INTEGRATED / DUAL DEGREE BCA-MCA (5 YRS.) SYLLABUS
2018 BATCH ONWARDS

Semester 7th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMCAS1-701	Advanced Information Management System	3	1	0	40	60	100	4
BMCAS1-702	Design and Analysis of Algorithms	3	1	0	40	60	100	4
BMCAS1-703	Software Development Methodologies	3	1	0	40	60	100	4
Department Elective-I (Select any one)								
BMCAD1-711	Multimedia Systems	3	1	0	40	60	100	4
BMCAD1-712	Cyber Attacks	3	1	0	40	60	100	4
BMCAD1-713	Agile Computing	3	1	0	40	60	100	4
Software Lab								
BMCAS1-704	Software Lab-XIII (Based on BMCAS1—702)	0	0	4	60	40	100	2
Total		**-**	**-**	**-**	**220**	**280**	**500**	**18**

Semester 8th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMCAS1 -801	Theory of Computation	3	1	0	40	60	100	4
BMCAS1 -802	Machine Learning	3	1	0	40	60	100	4
Department Elective – II (Select any one)								
BMCAD1-811	Human Computer Interaction	3	1	0	40	60	100	4
BMCAD1-812	Cyber Forensics	3	1	0	40	60	100	4
BMCAD1-813	Software Testing and Quality Assurance	3	1	0	40	60	100	4
Software Lab								
BMCAS1-803	Minor Project (Implementation & Execution)	0	0	8	60	40	100	4
BMCAS1-804	Software Lab-XIV (Based on BMCAS1--802)	0	0	4	60	40	100	2
Total		**-**	**-**	**-**	**240**	**260**	**500**	**18**

Semester 9th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMCAS1-901	Compiler Design	3	1	0	40	60	100	4
BMCAS1-902	Cloud Computing	3	1	0	40	60	100	4
BMCAS1 -903	Computer Based Optimization Techniques	3	1	0	40	60	100	4
Department Elective – III (Select any one)								
BMCAD1-911	Digital Image Processing	3	1	0	40	60	100	4
BMCAD1-912	Block Chain Technology	3	1	0	40	60	100	4
BMCAD1-913	Software Architecture and Design Patterns	3	1	0	40	60	100	4
Software Lab								
BMCAD1-914	Software Lab-XV (Based on BMCAD1-911)	0	0	4	60	40	100	2
BMCAD1-915	Software Lab-XVI (Based on BMCAD1-912)	0	0	4	60	40	100	2
BMCAD1-916	Software Lab-XVI (Based on BMCAD1-913)	0	0	4	60	40	100	2
	Total	**-**	**-**	**-**	**220**	**280**	**500**	**18**

Semester 10th		Contact Hrs.			Marks			Credits
Subject Code	**Subject Name**	**L**	**T**	**P**	**Int.**	**Ext.**	**Total**	
BMCAS1-011	Research and Publication Ethics	3	1	0	40	60	100	4
BMCAS1-012	Project (Implementation & Execution)	0	0	20	60	40	100	10
	Total	**-**	**-**	**-**	**100**	**100**	**200**	**14**

ADVANCED INFORMATION MANAGEMENT SYSTEM

Subject Code: BMCAS1-701 **L T P C** **Durations: 60 Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
To learn the advanced concepts of database information and management and its implementation for assessment of understanding the course by the students.
After completion of this course, the students will be able to recover their databases, understanding of transaction processing in real life.

UNIT-I (17 Hrs.)

Transaction Processing and Concurrency Control Techniques: Introduction to Transaction Processing, Properties and states of Transactions, Scheduling of transactions, Serializability of Schedules, Locking Techniques for Concurrency Control, Two phase locking techniques.
Database Recovery Techniques: Recovery Concepts, Recovery Techniques Based on Deferred Update, Techniques Based on Immediate Update.

UNIT-II (15 Hrs.)

Distributed DBMS: Introduction, functions and architecture of a DDBMS, distributed relational database design, Transparencies in a DDBMS, Distributed transaction management, distributed concurrency control, distributed deadlock management, distributed database recovery.

UNIT-III (14 Hrs.)

Object-Oriented DBMS and NoSQL: Advanced database applications, weakness of RDBMS, Next generation database systems, OODBMS perspectives, persistence, advantages and disadvantages of OODBMS, Object-oriented database design, Object oriented extensions in Oracle, Comparison of ORDBMS and OODBMS. **Need of NoSQL and Its Data Models:** Key- value data model, Document data model, Column family data model, Graph data models, CAP Theorem.

UNIT-IV (14 Hrs.)

Data Warehousing Concepts, OLAP and Data mining: Evolution of data warehousing, data warehousing concepts, benefits and problems of data warehousing, comparison of OLTP systems and data warehousing, On-Line Analytical Processing, Introduction to data mining.

Recommended Books:

1 Thomas Connolly, Carolyn Begg, "Database Systems", Pearson Education, 4th Edition, **2005**
2 Pramod J Sadalage and Martin Fowler, "NoSQL Distilled", Pearson, **2012**
3 Hoffer, Prescott, Mcfadden, "Modern Database Management", Pearson Education Asia, **2007**
4 Ivan Bayross, "SQL and PL/SQL", BPB Publication , 4th Edition, **2010**

DESIGN AND ANALYSIS OF ALGORITHMS

Subject Code: BMCAS1-702 **LTP C** **Durations: 60 Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
The students will be taught to analyse the asymptotic performance of algorithms, Apply Important algorithmic design paradigms and methods of analysis.
On completion of course, students will be able to:

- Analyse worst-case running times of algorithms using asymptotic analysis.
- Explain the different ways to analyse randomized algorithms
- Describe divide and conquer, greedy programming and dynamic programming paradigm.

UNIT- I (17 Hrs.)

Introduction to algorithm analysis: Introduction to algorithms, Algorithm Specifications, performance analysis, case study on analysis of algorithms. Recursion and Induction: recursive procedures, induction proofs, proving correctness, recurrence equations, recursion.
Randomized Algorithms: Basic of Probability Theory, Description of Randomized algorithms, Identifying the repeated Elements, Partiality Testing, Advantages and Disadvantages of using randomized algorithms.

UNIT-II (15Hrs.)

Algorithmic Techniques: Introduction to Brute Force, Greedy, Divide and Conquer, Dynamic Programming techniques.
Linear Search Algorithm: Performance analysis of linear search algorithm, Binary Search Algorithm, Performance analysis of Binary Search Algorithm
Divide and conquer technique of problem solving: Quick sort, Merge Sort and Selection Sort Algorithms and their Performance Analysis.

UNIT- III (14 Hrs.)

Greedy algorithms: General Method, Case Study based on Greedy Algorithm (Knapsack Problem), Minimum cost Spanning Trees: Prim's algorithm, Kruskal's minimal spanning trees, Single source shortest paths, transitive closure and APSP problem.

UNIT –IV (14 Hrs.)

Dynamic Programming: General Method, Multistage graphs, All Pair Shortest Paths, Optimal Binary Search Trees and String Editing.
Intractable Problems: Nondeterministic Algorithms, NP Hard and NP complete Problems, NP Hard Graph Problem (Travelling Salesman problem), NP Hard Scheduling Problems (Job Shop Scheduling).

Recommended Books:
1 Coreman, Leiserson & Rivest, 'Introduction to Algorithm, PHI Publication.
2 Donald Knuth, 'The art of Computer Programming' Pearson Education.
3 Mark Allen Weiss, 'Data Structures and Algorithm Analysis in C, Pearson Education

SOFTWARE DEVELOPMENT METHODOLOGIES

Subject Code: BMCAS1-703 **LT P C** **Durations: 60Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
This course will enable you to develop a broad and critical understanding of all the processes for engineering high quality software and the principles, concepts and techniques associated with software development, an ability to analyze and evaluate problems and draw on the theoretical and technical knowledge to develop solutions and systems.
On completion of course, students will be able to:

- A range of skills focused on the analysis of requirements, design, and implementation of reliable and maintainable software, with strong emphasis on engineering principles applied over the whole
  development lifecycle.
- An awareness of current research in software development, the analytical skills and research techniques for their critical and independent evaluation and their application to new problems.

UNIT- I (17 Hrs.)

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, legacy software, Software myths A Generic view of process: Software engineering – A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), Process patterns, process assessment, personal a team process models. Process models: The waterfall model, Incremental process
models, Evolutionary process models, specialized process models, The Unified process.

UNIT- II (14 Hrs.)

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document. Requirements engineering process: Feasibility studies, Requirement's elicitation and analysis, Requirements validation, Requirements management. System models: Context Models, Behavioural models, Data models, Object models, structured methods.

UNIT- III (14 Hrs.)

Design Engineering: Design process and Design quality, Design concepts, the design model, pattern-based software design. Creating an architectural design: software architecture, Data design, Architectural styles and patterns, Architectural Design, assessing alternative architectural designs, mapping data flow into software architecture. Software Design Approaches, Structured Analysis, Structured Design.

UNIT- IV (15 Hrs.)

Object Oriented: Concepts and Principles, Object Oriented Analysis, Object Oriented Design, Modelling component-level design: Designing class-based components, conducting component level design, object constraint language, designing conventional components.
User Interface Design: Performing User interface design: Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation. Coding and Documentation.

Recommended Books:

TEXT BOOKS:

1. Software Engineering: A practitioner's Approach, Roger S Pressman, sixth edition. McGraw Hill International Edition, 2005
2. Software Engineering by Jibitesh Mishra, Ashok Mohanty. Pearson.

REFERENCE BOOKS:

1. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, **2010.**
2. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, **2008**
3. Fundamentals of Software Engineering, Rajib Mall, PHI, **2005**
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, **2006.**
6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition, **2006.**
7. Software Engineering Foundations, Yingxu Wang, Auerbach Publications, **2008.**
8. Software Engineering 3: Domains, Requirements and Software Design, D.Bjorner, Springer, International Edition.
9. Software Engineering Principles and Practice, Hans Van Vliet, **3rd edition, Wiley India edition.**
10. Introduction to Software Engineering, R.J. Leach, **CRC Press.**
11. Software Engineering Fundamentals, Ali Behforooz and Frederick J. Hudson, Oxford University Press, RP **2009**
12. Software Engineering Handbook, Jessica Keyes, Auerbach, **2003.**

MULTIMEDIA SYSTEMS

Subject Code: BMCAD1-711 **LT PC** **Durations: 60 Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:

The objective of the course is to learn the technical details of common multimedia data formats, protocols, and compression techniques of digital images, video, and audio content. It enables to learn about the significance of quality of service in multimedia networking.

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

- Learn the basics of multimedia systems such as design issues, storage requirements and interchange standards.
- Understand and compare various file formats for audio and video.
- Analyze and evaluate the standard compression techniques for multimedia data.
- Learn and apply various networking protocols for multimedia communication and distributed multimedia systems.
- Apply different coding technique for solving real world problem
- Design interactive multimedia software and evaluate multimedia application for its optimum performance.

UNIT-I (15 Hrs.)

Introduction: Multimedia and its types, Introduction to Hypermedia, Hypertext, Multimedia Systems: Characteristics, Challenges, Desirable Features, Components and Applications, Trends in Multimedia.

Multimedia Technology: Multimedia Authoring Paradigms, Design Issues in Multimedia Applications, Standards for Document Architecture: SGML (Standard Generalized Markup Language), ODA (Open Document Architecture); Multimedia Standards for Document Interchange: MHEG (Multimedia Hypermedia Expert Group).

UNIT-II (14 Hrs.)

Storage Media: Magnetic and Optical Media, RAID and its levels, Compact Disc and its standards, DVD and its standards, Multimedia Servers.

Audio: Basics of Digital Audio, Sample Rates, Bit Size, Nyquist's Sampling Theorem; Audio File Formats; Introduction to MIDI (Musical Instrument Digital Interface): Components of a MIDI System, Hardware Aspects of MIDI, MIDI Messages.

UNIT- III (17 Hrs.)

Images, Graphics and Videos: Types of Color Models, Graphic/Image Data Structures, Graphic/Image File Formats, Types of Color Video Signals, TV Standards.

Image Compression: Types of Redundancies, Classifying Compression Algorithms, Basics of Information Theory, Entropy Encoding: Run-length Encoding, Pattern Substitution, Huffman Coding, Huffman Coding of Images, Adaptive Huffman Coding, Arithmetic Coding, Lempel-Ziv-Welch (LZW) Algorithm, Source Coding Techniques: Transform Coding, Frequency Domain Methods, Differential Encoding, Hybrid Coding: Vector Quantization, JPEG Compression.

Audio Compression: Simple Audio Compression Methods, Psychoacoustics Model, MPEG Audio Compression.

Video Compression: Intra Frame Coding (I-frame), Inter-frame (P-frame) Coding, H.261 Compression, MPEG Compression, MPEG Video, MPEG Video Bitstream, Decoding MPEG Video in Software.

UNIT-IV (14 Hrs.)

Multimedia Communication: Building Communication Network, Application Subsystem, Transport Subsystem, QOS, Resource Management, Distributed Multimedia Systems.

Recommended Books:

1 Ralf Steinmetz and KlaraNahrstedt, Multimedia Computing, Communications and Applications, Pearson Education
2 Prabhat K. Andleigh, KiranThakkar, Multimedia System Design, PHI
3 Li, Drew, Multimedia Computing, Pearson Education
4 Fred Halsall, Multimedia Communications, Pearson Education
5 Parag Havaldar, Gerard Medioni, Multimedia Systems, Cengage LearningPublication

CYBER ATTACKS

Subject Code: BMCAD1-712 **L T P C** **Durations: 60 Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:

The objective of the course is to understand terminology and mechanisms of launching attacks so as to devise effective defence strategies. This course covers awareness of various attack artifacts and malwares. Open source attack tools are analysed and case studies are prepared to know the attack trends and their impacts.

After completion of the course, students will be able to:

- To define cyber attack terminology and present various reports and trends.
- To illustrate modus-operandi of well known attacks and analyze their impacts.
- To introduce ethical hacking and demonstrate assessment and testing practices.
- To perform experimental analysis of various attack artifacts.
- To install various malwares, keyloggers and spying tools in experimental test bed environment and perform their analysis using penetration testing.
- To perform case study of various attack tools.

UNIT-I (14 Hrs.)

Introduction: Cyber Threat, Definition of Cyber Crime, Classification, Current Threats and Trends, Diversity of Cyber Crime, Cyber Hate Crimes, Cyber Terrorism.

Types of Cyber Attacks: Denial-of-service (DoS) and distributed denial-of-service (DDoS) attacks, Man-in- the-middle (MitM) attack, Phishing and spear phishing attacks, Drive-by attack, Password attack, SQL injection attack, Cross-site scripting (XSS) attack, Zero-day exploit, Eavesdropping attack, Malware attack, DNS Tunneling.

UNIT-II (14 Hrs.)

Ethical Hacking: Ethical Hacking Concepts and Scopes, Threats and Attack Vectors, Information Assurance, Threat Modelling, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration Testing.

UNIT-III (17 Hrs.)

Attack Artifacts: Virus, Worm, Trojan horse, Rootkits, Botnet, Social Engineering: Types of Social Engineering, Social Engineering Targets and Defence Strategies, Logic Bomb, Time Bomb.

Cyber Issues: Window Password Hacking and Cracking, Steganography, Hiding Secret Message, Anonymous Call, Message and Email Header Analysis, Access Darknet or Darkweb Using TOR: Anonymous Browsing - Access Darknet or Darkweb Using TOR: Anonymous Browsing.

UNIT- IV (15 Hrs.)

Malware and Keylogger Analysis: Malware Analysis and Investigation – Introduction to Malware – Static Malware Analysis - Mobile Phone Hacking & Penetration Testing - Introduction of Keylogger: Art of Spying.

Tools and case study: Various open source attack tools may be explored, exposure of various government sites to have information of latest trends in attacks, each student may be required to prepare a report on various attack incidents.

Recommended Books:

1. Erdal Ozkaya, Yuri Diogenes., Cybersecurity – Attack and. Defense Strategies, Packt Publishing 2018
2. Protecting National Infrastructure by Edward Amoroso. 2010, Elsevier, Cyber Attacks
3. Martti Lehto, Pekka Neittaanmäki. Cyber Security: Analytics, Technology and Automation edited., International Publishing Switzerland 2015

Online Course:

1. Cyber Threats and Attack Vectors by Greg Williams, Coursera
2. Introduction to Cyber Security Tools & Cyber Attacks by IBM, Coursera

AGILE COMPUTING

Subject Code: BMCAD1-713 **LT P C** **Durations: 60 Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
The main aim of this course is to understand the basic concepts of agile software process, to gain knowledge in the area of various Agile Methodologies and to know the principles of Agile Testing.
After completion of this course, the students will be able to:

- Understand the practices and philosophies of agile methods.
- Analyze the tradeoffs in selecting a software engineering method.
- Understand the basic agile design principles.
- Define and extend the usage of scrum and extreme programming in software product development.
- Familiarize with various tools for agile project management.
- Understand about various testing methods used in Agile.

UNIT-I (14 Hrs.)

Introduction of Agile: Goals/Manifesto and principles, Key Features, Challenges, Advantages and disadvantages, Agile usage, Agile Vs Traditional Software development (Waterfall), Agile Software Development lifecycle.
Agile Design: Agile Design Practices, Design smells and software rotting, SOLID Principles: SRP – The Single Responsibility Principle, OCP – the Open Closed Principle, LSP – The Liskov Substitution, DIP – The Dependency Inversion Principle, ISP – The Interface Segregation Principle.

UNIT-II (17 Hrs.)

Agile Methodologies: Scrum: Overview of scrum theory, Scrum Team, Scrum Roles, The Sprint, Sprint Planning, Daily Scrum, Sprint review, Sprint retrospective, Scrum artifacts, Product back log, sprint backlog, Progress Monitoring. Extreme Programming (XP): Overview of XP, Concept, Values, Rules, Principles,
Scalability, Practices, Issues.

UNIT-III (14 Hrs.)

Agile Project Management: Overview of Agile project management, Agile project management model: Overview of agile enterprise framework and agile delivery framework, Scaling and governing agile projects. Tools for Agile project management.

UNIT–IV (15 Hrs.)

Agile Testing: Introduction to agile testing, Principles for testers, Overview of organizational challenges, The Agile testing Quadrants, Test Automation, The Agile lifecycle and its impact on testing, Types of testing in agile : TDD, BDD, Acceptance tests Exploratory testing, Risk based testing, Regression tests, Unittesting, Integration testing, system testing, Tools to support the Agile Tester.

Recommended Books:
1. West D. B.: Introduction to graph theory, Pearson Education Asia
2. Wilson R. J.: 'Introduction to graph theory', Pearson Education, Asia.

SOFTWARE LAB-XIII (BASED ON BMCAS1—702)

Subject Code: BMCAS1-704 **L T P C**
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAS1-702. Students are required to do at least 8 assignments based on the paper.

THEORY OF COMPUTATION

Subject Code: BMCAS1-801 **LT P C** **Durations: 60 Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
The student will study various types of Finite Automata, Understand the grammar and PDA for a given language and will understand the challenge for Theoretical Computer Science and its contribution
After completion of this course, the students would be able to:

- Discuss abstract model of computing machine through Turing Machine and its types.
- Draw to create modern techniques to solve NP completeness problems.
- Recognize whether a problem is decidable or undecidable.

UNIT- I (17 Hrs.)

Finite Automata: Formal language, need for formal computational models, Non-computational models, Deterministic finite Automata, Non-deterministic finite Automata, Equivalence of NFA and DFA, 2-Way Finite Automata, Crossing sequences, Moore and Mealy Machine, Application of finite automata i.e., Lexical Analyzers, text editors.

UNIT- II (14 Hrs.)

Regular Expression and Languages: Regular expression, Equivalence of finite Automata and Regular expressions, Conversion between regular expressions and finite Automata, Application of Regular Expressions, Lexical analysis, Finding pattern in text.

UNIT- III (14 Hrs.)

Regular Languages and Regular Sets: Pumping lemma for regular sets, Applications of pumping lemma. Closure properties of regular language, The Myhill-Nerode Theorem, Minimization of finite Automata.
Pushdown Automata: Pushdown Automata, Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context free grammar.

UNIT- IV (15 Hrs.)

Context Free Grammar and Languages: Context free Grammars, Derivation Trees, Leftmost and rightmost derivations, Ambiguity, Parsing techniques for parsing of general CFG's, Properties of Context free Languages, Normal forms for context free grammars, The Pumping Lemma for context free Languages,
Closure properties of context free languages.
Turing Machine (TM): One Tape, multi-tape, the notions of time and space complexity in terms of T.M. Construction of simple problems, Computational complexity.

Recommended Books:

1 John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, 'Introduction to Automata Theory, Languages and Computation', 3rd Edn., Pearson, **2006.**

2 Daniel I.A. Cohen, 'Introduction to Computer Theory', 2nd Edn., Wiley, **2011**.

3 Adesh K. Pandey, 'Theory of Automata and Computation', S.K. Kataria & Sons, **2013**.

4 K.L.P. Mishra, 'Theory of Computer Science: Automata, Languages and Computation', 3rd Edn., Prentice Hall India Course Private Limited, **2006**.

MACHINE LEARNING

Subject Code: BMCAS1-802 **L T PC** **Duration: 60Hrs.**
3 1 0 4

Course Objective and Expected Outcomes:

The aim of this course is to introduce the students to the basic concepts and techniques of Machine Learning, develop skills of using recent machine learning software solving practical problems, to gain experience of doing independent study and research.

At the end of the course students should be able to design and implement machine learning solutions to classification, regression and clustering problems and be able to evaluate and interpret the result of the algorithms.

UNIT- I (14 Hrs.)

Supervised Learning: Regression/Classification. Basic methods: Distance-based methods, Nearest Neighbours, Decision Trees, Naive Bayes. Linear models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Nonlinearity and Kernel Methods. Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.

UNIT- II (17 Hrs.)

Unsupervised Learning: Clustering: K-means/Kernel K-means. Dimensionality Reduction: PCA and kernel PCA. Matrix Factorization and Matrix Completion. Generative Models (mixture models and latent factor models). Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging and Random Forests).

UNIT- III (15 Hrs.)

Modeling and Estimation: Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning. Scalable Machine Learning (Online and Distributed Learning).

UNIT- IV (14 Hrs.)

Learning: Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference. Learning techniques of machine learning and classification methods for IOT applications. Various models for IOT applications.

Recommended Books:

1 Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, **2012**

2 Christopher Bishop, Pattern Recognition and Machine Learning, Springer, **2007**

HUMAN COMPUTER INTERACTION

Subject Code: BMCAD1-811 **L T PC** **Duration: 60Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
The objective of this course is to familiarize the students with the key areas, approaches, and developments in the field of Human Computer Interaction (HCI).
It aims to get the students think constructively and analytically about how to design and evaluate interactive technologies.
After the completion of this course, the students will be able to:

- Understand the need and importance of designing interactive products and examine various interaction devices.
- Illustrate and analyze user needs and formulate user design specifications.
- Learns various tools for graphics design and examine the interactive design process for developing HCI systems.
- Examine the Mobile ecosystem to enable the development of mobile applications and tools.
- Learn and apply various Windows characteristics features for designing interactive applications.

UNIT-I (15 Hrs.)

Introduction to Human Computer Interface Importance of User Interface, History of Human Computer Interface, Importance of Good Design, Benefits of Good Design, Principles of User Interface Design.
Interaction Devices: Keyboard Keys, Function Keys, Pointing Devices, Speech Recognition, Handwriting Recognition, Speech Generation, Image Display, Video Display, Device Drivers.

UNIT-II (14 Hrs.)

Color and Content: Why Colors, Color Uses, Choosing Colors, Possible Problems With Colors, Page Title, Headings, Text, Messages, Error Messages, Icons.
Design Process: Understanding How User Interact with Computers, User Interface Models, Design Methodologies, Designing an Interface, Process of Interaction Design.

UNIT-III (17 Hrs.)

Graphical User Interface: Popularity of Graphics, Characteristics of Graphical User Interface, Concepts of Direct Manipulation, Graphical System Advantages and Disadvantages, Web User Interface Characteristics and Popularity.
Device and Screen-Based Control: Device Based Controls, Operable Controls, Text Entry/Read-Only Controls, Selection Controls, Combining Entry/Selection Controls, Other Operable Controls, Presentation Controls and Selecting Proper Controls.

UNIT- IV (14 Hrs.)

Mobile HCI: Mobile Ecosystem: Platforms, Application Frameworks- Types of Mobile Applications: Widgets, Applications, Games – Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.
Windows: Window characteristics, Components of Window, Window Presentation Styles, Types of Windows, Window Management.

Recommended Books:

1 Dix A. et al., Human-Computer Interaction, Harlow, England: Prentice Hall, **2004.**

2 Yvonne Rogers, Helen Sharp, Jenny Preece, Interaction Design: Beyond Human Computer Interaction, 3rd Edition, Wiley, **2011.**

CYBER FORENSICS

Subject Code: BMCAD1-812 **L T PC** **Duration: 60 Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:

The objective of the course is to enable the student to identify, analyze and remediate computer security breaches; and to teach students about the various forms of cybercrimes and fundamentals of cyber forensic technologies.

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

- Understand the fundamentals of Cyber-crimes and analyze its impact on the society.
- Learn the techniques for investigating Cyber-crimes and procedures for collecting & preserving evidences.
- Examine the evidence collected and apply it for the reconstruction of past events.
- Understand the legal and ethical aspects of Cyber-crimes.
- Design and develop a security architecture for an organization.

UNIT- I (17 Hrs.)

Overview of Cyber Crime: Nature and Scope of Cyber Crime, Types of Cyber Crime, Introduction to Cyber forensics: Information Security Investigations, Corporate Cyber Forensics, Scientific method in forensic analysis, investigating large scale Data breach cases. Analyzing malicious software.

Computer Forensics Technologies: Types of Military Computer Forensic Technology, Types of Law Enforcement Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised Internet Tracing Methods, Security and Wireless Technologies, Avoiding Pitfalls with Firewalls Biometric Security Systems.

UNIT- II (15 Hrs.)

Types of Computer Forensics Systems: Internet Security Systems, Intrusion Detection Systems, Firewall Security Systems, Storage Area Network Security Systems, Network Disaster Recovery Systems, Public Key Infrastructure Systems, Wireless Network Security Systems, Satellite Encryption Security Systems, Instant Messaging (IM) Security Systems, Net Privacy Systems, Identity Management Security Systems, Identity Theft, Biometric Security Systems.

Introduction to Cyber Crime Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies, Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT- III (14 Hrs.)

Ethical Hacking: Essential Terminology, Windows Hacking, Malware, Scanning, Cracking. Digital Evidence in Criminal Investigations: The Analog and Digital World, Training and Education in digital

evidence, Evidence Collection and Data Seizure: Why Collect Evidence, Collection Options Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure,
Collection and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody, Reconstructing the Attack, The digital crime scene, Investigating Cybercrime, Duties Support Functions and Competencies.

UNIT- IV (14 Hrs.)

Identification of Data: Timekeeping, Forensic Identification and Analysis of Technical Surveillance Devices, Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files, Investigating Network Intrusions and Cyber Crime, Network Forensics and Investigating logs, Investigating network Traffic, Investigating Web attacks, Router Forensics. Cyber forensics tools and case studies.
Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and CrPC , Electronic Communication Privacy ACT, Legal Policies.

Recommended Books:

1 John R VACCA, Computer Forensics: Computer Crime Scene Investigation, Firewall Media , 2009 edition Reprint **2012.**
2 Bill Nelson, Amelia Phillips,Christopher Stuart Cengage, Guide To Computer Forensics And Investigations, Learning publications, latest edition.
3 Christof Paar, Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners,, Latest Edition, Springer's
4 Kevin Mandia, Chris Prosise, Incident Response and Computer Forensics, Tata McGraw -Hill, New Delhi
5 Robert M Slade, Software Forensics, Tata McGraw - Hill, New Delhi.

SOFTWARE TESTING AND QUALITY ASSURANCE

Subject Code: BMCAD1-813 **L T PC** **Duration: 60Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
The main of this course is to analyse different approaches to software testing and quality assurance and select optimal solutions for different situations and projects.
After completion of this course, the students would be able to:

- Conduct independent research in software testing and quality assurance and apply that knowledge in their future research and practice.
- Evaluate the work of peers constructively by following proven methods of peer-review, and by using the principles of research ethics.

UNIT- I (14 Hrs.)

Testing Principles: Need of testing, Basic concepts–errors, faults, defects, failures, test bed, unit testing, integration testing system, system testing, regression testing, alpha, beta and acceptance testing, functional testing, performance testing, white box testing, black box testing, verification and validation.

UNIT- II (15 Hrs.)

Test Management: Testing Life Cycle–Roles and activities, Test Planning, Develop test plan review, Test Cases design strategies. Black box approach: random testing, equivalence class partitioning and boundary value analysis.
White box approach: test adequacy criteria, coverage and control flow graphs, paths, loop testing, mutation testing.

UNIT- III (17 Hrs.)

Software Metrics: Scope of software metrics, Classifying software measures, Measurement basics – representational theory, scales, meaningfulness, What to measure–GOM technique, Control flow structure, product quality metrics – MTTF, defect density, customer problems, customer satisfaction, function point. **Quality Assurance:** Quality concepts–quality, quality control, quality assurance, cost ofquality Software quality assurance – SQA activities, software reviews, inspections, audits, Software reviews, inspections, audits, Software reliability Quality Attributes: correctness, reliability, usability, integrity, portability, maintainability, interoperability. Ishikawa's Seven Basic Tools.

UNIT- IV (14 Hrs.)

Quality Standards: Basic concept of–ISO 9000 & 9001, CMM, six sigmas. Development of CMM-CMM–Following KPAs: requirements management (RM), software project tracking and oversight (SPTO), software configuration management (SCM), organization process definition (OPD), software product engineering (SPE), peer reviews (PR), quantitative process management (QPM), process change management.

Recommended Books:

1. Kshirasagar Naik and PriyadarshiTripathy, 'Software Testing and Quality Assurance:Theory and Practice', 1stEdn., Wiley, 2008.
2. Jeff Tian, 'Software Quality Engineering: Testing, Quality Assurance, and Quantifiable, Improvement', 1stEdn., Wiley, 2005.
3. William E. Perry, 'Effective Methods for Software Testing: Includes Complete Guidelines, and Checklists', 3rdEdn., Wiley, 2006.
4. Glenford J. Myers, 'The Art Of Software Testing', 3rdEdn., Wiley, 2015

MINOR PROJECT (IMPLEMENTATION & EXECUTION)

Subject Code: BMCAS1-803 **L T P C**
0 0 8 4

Students are required to develop a minor project according to latest technology.

SOFTWARE LAB-XIV (BASED ON BMCAS1-802)

Subject Code: BMCAS1-804 **L T P C**
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAS1-802. Students are required to do at least 8 assignments based on the paper.

COMPILER DESIGN

Subject Code: BMCAS1-901 **L T PC** **Duration: 60Hrs.**
3 1 0 4

Course Objective and Expected Outcomes:
The objective of the course is to provide an understanding of the fundamental principles in Compiler Design. Learn the process of translating a modern high-level language to executable code required for compiler construction.
At the end of course students will be able to:

- Use modern tools and technologies for designing new compiler.
- Understand fundamentals of compiler and identify the relationship among different phases of the compiler.

UNIT-I (14 Hrs.)

Introduction to Compiling: Compiler's v/s Interpreters, Phases of a Compiler, Cross- compiler, Compiler Construction tools. One Pass-Compiler, Syntax definition.
Parsing: Predictive Paring, Design of a Predictive Parser, Symbol tables.

UNIT- II (15Hrs.)

Lexical Analysis: Rote of Lexical Analyser, Specification and Recognition of Tokens, Finite Automata from Regular Expression, Regular expression to a NFA.
Syntax Directed Translation: Syntax directed translation scheme, Quadruples, Triples, Indirect triples, Constructing syntax trees, Bottom-up evaluation of S-attributed definitions, L attributed definitions.

UNIT- III (17Hrs.)

Syntax Analysis: Rate of parsing, CFG, Top-down parsing, bottom up, Parse tree, Operator Precedence Parsing, LR parsers, Using ambiguous grammar. Runtime Environment, Storage organization, storage allocation strategies.

UNIT- IV (14Hrs.)

Code Generation: Issue in design of code generator, Basic Block and flow graphs, Next-use Information, DAG representation of basic blocks. Code Optimization: Peep optimization, Principal source of optimization, Optimization of basic blocks. Introduction to Global DFA.

Recommended Books:
1. Allen. I. Holub, 'Compiler Design in C', Pearson Publications
2. M. Joseph, 'Elements of Compiler Design', Laxmi Publications
3. Randy Allen, Ken Kennedy, 'Optimizing Compilers for Modern Architectures: A Dependence-based Approach', Morgan Kaufmann Publishers.
4. Steven S. Muchnick, 'Advanced Compiler Design and Implementation, Morgan Kaufmann Publishers – Elsevier Science, India.

CLOUD COMPUTING

Subject Code: BMCAS1-902 **L T P C** **Duration: 60Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
The main aim of this course is to understand the basic concepts Cloud Computing, to understand the taxonomy and types of Cloud Computing and to understand different hypervisors of Clouds for the

Virtualization.
At the end of course students will be able to:

- Identify problems, and explain, analyze, and evaluate various cloud computing solutions.
- Attempt to generate new ideas and innovations in cloud computing.

UNIT-I (14 Hrs.)

Evolution of Cloud Computing: Vision of Cloud Computing, Definition, Deployment models, Reference models, Benefits and Challenges to Cloud Computing, already using Cloud Computing; Electronic Faxing, Voice in the Cloud, Commerce in the Cloud, Distributed Hosting in the Cloud, Accounting and Online Banking in the Cloud, Cloud Computing Applications.

UNIT- II (15 Hrs.)

Cloud Service Providers and Cloud Vendor's: IaaS Providers, PaaS Providers, SaaS Providers, Specialized Cloud Software Providers. Cloud Vendor's IBM, Amazon AWS, HP, Oracle.

UNIT- III (17 Hrs.)

Securing the Cloud: Reliability, Availability and Security: FUDD Factor, DoS Attack, Trust, Standard and Vendor Selection, SAS70 and Cloud Computing, Cloud Security Alliance, SysTrust Certification, Cloud Audit.

UNIT- IV (14 Hrs.)

Demystifying the Cloud: A Case Study using Amazon's Cloud Service, Using Amazon's S3 Functionality, moving a Simple Application to the Cloud; Step1, Move Static Content to S3, Step 2; Move Web Servers and Backend, Moving the database, Eucalyptus, Nimbula.

Recommended Books:
1 Rajkumar Buyaa, James Broberg, Andrzej Goscinski, 'Cloud Computing Principles and Paradigms' 1 st Edn., Wiley, **2011.**
2 David E.Y. Sarna, 'Implementing and Developing Cloud Computing Applications', 1 st Edn., CRC Press, **2011.**
3 Chris Wolf, Erick M. Halter, Virtualization: From the Desktop to the Enterprise, 1 st Edn., A Press, **2005.**
4 George Reese, 'Cloud Application Architectures: Building Applications and Infrastructure in the Cloud', 1st Edn., O'Reilly Publishers, **2009.**

COMPUTER BASED OPTIMIZATION TECHNIQUES

Subject Code: BMCAS1-903 **LT P C** **Durations: 60Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
To well ground students in modelling skills that are the basis for computer-based optimization techniques, and they will be prepared to apply those skills to the efficient design, analysis, operation and control of complex systems.
After completion of this course students will be able:

- To create simple architecture for evolutionary algorithms.
- To have the knowledge of applying evaluation optimization technique to engineering applications.

UNIT- I (17 Hrs.)

OR models: solving the OR Model, Introduction to Linear Programming, two-variable LP model, Graphical LP Solution, Graphical sensitivity Analysis, Simplex Method, Big M Method, Two Phase Method, Special cases in Simplex Method Application.

UNIT- II (15 Hrs.)

Duality and Sensitivity Analysis: Definition of the Dual problem, Primal dual relationship, Additional Simplex Algorithm for LP, Post optimal or Sensitivity Analysis. Transportation Model, Transportation Algorithm, Assignment Model.

UNIT- III (14 Hrs.)

Networks Models: Definition, Minimum spanning trees algorithms, Shortest Route Problem, Maximum flow Model, Minimum Cost Capacitors flow problem, PERT & CPM.

UNIT- IV (14 Hrs.)

Non-Linear Programming: Unconstrained Algorithms, Direct search Method, Gradient Method, Constrained Algorithm, Separable programming, Quadratic Programming, Geometric Programming

Recommended Books:

1. Kanti Swarup, "Operations Research"
2. N.G. Nari, "Operations Research"
3. Prem Kumar Gupta and D.S. Hira, "Operations Research"
4. S.D. Sharma, "Operations Research"
5. Goel and Mittal, "Operational Research"
6. V.K. Kapoor, "Problems and Solutions in Operations Research"

DIGITAL IMAGE PROCESSING

Subject Code: BMCAD1-911 **L T PC** **Duration: 60 Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
The main aim of this course is to study the image fundamentals and mathematical transforms necessary for image processing, to study the image enhancement techniques, to study image restoration procedures and to study the image compression procedures.
After completion of this course, the students will be able to:

- Review the fundamental concepts of a digital image processing system.
- Analyze images in the frequency domain using various transforms.
- Evaluate the techniques for image enhancement and image restoration.
- Categorize various compression techniques.
- Interpret Image compression standards.
- Interpret image segmentation and representation techniques.

UNIT-I (14 Hrs.)

Introduction and Digital Image Fundamentals: Digital Image representation, Fundamental steps in Image processing, Elements of digital Image processing, Sampling and quantization, some basic relationships like neighbor's connectivity, distance measure between pixels, Image geometry.

Image Transforms: Discrete Fourier transform, Some properties of two-dimensional Fourier transform, Fast Fourier transform, Inverse FFT.

UNIT-II (15 Hrs.)

Image Enhancement: Point Operations, Histograms, Spatial Domain methods, Frequency domain Methods, Enhancement by point processing, Spatial filtering, low pass filtering, High pass filtering, Homomorphic filtering, Colour image processing.
Image Restoration Degradation model, Algebraic approach to Restoration, Inverse filtering, Wiener Filter, constrained least square restoration, Interactive restoration, Restoration in spatial domain.

UNIT-III (17 Hrs.)

Image Compression: Coding Inter-pixel and Psycho visual redundancy, Image Compression models, Error Free compression, Lossy Compression, Image Compression standards.
Image Segmentation: Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region Orientation Segmentation, Motion based segmentation.

UNIT-IV (14 Hrs.)

Representation and Description: Representation schemes like chain coding, Polygonal approximation, Signatures, Boundary Segments, Skeleton of region, Boundary Description, Regional descriptors, Morphology.
Recognition and Interpretation: Elements of Image Analysis, Pattern and pattern classes, Decision Theoretic methods, Structural methods, Interpretation.

Recommended Books:
1. A.K. Jain," Fundamentals of Digital Image Processing", Pearson Education.
2. Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", AWL.

3. W. K. Pratt," Digital Image Processing".
4. Ramesh Jain, Brian G. Schunck, "Machine Vision", TMH.

BLOCK CHAIN TECHNOLOGY

Subject Code: BMCAD1-912 **L T PC** **Duration: 60 Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
After successful completion of this course, students will be familiar with block chain and crypto currency concepts. Also, they can build their own application using the learned concepts.
After the completion of this course, the students will be able to:

- Describe emerging abstract models for Block chain Technology, the structure of a block chain and why/when it is better than a simple distributed database.
- Evaluate the setting where a block chain based structure may be applied, its potential and its limitations.
- Analyze various cryptography mechanisms and evaluate their role in block chain.

UNIT-I (14 Hrs.)

Introduction to Block Chain: The consensus problem, Asynchronous Byzantine Agreement, AAP protocol and its analysis, Nakamoto Consensus on permission-less, nameless, peer-to-peer network, Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS).

UNIT-II (15 Hrs.)

Overview to Cryptography: Symmetric-key cryptography, Public-key cryptography, Digital Signatures, Hash functions, Elliptic curve cryptography, Basics for crypto currency, Application of Cryptography to Blockchain- Using hash functions to chain blocks, Digital Signatures to sign transactions, Using hash functions for Proof-of-Work

UNIT-III (17 Hrs.)

Introduction to Bitcoin: Wallet, Blocks, Merkley Tree, Hardness of mining, Transaction verifiability, Anonymity, Forks, Double spending, P2P gateway, Mathematical analysis of properties of Bitcoin.
Ethereum and Hyperledger: Ethereum networks, Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity language, decentralized applications using Ethereum. Solidity- Smart Contracts, Attacks on smart contracts, Hyperledger fabric, the plug and play platform and mechanisms in permissioned block chain.

UNIT-IV (14 Hrs.)

Security issues of Blockchain: Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains – such as Sybil attacks, selfish mining, 51% attacks - -advent of algorand, and Sharding based consensus algorithms.

Recommended Books:

1. Lecture Notes, Online: https://www.ee.iitb.ac.in/~sarva/bitcoin.html, An Introduction to Bitcoin, Vijayakumaran, Saravanan
2. Narayanan, Arvind, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction., Princeton University Press, 2016

3. Andreas O'Reilly, M. Mastering Bitcoin: Programming the Open Blockchain Antonopoulos, Media, Inc., 2017

SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

Subject Code: BMCAD1-913 **L T PC** **Duration: 60 Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
This course will enable students to Learn How to add functionality to designs while minimizing complexity, What code qualities are required to maintain to keep code flexible, to Understand the common design patterns, to explore the appropriate patterns for design problems.
The students should be able to:

- Design and implement codes with higher performance and lower complexity.
- Be aware of code qualities needed to keep code flexible.
- Experience core design principles and be able to assess the quality of a design with respect to these principles.
- Capable of applying these principles in the design of object-oriented systems.
- Demonstrate an understanding of a range of design patterns. Be capable of
- comprehending a design presented using this vocabulary.
- Be able to select and apply suitable patterns in specific contexts.

UNIT-I (14 Hrs.)

Introduction: Introduction to design pattern, describing design patterns, the catalog of design pattern, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern. object-oriented development, key concepts of object-oriented design other related concepts, benefits and drawbacks of the paradigm.

UNIT-II (15 Hrs.)

Analysis a System: Overview of the analysis phase, stage 1: gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain. Design and Implementation, discussions and further reading.

UNIT-III (17 Hrs.)

Design Pattern Catalog: Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy.
Interactive systems and the MVC architecture: Introduction, The MVC architectural pattern, analyzing a simple drawing program , designing the system, designing of the subsystems, getting into implementation, implementing undo operation , drawing incomplete items, adding a new feature , pattern based
solutions.

UNIT-IV (14 Hrs.)

Designing with Distributed Objects: Client server system, java remote method invocation, implementing an object-oriented system on the web (discussions and further reading) a note on input and output, selection statements, loops arrays.

Recommended Books:

Text Books:

1 Object-oriented analysis, design and implementation, brahma dathan, sarnath rammath, universities press,**2013**

2 Design patterns, erich gamma, Richard helan, Ralph johman , john vlissides, PEARSON Publication,**2013.**

Reference Books:

1. Frank Bachmann, RegineMeunier, Hans Rohnert "Patter n Oriented Software Architecture" –Volume 1, **1996.**

2. William J Brown et al., "Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis", John Wiley, **1998.**

SOFTWARE LAB-XV (BASED ON BMCAD1-911)

Subject Code: BMCAD1-914 **L T P C**
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAD1-911. Students are required to do at least 8 assignments based on the paper.

SOFTWARE LAB-XVI (BASED ON BMCAD1-912)

Subject Code: BMCAD1-915 **L T P C**
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAD1-912. Students are required to do at least 8 assignments based on the paper.

SOFTWARE LAB-XVI (BASED ON BMCAD1-913)

Subject Code: BMCAD1-916 **L T P C**
0 0 4 2

This laboratory course will comprise as exercises to supplement what is learnt under paper BMCAD1-913. Students are required to do at least 8 assignments based on the paper.

RESEARCH AND PUBLICATION ETHICS

Subject Code: BMCAS1-011 **L T PC** **Duration: 60 Hrs.**
3 1 0 4

Course Objectives and Expected Outcomes:
The aim of this course is to provide students with knowledge, general competence and analytical skills in Research Methodology and Research and Publication Ethics.
After completion of this course students will be able to equip themselves with ethical issues related to Research and Publication and build a strong foundation for future research work in a systematic manner by applying notions of Research Methodology.

UNIT-I (14 Hrs.)

Philosophy and Ethics – Introduction to Philosophy; Nature and Scope; Branches of Philosophy.
Ethics-Need of Ethics; Ethics Vs. Moral; Meta Ethics; Prescriptive Ethics; Violation of Ethics; Principles.

UNIT-II (15 Hrs.)

Publication Ethics -Introduction; Ethical issues in publication; types of publication misconduct; Ethics related to submission; Standard guidelines; conflict of interest; Appeals and Complaint;Plagiarism; Types of Plagiarism; Avoiding Plagiarism; Plagiarism detection software.
Publication Misconduct: FFP issues in Research; Subject specific Ethical issues.

UNIT-III (17 Hrs.)

Open Access Publishing – Overview of Open Access Publishing; Types of Open Access Publishing; History of Open Access Publishing; Benefits; Features; Open Access publishing Licenses; SHERPA RoMEO-Copyrights and Open Access Self Archiving Policies; Journal finder tools.

UNIT-IV (14 Hrs.)

Databases and Research Metrics Online Databases for Research: Introduction; characteristics of Online Databases; Types of Online Databases; Indexing databases; characteristics of Citation databases; need to use a citation database.
Research Metrics: Introduction; Types of Metrics-Author Level Metrics; Article Level Metrics; Journal Level Metrics; Impact Factor; Cite Score; SNIP; Quality indicators for a journal.

Recommended Books:
1. Dr. G.S Batra and Dr. Vishal Goyal, 'Research and Publication Ethics', D.P.S. Publishing House, **2021**.

PROJECT (IMPLEMENTATION & EXECUTION)

SubjectCode:BMCAS1-012 **L T PC**
0 0 2 1

Students are required to develop a major project according to latest technology.