Khanna; Dhanpat Rai and Sons, Delhi
5. Welding Engineering and Technology by RS Parmar; Khanna Publishers, Delhi
6. Welding Technology by Srinivasan; Khanna Publishers, Delhi
7. Welder Trade Theory and Assignment / Test (Solved) by G.S. Sethi; Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
8. Engineering Drawing for Welding by National Instructional Media Institute, Chennai
9. Engineering Drawing by Kapil Dev; Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
10. Workshop Calculation and Science by Kapil Dev, G.V. Ramana Murthy; Computech Publications Ltd. (Division – Asian Publishers, New Delhi)
11. Fabrication (Fitting And Welding) Theory And Assignment / Test (Solved) by G.S. Sethi, Balbir Singh; Computech Publications Ltd. (Division – Asian Publishers, New Delhi)

8. RECOMMENDATIONS FOR EFFECTIVE CURRICULUM IMPLEMENTATION AND EVALUATION

Since this skill development course is tailor made i.e. designed to meet the requirement of selected group of students for developing desired competencies in the given trade, it is pertinent for trainers to understand the design philosophy and arrange teaching-learning process using appropriate strategies. The following points may be considered by the trainer at the time of planning the training programme and subsequently during the implementation and evaluation stages:

1. There are multiple competencies in each unit. The course curriculum also includes a core unit on developing effective communication and entrepreneurial qualities. Each unit has specific competencies which trainees are expected to acquire at the end of the each unit. In order to achieve these competencies, the curriculum describes the practice tasks/exercises and related theoretical knowledge. Time has been allocated for both of these components.
2. The curriculum is designed for contact period of 35 hours per week but can be increased/changed as per convenience of the trainees and the trainer.
3. The trainer will assess the attainment of each specific learning outcome of the individual learner and will maintain record whether the trainee has achieved desired level i.e. Yes/No. In case of 'No' the trainee will work further to learn and attain the desired skills till s/he earns 'Yes'.
4. Each learning outcome will be assessed/tested by the trainee as per acceptable norms and record will be maintained for final certification. The final assessment of skills attained through practice jobs and acquisition of relevant knowledge should preferably be carried out appropriately.
5. The examiner will set an objective type question paper for theory examinations of each unit under final assessment. Preferably the question paper should aim at testing the understanding of basic principles and concepts by students and their applications.
6. The final assessment of practical skills development should not be limited to testing a few units, but should spread over to all the acquired skills in an integrated manner. It should ultimately assess the ability of the student to accomplish the desired learning outcomes of the programme.

9. LIST OF EXPERTS/CONTRIBUTORS

- a) Following experts participated in the workshop to design curriculum of certificate programme in 'Welder' for MRSPTU, Bathinda on 11-12 July, 2016 at NITTTR, Chandigarh.

1.	Prof. Pardeep Gupta, Professor, Mechanical Engineering Department, SLIET, Longowal, Punjab
2.	Dr. Kulwant Singh, Professor, Mechanical Engineering Department, SLIET, Longowal, Punjab
3.	Prof. J.S. Gill, Associate Professor, Mechanical Engineering Department, SLIET, Longowal, Punjab
4.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
5.	Shri G.S. Sethi, A-301, Rishi Apartments, Sector-70, Mohali, Punjab
6.	Shri NM Suri, Associate Professor, PEC University of Technology, Sector-14, Chandigarh
7.	Shri Ashish Pal, YMCA University of Science and Technology, Faridabad, Haryana
8.	Shri Mange Ram, Sr. Tech. Officer, ISTC (CSIO), Sector 30, Chandigarh
9.	Shri Atinder Pal Singh, Govt. Polytechnic College, Khunimajra
10.	Shri Harkesh Kumar, Govt. Polytechnic College, Khunimajra
11.	Shri Viney Kumar, Instructor Welder, Govt. Industrial Training Institute, Patiala, Punjab
12.	Shri Maninder Singh, Instructor Welder, Govt. Industrial Training Institute, Patiala, Punjab
13.	Shri Subhash Chand, Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
14.	Shri Rakesh Verma, Instructor, Govt. Industrial Training Institute, Sector-28, Chandigarh
15.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

- b) Further, a curriculum workshop to finalize the curriculum of certificate programme in 'Welder' was held on 28th July, 2016 at NITTTR, Chandigarh. The following experts participated in the workshop:

1. Shri HS Kalra, Ex-Principal, Govt. ITI, Sector-28, Chandigarh
2. Shri G.S. Sethi, A-301, Rishi Apartments, Sector-70, Mohali
3. Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh

- c) Following experts participated in the workshop to review curriculum of certificate programme in “Welder” for MRSPTU, Bathinda held on 6 January, 2017 at NITTTR, Chandigarh.

1.	Dr. Ashok Kumar Goel, Director, College Development Council, MRSPTU Campus, Bathinda, Punjab
2.	Dr. Balraj Singh, Director, PIT, Rajpura
3.	Shri HS Kalra, Ex-Principal, Govt. Industrial Training Institute, Sector-28, Chandigarh
4.	Shri GS Sethi, Consultant, IndiaCan, A-301, Rishi App, Sector 70, Mohali
5.	Shri Asheesh Kumar Saini, Centre Head, IL&FS, IIS, Ropar
6.	Shri Jasvir Singh Tiwana, Associate Professor, GZSCCET, Bathinda
7.	Shri Sikander Singh Sidhu, Assistant Professor, GZSCCET, Bathinda
8.	Shri J Ghosh Roy, Aryabhat Polytechnic, Delhi
9.	Shri Jagdeep Singh, Central Tool Room, A-5, Phase-5, Focal Point, Ludhiana
10.	Shri Rakesh Goel, Estate Officer, NITTTR, Chandigarh
11.	Dr. AB Gupta, Professor & Head, Curriculum Development Centre, NITTTR, Chandigarh
	Coordinator

**“ Earn while Learn ” Skill Development Programme
In Traditional Textile & Apparel Development (TTAD)**

I. Objective of the Programme

- 1.1 The objective of the programme is Socio-Economic interaction of MRS PTU, Bathinda with the weaker section. The un-employed and unprivileged candidates will be trained and given the basic knowledge in textile manufacturing, apparel, design & development by using the in house facility (Laboratories of Textile Engineering Department, GZSCCET, Bathinda). The trainees will develop textile products and sell themselves from the University provided platform to be named as “Traditional Textile & Apparel Development Centre”
- 1.2 The Programme will help in reviving the cottage industry (specially handloom) and sincere effort to revive and train the youngsters in the Traditional art of Phulkaris “Baags” handicrafts etc. Which has become a very lucrative business.
- 1.3 The sincere students (Textile Engg.) will also be involved in the programme in bringing a culture of “Earn while Learn”. This will incorporate entrepreneurship capabilities in students. Students will be assert to the programme and will assist in managing the programme and production resources (5 M’s).
- 1.4 On the survey of the market and visit to the institutes nearby and it observed that in and around Bathinda there are number of educational institutes, centres offering certificate course/ ITI/Diploma/Bachelor degree programs of various durations. The institutes are not available to produce the students who are able to work on the skilled jobs and lack confidence and technical skills to start their own ventures. The reason behind this is that most of the institutes have only basic machines skills of either one Apparel or Surface ornamentation. They have no manufacturing machines of raw material nor they produce any products that can be marketed.
- 1.5 The programme will enhance the efficiency of the department by utilising the manufacturing machines, testing equipment’s. The yarn/cloth and other material produced during the practical’s of the B.Tech. students, will be used optimally as raw material for the course.
- 1.6 The program will train the students, make them confident in apparel designing, surface ornamentation, earn revenue for the department, candidates and staff. The B.Tech. (Textile Engg.) will also get practical hands on the machines.

II. Intake and Qualification of Candidates

MRSPTU ONE YEAR SKILL CERTIFICATE PROGRAMME IN TRADITIONAL TEXTILE & APPAREL DEVELOPMENT (TTAD)

- 2.1.1 **No of seats:** Batch strength is proposed of 50-60 candidates amongst the semi-skilled candidates with additional 5-10 seats for the regular B.Tech. Textile Engg. students. (Justification: Students will not be given stipend but they will be given opportunity to earn through selling). The maximum strength of 60 students. The reservation will be as rule.
- 2.2 **Age:** Between 18 - 38 years.
- 2.3 **Eligibility:** Matric pass from recognise board, and essential Technical Qualification - 2 year ITI/Diploma with Sewing Technique/Surface ornamentation/fashion design/fashion technology/Textile Engg. Two seats reserved for candidates less qualified on the basis of performance among the experienced candidates/workers in the traditional field (spl. Khaddi, Phulakari, handicrafts etc). Because, this is a new and first of its kind programme; keeping in view response and time schedule the committee for the admission to the course may be authorised to relax the essential qualification in case the number of applications are less than 60.
- 2.4 **Selection:** Selection will be on the basis Merit: 40% Academic & 60 % Practical exam
(In the field of Apparel Design and surface Ornamentation concepts)
- 2.5 **Attendance:** 75% attendance minimum in all the classes mandatory for the completion and eligibility for the stipend and the privilege of the earn while selling.

III. Programme tenure and Timings:

The course will be of six months. Tentative start of the program will be July to December. The classes will be held only four days in a week. (Justification: This time management will help in managing the classes and utilisation of the staff & the trainee's will be able to manage their home affairs easily) .

IV. Registration, Fees, Stipend:

The advertisement will be given in local news paper and through FM radio and also by meeting with the Public Representatives etc. The Registration fees will be Rs. 300. The monthly fees will be Rs. 1500. The Each candidate will be given stipend of Rs. 500 per month on the basis performance (i.e. 75% attendance and practical performance etc.)

V. Course will have 6 Main Modules

(The basic course work will be mostly in local language.)

**MRSPTU ONE YEAR SKILL CERTIFICATE PROGRAMMME IN TRADITIONAL
TEXTILE & APPAREL DEVELOPMENT (TTAD)**

- 5.1 Theoretical Module -Basics of Important Topics (detailed below)
- 5.2 Training and Development, manufacturing of Textile products (Yarn, knitted & Woven fabrics)
- 5.3 Training and Development of Apparels and Basic Household utilities
- 5.4 Training and Development of Traditional and contemporary products
- 5.5 Field Visits to various Industry, markets
- 5.6 Marketing, Packaging and Presentation

5.1 Theoretical Module:- List of Basics Topics

- a. In this module the basics of various aspects of textile Engineering, and basics of General subjects will be taught keeping view point of the education level of candidates and create interest in the subject
- b. Identification of various fibres and fabrics, basic machinery, Colouring and dyeing, Testing of all kind of materials.
- c. Textile Manufacturing and Products
Training and learning various textile manufacturing processes and Products.
- d. Entrepreneurship in Textiles:
Basics of opportunity to start own business in Textile Engg.
- e. Basics of Practical Computing:
- f. Basics of Spoken English
- g. Basic of Accountancy
- h. Basics of Marketing & HR Management
- i. Personality Development & how to face:
- j. Environment and Industrial Safety
- k. Digitisation, Banking Loaning etc.
- l. Quality Control in Textile
- m. Marketing, Packaging and Presentation
(Any other topics as per the requirement of the course)

VI. Evaluation and Certification of the Course:

The evaluation of the training will be done in the Bases of the performance in the various modules.

The total marks will 1000 as detailed below:

**MRSPTU ONE YEAR SKILL CERTIFICATE PROGRAMME IN TRADITIONAL
TEXTILE & APPAREL DEVELOPMENT (TTAD)**

S.No	Module	Marks
1	Theoretical Module - Basics of Important Topics	100
2	Training and Development/manufacturing of Textile products	250
3	Training and Development of Apparels and Basic Household utilities	250
4	Training and Development of Traditional and contemporary products	250
5	Field Visits to various Industry.	50
6	Marketing, Packaging and Presentation	100

The candidates will be awarded with a certificate on completion. Cash award to best and runner up student Rs. 3000 and 2000 respectively.

VII. Manufacturing & Product development:

This is the most important aspect of the program as with this development only the course will move further and help the candidates practically and financially. The some of the products initially discussed and proposed for manufacturing will be in three fields:

1	Training and Development/manufacturing of Textile products	Bed Sheets, Pillow covers, Dusting cloth, Hanker chief etc
2	Training and Development of Apparels and Basic Household utilities	Banian, Lower, Legin, Kurta Pajama, gloves, tee-shirts etc
3	Training and Development of Traditional and contemporary products	Bed Sheets, Pillow covers, hanker chief , handbags, Suits, Khes, Phulkari, dupatta etc.

The finalisation of the products will be finalised by proposed committees keeping in view the availability of the raw material, machine capacities and the marketing potentials. The committee shall be called "Product Finalisation Committee:

The committee will be chaired by the HOD Textile Engineering and the following as its members:

1. Dr.Kalyan Roy Member
2. Er. Rajinder Singh Member
3. Kewal Singh Toor Member
4. Expert in the field of the Apparel/surface Ornamentation Member

VIII. Product Price Fixation, and Financial Committee of the Programme

**MRSPTU ONE YEAR SKILL CERTIFICATE PROGRAMME IN TRADITIONAL
TEXTILE & APPAREL DEVELOPMENT (TTAD)**

The products developed in the training will be planned in way that they can be easily marketed by the candidates so as to recover the raw material cost, manpower input etc and a profit that can be earned for the student and the Centre. Since the programme will be first of its kind the financial aspects of it will require a committee proposed as below:

1. Incharge. Traditional Textile & Apparel Development Centre - Chairman
2. Representative of Accounts Member
3. H.L. Attri Member
4. Kewal Singh Toor Member
5. Er. Rajinder Singh Member

Proposal for the share Distribution

1. a. Actual cost of the product (Production & material excluding the labour) - 100%
To the account of “Traditional Textile & Apparel Development Centre”
- b. Share distribution of the Profit (Sale-price- Actual cost of the products) assumed 100%

- | | |
|--|--------|
| A/C of “Traditional Textile & Apparel Development Centre | – 25% |
| Chairman of the Project | – 10% |
| Project Technical Officer | – 15% |
| Project Development Officer (Convenor) | – 15% |
| Lab Attendant/Class IV | -- 10% |
| Project Student Earning | – 25% |

IX. Budget Requirement Equipment & Infrastructure etc

a. Surface Ornamentation: Rs. 2.16 Lacs

S.No	Name of item	Amount	Category	Remark
1	Working Table- 4 No.'s (8x5)	20000	Non-recurring	Asset
2	Carpets 18 ft x 25 ft-2 Pc	8000	Non-recurring	Asset
3	Embroidery frames-4 pc	8000	Recurring	
4	Interlocking Machine	60000	Non-recurring	In process of deptt. Purchase
5	Embroidery Machine	10000	Non-recurring	Asset
6	Fashion maker-2	40000	Non-recurring	Asset
7	Raw material for embroidery i.e yarn for machines and after processing of cloth for surface ornamentation	50000	Recurring	The qty may vary depending on the products for sale
8	Surface ornamentation basic tools, designer items, eg. Needles, gota jari etc.	20000	Recurring	There is varied variety of products
9	Computerised Embroidery Machine			This machine is proposed after the

**MRSPTU ONE YEAR SKILL CERTIFICATE PROGRAMMME IN TRADITIONAL
TEXTILE & APPAREL DEVELOPMENT (TTAD)**

				success of 1 st group
	Total	216000		

b. Apparel Design & Production: Rs. 1.68 Lacs

S.No	Name of item	Amount	Category	Remark
1	Scissors set -20 pc	2200	Recurring	
2	Seam reapers-10 pc	2000	Recurring	
3	Cuter thread-10 pc	2000	Recurring	
4	Pressing Table-2	8000	Non-Recurring	
5	Press industrial-2	4000	Non-Recurring	
6	Marking, measuring, designing, patterns, threads, buttons, accessories of sewing, Misc items etc.	20000	Recurring	
7	Raw Material yarn, non-manufactured cloth (In Lab.) and processing of manufactured cloth to make the end product	80000	Recurring	
8	Repair, Maintenance, lubrication etc of the Departmental Machines	50000	Recurring	
	Total	168000		

c. Other Expenses/Miscellaneous: Rs. 8.20 lacs

S.No	Name of item	Amount	Category	Remark
1	Hiring of 2 Faculty/ Technical Persons for the period of 7 months @ Rs. 25,000	350000	Recurring	Course teacher is required in advance to plan the course
2.	Stipend/Scholarship @ Rs. 500 for 6 months for 50 students	150000	Recurring	Will be given only eligible students
3	Transportation	50000	Recurring	
4	Branding, Printing & Advertisement	100000	Recurring	
5	Office Expenses Stationary etc	25000	Recurring	
6	Storage & Selling	20000	Recurring	
7	Lectures, Expert Lecture, artesian, Honorarium etc	70000	Recurring	
8	Miscellaneous	50000	Recurring	
9	Awards to Students	5000		
	Total	820000		

Summary of Budget

S.No	Head of expenditure	Recurring	Non-recurring	Total (In lacs)
1	Surface ornamentation	70000	146000	2.16
2	Apparel	156200	12000	1.68

**MRSPTU ONE YEAR SKILL CERTIFICATE PROGRAMME IN TRADITIONAL
TEXTILE & APPAREL DEVELOPMENT (TTAD)**

3	Other Expenses/Miscellaneous	820000	0	8.20
	Total	1046200	158000	12.04

Expected Revenue Earnings:

S.No.	Head of expenditure	Amount
1	Registration fees/application fees @ 300 x 300	0.90
2	Monthly fees @ Rs. 1500 x 55 for 6 months	4.95
3	Revenue that will earned through selling the products/giving services etc. a. Reimbursement of the material cost etc (100%) b. Share amount of Profit (25%)	6.00
	Total	11.85 Lacs

Conclusion of funds/Budget

1. Expected Revenue generation-	Rs.11.85 Lacs
2. Assets created -	Rs.1.58 Lacs
3. Expected expenditure -	Rs. 12.04 Lacs
Net Profit (1+2-3)	- Rs. 1.39 Lacs

X. Hiring of Technical Persons & arrangement of Lectures, arrangement of visits etc. There will be requirement of experts other department faculty, staff, artisans. In the following fields.

1. Contractual basis 2 Faculty in Apparel Design/Fashion Technology & Surface Ornamentation
2. Expert Lecture in the field of Textile, successful entrepreneur, Banking, Environment, Marketing, HR, Project guidance, Computer/Communication Skill, personality development
3. The programme will require the workshop/training from the artisans who are the expert in the field.

XI. Justification for the Request of Autonomy to initiate the Project

The programme proposed is first of its kind and the stake of the department will be on its success. This is going to be totally on different lines as there is very little of academics and more of practical and marketing selling approach. The department has not all the facilities and laid down procedures to handle basics hurdles in the first programme and to tackle with it the Project team requires genuine autonomy to make it an example for all the institutes and departments.

MRSPTU ONE YEAR SKILL CERTIFICATE PROGRAMME IN TRADITIONAL TEXTILE & APPAREL DEVELOPMENT (TTAD)

- i. As the raw material is of vivid nature and the quantity will be on the day to day basis/requirement of the product.
- ii. The machines will require yarn for manufacturing cloth and the quantity, quality and the place of purchase will depend on availability and our demand.
- iii. For the product development, the utilisation of the waste material and creating new/vivid products there will be requirement of variety of small items which are very difficult to enlist and procure as some time their amount may not even be in hundreds.
- iv. The products produced before selling has to be finished, dyed, special processes etc. and the services has to be arranged on day to day basis.
- v. For the assets the project team has no problem to follow the laid down procedures.
- vi. To create new ideas the team has to continuously visit the industries, markets, artisan.
- vii. MOU or mutual visits to Govt./Pvt institutes needs to be undertaken so as to refine the project.
- viii. Preparing project for seeking funds from various Departments, Ministries and NGO's etc.
- ix. For selling the products there will be requirement of different methods.

XII. Futuristic and ideal approach on the concept Class Room to Industry

The Department will develop a centre on the basis of the success of the first Programme and the centre will be setup towards a manufacturing, branding and optimum utilisation of machines Infrastructure and other requirements for the Traditional Textile & Apparel Development Centre (GZSCCET, Bathinda)

The requirements for the centre will be separate Hall not less than 40-50 ft x 100ft equipped with LCD projector, audiovisual, work tables – 20 No.'s, cutting tables-10, embroidery stations -10, try room, office, lockers, store room, and show room to show case the products with a sale counter.

XIII. Assurance from the Team of the Programme

We assure that we will work with zeal and enthusiasm to make the project a success and create example that our machines and raw material will be used in most judicious way. The project will benefit the society economically and socially. The department will earn revenue, create jobs, skill craftsman, make efforts for the revival of the traditional articles in the class and make it national fame project.

“Commitment we will pave way for Class Room to Industry”

Brief Note on the Power Looms & Hand Looms

The preliminary information collected by the department on the working of Power Looms and the hand looms by the department is as below:

1. Hand Looms (Khadi work): In the villages of Bathinda very few people are involved in the field of Hand Loom. The business is dying because there is no profit in the work contrary to this there is demand of the hand spun yarn for the mattresses, khesi, khes etc. But the cost of the material and the working hours involved in the work has made it a non-profitable work. The market places to buy the spun yarn is Panipat which is very far. The artisans are not able to buy yarn at wholesale prices, they instead has to go to the sub-dealers and buy at retail prices from the nearby markets. The time consumed to the ratio of the margin is high and the average 8 hours wage is Rs. 80 approx which very meagre as compared to the minimum wages.
2. Power Loom: In Bathinda three centre (Kaljharani, Chak Fateh Singh Wala and Baluana) were opened by Department of Small Scale industries in the year 2000. All the three centres have been closed. As per the information collected the centre were closed due to multiple reasons.
 - i. Untrained loom workers
 - ii. Co-ordination among the workers or members of the self help groups
 - iii. Continuous technology and quality up gradation as per the market demand.



Mobile Tutor Private Limited
No. 12, AH Block 3rd Street,
Annanagar, Chennai-600 040.
☎ +91-44-42179352

MEMORANDUM OF UNDERSTANDING

Between

MOBILE TUTOR PRIVATE LIMITED

AND

Maharaja Ranjit Singh State Technical University, Bathinda

This MEMORANDUM OF UNDERSTANDING (here in after referred to as MOU) Is by and Between Mobile Tutor Private Limited a registered company under the companies act 1956 having its registered office at No.12, AH Block, 3rd Street, Annanagar, Chennai – 600040 here in after referred to as (COMPANY) and Maharaja Ranjit Singh State Technical University, Bathinda here in after referred to as (UNIVERSITY). This MOU is effective from the date of signing it.

WITNESSETH

NOW THEREFORE, for the purpose of enabling application oriented course contents for University students pursuing Engineering courses, the parties here to agree as follows:

BASIC UNDERSTANDING AND OBJECTIVES

1. The company and the university have a mutual desire to develop application oriented, course ware for engineering college students. This will enable students to understand the subject better and deliver better. The company has developed digital contents as per the university syllabus by name M-Tutor.
2. The university wanted to host these contents on their web portal and allow their students to download the contents in their smart phone or Tablets for offline learning as well as to browse it on their web portal.



3. The university will allow access to these contents for the students of the Engineering stream starting from the academic year 2016-17. This will be free of cost to the university students for the complete B.Tech Program.
4. This will benefit the students and by end of first year the company and university will be able to measure the performance of the students who have used this course ware.

OBLIGATIONS OF THE COMPANY

1. The company shall provide the university digital course ware in English & Hindi for the first year curriculum.
2. This will be integrated to the university portal, so that the eligible students will log in and have online access to these contents as well as down load the contents to their smart phone or tablet for offline access.
3. This will be offered free of cost for the complete B.Tech Programs of the UNIVERSITY.
4. The company will engage with the students and teachers of the university, its constituent colleges and affiliated colleges to create awareness about this course ware and measure the learning outcomes.
5. The company will conduct training sessions for the university teachers at multiple locations and make them use this courseware for better utility.
6. The feedback will be taken from the University for Further Development of course material during the course of time.



OBLIGATIONS OF THE UNIVERSITY

1. The university will issue a circular to all constituent colleges and affiliated colleges about this course ware.
2. The university will provide the necessary IT infrastructure to integrate this course ware to the university web portal.
3. The university has to create awareness among the students about existence of such course ware so that the students will derive the full benefits of this course ware.

CHANGES TO THE MEMORANDUM

A change to the terms of the MOU shall be valid only if the change is made in writing and executed by the university and company.

DURATION AND TERMINATION OF THE MOU

The MOU shall remain in effect from the date of execution till completion of the academic year 2017-18 and shall be renewed on yearly basis on mutual consent.

CONFIDENTIAL INFORMATION

The parties may wish, from time to time, in connection with work contemplated under the MOU, to disclose confidential information to each other. Each shall use reasonable efforts to prevent the disclosure of any of the other party's confidential information to third parties during the Term of the MOU.

A handwritten signature in blue ink, appearing to be 'S. Sath', is written over a circular blue stamp. The stamp contains the text 'MOBILE TUTOR PRIVATE LIMITED' around the perimeter and 'CHENNAI' in the center.

GENERAL

Any notices required by this MOU shall be given by Registered Post return receipt requested, addressed in the case of the University:

The Registrar,
Maharaja Ranjit Singh State Technical University,
Bathinda – 151 001.

In case of the Company –

The
Director
Mobile Tutor Private Limited
NO.12, AH Block, 3rd Street
Annanagar
Chennai – 600040

This MOU shall be governed by, constituted by, and enforced in accordance with the jurisdiction of Punjab.

In witness whereof the parties have signed this Memorandum of Understanding of the day, of February 2016 first herein above written.

For Maharaja Ranjit Singh State Technical University,



REGISTRAR

for Mobile Tutor Pvt Ltd



VICE PRESIDENT - ALLIANCES

Witnesses:

- 1.
- 2.



seedTM
beyond the obvious

MEMORENDUM OF UNDERSTANDING

BETWEEN

MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNVIERSITY, BATHINDA

AND

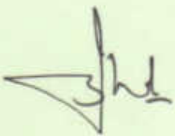
SEED INFOTECH LIMITED, PUNE

Memorandum of Understanding

This Memorandum of Understanding ("MOU") is made on 20th day of December, 2016.

Between:

SEED Infotech Limited, a company registered under the Companies Act, 1956 and having its registered office at "Panchsheel", 42/16, Erandawana, Income Tax Office



Lane, Off. Karve Road, Pune 411 004 through its authorized representative Mr. Sushil Salve, HEAD SAP Training Services (Herein after called as "SEED" which expression shall, unless it is excluded by or repugnant to the context, include its successors and its permitted assigns)

And

Maharaja Ranjit Singh Punjab Technical University, having its office at Badal Road, Bhatinda, Punjab – 151 001 through its authorized representative Prof. (Dr.) Jasbir Singh Hundal, Registrar, MRSPTU (Herein after called as "MRSPTU" which expression shall, unless it is excluded by or repugnant to the context, include its successors and its permitted assigns)

SEED and MRSPTU are hereinafter individually referred to as "Party" and collectively as "Parties."

WHEREAS SEED is into business of providing high end software training, consultancy, staffing solutions and other IT allied services under its brand name **seed®** (beyond the obvious). SEED is a leading IT education Company from Maharashtra and Western part of India and has trained more than 6,00,000 students, job aspirants and professionals in last 23 years. The core object with which SEED was established is to bridge the gap between academics and industry needs and to make the students more employable in the market. In order expand its offerings SEED is also acting as SAP Authorized Education Partner.

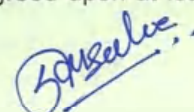
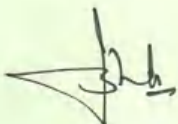
AND WHEREAS MRSPTU is North India's largest education network. MRSPTU is a fast growing and premier educational university with around 100000 students in over 108 colleges across North India.

AND WHEREAS SAP has granted an University Site License to MRSPTU and MRSPTU has approached SEED to act as its execution partner in this venture and SEED has agreed for the said association with MRSPTU and its colleges.

AND NOW THEREFORE, SEED and MRSPTU, in consideration of the mutual representations, warranties and covenants contained herein, and subject to the terms and conditions set forth in this MOU, and intending to be legally bound, hereby agree as follows:

1. Duration:

This MOU shall be valid for a period of 3 Years from the date of execution of this MOU. Any subsequent renewal or extension of this MOU shall be on terms mutually agreed in writing by the SAP. However SAP and MSRPTU will review the performance of SEED and give consent for renewal. Any renewal or extension of this MOU has to be finalized and agreed upon at least thirty (30) days prior to the expiry of the term.



2. Purpose of this document:

This document is for defining the academic understanding among the above-mentioned entities herein after referred to as SEED and MRSPTU respectively, wherein SEED shall act as a execution partner of MRSPTU for imparting SAP courses and shall provide training on SAP R/3 and Business Process course to MRSPTU's faculties at MRSPTU's faculties at MRSPTU's constituent, affiliated & associate college premises.

3. Proposed Transaction

The proposed transaction contemplates that:

Deliver/Facilitate SAP R/3 Training and Business Process Course to the faculty members of MRSPTU and its colleges, at the premises mutually agreed upon.

Each Party shall contribute their respective resources as per the responsibilities mentioned herein for delivering/facilitating SAP R/3 and Business process Online Training Course to the students of MRSPTU constituent affiliated & associate college campus.

MRSPTU and its colleges shall be authorized to use the appropriate SAP Partner logo in all promotional and marketing activities.

4. SEED's standards of performance:

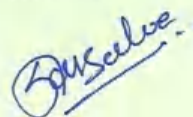
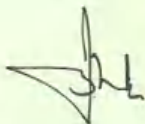
SEED shall expend reasonable efforts as follows to be utilized for the period of 12 months:

- SEED shall conduct train the trainer program for 30 faculties of MRSPTU and its colleges each year as under:
 - for 2 days orientation program for 40 Hrs Business Process module
 - for 10 days orientation program for each 200 hours module
 - understanding domain aspect of each module
 - understanding respective SAP module
 - understanding the execution of SAP course.
- SEED shall appoint competent faculties for conduct of aforesaid Train The Trainer.
- SEED shall arrange minimum 12 sessions of career awareness seminars.
- SEED shall carry out necessary Site License installation (Server & Client) of 3 Server site licenses and 100 clients each at 3 campuses identified by MRSPTU.
- SEED shall train and equip local (colleges) System Administration staff on carrying out client installations as and when required.
- SEED shall provide necessary technical support to maintain the software to keep it up and running at all time.
- SEED shall assist and provide necessary guidance in execution of SAP courses to MRSPTU and its colleges at its premises.
- SEED shall guide MRSPTU constituent affiliated & associate college in designing marketing campaign and marketing collaterals to market SAP Training program in its campuses.

5. **MRSPTU's standards of performance:**

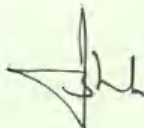
MRSPTU shall expend reasonable efforts as follows:

- MRSPTU will include the SAP Modules as suggested program in the Industrial training for all eligible students.
- MRSPTU shall market the SAP courses to be conducted by MRSPTU and its colleges faculties trained by SEED & SAP to the students of MRSPTU and its colleges.
- MRSPTU and its colleges shall nominate faculties with domain knowledge on the pedagogy of imparting SAP course as mutually agreed upon.
- MRSPTU and its colleges shall identify and nominate dedicated labs at each of its campuses as per required hardware (Server Machine – i5 with 8 GB RAM & 200 GB HDD, & software (Operating System – Windows 8 and above, MS Office, Internet Explorer, Flash Player and Sound Drivers) specification given by SAP for installation of SAP Site License Server and Clients software for access of SAP courses.
- MRSPTU and its colleges shall identify the central locations as mutually agreed upon for creating SAP Training centers in its campuses for delivering training across its constituent affiliated & associate colleges.
- MRSPTU and its colleges shall nominate administrator and technical staff from each college for day to day administration, hardware and other infrastructure maintenance at their campus to maintain and run day to day operations.
- MRSPTU and its colleges shall actively participate for pre-sales support in MRSPTU's campus with the prospective students.
- MRSPTU and its colleges shall cooperate with the SEED to ensure requisite support/ services as required from time to time for achieving any specific objective of proposed course.
- MRSPTU and its colleges shall provide electricity, UPS, inverter and/or other utilities to SEED at the various colleges where the students may undergo SAP Training.
- MRSPTU and its colleges will ensure that proper systems, network and Internet connectivity according to the requirement specified by SEED & SAP is made available.
- MRSPTU and its colleges in collaboration with the SEED shall ensure satisfactory training delivery of SAP Education to its students who have registered for the program through SAP Site Licenses.
- MRSPTU and its colleges shall be responsible for making a comfortable lodging and boarding arrangements for the faculties and support staff provided by SEED at each such locations.



6. **Joint Responsibilities:**

- Both the parties shall provide necessary help and guidance to each other for delivering SAP R/3 Training to the faculties of MRSPTU and its colleges.
- Both the parties shall take joint responsibility to execute the said training successfully which would be mutually win-win for both parties.
- Unless otherwise agreed to between the Parties, each Party will be responsible for its own costs and expenses (which may be incurred in relation to their respective responsibilities as set out in this MOU).
- This MOU is non-exclusive and notwithstanding the provisions in this MOU, SEED retains absolute right to engage / participate in similar activities and/or invest in similar ventures as contemplated herein.
- The parties acknowledge that SAP owns all intellectual property rights on its all training program materials on SAP Training Course materials including but not limited to training method, concept, technique, know-how, training material/ tools, techniques, methodologies etc. and an enhancement thereof (herein after referred as "SAP Proprietary Information").
- Under this MOU, MRSPTU and SEED shall receive, handle and use SAP Proprietary Information in a manner as specified by SAP from time to time. In no event, MRSPTU and SEED shall copy, translate, disassemble, or decompile, nor create or attempt to create any part of the SAP Proprietary Information except for the rights set forth in this MOU. MRSPTU and SEED are not permitted to make derivative works of SAP Proprietary Information and ownership of any unauthorized derivative works shall vest in SAP. Notwithstanding anything contrary herein, from time to time SAP shall be permitted to audit / verify the usage of the SAP Proprietary Information by MRSPTU and SEED as contemplated herein.
- The Parties agree that nothing herein shall constitute a transfer of any intellectual property from one Party to the other. Each Party shall retain the full rights to their own respective intellectual property at all times. MRSPTU and SEED agrees to take all reasonable steps and the same protective precautions to protect the Proprietary Information from disclosure to third parties as with its own proprietary and confidential information. MRSPTU and SEED shall not, without SAP's prior written consent, disclose any of SAP Proprietary Information to any person, except to its bona fide individuals whose access is necessary to enable MRSPTU or SEED to exercise their rights hereunder.



7. **Commercials:**

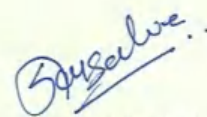
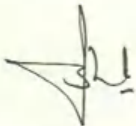
Module	No of Students/year	Fees Per Student
Business Process Module-40 Hrs	5000	INR 3200 Inclusive of Tax
SAP-FI SAP-MM SAP-ABAP SAP-SD SAP-HR (200 Hrs. Each)	3000	INR 7900 Inclusive of Tax

- Fee for respectively Module will be paid directly by students in the account of SEED.
- Every Student will pay respective module fees (INR 3200/- for 40 hours Business Process Course and INR 7900/- for SAP R/3 Course) to SEED which is inclusive of administrative charges for Colleges.
- SEED will pay the respective college amount of INR 320/- per student for 40 Hours Business Process Course and INR 790/- per student for 200 Hours Consulting Course as administrative charges after deducting the applicable government taxes.
- The below per student slab rate will be applicable per year.

8. **Confidentiality:**

Both the parties may receive information proprietary to other party (the "Confidential Information") in the course of performance of their obligations under this MOU. Confidential Information is not meant to include any information which (a) is publicly available (b) is rightfully received by the parties from third parties without accompanying secrecy obligations; (c) is already in either party's possession and was lawfully received from sources other than the parties or (d) is independently developed by the parties. The two bodies understand and acknowledge that the Confidential Information is valuable and confidential and agrees that it will at all times be kept in trust, to be disclosed only to such persons as have a "need to know" the same for the effective implementation of this MOU and that it will only be used by the parties for the benefit of others.

Unless otherwise required by law, neither Party will disclose the existence of this MOU or the subject matter thereof, or issue any press release or public announcement with respect thereto, without the express prior written consent obtained from the other Party.


Page 06 of 09

9. Termination:

- Either party can terminate this MOU by giving 30 days prior written notice to the other party.
- SAP may mandate SEED to terminate this MOU at any time upon giving written notice (a) in the event that either MRSPTU or SEED fails to discharge any obligations or remedy any default under this MOU for a period of thirty (30) days after SAP has given MRSPTU / SEED written notice specifying such failure or default, or (b) in the event that MRSPTU or SEED makes an assignment for the benefit of creditors, or commences or has commenced against it any proceeding in bankruptcy, insolvency, or reorganization pursuant to bankruptcy laws or laws of debtor's moratorium.

10. Limitation of Liability:

Notwithstanding anything to the contrary in this MOU, except for damages resulting from unauthorized use or disclosure of the proprietary information/ confidential information, under no circumstances shall SAP, its Licensors or MRSPTU or SEED be liable to each other, or any other person or entity, for an agreement of damages in excess of the agreement of fees paid to SAP under this MOU in preceding six months or be liable in any Agreement for special, incidental, consequential, or indirect damages, loss of goodwill or business profits, work stoppage, data loss, computer failure or malfunction, or exemplary or punitive damages.

11. Dispute Settlement:

Any and all disputes between SEED and MRSPTU shall be sorted out or settled by both the parties mutually.

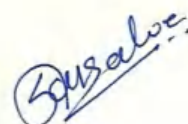
12. Jurisdiction:

In case of dispute between the parties, which cannot be settled amicably, the courts in Pune / Bhatinda shall have the exclusive jurisdiction.

13. Indemnification:

Both the parties shall indemnify and hold each other harmless from and against any claim, loss, liability, or expense, including, but not limited to, damages, patent and trademark infringement, costs and attorneys' fees, arising out of or in connection with any acts or omissions of their agents or employees.

MRSPTU specifically indemnifies SEED against any loss or liability caused due to MRSPTU's non compliance of the terms and conditions of an agreement executed by MRSPTU with SAP.



14. Relationship:

Nothing contained in this MOU shall be construed as resulting in the creation of a relationship of employer and employee or principal and agent between SEED and MRSPTU. SEED and MRSPTU is not authorized to make any representation, contract, or commitment on behalf of each other without the prior written consent of other party.

15. Notices:

All notices or reports which are required or may be given pursuant to this MOU shall be in writing and shall be deemed duly given when delivered to the respective executive offices of MRSPTU and SEED at the addresses first set forth above.

16. Severability:

If any provision or part of any provision of this MOU is held invalid or unenforceable by a court of competent jurisdiction, such holding shall not affect the enforceability of any other provisions or parts thereof, and all other provisions and parts thereof shall continue in full force and effect. All Parties acknowledge that the other Party's rights under this MOU are cumulative and not exclusive of one another and that either Party's undertakings and agreements contained herein, including, without limitation, the several covenants contained herein, are each severable covenants independent of one another or any other provisions or covenants of this MOU.

17. Express Disclaimer:

SAP and its Licensors including SEED disclaims all other warranties express or implied, including, without limitation, any implied warranties of merchantability or fitness for a particular purpose except to the extent that any warranties implied by law cannot be validly waived.

18. Assignment:

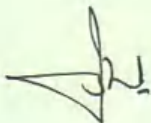
Neither this MOU nor any of the rights, interests or obligations there under will be assigned by either party thereto, in whole or in part (whether by operation of law or otherwise), without the prior written mutual consent of the Parties, and any attempt to make any such assignment without such consent will be null and void.

19. Force Majure:

Neither Party shall be liable for performance delays or for non-performance due to causes beyond its reasonable control including but not limited to natural disasters or governmental acts etc.

20. Modification:

Any changes in implementation procedures which are not as per the present MOU, will be discussed and will be incorporated in agreement with two parties.



All the above-mentioned parties have agreed on the above clauses and have set their hands to sign on the date mentioned hereinabove.

For SEED Infotech Limited

For Maharaja Ranjit Singh Punjab
Technical University

Sushil Salve
20/12/2016

Jasbir Singh Hundal
20/12/2016

Mr. Sushil Salve
HEAD – SAP Training Services



Prof. (Dr.) Jasbir Singh Hundal
Registrar

Registrar
Maharaja Ranjit Singh
Punjab Technical University, Bathinda

In Presence of

1. *Ashok Kumar Goel*
20/12/2016
(ASHOK KUMAR GOEL)
2. Atul V. Ghate *A.V. Ghate*

**MEMORANDUM OF UNDERSTANDING
BETWEEN
CENTRAL UNIVERSITY OF PUNJAB,
BATHINDA
AND
MAHARAJA RANJIT SINGH PUNJAB
TECHNICAL UNIVERSITY, BATHINDA**



The **Central University of Punjab, Bathinda** hereinafter referred to as 'CUPB' has been established through the Central Universities Act 2009 which received the assent of the President of India on 20th March 2009. Its territorial jurisdiction extends to the whole State of Punjab. This Central University at Bathinda is destined to emerge as a premier educational institution with the state of the art infrastructure to provide quality education and research in science and technology as well as humanities and social sciences.

Maharaja Ranjit Singh Punjab Technical University, Bathinda hereinafter referred to as 'MRSPTU' is established by Govt. of Punjab vide Punjab Act No. 5 of 2015 notified through Punjab Government Gazette-Extraordinary (Regd. No. CHD/0092/2015-2017) notification No. 5-Leg./2015 dated 12th February 2015 and registered with UGC u/s 2(f). The major objective of this University is advancement of education, development and research in the subjects of Engineering Technologies, Sciences, Management, Humanities, Pharmacy, Social Sciences and Architecture in the State of Punjab, particularly in the districts of Bathinda, Barnala, Faridkot, Fatehgarh Sahib, Fazilka, Ferozepur, Mansa, Moga, Sri Muktsar Sahib, Patiala and Sangrur.

This MEMORANDUM OF UNDERSTANDING (MoU) is entered into on 20th June, 2016.

BETWEEN

MRSPTU, a State Technical University of Punjab engaged in providing, upgrading and promoting Quality Education, Training and Research in the subjects of Engineering Technologies, Sciences, Management, Humanities, Pharmacy, Social Sciences and Architecture and to create Entrepreneurship and a conducive environment for the pursuit of Technical Education in close cooperation with industry.

and

CUPB, a Central University, an institution of national importance engaged in advancement of teaching and research in several branches of Sciences, Engineering,

Humanities & Management, Mathematics, reassuring its resolve, commitment and social responsibility towards the educational needs of the area.

MRSPTU and CUPB with complimentary tasks have come to an understanding to promote cooperation between the two organizations in the field of education, research and development and agree to the following broad terms of cooperation:

1. Both the Universities shall cooperate in education, innovation and research in the fields of Engineering, Humanities & Management, Basic and Applied Sciences, Mathematics, Languages, Computer Applications & Social Sciences and will support each other's endeavours in delivery of academic programmes and research activities through the following but not limited to:

- Exchange of scientific and technical information
- Joint supervision of Postgraduate and Ph.D. students
- Undertaking collaborative research activities through participation in nationally and internationally funded projects
- Jointly organize events such as seminars, Workshops, conferences and training programmes. The faculty and research scholars of mutual institutions may not be charged any fee.
- Validity for credits for joint courses, common to the two universities, may be extended.
- The labs, library, equipment and infrastructure of the two institutions may be shared to ensure better education and research facilities to the faculty and research scholars.
- Training of students of both institutions as per the facilities and resources available
- Both the institutions shall identify faculty for accomplishing the above laid down objectives. Each party shall attempt to make such faculty available as and when required. Such identified faculty may be given Visiting or Adjunct Faculty appointments in accordance with the norms and procedures of the host institution.
- Both the institutions shall organize regular faculty interactions/meets to promote research interaction and collaboration among their faculty members. These meets may be organised for entire institute or specific to any department as per mutual convenience.
- Every individual research collaboration will have separate agreement/terms of contract that addresses issues such as Intellectual Property Right (IPR) funding pattern, disclosure of confidential information etc.

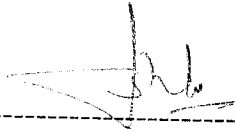
- Any other objective as agreed upon in writing by both the institutions.
2. **This MoU can also serve purpose of Rashtriya Avishkar Abhiyan and Unnat Bharat Abhiyan of MHRD through inspiring and motivating the young minds, teachers, and students for research and innovations.**

Terms and Conditions

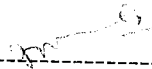
1. In the event of any dispute or difference arising in the implementation of the MoU, such disputes shall be resolved amicably by mutual discussions by the Heads of the institutions or be settled through arbitration by referring to a committee jointly appointed by both. All such decisions shall take into account the status of students working/projects under this arrangement and the interest of such students/projects shall be guarded as much as possible.
2. The MoU remains in place for a period of five years from the date of signing of the agreement and may be renewed for a further period of five years or such time period as agreed by both the parties in writing.
3. No party shall have the right to use the name or logo of another party without the prior approval of that party in writing.
4. The terms of this MoU may be modified/amended at any time subject to mutual written agreement. Such modifications/changes shall be effective from the date on which both the parties execute them in writing.
5. The MoU shall be deemed to have been automatically rescinded after the expiry of the MoU period, unless renewed for any further period as per mutually agreed upon terms at a later stage. It is further agreed that following the termination of the MoU, both the parties shall refrain from carrying out the balance of the activities agreed upon in this MoU.
6. Either of the parties hitherto shall be entitled to terminate the MoU at any time with valid reasons acceptable in writing to both parties and in such case, the MoU will terminate six months after the date of written notification or date of expiry of the MoU, whichever is earlier. In case of such premature termination of the MoU, all rights and obligations of both parties shall automatically cease except for those covered by written contracts including ongoing collaborative activity that can no longer be cancelled.
7. Termination of MoU shall be done in a cost-effective manner subject to proper turnover and accounting of expenses that may have been incurred, where applicable.

Now, based on the aforementioned promise(s) the parties put their signatures on this MoU on 20th June, 2016.

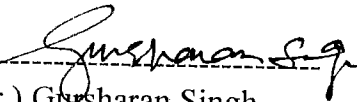
IN WITNESS WHEREOF, the authorized representatives of both parties will hereinto affixed their signatures on the date indicated below:



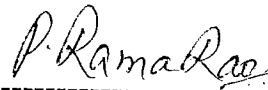
Prof. (Dr.) Jasbir Singh Hundal
Registrar
Maharaja Ranjit Singh Punjab Technical
University, Bathinda



Prof. (Dr.) Jagdeep Singh
Registrar
Central University of Punjab, Bathinda

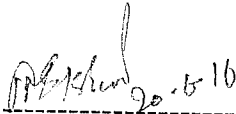


Prof. (Dr.) Gursharan Singh
Dean Academic Affairs
Maharaja Ranjit Singh Punjab Technical
University, Bathinda

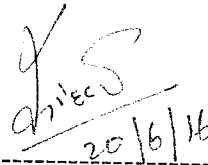


Prof. (Dr.) P. Ramarao
Dean Academic Affairs
Central University of Punjab, Bathinda

In the presence of:



Prof. (Dr.) Mohan Paul Singh Ishar
Vice Chancellor
Maharaja Ranjit Singh Punjab Technical
University, Bathinda



Prof. (Dr.) R. K. Kohli
Vice Chancellor
Central University of Punjab, Bathinda



Memorandum of Understanding

between

Engineering Staff College of India (ESCI)
Hyderabad, Telangana, India

and

Maharaja Ranjit Singh
Punjab Technical University, Bathinda



The Memorandum of Understanding (MoU) is made on the 24th day of June 2018 between Engineering Staff College of India hereinafter referred to as 'ESCI' represented by its authorized officer, Director and Maharaja Ranjit Singh Punjab Technical University Bathinda, herein after referred to as 'MRSPTU'.

A. ABOUT ESCI:

Engineering Staff College of India (ESCI) is a unique Institution set up in October 1981 by the premier body of engineers, The Institution of Engineers, India.

MRSPTU Awarded the membership of Institution of Engineers (India) incorporated with an approved department of Continuing Education, Professional Development Programmes, Specific Training Programmes, Research & Development Consultancy services and PG Diploma Programmes in Engineering, Technology and Management areas.

B. ABOUT MRSPTU:

Maharaja Ranjit Singh Punjab Technical University Bathinda has been established by the State Government of Punjab vide Punjab Act no. 5 of 2015 and is registered with UGC under section 2(f) of the UGC Act of 1956. All the colleges imparting technical education are situated within the territorial jurisdiction of Bathinda, Barnala, and Khatkhat, Sarai, Faridkot, Fazilka, Moga, Sri Muktsar Sahib, Patiala and Sahiwal districts of Punjab and are affiliated with the university.


c. SCOPE:

The Scope of the MoU are:

- i) To conduct Framing Programmes in the areas of Engineering, Management, Technology and Science domains for MRSPTU and its constituent and affiliated colleges.
- ii) Conducting Special Training Programmes relating to Institution Development, Faculty Development, Student Development
- iii) Disseminating Information through collaborative Seminars at Hyderabad / Bathinda as mutually agreed
- iv) To enable collaboration amongst ESCI, MRSPTU and IET Centres to conduct programmes in diverse technology domains
- v) To take up joint projects in areas of research and technology development
- vi) To facilitate student internship programmes and innovative projects at UG/PG/PhD levels

A Project committee team consisting of two (2) members each from ESCI and MRSPTU would meet at least every semester to decide, formulate and implement joint programmes in various domains. Terms of partnership and techno-commercial conditions will be decided on project-to-project basis prior to initiation of such knowledge dissemination.

- vii) To create a Nodal centre at IET for conceptualization and implementation of programmes of ESCI. Also use of the Nodal centre to facilitate capacity and skill development of faculty, students of MRSPTU and its constituent and affiliated institutions in various areas of engineering, management, technology and science under the aegis of ESCI, Hyderabad






D. GENERAL TERMS & CONDITIONS:

- a) This MoU shall be effective from the date of affixture of signatures of the parties and will remain in force for a period of three(3) years.
- b) This MoU will be reviewed by the partnership committee members from time to time and may be amended with the consent of both the parties and thereafter confirmed in writing.
- c) The parties do not intend to transfer any of their rights are granted except as explicitly stated herein.
- d) Neither party shall transfer or assign its interests, obligations or rights in this agreement without the written consent of the parties, provided that such consent will not be unreasonably withheld.
- e) Neither party shall be liable by reason of failure or delay in the performance of its obligation under this MoU if such failure or delay is caused by the acts of God, Strikes, Lockouts or any other causes beyond its control and without its fault or negligence or mutual agreement.
- f) All other commitments of all parties in this agreement shall be made on mutually agreed terms and conditions.
- g) No amendments to the MoU shall be valid unless executed in writing and signed by both the parties.

D. TENURE AND TERMINATION:


This Agreement shall commence from the date of agreement and shall continue in force for three (3) years until terminated by either party.



Either party may terminate this Agreement upon prior written notice to the other party, which will however be subject to compliance to completion of all commitments made. Notwithstanding any such termination, both parties shall ensure that all activities in progress are completed successfully.


For and on behalf of
Engineering Staff College of India

For and on behalf of
Maharaja Ranjit Singh
Punjab Technical University, Bathinda



(Dr. D.N.Reddy)
Director

10/03/2019
10/03/2019

Witness:


Registrar
(Dr. H.S. Handal)
Registrar
MRSPTU
Bathinda

Witness:


(Dr. Ashok K. Goel)
Director, College Development
MRSPTU, Bathinda



भारतीय प्रौद्योगिकी संस्थान मुंबई
पवई, मुंबई - 400 076, भारत
Indian Institute of Technology Bombay
Powai, Mumbai - 400 076 India

दूरभाष/Phone : (+91-22) 2572 2545
फैक्स/Fax : (+91-22) 2572 3480
वेबसाइट/Website : www.iitb.ac.in

IIT Bombay



Agreement between Maharaja Ranjit Singh Punjab Technical University (MRSPTU)
and
Spoken Tutorial Project, IIT Bombay

We are happy to announce, collaboration between Maharaja Ranjit Singh Punjab Technical University (MRSPTU) and IIT Bombay Spoken Tutorial program. We are providing opportunity to conduct Software Training Program from Spoken Tutorial Project - IIT Bombay, Free of Cost to all affiliated colleges of MRSPTU. Entire program will be handled from Spoken Tutorial Team. The Spoken Tutorial activity is funded by the National Mission on Education through ICT, MHRD, Government of India, through the Talk to a Teacher Project at IIT Bombay.

Maharaja Ranjit Singh Punjab Technical University (MRSPTU) will -

- Conduct a Faculty Development Training Program in Maharaja Ranjit Singh Punjab Technical University. MRSPTU will energize Train the Trainer activity, where one faculty member from each affiliated college will train through Faculty Development Training Program in MRSPTU for running Software training in SELF learning way, in their respective colleges.
- Identify the Central Co-ordinator from the university office who will actively work and co-ordinate with Spoken Tutorial team, IIT Bombay.
- Put up the signed agreement note on the MRSPTU website along with Spoken Tutorial site link and Punjab manager Mr. Rudra Biswas contact details.
- Issuing circular to all colleges Principal to introduce and roll out the Spoken Tutorial based software training in this colleges immediately after the centre is set up.
- Issuing periodic circulars and notification to all the affiliated colleges coming under the MRSPTU to introduce and roll out the Spoken Tutorial based software training in their colleges. All the notification should go mentioning the relevant links and contact details.
- Incorporate the relevant FOSS series Tutorials in the course curriculum of affiliated colleges, wherever feasible.
- Mandate that all the colleges start the training by writing to IIT Bombay Spoken Tutorial team.
- **All the colleges should include the relevant FOSS with in the time table.**

Mr. Rudra Biswas mail ID: rudrabiswas9@gmail.com,

Mob. : 08879248798

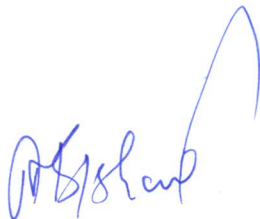
Website link: <http://spoken-tutorial.org>

As a Partner, the Spoken Tutorial Project, IIT Bombay will -

- Work as a mentor for MRSPTU.
- Spoken Tutorial program, IIT Bombay will support the Training and roll out by MRSPTU by providing manuals and continuous guidance at the smallest that is the departmental level.
- Spoken Tutorial, IIT Bombay representative will work from Faculty Development Training Program in MRSPTU.
- Provide the know - how and course content which includes online material, instruction sheets and other training documents to MRSPTU at free of cost.
- Issue certificates based on online assessment tests where online testing is available.
- Provide the promotional materials like posters, brochures, leaflets, banners etc., to the Centre, MRSPTU and the colleges free of cost.

General

- This agreement can be modified from time to time, if necessary, based on mutual agreement.



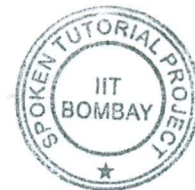
Dr. Mohan Paul Singh Ishar

**Vice Chancellor
MRSPTU, Bathinda
Punjab**



Mr. Rudra Biswas

**Training Co-ordinator
Punjab
Spoken Tutorial Project, IITB**



Memorandum of Understanding

This Memorandum of Understanding (MoU) is made between:

- (A) National Institute of Technical Teachers Training and Research (NITTTR), Sector 26, Chandigarh – 160019 (India)
- (B) Maharaja Ranjit Singh State Technical University, Bathinda, Punjab

National Institute of Technical Teachers Training and Research, Chandigarh (hereinafter referred to as NITTTR, Chandigarh) is centrally funded institution of higher and technical education in the country.

and

Maharaja Ranjit Singh State Technical University, Bathinda has been established by the Government of Punjab vide Punjab Act no. 5 of 2015, to provide for the establishment and incorporation of the University for the advancement of education, development and research in the subjects of Engineering Technologies, Sciences, Management, Humanities, Pharmacy, Social Sciences and Architecture in the State of Punjab, in the districts of Bathinda, Barnala, Faridkot, Fatehgarh Sahib, Fazilka, Ferozepur, Mansa, Moga, Sri Muktsar Sahib, Patiala and Sangrur.

To promote academic and research cooperation and the development of these two institutions as Centres of Excellence of higher technical education and scientific research, the two institutions agree to the following broad terms of cooperation:

1. Both the institutions will support each other's endeavours in delivery of academic programmes and research activities through the following but not limited to:
 - Exchange of scientific and technical information
 - Joint supervision of Postgraduate and Ph.D. students
 - Undertaking collaborative research activities through participation in nationally and internationally funded projects
 - Jointly organize events such as seminars, workshops, conferences and training programmes

- Training of students of both institutions as per the facilities and resources available
 - Any other objective as agreed upon in writing by both the institutions
2. Both parties acknowledge and understand that all financial arrangements, if any, will be subjected to prior written agreement and availability of funds for each activity/project undertaken.
 3. The MoU remains in place for a period of five years from the date of signing of the agreement and may be renewed for a further period of five years or such time period as agreed by both the parties in writing.
 4. No party shall have the right to use the name or logo of another party without the prior approval of that party in writing.
 5. The terms of this MoU may be modified/amended at any time subject to mutual written agreement. Such modifications/changes shall be effective from the date on which both the parties execute them in writing.
 6. The MoU may be terminated by either party by giving 3 months written notice. In the event of termination, both parties shall ensure that the interest of students working/projects under this MoU are safeguarded to the extent possible.

Responsibilities of the Parties


1. Both the institutions mutually agree to identify various areas of interest and depute faculty/staff as per the requirements with mutual consent. The inviting institution shall meet the travelling expenditure and any honorarium/remuneration as may be applicable. The inviting institution shall make necessary lodging and boarding arrangements for the deputed person.
2. Both the institutions shall identify faculty for accomplishing the above laid down objectives. Each party shall attempt to make such faculty available as and when required. Such identified faculty may be given Visiting or Adjunct Faculty appointments in accordance with the norms and procedures of the host institution.
3. Both the institutions shall organize regular faculty interactions/meets to promote research interaction and collaboration among their faculty members. These meets may be




organised for entire institute or specific to any department as per mutual convenience.

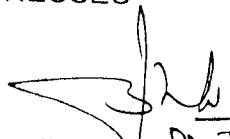
4. Every individual research collaboration will have separate agreement/terms of contract that addresses issues such as Intellectual Property Right (IPR) funding pattern, disclosure of confidential information etc.
5. In the event of any dispute or difference arising in the implementation of the MoU, such disputes shall be resolved amicably by mutual discussions by the Directors of the institutions. All such decisions shall take into account the status of students working/projects under this arrangement and the interest of such students/projects shall be guarded as much as possible.


Now, based on the aforementioned promise(s) the parties put their signatures on this MoU on 23rd day of March, 2016.



Prof. (Dr.) M.P.S. Istar
Vice Chancellor
Maharaja Ranjit Singh
State Technical University,
Bathinda, Punjab

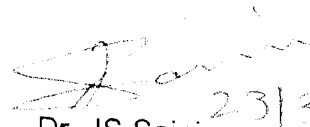

Prof. (Dr.) M P Poonia
Director
National Institute of Technical
Teachers Training and
Research, Chandigarh
Sector -26,
Chandigarh

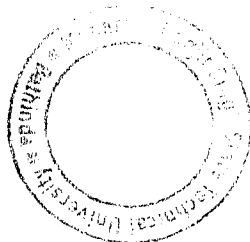
WITNESSES


1. Registrar Dr. Jasbir S. Hundal
MRSSTU, Bathinda


1. Dr. (Ms.) PK Tulsi
Dean, Research & Development
NITTTR, Chandigarh


2. Director, CDC Dr. Ashok K. Goel
MRSSTU, Bathinda


2. Dr. JS Saini
Dean, Extension Services and
Consultancy, NITTTR
Chandigarh



Subject: Co-opting members in BOS in place of Dr. Kamaljit Bhatia and Dr Dalwinder Kaur

Board of Studies (BOS) of Electronics Engg., Electrical Engg. and Electrical and Electronics Engg. have been constituted for the tenure 01-10-2015 to 30-09-2017 vide MRSPTU Notification/20-22 dt. 07-10-2015. Further on 13-09-16, approval to co-opt two Assistant Professors each from ECE deptt. and EE deptt were granted (copy enclosed). But out of the approved names, two faculty members namely Dr. Kamaljit Bhatia, ECE deptt and Dr Dalwinder Kaur, EE deptt. have resigned and left the college. Now two experienced Assistant Professors with PhD degree have joined in ECE Deptt. and EE Deptt. and it is felt that their expertise can be utilized in framing the syllabi and other academic purposes. So, the revised list of co-opted faculty members in the BOS as detailed below is recommended please.

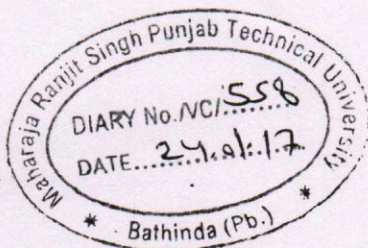
S. No.	Name of Faculty Member	BOS in which to be co-opted
1	Dr. Shweta Rani, Assistant Professor	Electronics Engg. Electrical & Electronics Engg.
2	Dr. Manoj Sharma, Assistant Professor	Electronics Engg. Electrical & Electronics Engg.
3	Dr. Amit Manocha, Assistant Professor	Electrical Engg. Electrical & Electronics Engg.
4	Dr. Ved Parkash, Assistant Professor	Electrical Engg. Electrical & Electronics Engg.

It is worth mentioning here that it will not have any financial burden on the University.

Submitted for approval and necessary action please.

Taxeni
20/01/17
Dr Jyoti Saxena
Professor (ECE)
Chairperson, BOS (Electrical Engg.)
BOS (Electronics Engg.)
BOS (Electrical and Electronics Engg.)

Recomand
Sum
20/1/17
VICE CHANCELLOR
[Signature]
Dean Academics, MRSPTU



Inclusion of three members in BOS in Fashion Technology


1.	Name: Designation: Department: Name of the Institute: Email ID: Phone No.:	Er. KalyanRoy, (Special Invitee) Associate Professor Department of Textile Engg., GZS Campus CET, Dabwali Road, Bathinda-151001 kalyankalyan1@yahoo.co.in 09815099040
2.	Name: Designation: Department: Name of the Institute: Email ID: Phone No.:	Dr. K.N. Chatterjee, (Special Invitee) Professor & Head, Fashion & Apparel Engineering Research and Consulting, The Technological Institute of Textile & Sciences, Birla Colony, Bhiwani, Haryana-127021. kn.chatterjee@gmail.com 09255176649
3.	Name: Designation: Department: Name of the Institute: Email ID: Phone No.:	Er. Mayank Jain, (Special Invitee) Director, NavpadaKnitwears, B-XXIV-2780, Sundar Nagar, Ludhiana-141007. mayank20202000@gmail.com 09876121712

Jushan
27/2/17
Academic Affairs,
MRSSTU, Bathinda

FACULTY OF PHARMACY

Additional Members to Co-opt

	Name	Address	Mobile	Email
1.	Bahadur Singh	Professor, Govt. Polytechnic College for Girls, Patiala	9914925325	bs_cale@yahoo.com
2	Prof. Rahul Deshmukh	Professor, ISF College of Pharmacy, GT Ferozpur Road, NH 95, PO Ghal Kalan, Moga	9988904375	login2rd@gmail.com
3	Dr. Puneet Kumar	Associate Professor, Department of Pharmaceutical Sciences & Technology, MRSPTU, Bathinda	9876100692	punnubansal79@gmail.com
4	Dr. Uttam Kumar Mandal	Associate Professor, Department of Pharmaceutical Sciences & Technology, MRSPTU, Bathinda	9872419542	mandalju2007@gmail.com
5	Ms. Sonia Pahuja	Swami Vivekanand College of Pharmacy, Chandigarh-Patiala Highway, Sector-8, Ramnagar, Banr, District Patiala, Punjab	9815613484	pharmsoniapahuja@gmail.com
6	Anshul Gupta	Assistant Professor, SWIFT School of Pharmacy, Ghaggar Sarai, Rajpura, Punjab	9417141755	anshugupta@swiftcollegeedu.in


 19.5.17

ਪ੍ਰੋ. (ਡਾ.) ਸਵੀਨਾ ਬਾਂਸਲ
ਡੀਨ (ਖੋਜ ਅਤੇ ਵਿਕਾਸ)

Prof. (Dr) SAVINA BANSAL
PhD (Engg) FIE, FIETE, SMCSI
DEAN (Research & Development)



ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ
(ਯੂ.ਜੀ.ਸੀ. ਵਲੋਂ ਮਾਨਤਾ ਪ੍ਰਾਪਤ)
Maharaja Ranjit Singh Punjab Technical University
(Act 5(2015) of Pb & 2(f) of UGC)
ਡੱਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ (ਪੰਜਾਬ) -151 001
Dabwali Road, Bathinda (Punjab) -151 001

RefNo: DRD/MRSPTU/_____ ਪੱਤਰ ਨੰ: ਡ.ਖ.ਵ/ਮਰਸਪਟਯ

Dated: _____ ਮਿਤੀ

MINUTES OF MEETING

The interview for admission in PhD course in the Discipline of Chemistry under the Faculty of Sciences was held on 24th June, 2016 at 12:30 PM in the presence of Chairperson and members of DDRC in the office of Dean R&D, Maharaja Ranjit Singh Punjab Technical University, Bathinda. Only one candidate, Nirmal Singh appeared for interview. It was decided collectively that candidate will be given period of 15 days to produce the following documents.

1. Consent form from Supervisor/ Co-Supervisor.
2. NOC from his employer, for attending regular course work in MRSPTU, Bathinda.

Subroth Kumar
24.6.16
(Chairperson)

Member

Member

24/06/16
Member

24.6.16
Member

Member

ੳਏ.

P1. Recheck all documents, as desired, & intine after receiving above for issuing enrolme letters, as applicable

clerk (R&D)

ਪ੍ਰੋ. (ਡਾ.) ਸਵੀਨਾ ਬਾਂਸਲ
ਡੀਨ (ਖੋਜ ਅਤੇ ਵਿਕਾਸ)

Prof. (Dr) SAVINA BANSAL
PhD (Engg) FIE, FIETE, SMCSI
DEAN (Research & Development)



ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ
(ਯੂ.ਜੀ.ਸੀ. ਵਲੋਂ ਮਾਨਤਾ ਪ੍ਰਾਪਤ)
Maharaja Ranjit Singh Punjab Technical University
(Act 5(2015) of Pb & 2(f) of UGC)
ਡੱਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ (ਪੰਜਾਬ) -151 001
Dabwali Road, Bathinda (Punjab) -151 001

RefNo: DRD/MRSPTU/ _____ ਪੱਤਰ ਨੰ: ਡ.ਖ.ਵ/ਮਰਸਪਟਯ

Dated: _____ :ਸਿਤੀ

MINUTES OF MEETING

The interview for admission in PhD course in the Discipline of Mathematics under the Faculty of Sciences was held on 24th June, 2016 at 11:30 AM in the presence of Chairperson and members of DDRC in the office of Dean R&D, Maharaja Ranjit Singh Punjab Technical University, Bathinda. Three candidates as given below appeared for interview.

1. Angrej Kumar
2. Deepika
3. Lucky Sharma

It was decided unanimously that candidates are required to submit the following documents within two weeks.

- 1 Consent form from Supervisor/ Co-Supervisor through proper channel.
- 2 NOC from his/her employer, for attending regular PhD course work at MRSPTU, Bathinda, as applicable

Sahdev Kumar
24-6-2016
(Chairperson)

SK Kumar
Member
24/06/2016

JP
Member
24/06/16

A
Member
24.6.16

Member

Member

of

Recheck all certificates, as desired, & intimate after receiving above documents for issuing enrollment letters, as applicable

Cherle (RAD)

All documents of Angrej Kumar checked and enrollment letter may be issued. *Cherle*

ਪ੍ਰੋ. (ਡਾ.) ਸਵੀਨਾ ਬਾਂਸਲ
ਡੀਨ (ਖੋਜ ਅਤੇ ਵਿਕਾਸ)

Prof. (Dr) SAVINA BANSAL
PhD (Engg) FIE, FIETE, SMCSI
DEAN (Research & Development)



ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ
(ਯੂ.ਜੀ.ਸੀ. ਵਲੋਂ ਮਾਨਤਾ ਪ੍ਰਾਪਤ)
Maharaja Ranjit Singh Punjab Technical University
(Act 5(2015) of Pb & 2(f) of UGC)
ਡੱਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ (ਪੰਜਾਬ) -151 001
Dabwali Road, Bathinda (Punjab) -151 001

RefNo: DRD/MRSPTU/ _____ ਪੱਤਰ ਨੰ: ਡ.ਖ.ਵ/ਮਰਸਪਟਯ

Dated: _____ :ਮਿਤੀ

MINUTES OF MEETING

The interview for admission in PhD course in the Discipline of Computer Application under the Faculty of Sciences was held on 24th June, 2016 at 12:00 PM in the presence of Chairperson and members of DDRC in the office of Dean R&D, Maharaja Ranjit Singh Punjab Technical University, Bathinda. Five candidates as given below appeared for interview.

1. Harjit Kaur
2. Rittu Garg
3. Nidhi Singla
4. Harmandeep Singh Brar
5. Karamjot Kaur

It was decided unanimously that candidates be given two-weeks time to produce the following documents.

- 1 Consent form from Supervisor/ Co-Supervisor through proper channel.
- 2 NOC from his/her employer, for attending regular course work in MRSPTU, Bathinda, as applicable.

Suhdev Kumar
24-6-2016
(Chairperson)

Member
24/06/16

24.6.16
Member

Member

Member

Member

9/c.

Recheck the certificates + intimate after receiving above documents for fna in regards to issuing enrollment letter.

clerk (R+D) All documents checked (of Karamjot Kaur and Harmandeep Singh Brar) and Enrollment letter may be issued.

ਪ੍ਰੋ. (ਡਾ.) ਸਵੀਨਾ ਬਾਂਸਲ

ਡੀਨ (ਖੋਜ ਅਤੇ ਵਿਕਾਸ)

Prof. (Dr) SAVINA BANSAL

PhD (Engg) FIE, FIETE, SMCSI

DEAN (Research & Development)



ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ

(ਯੂ.ਜੀ.ਸੀ. ਵਲੋਂ ਮਾਨਤਾ ਪ੍ਰਾਪਤ)

Maharaja Ranjit Singh Punjab Technical University

(Act 5(2015) of Pb & 2(f) of UGC)

ਡੱਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ (ਪੰਜਾਬ) -151 001

Dabwali Road, Bathinda (Punjab) -151 001

Ref No: DRD/MRSPTU/ _____ ਪੱਤਰ ਨੰ: ਡ.ਖ.ਵ/ਮਰਸਪਟਯ

Dated: _____ :ਮਿਤੀ

MINUTES OF MEETING

The interview for admission in PhD course in the Discipline of Computer Application under the Faculty of Sciences was held on 24th June, 2016 at 12:00 PM in the presence of Chairperson and members of DDRC in the office of Dean R&D, Maharaja Ranjit Singh Punjab Technical University, Bathinda. Five candidates as given below appeared for interview.

1. Harjit Kaur
2. Rittu Garg
3. Nidhi Singla
4. Harmandeep Singh Brar
5. Karamjot Kaur

It was decided unanimously that candidates be given two-weeks time to produce the following documents.

- 1 Consent form from Supervisor/ Co-Supervisor through proper channel.
- 2 NOC from his/her employer, for attending regular course work in MRSPTU, Bathinda, as applicable.

Suhmali (Cumar)
24-6-2016
(Chairperson)
(Dean Faculty of Sc.)

Gulshan
24/06/16
Member
(Dr. Gulshan)

R.K. Bansal
24.6.16
Member
(Dr. R.K. Bansal)

Savina Bansal
Member
(Dr. Savina Bansal)

Paranjit
Member
(Dr. Paranjit)

Naresh Garg
Member
(Dr. Naresh Garg)

for your kind approval & permission to issue
enrolment letters permissively, accordingly
with effect from date of fee submission
IP
(Dean R&D)

(ਡਾ.) ਸਵੀਨਾ ਬਾਂਸਲ

ਡੀਨ (ਖੋਜ ਅਤੇ ਵਿਕਾਸ)

Prof. (Dr) SAVINA BANSAL

PhD (Engg) FIE, FIETE, SMCSI

DEAN (Research & Development)



ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ

(ਯੂ.ਜੀ.ਸੀ. ਵਲੋਂ ਮਾਨਤਾ ਪ੍ਰਾਪਤ)

Maharaja Ranjit Singh Punjab Technical University

(Act 5(2015) of Pb & 2(f) of UGC)

ਡੱਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ (ਪੰਜਾਬ) -151 001

Dabwali Road, Bathinda (Punjab) -151 001

Ref No: DRD/MRSPTU/_____ ਪੱਤਰ ਨੰ: ਡ.ਖ.ਵ/ਮਰਸਪਟਯ

Dated: _____: ਮਿਤੀ

MINUTES OF MEETING

The interview for admission in PhD course in the Discipline of Physics under the Faculty of Sciences was held on 24th June, 2016 at 10:00 AM in the presence of Chairperson and members of DDRC in the office of Dean R&D, Maharaja Ranjit Singh Punjab Technical University, Bathinda. Only two candidates, Shekhar Dwivedi and Paramvir Kaur appeared for interview. It was decided collectively that candidate will be given period of 15 days to produce the following documents.

- 1 Consent form from Supervisor/ Co-Supervisor through proper channel.
- 2 NOC from his employer, for attending regular course work in MRSPTU, Bathinda. (as applicable)
- 3 Documents as per the undertaking given by the candidate, if any.

Sukhinder Kumar
24-6-2016
(Chairperson)
(Dean Faculty of Sci)

Member
Dr. Sarina Bansal

24.6.2016
Member
(Dr. R. K. Bansal)

Member
(Dr. Ravikant)

Member
24/6/16
(Dr. Sandeep Kausal)

for your kind approval + permission to issue enrolment letter provisionally, accordingly.

Vice-Chancellor

ਪ੍ਰੋ. (ਡਾ.) ਸਵੀਨਾ ਬਾਂਸਲ
ਡੀਨ (ਖੋਜ ਅਤੇ ਵਿਕਾਸ)

Prof. (Dr) SAVINA BANSAL
PhD (Engg) FIE, FIETE, SMCSI
DEAN (Research & Development)



ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ
(ਯੂ.ਜੀ.ਸੀ. ਵਲੋਂ ਮਾਨਤਾ ਪ੍ਰਾਪਤ)
Maharaja Ranjit Singh Punjab Technical University
(Act 5(2015) of Pb & 2(f) of UGC)
ਡੱਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ (ਪੰਜਾਬ) -151 001
Dabwali Road, Bathinda (Punjab) -151 001

RefNo: DRD/MRSPTU/ 154-56 ਪੱਤਰ ਨੰ: ਡ.ਖ.ਵ/ਮਰਸਪਟਯ

Dated: 6-7-16 ਮਿਤੀ

MINUTES OF MEETING

The interview for admission for PhD course in the Discipline of Commerce & Management under the Faculty of Commerce and Management was held on 6th July, 2016 at 10:00 AM in the presence of Chairperson and members of DDRC in the office of Dean R&D, Maharaja Ranjit Singh Punjab Technical University, Bathinda. Five candidates as given below appeared for interview and are recommended for provisional admission. Further, it was decided unanimously that candidates be given two-week time to produce the following documents, wherever applicable.

1. Consent form from Supervisor/ Co-Supervisor through proper channel.
2. NOC from his/her employer, for attending regular course work in MRSPTU, Bathinda, as applicable.

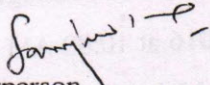
After successful submission of these documents and fee deposition, supervisor and course allocation is recommended as per the details given below-

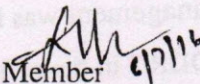
Sr. No.	Name	Course work allocated	Supervisor/Cosupervisor allocated	Broad R. Area
1.	Suman Garg (Gen)	PCBM -C101 PCBM -C102 PCBM -C103 PCBM E-104	Dr. Sukhwinder Kaur	Finance
2.	Davinder Kaur (Gen)	PCBM -C101 PCBM -C102 PCBM -C103 PCBM E-104 PPM MBAD-P01 (C-4)	Dr. Manoj Kumar Kulshreshtha	Finance
3.	Navleen Kaur (Gen)	PCBM -C101 PCBM -C102 PCBM -C103 PCBM E-105	Dr. Suman Kathuria/ Dr. Kiranjeet Kaur	Human Resource Management


1/2


4.	Manpreet Kaur Dhaliwal, (SGC/Gen)	PCBM -C101 PCBM -C102 PCBM -C103 PCBM E-105	Dr. Veerpal Kaur/ Dr. Kiranjeet Kaur	Human Resource Management
5.	Neeraj Kumar (Gen)	PCBM -C101 PCBM -C102 PCBM -C103 PCBM E-106	Dr. Manoj Kumar Kulshreshtha	Marketing

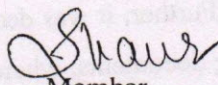
2/2.

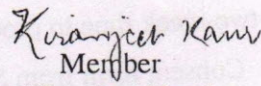

Chairperson
(Dr. Sanjeev Sharma)

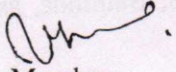

Member
(Dr. Savina Bansal)

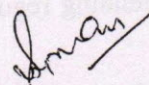

Member
(Dr. R K Bansal)


Member
(Dr. M.S Tandon)


Member
(Dr. Sukhwinder Kaur)


Member
(Dr. Kiranjeet Kaur)


Member
(Dr. Veerpal Kaur)


Member/Convener
(Dr. Suman Kathuria)

cc:

1. PA to VC for kind information
2. HoD, Deptt. of Mgt. Studies
3. Candidate's file
4. office copy

Plc kindly recheck all documents/certificates & intimate after receiving above documents, as desired, for issuing enrolment letters accordingly.

clerk (RAD)
All documents of Neeraj Kumar checked and enrolment letter may be issued
All documents of Manpreet Kaur checked and enrolment letter is issued.

(ਡਾ.) ਸਵੀਨਾ ਬਾਂਸਲ
ਡੀਨ (ਖੋਜ ਅਤੇ ਵਿਕਾਸ)

Prof. (Dr) SAVINA BANSAL
PhD (Engg) FIE, FIETE, SMCSI
DEAN (Research & Development)



ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ
(ਯੂ.ਜੀ.ਸੀ. ਵਲੋਂ ਮਾਨਤਾ ਪ੍ਰਾਪਤ)
Maharaja Ranjit Singh Punjab Technical University
(Act 5(2015) of Pb & 2(f) of UGC)
ਡੱਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ (ਪੰਜਾਬ) -151 001
Dabwali Road, Bathinda (Punjab) -151 001

RefNo: DRD/MRSPTU/ _____ ਪੱਤਰ ਨੰ: ਡ.ਖ.ਵ/ਮਰਸਪਟਯ Dated: _____ ਮਿਤੀ

MINUTES OF MEETING

The interview for admission in PhD course in the Discipline of Electronics & Comm. Engg under the Faculty of Engg & Tech was held on 21st July, 2016 at 10:00 AM in the presence of Chairperson and members of DDRC in the office of Dean R&D, Maharaja Ranjit Singh Punjab Technical University, Bathinda. Four candidates as given below appeared for interview and are recommended for provisional admission. Further, it was decided unanimously that candidates be given one-week time to produce the following documents, wherever applicable.

1. Consent form from Supervisor/ Co-Supervisor through proper channel.
2. NOC from his /her employer, for attending regular course work in MRSPTU, Bathinda, as applicable.

After successful submission of these documents and fee deposition, supervisor and course allocation is recommended as per the details given below-

Sr. No.	Name	Course work	Supervisor	Area
1	Palvinder Singh	Course work to be decided by Dean R&D after the submission of above documents in consultation with supervisor and HOD		
2	Sahil Gupta			
3	Sukhjinder Singh			
4	Ravinder Singh	Soft computing Research Methodology Research Lab/ Seminar	Dr. Shweta Rani	Signal Processing using soft computing Techniques

Dr. Savina Bansal
(Chairperson)

Dr. Naresh Garg
(Member)

Dr. R.K Bansal
(Member)

Dr. Shweta Rani
(Member)

Dr. Rahul Malhotra
(Member)

Dr. Jyoti Saxena
(Member/ Convener)

Recheck all documents/certificates & intimate after receiving above documents for issue for issuing enrollment letter, accordingly
clerk (R&D) All documents checked of Sh. Sukhjinder Singh and

ਪ੍ਰੋ. (ਡਾ.) ਸਵੀਨਾ ਬਾਂਸਲ

ਡੀਨ (ਖੋਜ ਅਤੇ ਵਿਕਾਸ)

Prof. (Dr) SAVINA BANSAL

PhD (Engg) FIE, FIETE, SMCSI

DEAN (Research & Development)



ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ

(ਯੂ.ਜੀ.ਸੀ. ਵਲੋਂ ਮਾਨਤਾ ਪ੍ਰਾਪਤ)

Maharaja Ranjit Singh Punjab Technical University

(Act 5(2015) of Pb & 2(f) of UGC)

ਡੱਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ (ਪੰਜਾਬ) -151 001

Dabwali Road, Bathinda (Punjab) -151 001

RefNo: DRD/MRSPTU/

ਪੱਤਰ ਨੰ: ਡ.ਖ.ਵ/ਮਰਸਪਟਯ

Dated: ਮਿਤੀ

MINUTES OF MEETING

The interview for admission in PhD course in the Discipline of Computer Sc & Engg under the Faculty of Engg & Tech was held on 21st July, 2016 at 11:30 AM in the presence of Chairperson and members of DDRC in the office of Dean R&D, Maharaja Ranjit Singh Punjab Technical University, Bathinda. Two candidates as given below appeared for interview and are recommended for provisional admission. Further, it was decided unanimously that candidates be given one-week time to produce the following documents, wherever applicable.

1. Consent form from Supervisor/ Co-Supervisor through proper channel.
2. NOC from his/her employer, for attending regular course work in MRSPTU, Bathinda, as applicable.
3. Migration Certificate, as applicable.

After successful submission of these documents and fee deposition, supervisor and course allocation is recommended as per the details given below-

Sr. No.	Name	Course work	Supervisor	Area
1	Ramanpreet Kaur	Soft computing Research Methodology Research Lab/ Seminar	Dr. Naresh Garg GZSCET Bathinda	Natural Language Processing
2	Deepti Garg	Soft computing Research Methodology Research Lab/ Seminar	Dr. Rahul Malhotra GTBWET, Chappianwali	Wireless Computer Networks

Dr. Gursharan Singh
(Chairperson) 21/7/16

Dr. Naresh Garg
(Member)

Dr. Shaveta Rani
(Member)

Dr. Baljit Singh
(Member) 21/7/16

Dr. Anupama Gupta
(Member) 21/7/16

Dr. R.K Bansal
(Member) 21.7.16

Dr. Recheck all testimonials/certificates as desired, & intimate after receiving above documents for issuing enrollment letter, accordingly.

clerk (R&D)

ਪ੍ਰੋ. (ਡਾ.) ਸਵੀਨਾ ਬਾਂਸਲ

ਡੀਨ (ਖੋਜ ਅਤੇ ਵਿਕਾਸ)

Prof. (Dr) SAVINA BANSAL

PhD (Engg) FIE, FIETE, SMCSI

DEAN (Research & Development)



ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ

(ਯੂ.ਜੀ.ਸੀ. ਵੱਲੋਂ ਮਾਨਤਾ ਪ੍ਰਾਪਤ)

Maharaja Ranjit Singh Punjab Technical University

(Act 5(2315) of Pb & 2(f) of UGC)

ਡੱਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ (ਪੰਜਾਬ) - 151 001

Dabwali Road, Bathinda (Punjab) - 151 001

RefNo: DRD MRSPTU

ਪੱਤਰ ਨੰ: ਡ.ਖ.ਵ/ਮਰਸਪਟਯ

Dated: _____: ਸਿਤੀ

MINUTES OF MEETING

The interview for admission in PhD course in the Discipline of Electrical Engg under the Faculty of Engg & Tech was held on 27th July, 2016 at 10:00 AM in the presence of Chairperson and members of DDRC in the Committee Room of GZSC CET, Bathinda. One candidate as given below appeared for interview and is recommended for provisional admission. Further, it was decided unanimously that candidate be given one-week time to produce the following documents, wherever applicable.

1. NOC from his /her employer, for attending regular course work in MRSPTU, Bathinda, as applicable.

After successful submission of these documents and fee deposition, supervisor and course allocation is recommended as per the details given below-

Sr. No.	Name	Code	Course work	Credit	Supervisor	Broad Area
1	Balkar Singh Brar	M5LE3-103	1.Advance Power System Analysis & design 2.Research Methodology 3.Research Lab* 4.Seminar*	4 4 2 1	Dr.Lakhwinder Singh, BBSBEC, Fathegarh Sahib	Power systems

* Syllabus recommended by DDRC to be approved by Academic Council

(Chairperson)

(Dr. Savina Bansal)

27.7.16
(Member)

(Dr. R. K. Bansal)

27/7/16
(Member)

(Dr. Lakhwinder S.)

(Member/convener) 27/7/2016
(Dr. A.K. Goel)

Recheck all testimonials & intimete after receiving above documents for issuing enrollment letter accordingly

Clerk (R.D.)

All documents checked and enrollment letter may be issued.

ਪ੍ਰੋ. (ਡਾ.) ਸਵੀਨਾ ਬਾਂਸਲ

ਡੀਨ (ਖੋਜ ਅਤੇ ਵਿਕਾਸ)

Prof. (Dr) SAVINA BANSAL

PhD (Ergg) FIE, FIETE, SMCSI

DEAN (Research & Development)



ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ

(ਯੂ.ਜੀ.ਸੀ. ਵਲੋਂ ਮਾਨਤਾ ਪ੍ਰਾਪਤ)

Maharaja Ranjit Singh Punjab Technical University

Act 5 of 2015 of P.B. & 2 of 1932

ਡਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ (ਪੰਜਾਬ) - 151 001

Dabwali Road, Bathinda (Punjab) -151 001

Ref No: DRD/MRSPTU/ _____ ਖੱਤਰ ਨੰ: ਡ.ਖ.ਵ/ਮਰਸਪਟਯ

Dated: _____ ਮਿਤੀ


MINUTES OF MEETING


The interview for admission in PhD course in the Discipline of Pharmacy under the Faculty of Pharmacy was held on 23rd Aug., 2016 at 10:00 AM in the presence of Chairperson and members of DDRC in the office of Dean R&D, Maharaja Ranjit Singh Punjab Technical University, Bathinda. Three candidates as given below appeared for interview and are recommended for provisional admission. Further, it was decided unanimously that candidates be given one-week time to produce the following documents, wherever applicable.

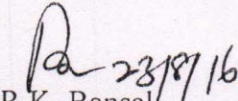
1. NOC from his/her employer, for attending regular course work in MRSPTU, Bathinda, as applicable.
2. Migration Certificate, as applicable.
3. Revised Research Proposal

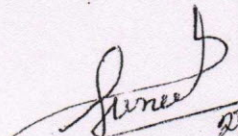
After successful submission of these documents and fee deposition, supervisor allocation is recommended as per the details given below:

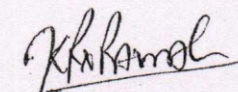
Sr. No.	Name	Course work	Supervisor	Area
1	Bharat Khurana	Course work to be decided by Dean R&D after the submission of above documents in consultation with supervisor and HOD	Dr. R.K. Narang	Pharmaceutics
2	Rohit Bhatia		Dr. R.K. Rawal	Pharmaceutical Chemistry
3	Ashish Kumari		Dr. Puneet Kumar	Pharmacology

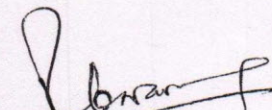

23/08/16
Prof. Ashish Baldi
(Chairperson & Convener)

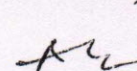

Prof. Gursharan Singh
(Member)
(on duty leave)


23/08/16
Dr. R.K. Bansal
(Member)


23/08/16
Dr. Puneet Kumar
(Member)


Dr. R.K. Rawal
(Member)


Dr. R.K. Narang
(Member)

ੴ. Pl. recheck all documents/certificates + intimates after receiving above documents, as desired, before issuing enrollment letter. 

CSE/5283

Date: 06-1-17

ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ, ਬਠਿੰਡਾ
MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY, BATHINDA

(Estb. under Act 5 (2015) of Punjab Govt. & under section 2(f) of the UGC Act at SNo 428)

Dabwali Road, Bathinda (Punjab) -151 001

Sub: Minutes of DDRC Meeting of CSE Deptt held on 5.1.2017

The DDRC meeting of Deptt of CSE, GZSCCET, Bathinda was held on 5th Jan 2017 at MRSPTU, Bathinda. PhD Progress report cum R proposal presentation of Ms Vidhu Kiran, Enrollment No 15107FFQ01, was held and found satisfactory. Detailed report is enclosed. In addition, following candidate presented themselves before the committee for MRSPTU PhD admission Jan-2017.

1. Galaxi Bansal

The committee recommends the provisional admission of candidate in the broad area of Image processing subjected to fulfillment/submission of following documents, as applicable, within 2 weeks.

- a) Migration certificate
- b) Supervisor consent form
- c) NOC from employer to attend regular course work

After successful submission of these documents and admission fee deposition, pre-PhD course work recommended is as follows-

Name of candidate	Course allocated with sub code	L-T-P-C	Supervisor *allocated
Galaxi Bansal	1. Research Methodology 2. Soft Computing 3. Research Lab 4. Seminar	4-0-0-4 4-0-0-4 0-0-4-2 0-0-2-1	

* In case of non-availability/finalization of supervisor by the candidate within two weeks, candidate/s may be allowed to take up the course-work at their own risk and responsibility. He/She may decide about the supervisor with mutual consultations and consent during the completion of course work and intimate it to Dean(R&D) through HoD(CSE), who shall act as officiating/caretaker supervisor till then. In addition, Dean(R&D) is authorized to decide on course-work re-allocation, if need be, in consultation with and as per the recommendations of Supervisor and HoD(CSE).

The meeting ended with vote of thanks to the Chairman.

1. Paramjit Singh 5.1.17
Dr Paramjit Singh Dean F&ET

2. Mande 5.1.17
Dr Mande Dave (exprof)

3. Dr Nareesh Garg 5.1.17
(Dr Nareesh Garg) HoD CSE

4. Dr Shaveta Ram
Dr Shaveta Ram Professor CSE

5. Dr Paramjit S. Pr 5.1.17
(Name and signatures of DDRC members with date)

6. Dr R. Bansal 5.1.17
Dr R. Bansal Dean R&D - Nominee

7. Gursharan 05/01/17
(Dr Gursharan Singh) VC - Nominee

Dean R&D (MRSPTU)

Forwarded
06/01/17

for records & file
clerk
20/1/17

for your kind perusal, approval & permission to issue enrolment/legislate letters, accordingly
(Dean R&D)

ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ, ਬਠਿੰਡਾ
MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY, BATHINDA
 (Estb. under Act 5 (2015) of Punjab Govt. & under section 2(f) of the UGC Act at SNo 428)
 Dabwali Road, Bathinda (Punjab) -151 001

TO BE SUBMITTED TO O/O DEAN (RESEARCH & DEVELOPMENT)

Sub: Minutes of DDRC Meeting of Deptt of Humanities & Management, held on 10.1.2017

The DDRC meeting of Deptt of **Humanities & Management**, GZSCCET, Bathinda was held on 10th Jan 2017 at MRSPTU, Bathinda. Following candidates presented themselves before the committee for MRSPTU PhD admission Jan-2017.

1. Mukta
2. Anshita
3. Sugandha

The committee recommends the provisional admission of candidates subjected to fulfillment/submission of following documents, as applicable, within 2 weeks.

- a) Supervisor consent form
- b) NOC from employer for pursuing REGULAR course work
- c) Migration certificate

After successful submission of these documents and admission fee deposition, pre-PhD course work and supervisor are recommended as follows-

Name of candidate	Course allocated with sub code	L-T-P-C	Supervisor allocated
1. Mukta	1. Research Methodology (MREM0-101)	4-0-0-4	Dr Rajinder Kaur
2. Anshita	2. Contemporary Issues in Management (PCBM1-101)	4-0-0-4	Dr Rajinder Kaur
3. Sugandha	3. Advance Financial Management(PCBM1-103)	4-0-0-4	Dr MK Kulshrshtha
	4. Marketing Management (MBAD0-F94)	3-0-0-3	
	5. Seminar (PCBM1-102)	0-0-2-1	

The meeting ended with vote of thanks to the Chairman.

1. [Signature] 10/1/17
 2. [Signature] 10.1.2017
 3. [Signature]
 4. [Signature]
 5. [Signature]
 6. [Signature]
 7. [Signature]

(Name and signatures of DDRC members with date)

Dr. Veerpat
 Dr. Suman
 (HOD)

for your kind perusal, approval a permission to issue
 enrollment letters accordingly

[Signature]
 Vice-chancellor

for recording candidates file
[Signature]
 clerk

ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ, ਬਠਿੰਡਾ
MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY, BATHINDA
 (Estb. under Act 5 (2015) of Punjab Govt. & under section 2(f) of the UGC Act at SNo 428)
 Dabwali Road, Bathinda (Punjab) -151 001

TO BE SUBMITTED TO O/O DEAN (RESEARCH & DEVELOPMENT)

Sub: Minutes of DDRC Meeting of Deptt of Computer Application, held on 10.1.2017

The DDRC meeting of Deptt of Computer Application, GZSCCET, Bathinda was held on 10th Jan 2017 at MRSPTU, Bathinda. Following candidates presented themselves before the committee for MRSPTU PhD admission Jan-2017.

1. Chahat Monga

The committee recommends the provisional admission of candidate# subjected to fulfillment/submission of following documents, as applicable, within 2 weeks.

- a) Supervisor consent form
- b) NOC from employer for pursuing REGULAR course work
- c) Migration certificate

After successful submission of these documents and admission fee deposition, pre-PhD course work is recommended as follows-

Name of candidate	Course allocated with sub code	L-T-P-C	Supervisor allocated*
1. Chahat Monga	1. Research Methodology (MREM0-101) 2. Soft Computing (MCSE1-103) 3. Information Security (MCA-302) 4. R. Lab ✓ 5. Seminar ✓	4-0-0-4 4-0-0-4 4-1-0-5 0-0-4-2 0-0-2-1	

• As per the Supervisor consent submitted by the candiadte

In addition, it was decided that all candidates with MCA qualification only shall have to complete minimum 15 credits pre-PhD course work. Further, Dean (R&D) is authorized to allocate any additional course/s as per the recommendations of the Supervisor/HoD concerned.

The meeting ended with vote of thanks to the Chairman.

1. Subodh Kumar 10-1-2017 2. [Signature] 10/1/17 3. [Signature] 10.1.2017 4. [Signature]
 (Dr. Subodh, Dean Faculty of Sc.) (Dr. Savitri Bansal) (Dr. R.K. Bansal) (Dr. Naresh Garg.)
 5. [Signature] 6. [Signature] 7. [Signature]
 (Name and signatures of DDRC members with date)

HOD (Comp. Appⁿ)

for your kind pencil, approval & permission to issue endorsement letters accordingly.

[Signature]
 Vice-Chancellor

Recheck & intimate on receipt
[Signature]

ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ, ਬਠਿੰਡਾ
MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY, BATHINDA
 (Estb. under Act 5 (2015) of Punjab Govt. & under section 2(f) of the UGC Act at SNo 428)
 Dabwali Road, Bathinda (Punjab) -151 001

TO BE SUBMITTED TO O/O DEAN (RESEARCH & DEVELOPMENT)

Sub: Minutes of DDRC Meeting of Deptt of Chemistry, GZSCCET, Bathinda on 10.1.2017

The DDRC meeting of Deptt of **Chemistry**, GZSCCET, Bathinda was held on 10th Jan 2017 at MRSPTU, Bathinda. Following candidates presented themselves before the committee for MRSPTU PhD admission Jan-2017.

1. Baljinder Kaur

The committee recommends the provisional admission of candidate subjected to fulfillment/submission of following documents, as applicable, within 2 weeks.

- a) Supervisor consent form
- b) NOC from employer for pursuing REGULAR course work
- c) Migration certificate in original
- d) Qualifying Degree Certificate, immediate on receipt from the concerned University

After successful submission of these documents, as applicable, and admission fee deposition, pre-PhD course work is recommended as follows-

Name of candidate	Course allocated with sub code	L-T-P-C	Supervisor allocated*
Baljinder Kaur	1. Research Methodology (MREM0-101)	4-0-0-4	
	2. Environmental Chemistry (MSCH-402)	4-0-0-4	
	3. Analytical Principles & Instrumental Method of Analysis (MSCH-403)	4-0-0-4	
	4. R. Lab**	0-0-4-2	
	5. Seminar**	0-0-2-1	

• As per the Supervisor consent submitted by the candidate

** Syllabus, as discussed, to be prepared and got ratified by Deptt from BoS/Academic Council

The meeting ended with vote of thanks to the Chairman.

1. Sichandh Kumar 10-1-2017
 (Dean Faculty of Sci)

2. [Signature] 10/1/17
 (Dr. S. Bansal)

3. [Signature] 10.1.2017
 (Dr. R. K. Bansal)

4. [Signature] 10/1/17
 (Dr. Gurbhawan S.)

5. [Signature] 10/1/17
 (Dr. Seema Sharina)

6. [Signature] 10/1/17

7. [Signature]

(Name and signatures of DDRC members with date)

(Dr. Seema Sharina)
 HOD

In your kind consent, approval & permission to issue endorsement letters accordingly

[Signature] (Dean Res)

[Signature]
 Vice-Chancellor

ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ, ਬਠਿੰਡਾ
MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY, BATHINDA
 (Estb. under Act 5 (2015) of Punjab Govt. & under section 2(f) of the UGC Act at SNo 428)
 Dabwali Road, Bathinda (Punjab) -151 001

TO BE SUBMITTED TO O/O DEAN (RESEARCH & DEVELOPMENT)

Sub: Minutes of DDRC Meeting of ECE Deptt held on 11.1.2017 to admit PhD candidates

The DDRC meeting of Deptt of ECE, GZSCCET, Bathinda was held on 11th Jan 2017 at MRSPTU, Bathinda to admit PhD candidates in the session Jan-2017. The candidate Ravinder Singh did not report for Interview and remained absent. Following candidates presented themselves before the committee for MRSPTU PhD admission Jan-2017.

1. Sahil Gupta
2. Palvinder Singh
3. Mohandeep Singh
4. Prabhjyot Kaur

The candidate at Sr No 2 Palvinder Singh submitted his inability to attend REGULAR course work. The committee recommends provisional admission of candidates at Sr No 1, 3 and 4 subjected to fulfillment/submission of following documents, as applicable, within 2 weeks.

- a) Supervisor Consent form
- b) NOC from employer for allowing REGUAR course work
- c) Migration certificate in original

After successful submission of these documents and admission fee deposition, pre-PhD course work recommended is as follows-

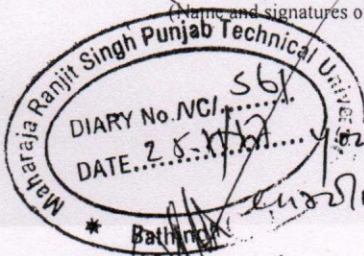
Name of candidate	Course allocated with sub code	L-T-P-C	Supervisor *allocated
1. Sahil Gupta	1. Research Methodology	4-0-0-4	←NIL→
2. Mohandeep Singh	2. Soft computing	4-0-0-4	
3. Prabhjyot Kaur	3. Research Lab**	0-0-4-2	
	4. Seminar**	0-0-2-1	

* as per the supervisor consent submitted by candidate in their area of research as per University norms

** as per the syllabus proposed, to be ratified at BoS/academic council level

The meeting ended with vote of thanks to the Chairman.

1. Paramjit Singh 11.1.17 (Dr. Paramjit S.)
 2. Ray 11.1.17 (Dr. Nareesh Gang)
 3. Rup 11.1.17 (Dr. S. Bansal)
 4. R 11.1.17 (Dr. R. K. Bansal)
 (Name and signatures of DDRC members with date)
 (Dr. Jyoti Saxena) for HoD ECE



your kind perusal, approval + permission to issue
 e-mail letters accordingly

3/15

ਪ੍ਰੋ. (ਡਾ.) ਸਵੀਨਾ ਬਾਂਸਲ

ਡੀਨ (ਖੋਜ ਅਤੇ ਵਿਕਾਸ)

Prof. (Dr) SAVINA BANSAL

PhD (Engg) FIE, FIETE, SMCSI

DEAN (Research & Development)



ਮਹਾਰਾਜਾ ਰਣਜੀਤ ਸਿੰਘ ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ

(ਯੂ.ਜੀ.ਸੀ. ਵੱਲੋਂ ਮਾਨਤਾ ਪ੍ਰਾਪਤ)

Maharaja Ranjit Singh Punjab Technical University

(Act 5(2015) of Pb & 2(f) of UGC)

ਡੱਬਵਾਲੀ ਰੋਡ, ਬਠਿੰਡਾ (ਪੰਜਾਬ) -151 001

Dabwali Road, Bathinda (Punjab) -151 001

RefNo: DRD/MRSPTU/ _____ ਪੱਤਰ ਨੰ: ਡ.ਖ.ਵ/ਮਰਸਪਟਯ

Dated: _____ :ਮਿਤੀ


MINUTES OF MEETING

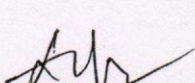
The interview for admission in PhD course in the Discipline of Pharmacy under the Faculty of Pharmacy was held on 11th Jan., 2017 at 3:00 PM in the presence of Chairperson and members of DDRC in the office of Dean R&D, Maharaja Ranjit Singh Punjab Technical University, Bathinda. One eligible candidate as given below appeared for interview and is recommended for provisional admission. Further, following documents are enclosed herewith:


1. Interview attendance sheet
2. Migration Certificate, in original.
3. Brief Research Proposal
4. Self attested copies in support of qualification and eligibility
5. Approval for the change in VC nominee for the meeting
6. Recommendation of DDRC for Ph.D. enrolment and broad area of research
7. Recommendation of DDRC for Ph.D. course work and supervisor allocation

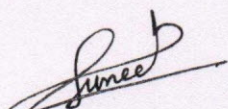
After confirmation and fee deposition, supervisor allocation is recommended as per the details given below:

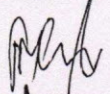
Sr. No.	Name	Course work	Supervisor	Area
1	Neha Rawat	Course work to be done as per University norms	Dr. Ashish Baldi	Pharmaceutics


Prof. Ashish Baldi
(Chairperson & Convener)


Prof. Savina Bansal
(Member)


Prof. R.K. Bansal
(Member)


Dr. Puneet Kumar
(Member)

Submitted for your kind perusal,
approval & permission to issue
enrolment letter accordingly

Vice-Chancellor