MAHARAJA RANJIT SINGH PUNJAB TECHNICAL UNIVERSITY BATHINDA-151001 (PUNJAB), INDIA

(A State University Estb. by Govt. of Punjab vide Punjab Act No. 5 of 2015 and Approved u/s 2(f) & 12 (B) of UGC; Member AIU)

Department: **ELECTRONICS & COMMUNICATION ENGINEERING**
Giani Zail Singh Campus College of Engineering & Technology, MRSPTU

Program: B Tech Electronics & Communication Engineering

COURSE ARTICULATION MATRIX (STUDY SCHEME: 2018)

Subject	S Code	Semester	Credit	Duration (Hrs)	L T P	COs	Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
Electronic Devices & Circuits	BECES1-301	3	4	60 Hrs.	3 1 0	CO1	Understand the principles of semiconductor physics	3									2		2			
						CO2	Understand the concepts of junction diodes and their applications.	3									2		2			
						CO3	Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems	3	2	2							2		2			2
						CO4	Analyze BJT characteristics and determine their behavior under low and high frequencies.		2		1						2		2	2		2

						CO5	Analyze various concepts of FETs and their characteristics.				1					2		2	2		2
						CO6	Design low and high frequency models and observe and their various characteristics.			2	1					2		2	2		2
Digital Electronic Circuits & Design	BECES1-302	3	4	60 Hrs.	3 1 0	CO1	Understand working of logic families and logic gates.	3			1						2		2			2
						CO2	Design and implement Combinational and Sequential logic circuits.		2	2	1						2		2	2		2
						CO3	Design & analyze modular combinational circuits with MUX/DEMUX, Decoder, Encoder		2	2	1						2		2	2		2
						CO4	Design & analyze synchronous sequential logic circuits		2	2	1						2		2	2		2
Signals and Systems	BECES1-303	3	4	60 Hrs.	3 1 0	CO1	Analyze the properties of signals & systems and representation in time and frequency domain.		2	2	1						2					2
						CO2	Classify systems based on their properties and determine the response of LSI system.		2	2	1						2			2	1	2
						CO3	Apply random signal theory and understand various types of noise.	3				1					2			2	1	2
						CO4	Understand the process of sampling and reconstruction	3	2		1						2			2	1	2
Network Theory: Analysis & Synthesis	BECES1-304	3	4	60 Hrs.	3 1 0	CO1	Understand basics electrical circuits with nodal and mesh analysis.	3	2								2			2		2
						CO2	Appreciate electrical network theorems.	3	2								2			2		2
						CO3	Apply Laplace Transform for steady state and transient analysis	3	2	2	1	1					2			2		2
						CO4	Determine different network functions.	3	2								2			2		2

						CO5	Appreciate the frequency domain techniques.	3	2								2			2		2
						CO6	Students will be able to design analog filters.	3		2	1	1					2			2		2
Electronic Devices & Circuits Lab	BECES1-305	3	1	30 Hrs.	0 0 2	C01	An ability to understand all types of electronics devices and circuits	2	2								2			2	3	2
						CO2	An ability to conduct experiments, as well as to analyze and interpret various data sheets.		2	2	2	3				3	2		2	2	3	2
Digital Electronic Circuits & Design Lab	BECES1-306	3	1	30 Hrs.	0 0 2	C01	An ability to test and verify working and truth tables of combinational and sequential circuits.		2	2	1	1				1	2		2	2	1	2
						CO2	Working knowledge of different converters.	3		2	1	1				1	2		2	2	1	2
						CO3	To perform multiplexer and demultiplexer.			2	1	1				1	2		2	2	1	2
Mathematics-III	BMATH3-301	3	4	60 Hrs.	3 1 0	C01	Apply the concept of fourier series and transformation to solve practical problems in physics and various areas of mathematics	2	1		2	2								2	2	1
						CO2	Apply a range of techniques to solve first & second order partial differential equations.	2	1		1	1								1	1	1
						CO3	Model physical phenomena using partial differential equations such as the heat and wave equations.	3	1		2	2								2	2	2
						CO4	To understand concepts of partial order relations, Boolean algebra, Lattices and to show logical equivalences by using truth tables and rules in logics	2	2		2	1	1				1		1	1	2	1
Training-I	BECES1-307	3	4	-	-	C01	Students should know various tools available in the field of ECE	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

						CO2	Gain knowledge & skills for usage of tools/ trainers.	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3
						CO3	Design simple analog/digital circuits	3	3	3	3	3		3		2	3	2	2	3	3	2
Analog and Digital Communication	BECES1-401	4	4	60 Hrs.	3 1 0	CO1	Analyze and compare different analog modulation schemes for their efficiency and bandwidth.		2	2	1	1					2		2	2		2
						CO2	Analyze the behavior of a communication system in presence of noise.		2	2	1	1					2		2	2		2
						CO3	Investigate pulsed modulation system and analyze their system performance.	3	2	2	1	1					2		2	2		2
						CO4	Analyze different digital modulation schemes and can compute the bit error performance		2	2	1	1					2		2	2		2
Analog Electronic Circuits	BECES1-402	4	4	60 Hrs.	3 1 0	CO1	Understand the characteristics of diodes and transistors	3	2								2		2	2		2
						CO2	Design and analyze various rectifier and amplifier circuits		2	2	2						2		2	2		2
						CO3	Design sinusoidal and non-sinusoidal oscillators		2	2	2						2		2	2		2
						CO4	Understand the functioning of OP-AMP and design OP-AMP based circuits	3	2	2	2						2		2	2		2
						CO5	Design ADC and DAC		2	2	2						2		2	2		2
Electromagnetic Theory & Applications	BECES1-403	4	4	60 Hrs.	3 1 0	CO1	Examine the phenomena of wave propagation in different media and its interfaces and in applications of microwave engineering.	3	2	2	1						2		2	2		2
						CO2	Understand the concepts of magnetic field and magnetic field intensity.	3	2								2		2	2		2

						CO3	Analyze Maxwell's equation in different forms (differential and integral) and apply them to diverse engineering problems.		2	2	1						2		2	2		2
						CO4	Understand transmission lines and use of smith chart in electromagnetic engineering problems.	3	2	2	1	1					2		2	2		2
Analog and Digital Communication Lab	BECES1-404	4	1	30 Hrs.	0 0 2	C01	An ability to perform transmission of signals from transmitter to receiver using various modulation and demodulation techniques.	2	2	2	2	3				3	2		2		1	2
						CO2	Design and implement base band transmission schemes.		2	2	2	3				3	2		2		1	2
						CO3	Design and implement band pass signaling schemes.		2	2	2	3				3	2		2		1	2
						CO4	Understand basic blocks of communication using MATLAB									3	2		2		1	2
Analog Electronic Circuits Lab	BECES1-405	4	1	30 Hrs.	0 0 2	C01	An ability to understand different types of electronics devices and circuits	3	2	2	2	3				3	2		2	2	3	2
						CO2	An ability to design and conduct experiments, as well as to analyse and interpret output.	3	2	2	2	3				3	2		2	2	3	2
Engineering Mechanics	BMECE0-001	4	4	60 Hrs.	3 1 0	C01	Students shall be able to understand problems related to Mechanics	1	1					2		1	1			2	1	
						CO2	Shall be able to apply this knowledge to find solution of engineering problems			2								2		2	1	
						CO3	This will make student learning life long	3	3	1					2	3	3	1		2	1	
						CO4	Students can use knowledge in new areas													2	1	
Microprocessors & Microcontrollers	BECES1-501	5	4	60 Hrs.	3 1 0	C01	To learn architecture of microprocessors 8085 & 8086 and microcontroller 8051.	3	2								2		2	2		2

						CO2	To understand interfacing of microprocessor 8085 with memory and peripheral devices.	3	2			1					2		2	2		2
						CO3	To write assembly language programs for 8 bit microprocessors and microcontrollers.	3	2	2	2	1					2		2	2		2
						CO4	To apply and implement the interfacing and programming techniques of microprocessors and microcontrollers in various practical problems/projects.	3	2	2	2	1				1	2	1	2	2		2
Information Theory and Coding	BECES1-502	5	4	60 Hrs.	3 1 0	CO1	Explain measure of information and entropy.	3	2	2	2	1					2		2	2		2
						CO2	Model the continuous and discrete communication channels.	3				1					2		2	2		2
						CO3	Describe the encoding and decoding for various codes	3	2								2		2	2		2
Control Systems & Applications	BECES1-503	5	4	60 Hrs.	3 1 0	CO1	Perform time domain and frequency domain analysis of control systems required for stability analysis.	3	2								2		2	2		2
						CO2	Determine and use models of physical systems in forms suitable for use in the analysis and design of control systems.	3	2	2	2	1					2		2	2		2
						CO3	Express and solve system equations in state-variable form (state variable models).	3	2	2	2						2		2	2		2
						CO4	Determine the (absolute) stability of a closed-loop control system	3	2	2	2						2		2	2		2
						CO5	Apply root-locus technique to analyze and design control systems.	3	2	2	2	1					2		2	2		2
Control Systems Lab	BECES1-504	5	1	30 Hrs.	0 0 2	CO1	Perform time domain and frequency domain analysis of control systems required for stability analysis.	2	2	2	2					3	2		2			

						CO2	Apply root-locus technique to analyze and design control systems.	2	2	2	2					3	2		2			
						CO3	Use servomotor and potentiometers for various control system applications.	2	2	2	2					3	2		2			
Microprocessors & Microcontrollers Lab	BECES1-505	5	1	30 Hrs.	0 0 2	CO1	Interface different I/Os with processor.	2	2	2	2	3				3	2		2		1	2
						CO2	Execute various assembling language programs in 8085/8051.	2	2	2	2	3				3	2		2		1	2
						CO3	Write programs for 8051 micro controller kit	2	2	2	2	3				3	2		2		1	2
						CO4	Understand programs for speed control of stepper motor and DC motor.	2	2	2	2	3		2		3	2		2		1	2
Training-II	BECES1-506	5	4	-	-	CO1	To justify acquired engineering knowledge with real industrial environment.	3	3					3		3	3		3	3	3	2
						CO2	Exposure to advanced tools, techniques and engineering practices in the industry.	3	3	3		3		2		3	3	3	2	3	2	3
						CO3	Exposure to general work place behavior, professional ethics and to build interpersonal and team skills.	3					3	3	3	3	3	3	3	2	3	3
						CO4	To prepare and present professional work, reports and presentations etc.	3				3			3		3	3	3	3	2	3
Antenna and Wave Propagation	BECES1-511	5	4	45 Hrs.	3 0 0	CO1	Understand the properties and various types of antennas.	3	2								2		2	2		2
						CO2	Describe the radiation from a current element.	3	2								2		2	2		2
						CO3	Analyze the properties of different types of antennas and their design.	3	2	2	1						2		2	2		2
						CO4	Analyze the antenna arrays, aperture antennas and smart antennas.	3	2	2	1						2		2	2		2

						CO5	Describe the different modes of wave propagation.	3	2								2		2	2		2
VHDL Design	BECES1-512	5	4	45 Hrs.	3 0 0	CO1	Understand the hardware description language	3	2	2	1	1					2		2	2		2
						CO2	Model and design digital logic systems using VHDL.	3	2	2	1	1					2		2	2		2
						CO3	Design of digital systems using ROMs, PALs, PLDs, etc.	3	2	2	1	1					2		2	2		2
						CO4	Design and model dedicated and general-purpose microprocessor using VHDL	3	2	2	1	1					2		2	2		2
Computer Architecture	BECES1-513	5	4	45 Hrs.	3 0 0	CO1	Define the basic structure of a computer	3	2	2	1	1	1				2		2	2		2
						CO2	Explain the principles of functional blocks of a computer	3	2				1				2		2	2		2
						CO3	Analyze the performance of computers	3	2	2			1				2		2	2		2
						CO4	Apply the knowledge to design a hypothetical computer	3	2	2	1	1	1				2		2	2		2
Industrial Automation	BECES1-514	5	4	45 Hrs.	3 0 0	CO1	Understand various industrial automation components and control systems.	3	2								2		2	2		2
						CO2	Explain architecture of industrial automation system.	3	2								2		2	2		2
						CO3	Use Internet of Things for industrial automation.	3	2	2	1	1					2		2	2		2
						CO4	Understand Programmable logic controllers, PLC programming, Advantage of using PLC for Industrial purposes.	3	2	2	1	1	1				2		2	2		2
						CO5	Describe the overview of Industrial automation using robots.	3	2								2		2	2		2

Digital Signal Processing	BECES1-601	6	4	60 Hrs.	3 1 0	CO1	Represent signals mathematically in continuous and discrete time and frequency domain.	3	2								2		2	2	1	2
						CO2	Obtain the response of LSI systems to various signals.	3	2		1						2		2	2	1	2
						CO3	Apply DFT for the analysis of digital signals & systems.	3	2	2	1	1					2		2	2	1	2
						CO4	Implementation of LSI systems.	3	2	2	1	1					2		2	2	1	2
						CO5	Design IIR and FIR filters for various signal processing applications.	3	2	2	1	1					2		2	2	1	2
Computer Communication Networks	BECES1-602	6	4	60 Hrs.	3 1 0	CO1	Describe the architecture of computer and wireless communication networks	3									2		2	2		2
						CO2	Compare OSI reference model and TCP/IP protocol suite.	3	2								2		2	2		2
						CO3	Classify computer and communication networks and associated standards	3	2	2	1						2		2	2		2
						CO4	Acquire knowledge about wireless cellular communication with different technologies.	3				1					2		2	2		2
						CO5	Compare wireless networks on the basis of technologies, architecture and applications	3	2	2	1	1					2		2	2		2
						CO6	Assess the performance of a cellular network in terms of its coverage and capacity	3	2	2	1	1					2		2	2		2
						CO7	Apply knowledge in understanding working of various emerging network technologies	3	2	2	1	1					2		2	2		2
Digital Signal Processing Lab	BECES1-603	6	1	30 Hrs.	0 0 2	CO1	Understand the handling of discrete signals using MATLAB platform.	2	2	2		3				3	2		2	2	3	2
						CO2	Understand the basic operations of digital signal processing.	2	2							3	2		2	2	3	2

						CO3	Design IIR and FIR filters for low pass and high pass applications.	2	2	2	2	3				3	2		2	2	3	2
Computer Communication Networks Lab	BECES1-604	6	1	30 Hrs.	0 0 2	CO1	Identify the different types of network devices and their functions within a network	2	2							3	2		2	2	3	2
						CO2	Compare different network topologies		2	2		3				3	2		2	2	3	2
						CO3	Familiarity with the basic protocols of computer networks 4.	2	2	2	2					3	2		2	2	3	2
						CO4	Acquire the ability to setup and configure LAN/WLAN.	2	2	2	2					3	2		2	2	3	2
						CO5	Analyze the simulated performance of different protocols.	2	2	2	2	3				3	2		2	2	3	2
Electronic Measurement	BECES1-605	6	1	30 Hrs.	0 0 2	CO1	Design and validate DC and AC bridges	3	2	2	1	1				1	2		2	2	1	2
						CO2	Analyze the dynamic response and the calibration of few instruments.	3	2	2	1	1				1	2		2	2	1	2
						CO3	Learn about various measurement devices, their characteristics, their operation and their limitations.	3	2		1					1	2		2	2	1	2
						CO4	Understand data acquisition.	3	2		1					1	2		2	2	1	2
Mini Project/Electronic Design Workshop	BECES1-606	6	2	-	0 0 4	CO1	Perform electronics projects as an individual or as an team member	3	3				3	3	2	3	2	2	3	3		3
						CO2	Use literature to identify the engineering problems and its applications.	3	3				2		2		2		3	3		
						CO3	Explore the suitable methods to solve the basic engineering problems and justifying engineering ethics considering conservation of eco-system.	3	3	3	3	3		2		3	3	3	3	3	3	

						CO4	To develop the skills for report writing and presentation.	3							3		3			3	3	2
Microwave Theory and Techniques	BECES1-611	6	3	45 Hrs.	3 0 0	CO1	Understand various microwave system components and their properties.	3	2		2					1	2		2	2	1	2
						CO2	Analyze microwave circuits using scattering parameters.	3	2		2					1	2		2	2	1	2
						CO3	Analyze various antenna parameters and different kinds of antennas.	3	2		2					1	2		2	2	1	2
						CO4	Understand different microwave systems.	3	2							1	2		2	2	1	2
Power Electronics	BECES1-612	6	3	45 Hrs.	3 0 0	CO1	Build and test circuits using power devices such as SCR.	3	2	2						2	2		2	2	2	2
						CO2	Analyze and design controlled rectifier, DC to DC converters, DC to AC inverters.	3	2	2	1	1				2	2		2	2	2	2
						CO3	Learn how to analyze these inverters and some basic applications.	3	2	2	1					2	2		2	2	2	2
						CO4	Apply power electronics technology to design SMPS	3	2	2	1	1	1	1		2	2		2	2	2	2
Embedded Systems	BECES1-613	6	3	45 Hrs.	3 0 0	CO1	Build design approach using advanced controllers to real-life situations.	3	2	2	2	1		1		1	2		2	2	1	2
						CO2	Design interfacing of the systems with other data handling/processing systems.	3	2	2	2	1		1		1	2		2	2	1	2
						CO3	Appreciate engineering constraints like energy dissipation, data exchange speeds etc.	3	2							1	2		2	2	1	2
Fundamentals of Management for Engineers	BHSMC0-014	6	3	45 Hrs.	3 0 0	CO1	Recognize the role of a manager and how it relates to the organization's mission.	2	1											3		3
						CO2	Define management, its four basic functions and skills.		2										2	3	1	3

						CO3	Know critical management theories and philosophies and how to apply them.	1		2	2		2								3		3
						CO4	Recognize the concept of social responsiveness and its benefits.							3					2	3		3
						CO5	Explain the relationship between strategic, tactical, and operational plans	1			2									2		
Fiber Optic Communications	BECES1-711	7	3	45 Hrs.	3 0 0	CO1	Understand the principles of fiber optic communication and the bandwidth advantages.	3	2								2		2	2		2
						CO2	Understand the properties of the optical fibers and optical components.	3	2								2		2	2		2
						CO3	Understand the operation of lasers, LEDs, and detectors.	3	2								2		2	2		2
						CO4	Design Fiber optic link and understand non-linear effects in optical fibers.	3	2	2	2	1					2		2	2		2
Mobile Communication and Networks	BECES1-712	7	3	45 Hrs.	3 0 0	CO1	Understand the working principles of the mobile communication systems.	3	2								2		2	2		2
						CO2	Understand the relation between the user features and underlying technology.	3	2								2		2	2		2
						CO3	Analyze mobile communication systems for improves performance.	3	2		2						2		2	2		2
Parallel Processing	BECES1-721	7	3	45 Hrs.	3 0 0	CO1	Understand the need and applications of parallel processing.	3	2	2	2								2	2		2
						CO2	Explain terminologies used for parallel computation.	3	2	2		1					2		2	2		2
						CO3	Describe software and hardware related issues and challenges of parallel processing	3	2	2	2	1							2	2	1	2
						CO4	Differentiate among the popular parallel computing architectures.	3	2		2								2	2		2

Scientific Computing	BECES1-722	7	3	45 Hrs.	3 0 0	CO1	Understand the basic concepts of scientific computing.	3									2		2	2		2
						CO2	Demonstrate the knowledge of scientific applications of computer programs.	3	2	2	2	1					2		2	2		2
						CO3	Understand simple mathematical models and scientific problems and implement a solution in an adequate scientific programming language.	3	2	2	2	1					2		2	2		2
Neural Network & Fuzzy Logic	BECES1-723	7	3	45 Hrs.	3 0 0	CO1	To design different types of ANNs for variety of applications.	3	2	2	2	1					2		2			2
						CO2	To apply ANN to various real world applications.	3	2	2	2	1					2		2			2
						CO3	To learn Fuzzy Algebra and design fuzzy inference systems.	3	2	2	2	1					2		2			2
						CO4	To design and apply Neuro-fuzzy and genetic algorithms for different applications.	3	2	2	2	1					2		2			2
VLSI Technology	BECES1-731	7	3	45 Hrs.	3 0 0	CO1	Demonstrate an understanding of the processes involved in IC fabrication.	3	2								2		2	2	1	2
						CO2	Understand the assembly and packaging of ICs and their significance.	3	2								2		2	2	1	2
						CO3	Understand the design procedural sequence of various processes for IC fabrication of CMOS and bipolar devices	2	2	2	2	1					2		2	2	1	2
						CO4	To learn the concepts of designing VLSI Subsystems	2	2	2	2						2		2	2	1	2
CMOS Design	BECES1-732	7	3	45 Hrs.	3 0 0	CO1	Understand the operation of MOS devices.	3	2								2			2	1	2

						CO2	Design different CMOS circuits using various logic families along with their circuit layout.	3	2	2	2	1					2			2	1	2
						CO3	Design different CMOS combinational and sequential circuits.	3	2	2	2	1					2			2	1	2
High Speed Electronics	BECES1-733	7	3	45 Hrs.	3 0 0	C01	Understand significance and the areas of application of high-speed electronics circuits.	3	2								2		2	2		2
						CO2	Understand the properties of various components used in high-speed electronics.	3	2								2		2	2		2
						CO3	Design High-speed electronic system using appropriate components.	3	2	2	2	1					2		2	2		2
Project Stage-I	BECES1-701	7	2	45 Hrs.	0 0 4	C01	Perform multi-disciplinary task/project as an individual or as an team member	3	3				3	3	2	3	2	2	3	3		3
						CO2	Use literature to identify the latest engineering problem and it scope in real time applications.	3	3				2		2		2		3	3		
						CO3	Apply the suitable methods and material to solve the identified engineering problem justifying engineering ethics and conservation of eco-system.	3	3	3	3	3		2		3	3	3	3	3	3	
						CO4	Represent the engineering activities undertaken with the effective report writing and presentation.	3							3		3			3	3	2
						CO5	Perform multi-disciplinary task/project as an individual or as an team member	3	3				3	3	2	3	2	2	3	3		3
Environmental Science (MC)	BMNCC0-102	7	-	30 Hrs.	2 0 0	C01	Technologies based on ecological principles and environmental regulations, which in turn helps in sustainable development.	-	-	3	-	-	2	3	-	-	-	-	-	3	-	-
						CO2	Conceptualize the processes and various factors involved	1	-	-	3	-	-	-	-	-	-	-	-	-	-	2

							in the formation of environment.															
						CO3	Recognize the importance of environment and the sustainable natural resources.	-	-	-	-	-	-	3	-	-	-	-	-	-	-	2
						CO4	Use scientific reasoning to identify and understand environment problems and evaluate potential solution.	3	3	3	-	-	-	-	-	-	-	-	-	3	-	-
						CO5	Identify the impacts of human activities on environment and role of society in these impacts.	-	-	-	-	-	-	-	-	3	-	-	2	-	2	2
Training-III	BECES1-702	7	4	-	-	C01	To justify acquired engineering knowledge with real industrial environment.	3	3					3		3	3		3	3	3	2
						CO2	Exposure to advanced tools, techniques and engineering practices in the industry.	3	3	3		3		2		3	3	3	2	3	2	3
						CO3	Exposure to general work place behavior, professional ethics and to build interpersonal and team skills.	3					3	3	3	3	3	3	3	2	3	3
						CO4	To prepare and present professional work, reports and presentations etc.	3				3			3		3	3	3	3	2	3
Wireless Sensor Networks	BECES1-811	8	3	45 Hrs.	3 0 0	C01	Design wireless sensor networks for a given application	3	2	2	2	1					2		2	2		2
						CO2	Understand emerging research areas in the field of sensor networks	3	2			1					2		2	2		2
						CO3	Understand MAC protocols used for different communication standards used in WSN	3	2								2		2	2		2
						CO4	Explore new protocols for WSN	3	2		2						2		2	2		2
Satellite Communication	BECES1-812	8	3	45 Hrs.	3 0 0	C01	Visualize the architecture of satellite systems as a means of	3	2								2		2	2		2

							high speed, high range communication system.															
						CO2	Understand link design for satellite communication.	3	2	2	2	1					2		2	2		2
						CO3	Understand and utilize the basic approaches for multiple access techniques.	3	2	2	2	1					2		2	2		2
						CO4	Solve numerical problems related to orbital motion and design of link budget for the given parameters and conditions.	3	2	2	2	1					2		2	2		2
Error Correction Coding	BECES1-813	8	3	45 Hrs.	3 0 0	CO1	Understand fundamentals of channel coding schemes and their application areas	3	2								2		2	2		2
						CO2	Define the sources of error in digital communication	3									2		2	2		2
						CO3	Explain the fundamental limits to achieve the Shannon's Channel Capacity	3	2	2	2						2		2	2		2
						CO4	Describe the importance and principle of ECC in data communication and storage.	3	2								2		2	2		2
						CO5	Demonstrate an ability to compare and contrast strengths and weaknesses of various ECC	3	2	2	2						2		2	2		2
						CO6	Develop and model different ECC for appraise of reaching data rate to Shannon limit.	3	2	2	2	1					2		2	2		2
						CO7	Apply the mathematical ideas to design well known ECC	3	2	2	2	1					2		2	2		2
						CO8	Demonstrate competence in analyzing and evaluating different ECC	3	2	2	2	1					2		2	2		2
Machine Learning	BECES1-821	8	3	45 Hrs.	3 0 0	CO1	Understand the concept of data processing.	3	2								2		2	2		2
						CO2	Understand the concepts of supervised and unsupervised learning.	3									2		2	2		2

						CO3	Understand the concept of classification	3	2								2		2	2		2
Data Mining & Big Data	BECES1-822	8	3	45 Hrs.	3 0 0	C01	Develop algorithms for finding patterns in large data sets.	3	2	2	2	1					2		2	2		2
						CO2	Apply novel cutting-edge techniques to applications of Big Data Computing in industry.	3	2	2	2	1					2		2	2		2
						CO3	Analyze various frameworks and large-scale data storage technologies.	3	2	2	2	1					2		2	2		2
						CO4	Apply Data Mining concepts to real life problems.		2	2	2	2					2		2	2		2
Artificial Intelligence	BECES1-823	8	3	45 Hrs.	3 0 0	C01	Apply the concepts of knowledge representation, planning and reasoning for real world applications.	3	2	2	2	1					2		2	2		2
						CO2	Apply AI techniques to solve complex problems of Industry using machine learning.	3	2	2	2	1					2		2	2		2
						CO3	Apply AI techniques to solve problems in Image Processing and NLP.	3	2	2	2	1					2		2	2		2
						CO4	Learn to use AI with complete Ethics and Follow legal considerations.	3					1		2		2		2	2		2
Internet of Things	BECES1-824	8	3	45 Hrs.	3 0 0	C01	Explore the interconnection and integration of the physical world and the cyber space.	3	2	2	2	1					2		2	2		2
						CO2	Develop skills to build machine to machine communication.	3	2	2	2	1					2		2	2		2
						CO3	Design and develop of IoT Devices.	3	2	2	2	1					2		2	2		2
						CO4	Identify how IoT differs from traditional data collection systems.	3	2	2	2	1					2		2	2		2
Project Stage-II	BECES1-801	8	5	-	0 0 10	C01	Perform multi-disciplinary task/project as an individual or as an team member	3	3				3	3	2	3	2	2	3	3		3

						CO2	Use literature to identify the latest engineering problem and it scope in real time applications.	3	3				2		2		2		3	3		
						CO3	Design the suitable methods and material to solve the identified engineering problem justifying engineering ethics and conservation of eco-system.	3	3	3	3	3		2		3	3	3	3	3	3	3	
						CO4	Represent the engineering activities undertaken with the effective report writing and presentation.	3							3		3			3	3	3	2
Essence of Indian Knowledge Tradition (MC)	BMNCC0-006	8	-	30 Hrs.	2 0 0	CO1	Understand philosophy of Indian culture.	2					2	1	2	2			3			2
						CO2	Distinguish the Indian languages and literature among difference traditions.	2	2				2	1	2	2			3			2
						CO3	Learn the philosophy of ancient, medieval and modern India.	2	2				2	1	2	2			3			2
						CO4	Acquire the information about the fine arts in India.	2	2				2	1	2	2			3			2
						CO5	Know the contribution of scientists of different eras.	2	2				2	1	2	2			3			2
						CO6	The essence of Yogic Science for Inclusiveness of society.	2	2				2	1	2	2			3			2
Project Management and Entrepreneurship	BHSMC0-024	8	3	45 Hrs.	3 0 0	CO1	Understand project characteristics and various stages of a project.	2							2					3	3	
						CO2	Analyze the learning and understand techniques for Project planning, scheduling and Execution Control.					2							2	3	3	
						CO3	Know the parameters to assess opportunities and constraints for new business ideas.	1					2							3	3	2
						CO4	Understand the systematic process to select and screen a business idea	1							1			3	2	3	3	2

						CO5	Understand various funding opportunities available for start-up and new ventures										1		3	3	1	3

Enter Correction levels 1, 2 or 3 as defined below:

1. Slight (Low) - upto 30% 2. Moderate (Medium) – above 30% and upto70% 3. Substantial (High) – above 70%