



(AUTONOMOUS)
NAAC "A" GRADE

SYLLABUS FOR B.E ECE

Batch 2023

Semester 1

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
1	BSC-101	Engineering Mathematics-I	BSC	5	4	1	0	50	100	150
2	BSC-102	Engineering Physics	BSC	5	4	1	0	50	100	150
3	COM-101	Introduction to C Programming	ESC	5	4	1	0	50	100	150
4	HSMC-101	Design Thinking	HSMC	3	3	0	0	50	100	150
5	BSC-112	Engineering Physics Lab	BSC	1	0	0	2	50	0	50
6	COM-111	C Programming Lab	ESC	2	0	0	4	50	0	50
7	ESC -112	Electrical and Electronics Workshop	ESC	1	0	0	2	50	0	50
8	NCC-101	Induction Training	NCC	0	0	0	3	-	-	S/NS*
9	MCC-102	Indian Constitution	MCC	1	0	0	2	50	-	50
Total				23	31					800

*Note: S=Satisfactory, NS=Not Satisfactory, MCC=Mandatory Credit Course

Semester 2

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
1	BSC-201	Engineering Mathematics-II	BSC	5	3	2	0	50	100	150
2	ECE-201	Basic Electrical and Electronics Engineering	PCC	4	3	1	0	50	100	150
3	ESC-202	Introduction to Programming with Python	ESC	4	3	1	0	50	100	150
4	HSMC-201	Technical Communication	HSMC	3	2	1	0	50	100	150
5	ECE-211	Basic Electrical and Electronics Engineering Lab	PCC	1	0	0	2	50	0	50
6	ESC-212	Python Programming Lab	ESC	2	0	0	4	50	0	50
7	COM-212	Business Process Automation with RPA Lab	ESC	2	0	0	4	50	0	50
8	NCC-201	Environment & Sustainability	NCC	0	2	0	0	-	-	S/NS*
Total				21	28					750

Note*: S=Satisfactory, NS=Not Satisfactory

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Total Marks
1	ECE-304	Professional Industrial Training/Internship	Summer Internship	3	0	0	0	100

*Note: Students are required to complete the professional industrial training / internship during summer semester breaks.

Semester 3

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks			
								Sessional	Final Exam	Total	
1	ECE-301	Electronic Devices and Circuits	PCC	4	3	1	0	50	100	150	
2	BSC-302	Mathematics-III	BSC	5	4	1	0	50	100	150	
3	ECE-302	Digital Electronics	PCC	4	3	1	0	50	100	150	
4	ECE-303	Network Analysis and Synthesis	PCC	4	3	1	0	50	100	150	
5	ECE-311	Electronic Devices and Circuits Lab	PCC	1	0	0	2	50	0	50	
6	ECE-312	Digital Electronics Lab	PCC	2	0	0	4	50	0	50	
7	ECE-313	Electronic Measurement and Instrumentation Lab	PCC	1	0	0	2	50	0	50	
8	HSMC-312	Placement Overview and Career Planning	HSMC	2	0	0	4	50	0	50	
9	MNC-XXXX	MOOC*	NCC	0	0	0	0	-	-	S/NS*	
Total				26*	29						900

*Note: MOOCs List is to be prepared by the department level committee.

S=Satisfactory, NS=Not Satisfactory

Summer Internship Credits/Marks are also added in this semester's marks sheet.

Minor Degree Course

Course Code	Specialization Track	Course Type	Cd	L	T	P	Mark		
							Mid-Semester	End-Semester	Total
MDC-AI/CS/CC/IoT/DS-301	Artificial Intelligence and Machine Learning Cyber Security IoT Data Science Cloud Computing	MOOC	5	5	0	0	25	125	150

*Note: Student can enrol in only one course from chosen Minor Degree Course. Total Marks is 150 for any one of the chosen courses in the Hons. / Minor Degree Course.

Semester 4

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
1	ECE-401	Microcontroller and Applications	PCC	4	3	1	0	50	100	150
2	ECE-402	Analog and Digital Communication	PCC	4	3	1	0	50	100	150
3	ECE-403	Automation with PLC and SCADA	ESC	4	3	1	0	50	100	150
4	HSMC-401	Entrepreneurship and Business Strategies	HSMC	3	3	0	0	50	100	150
5	ECE-411	Microcontroller Lab	PCC	1	0	0	2	50	0	50
6	ECE-412	Analog and Digital Communication Lab	PCC	1	0	0	2	50	0	50
7	ECE-413	Automation with PLC and SCADA Lab	ESC	2	0	0	4	50	0	50
8	HSMC-412	Corporate Etiquette and Personality Development	HSMC	2	0	0	4	50	0	50
Total				21	27					800

Minor Degree Course

Course Code	Specialization Track	Course Type	Cd	L	T	P	Marks		
							Mid-Semester	End-Semester	Total
MDC- AI/CS/CC/IoT / DS-401	Artificial Intelligence and Machine Learning Cyber Security IoT Data Science Cloud Computing	MOOC	5	5	0	0	25	125	150

***Note:** Student can enrol in only one course from chosen Minor Degree Course. Total Marks is 150 for any one of the chosen courses in the Hons. / Minor Degree Course.

Semester 1

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
1	BSC-101	Engineering Mathematics-I	BSC	5	4	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to	
CO1	Apply the knowledge of calculus to plot graphs of functions and solve the problem of maxima and minima.
CO2	Determine the convergence/divergence of infinite series, approximation of functions using power and Taylor's series expansion and error estimation.
CO3	Apply the concept of definite integrals to calculate area under the curves.
CO4	Understand and apply the concepts of matrices
CO5	Demonstrate knowledge of vector space by solving associated problems

Detailed Syllabus**Section-A**

Unit 1: Differential Calculus I: Leibnitz theorem (without proof), Partial differentiation, Euler's theorem on homogeneous functions, Asymptotes, Double points, curvature, Curve tracing in Cartesian, polar and parametric forms.

(11 Hrs)

Unit 2: Differential Calculus II: Rolle's Theorem, Mean value Theorem, Taylor's and Maclaurin's series with remainder, indeterminate forms, Taylor series in two variables, Maxima and Minima of functions of two variables, method of Lagrange's multipliers.

(11 Hrs)

Unit 3: Integral Calculus: Definite integrals with important properties, differentiation under the integral sign, Gamma, Beta and error functions with simple problems, applications of definite integrals to find length, area, volume and surface area of revolutions, transformation of coordinates, double and triple integrals with simple problems.

(10 Hrs)**Section-B**

Unit 4: Matrices- Matrices, vectors: addition and scalar multiplication, matrix multiplication, Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

(15 Hrs)

Unit 5: Vector Space, linear dependence of vectors, basis, dimension, Linear transformations, range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem, composition of linear maps, Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal matrices, eigenbases.

(10 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Engineering Mathematics	B.S. Grewal	Khanna Publications, New Delhi	44 th (2018)
2	Calculus and Analytic Geometry	Thomas and Finney	Addison Wesley, Narosa.	1 st (2010)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Advanced Engineering Mathematics	V. P. Mishra, Jyoti Sharma, Pratibha Mishra	Bhavya Books	2 nd (2019)
2	Integral Calculus	S. Narayan	S. Chand, New Delhi	35 th (2005)
3	Engineering Mathematics	N.P Bali	Laxmi Publications	13 th (2016)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
2	BSC-102	Engineering Physics	BSC	5	4	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to	
CO1	Use Maxwell's equations to describe propagation of electromagnetic waves in a medium.
CO2	Use the concept of wave function to find the probability of a particle confined in a box.
CO3	Explain the basic properties of semiconductors including the band gap, charge carrier concentration, doping and charge carrier injection/excitation
CO4	Understand the concept of interference, diffraction and polarization of light
CO5	Understand and Articulate the working principle of lasers and optical fiber

Detailed Syllabus**Section A**

Unit 1: Electromagnetic Fields and Waves: Concepts of Del Operator, Gradient, divergence, Curl, Displacement Current. Maxwell's equations in vacuum and non-conducting medium, Electromagnetic wave propagation in free space (EM wave equations for electric and magnetic fields for free space) and their solutions (plane wave solution), Velocity of electromagnetic waves.

(10 Hrs)

Unit 2: Inadequacies of Classical Mechanics, de-Broglie's concept of matter waves, Wave-packet (Wave-group), Phase and Group velocity, Heisenberg's uncertainty Principle, Experimental illustration of Uncertainty principle using single slit. Wave function: Definition, Interpretation and its significance, Schrodinger's Wave equation (Steady state and time dependent) for one dimension case, Concept of Operators and expectation Values, Applications of Schrodinger's equation (Time Independent) to: a) Particle in a One Dimensional Box of infinite height, b) Single Step Potential Barrier.

(16 Hrs)

Unit 3: Semiconductor Physics: Structure of Atoms, Energy Band diagram, Metal, Insulator and Semiconductor, Intrinsic and extrinsic semiconductors, Direct and Indirect semiconductor. Bond in semiconductor and effect of temperature on semiconductors, Hole and electron description, charge densities in semiconductor, Generation and Recombination of charge carrier, Law of mobility and conductivity, current densities in semiconductors, Fermi levels, Mass action law, Drift and Diffusion currents.

(12 Hrs)**Section B**

Unit 4: Applied Optics: Interference in thin films (by reflection and transmission of light), Theory of Newton's rings by reflected light, Determination of wavelength and refractive index of monochromatic light by Newton's rings theory, Fraunhofer and Fresnel's diffractions, Fresnel's half period zones and rectilinear propagation of light, Fraunhofer diffraction due to a single slit, Plane diffraction grating and its theory for secondary maxima and minima, Unpolarised and polarized light, Double refraction phenomenon, Nicol Prism, Mathematical representation of elliptically and circularly polarized light, Quarter and Half wave plates, Numerical problems.

(15 Hrs)

Unit 5: Principal of Laser action, Einstein's coefficients, Ruby Lasers, Propagation of Light in Optical fibres, Acceptance angle and acceptance cone, Numerical Aperture, Single mode and Multimode fibres, Characteristics and General applications of Lasers and Optical fibres, Numerical problems.

(5 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Fundamentals of Physics	Robert Resnick Jearl Walker, David Halliday	Wiley	10 th (2015)
2	Concepts of Modern Physics	Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury	McGraw Hill Education	7 th (2017)
3	Integrated Electronics	Jacob Millman	McGraw Hill Education	2 nd (2009)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Engineering Physics	H. K. Malik and A. K. Singh	McGraw Hill Education	2 nd (2017)
2	Engineering Physics	S. Sharma and J. Sharma	Pearson India	1 st (2018)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
3	COM-101	Introduction to C Programming	ESC	5	4	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Demonstrate an understanding of the overall syntax and semantics of C programs by writing programs for given specifications.
CO2	Apply techniques of structured (functional) decomposition to decompose problems and a program solution into smaller pieces.
CO3	Design and implement code that includes the reuse of both existing code and calling functions in the C standard libraries.
CO4	Debug and test programs to determine that the program performs as expected.
CO5	Analyze the operations of points, structures and unions and implement file operations in C programming for a given application.

Detailed Syllabus**Section-A**

Unit 1: Introduction to Programming: Evolution of programming languages, Structured Programming, Compilation process, object code, source code, executable code, Operating systems, Fundamentals of algorithms, flow charts and pseudocodes.

(6 Hrs)

Unit 2: Introduction to C: Introduction, Importance of C, Sample C programs, Basic structure of C programs, Executing a C program, Character set, Keywords, Identifiers, Constant and Variables, Data types, Operators, Precedence of operators, Statements, Expressions, Input-output functions.

(8 Hrs)

Unit 3: Control Statements, Storage Classes, Library Functions, Control Structures: Decision making and Branching, Control Structures: Decision making & looping, Storage Classes: Types of storage class, Scoping rules, Standard Library Functions, advantages and their use (I/O functions, String, Character, Mathematics, Time and Date functions).

(12 Hrs)**Section-B**

Unit 4: User-Defined Functions, Arrays, Recursion, Handling of character strings, Structures, Unions, User defined and standard functions, Formal and Actual arguments, Functions category, function prototypes, parameter passing, Call-by-value, Call-by-reference, Nested Functions, Recursion, One dimensional Array, Multidimensional Array declaration and their applications, Passing array to a function, String Manipulation, Declaration of structures, declaration of unions, pointer to structure & unions.

(12 Hrs)

Unit 5: Pointers, Dynamic memory allocation, File management in C, Pointer variable and its importance, Pointer Arithmetic, passing parameters by reference, pointer to pointer, pointer to functions, Dangling pointer, Dynamic memory allocation, Console input output functions, Disk input output functions, opening closing and creating Data files.

(10 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Programming with C	E. Balaguruswamy	McGraw Hill Education	7 th (2017)
2	Programming with C	Byron Gottfried	McGraw Hill Education	4 th (2018)
3	C Programming Language	Brian W. Kernighan, Dennis M. Ritchie	Pearson	2 nd (2015)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	C The Complete Reference	Herbert Schildt	McGraw Hill Education	4 th (2017)
2	C How to Program	Paul J. Deitel	Pearson	8 th (2015)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
4	HSMC-101	Design Thinking	HSMC	3	3	0	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Develop a strong understanding of the Design Process and how it can be applied in a variety of business settings.
CO2	Understand the unique needs of a company around specific challenges.
CO3	Apply design thinking framework and strategies to develop innovative solutions for complex business problems.
CO4	Evaluate the financial viability of a new product or service the „design thinking way“.
CO5	Work in a team to visualize & design a possible new product or service to assess the market, business and technical merits of the concept.

Detailed Syllabus**Section-A**

Unit 1: Design Thinking: Introduction of Design Thinking; Framework - 5 Phase Design; Detailed study - Empathize, Define, Ideate, Prototype, and Test; Case Study; Differentiate with Design Thinking; Design Thinking in the organization.

(6 Hrs)

Unit 2: Define: Frame the design problems, Overview of the define phase, Methods within Define. Prototype: Design the solutions; Overview of the Prototype phase; Methods within Design. Empathize: Discover design problems; Overview of the empathize phase; Define project stakeholders; Methods within empathize.

(8 Hrs)

Unit 3: Ideate: Come up with multiple solutions; Overview of the Ideate phase; Methods within the Ideate phase.

(5 Hrs)**Section-B**

Unit 4: Project Proposal: Project Identification - Developing Business Idea, Preparing Feasibility Report; Project Formulation - Feasibility Analysis Techno - Economic Analysis, Financial Analysis, Profitability Analysis, Social Cost Benefit Meaning; Significance of a business plan, components of a business plan.

(8 Hrs)

Unit 5: Small Scale Industries and policies for entrepreneurship development: Definition of small-scale industries; objectives. Role of SSI in economic Development of India. SSI registration, NOC from pollution Board; Machinery and equipment selection; Schemes and Policies for entrepreneurship development.

(8 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Designing for growth: A design thinking tool kit for managers	Jeanne Liedtka and Tim Ogilvie	Columbia University Press	1 st (2011)
2	The design thinking playbook: Mindful digital transformation of teams, products, services, businesses and ecosystems	Michael Lewrick, Patrick Link, Larry Leifer	Wiley	1 st (2018)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Presumptive design: Design provocations for innovation	Leo Frishberg and Charles Lambdin	Morgan Kaufmann	1 st (2016)
2	Systems thinking: Managing chaos and complexity: A platform for designing business architecture., Chapter Seven: Design Thinking	Jamshid Gharajedaghi	Morgan Kaufmann	3 rd (2011)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
5	BSC-112	Engineering Physics Lab	BSC	1	0	0	2	50	-	50

Course Outcomes:

At the end of the course the student will be able to	
CO1	Apply the concepts of magnetic field to understand the working of electrical vibrators and Faraday's laws.
CO2	Relate the phase variation between current and voltage through inductor, capacitor and resistor in LCR series and parallel circuits.
CO3	Analyze the working of diodes and transistors in different configurations.
CO4	Measure and analyze the intensity variation of light due to interference, diffraction and polarization.
CO5	Examine the basic operation of laser, solar cell and its application i.e. Planck's constant.

List of Activities for Engineering Physics Lab

S. No.	Activities
1	To measure the frequency of A.C. mains using an electrical vibrator.
2	To analyze the variation of EMF with respect to velocity of magnet to verify Faraday's laws.
3	To measure the impedance of LCR circuit.
4	To verify and plot the V-I characteristics of a PN junction diode.
5	To observe the common base/ common emitter characteristics of PNP/NPN transistors.
6	To verify Zener diode characteristics.
7	To determine the dispersive power of a given prism using a spectrometer.
8	To compute the wavelength of monochromatic light using Newton's rings apparatus.
9	To determine the wavelength of sodium light using a plane transmission grating.
10	To determine the specific rotation of sugar/glucose using Laurent's Half shade polarimeter.
11	To evaluate the value of Planck's constant using a photo-cell.
12	To examine the characteristics of a Solar cell.
13	To determine the wavelength of a He-Ne laser.

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
6	COM-111	C Programming Lab	ESC	2	0	0	4	50	-	50

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Demonstrate an understanding of the overall syntax and semantics of C programs by writing small programs from specifications given in class.
CO2	Apply techniques of structured (functional) decomposition to decompose problems and a program solution into smaller pieces.
CO3	Design and implement code that includes the reuse of both existing code and calling functions in the C libraries.
CO4	Debug and test programs in order to determine that the program performs as expected.
CO5	Implement programs that perform operations using derived data types and files.

List of Activities for C Programming Lab

S. No.	Activities
1	<ul style="list-style-type: none"> Familiarization with the Lab Environment. Hello World.
2	<ul style="list-style-type: none"> Arithmetic operations using addition, subtraction, multiplication and remainder operators. Area and Perimeter of Circle, Square and Rectangle. Find Euclidean distance between two points in a plane.
3	<ul style="list-style-type: none"> Number is even or odd. Check whether the alphabet is a vowel or consonant. Area of Circle, Square and Rectangle based on user choice.
4	<ul style="list-style-type: none"> Factorial using for loop. Fibonacci sequence using for loop. Maximum of n numbers using for loop.
5	<ul style="list-style-type: none"> Check if a number is prime or not using a while loop. Calculate sum of digits of a number using while loop. Check no. is Armstrong or not using while loop.
6	<ul style="list-style-type: none"> To find max element and index in the array. Sorting an array using insertion sort. Searching an element in an array using linear search.
7	<ul style="list-style-type: none"> To read and print elements in two dimensional arrays. Program to perform matrix multiplication. To demonstrate the use of various string operations.
8	<ul style="list-style-type: none"> Write a C program to create Simple Calculator using switch case and function for every operation Fibonacci sequence using recursion. Factorial using recursion.
9	<ul style="list-style-type: none"> Swapping of two numbers using call by value and call by reference.
10	<ul style="list-style-type: none"> To demonstrate the use of malloc(), calloc() and free() functions.
11	<ul style="list-style-type: none"> To store the information of student marks using structures and find total marks of individual student To store information of a student using union. Array of structures for student marks for each student and passing it to function for various operations.
12	<ul style="list-style-type: none"> Program to read and write in a file. Program for reading and writing the student marks data to files.

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
7	ESC-112	Electrical and Electronics Workshop	ESC	1	0	0	2	50	-	50

Course Outcomes:

At the end of the course the student will be able to	
CO1	Explain the general safety measures against electric shocks and different methods of earthing.
CO2	Identify the tools used for electrical wiring, wires, cables, batteries, electrical and electronics components and their standard symbols.
CO3	Develop the connection diagram; identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings.
CO4	Use different electronic components, instruments, and practice soldering and de-soldering techniques.
CO5	Work in a team to create basic models on 3D printer.

List of Activities for Electrical and Electronics Workshop

S. No.	Activities
1.	Demonstrate the precautionary steps adopted for the safety against electric shock.
2.	Familiarization of tools, electrical materials, symbols and abbreviations.
3.	Identify different types of cables, wires, switches, relays, fuses, fuse carriers, MCB, ELCB and MCCB with their specifications.
4.	Observe residential house wiring using fuse, switch, indicator, lamp and energy meter and measure energy consumption using single phase energy meter.
5.	Measure earth resistance and cost estimation for wiring of a single story building consisting light and power circuits and also determine earthing resistance electrical equipment.
6.	Practice wiring of light/fan circuit using two way switches. (Staircase wiring).
7.	Study house wiring i.e. batten, cleat, casing-capping and conduit wirings.
8.	Identify different types of batteries with their specifications and understand working of UPS and home inverter.
9.	Familiarize with electronic components, basic electronic instruments and draw the symbols of electronic components.
10.	Familiarization and testing of active and passive components.
11.	Identify different types of resistors and its colour coding, also measure the value of resistor using colour coding and verify it using DMM.
12.	Identify different types of capacitors and inductors and their colour coding schemes.
13.	Assemble electronic components on bread board.
14.	Practice soldering and de-soldering techniques for the given electronic circuit on a general purpose PCB.
15.	Measure the AC signal parameters using cathode ray oscilloscope (CRO) and function generator.
16.	Identify different types of transformers and their specifications.
17.	Familiarize and demonstrate operating functions of DSO and Spectrum Analyzer.
18.	Create basic models with 3-D printer.

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
8	NCC-101	Induction Training	NCC	0	0	0	3	-	-	S/NS*

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Understand the key initiatives undertaken at the Institute and perceive the benefits of enrolling into the program.
CO2	Develop skills to use different ICT tools for working on various activities.
CO3	Plan their technical career by understanding the advanced projects senior students are working upon.
CO4	Explore different MOOC platforms and identify the relevant MOOCs they need to go through during the course of the program.
CO5	Understand and participate in various clubs for different activities in the institution

List of Activities for Induction Training

S. No.	Activities
1	Orientation Session on Institution
2	Address by Director of the Institution
3	Mantra to Success using ICT Tools at MIET: Deep Dive into Official Email Id, Google Drive, Google Classroom & Google Meeting
4	Introduction to Google CS First
5	Personality Development workshop
6	Hands-On session on ERP system
7	Project Showcasing Session: AI, Computer Vision and RPA
8	E-Learning Resources at MIET (MOOC Platforms)
9	PI 360 Training session
10	Student Clubs at MIET (Ureka, Literary)
11	Orientation session on Library
12	Extra-Curricular Activities in College
13	Orientation session on Other Committees (NSS & Cultural)
14	Familiarization to Dept./Branch.
15	Orientation on Mentor Mentee Program

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
9	MCC-102	Indian Constitution	MCC	1	0	0	2	50	-	50

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Understand the emergence, evolution, structure and composition of Indian Constitution.
CO2	Understand and Analyze federalism in the Indian context.
CO3	Understand and Analyze Panchayati Raj institutions as a medium of decentralization and the three organs of the state in the contemporary scenario.
CO4	Understand and Evaluate the Indian Political scenario amidst the emerging challenges.
CO5	Evaluate Indian foreign relations under cold war and post cold war era

Detailed Syllabus**Section-A**

Unit 1: Introduction to Indian Constitution: Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947, Composition of the Constituent Assembly, Functions of the Constituent Assembly, Various Committees of the Constituent Assembly, Enforcement of the Constitution, Indian Constitution and its Salient Features.

(5 Hrs)

Unit 2: The role of B R Ambedkar in the making of the Indian Constitution, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Gandhian Principles, Liberal Principles, Socialistic Principles.

(5 Hrs)

Unit 3: Indian Federalism: Meaning and Definition of Federalism, Structure and Features of Indian Federalism, Difference between Indian and Federation of other states, Difference between federal and unitary features, Critical Evaluation of the Indian Federal System, Decentralisation of Powers, Centre-State Relations, 73rd Amendment, Panchayati Raj Institutions.

(5 Hrs)

Unit 4: Union Government: Powers of Indian Parliament, Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister.

(5 Hrs)

Unit 5: India's External Relations - Cold War and Post-Cold War era: What is Foreign Policy? Basic Determinants of Foreign Policy, Indian and its Neighbours, India's Extended Neighbourhood in West Asia and South-East Asia, India's relations with the United States and Russia, India and the World Organisations, India in the 21st century.

(5 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Working of a Democratic Constitution of India	G. Austin	New Delhi: Oxford University Press	1 st (2003)
2	Introduction to the Constitution of India	D. D. Basu	Lexis Nexis	24 th (2019)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Contemporary India: Economy, Society, Politics	N. Chandhoke & Priyadarshini	Pearson Education India	1 st (2009)
2	Understanding Contemporary India: Critical Perspectives	A. Vanaik and R. Bharghava	Orient Blackswan	1 st (2010)

SEMESTER 2

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
1	BSC-201	Engineering Mathematics-II	BSC	5	3	2	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to	
CO1	Understand probability and random variables and various discrete and continuous probability distributions and their properties
CO2	Calculate probabilities, and derive the marginal and conditional distributions of bivariate random Variables
CO3	Analyze statistical data using measures of central tendency, dispersion and location
CO4	Understand and discuss the issues surrounding sampling and significance
CO5	Develop analytical skills in structuring and interpreting the business problems statistically

Detailed Syllabus

Section-A

Unit 1: Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality

(9 Hrs)

Unit 2: Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities. Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

(12 Hrs)

Unit 3: Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions. Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation

(10 Hrs)

Section-B

Unit 4: Hypothesis – Introduction, Format and Types; Procedure of Hypothesis Testing; Errors in Hypothesis; Two-tail and One-tail Test of Hypothesis; Tests of Significance for Attributes; Tests of Significance for Variables; Tests of Significance for Small Samples; t-distribution and its application

(11 Hrs)

Unit 5: Difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes

(10 Hrs)

Text Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley	10 th (2015)
2	A First Course in Probability	S. Ross	Pearson Education India	6 th (2002)
3	"Introduction to Probability and Statistics for Engineers and Scientists	Sheldon M. Ross	Academic Press	5 th (2009)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Advanced Engineering Mathematics	R.K. Jain, S. R. K. Iyenger	Narosa Publishing House Pvt. Ltd.	5 th (2016)
2	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publications	43 rd (2017)
3	Engineering Mathematics	N.P Bali	Laxmi publications	13 th (2009)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
2	ECE-201	Basic Electrical and Electronics Engineering	PCC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to: -	
CO1	Apply fundamental concepts to solve simple DC and AC electric circuits.
CO2	Examine sinusoidal waveforms and classify measuring instruments
CO3	Explain the construction and principle of operation of single phase transformers and DC Machines.
CO4	Understand the characteristics of semiconductor devices and rectifier circuits.
CO5	Interpret the principle of various transistor configurations and characteristics.

**Detailed Syllabus
Section-A**

Unit 1: Elementary Concepts of DC and AC Circuits: Recent advancements in Electrical Engineering, DC Circuit elements (R, L and C), Voltage and Current sources, Kirchoff's Current and Voltage laws, mesh and nodal analysis. Superposition, Maximum power transfer, Thevenin and Norton theorems.

(8 Hrs)

Unit 2: Representation of Sinusoidal Waveforms, Peak and RMS values, Phasor representation, Real power, Reactive power, apparent power, power factor. Analysis of single-phase AC circuits. Classification of Instruments: Operating principle of Measuring Instruments.

(8 Hrs)

Unit 3: Single phase Transformers and Machines: Principle of operation, ideal and practical transformer, equivalent circuit, losses in transformers, transformer testing, regulation and efficiency, Principle of operation of DC and AC machines.

(6 Hrs)

Section-B

Unit 4: Semiconductor Devices and Applications: Evolution in Electronics (vacuum tubes to nano-electronics), Types and specifications of Resistor, Inductor, Capacitor and Color coding, PN junction and Zener diode characteristics, Types of diodes (Tunnel diode, Schottky diode, LED, photodiode, Varactor diode), Voltage Regulators, Wave Shaping Circuits (rectifiers, filters, clippers and clampers).

(8 Hrs)

Unit 5: Transistors and Biasing Circuits: BJT: Principle and operation of NPN transistor, configuration and characteristics (CB, CE, and CC), types of biasing circuit. Hybrid Parameters Introduction, Two port networks, hybrid model for CE, CC, CB configuration and their analysis using h-parameters, Miller theorem. FET: Principle of Operation and characteristics of JFET, biasing of FET, MOSFET and CMOS.

(10 Hrs)

Text Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Basic Electrical Engineering	D. P. Kothari and I. J. Nagrath	Tata McGraw Hill	4 th (2019)
2	Integrated Electronics	Millman and Halkias	Tata McGraw Hill	4 th (2015)
3	Electronic Devices and Circuit Theory	Boylstead	Pearson	11 th (2015)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Basic Electrical Engineering	A. E. Fitzgerald, David E Higginbotham and Arvin Grabel	Tata McGraw Hill	5 th (2009)
2	Electronic Principles	Malvino Leach	Tata McGraw Hill	7 th (2017)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
3	ESC-202	Introduction to programming with Python	ESC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Understand the programming basics of the operations, control structures, and data types
CO2	Analyze the various data structures available in Python programming language and apply them to solve computational problems.
CO3	Apply the knowledge in writing the script using python
CO4	Comprehend class inheritance and polymorphism
CO5	Identify real-world software development challenges, and create practical and contemporary applications

Detailed Syllabus**Section-A**

Unit 1: Conceptual Introduction to Python programming, Python Interpreter, Invoking the Interpreter, The Interpreter and Its Environment, Python as a Calculator, Numbers, Strings, Lists, First Steps Towards Programming, if Statements, for Statements, The range() Function, break and continue Statements, and else Clauses on Loops, pass Statements, Defining Functions, More on Defining Functions, Intermezzo: Coding Style

(12Hrs)

Unit 2: Data Structures: More on Lists, The del statement, Tuples and Sequences, Sets, Dictionaries, Looping Techniques, More on Conditions, Comparing Sequences and Other Types, Modules, More on Modules, Standard Modules, The dir() Function, Packages

(8Hrs)

Unit 3: Input and Output: Fancier Output Formatting, Reading and Writing Files, Errors and exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, Exception Chaining, User-defined Exceptions, Defining Clean-up Actions, Predefined Clean-up Actions

(8 Hrs)**Section-B**

Unit 4: Classes: A Word About Names and Objects, Python Scopes and Namespaces, A First Look at Classes, Random Remarks, Inheritance, Private Variables, Odds and Ends, Iterators, Generators, Generator Expressions.

(10 Hrs)

Unit 5: Brief Tour of the Standard Library, Simple Graphics and Image Processing: "turtle" module; simple 2d drawing - colors, shapes; digital images, image file formats.

(8Hrs)**Text Books**

S.No	Name of the Suggested Books	Name of Author	Publisher Name	Edition (Pub. Yr.)
1	The Fundamentals of Python: First Programs.	Kenneth A. Lambert	Cengage Learning	1 st (2011)
2	Introduction to Computation and Programming Using Python	John V Guttag	Prentice Hall of India	2 nd (2016)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Data Structures and Algorithms in Python.	Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser	Wiley	1 st (2013)
2	Core Python Programming	Wesley J. Chun	Prentice Hall	2 nd (2006)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
4	HSMC-201	Technical Communication	HSMC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to: -

CO1	Understand the constructs of written communication.
CO2	Develop competence in writing technical papers, research articles, proposals and reports.
CO3	Understand different aspects of verbal and non-verbal communication.
CO4	Gain effective communication skills and professional etiquettes for the workplace.
CO5	Demonstrate linguistic competence for public speaking and group discussion.

Detailed Syllabus**Section-A**

UNIT 1: Basic Writing Skills: Sentence, Creating Coherence, Use of Phrases and Clauses in Sentences, Organizing Principles of Paragraphs in Documents, Techniques for Writing Precisely. Identifying Common Errors in Writing: Subject-Verb Agreement, Noun-Pronoun Agreement, Misplaced Modifiers, Redundancies, Clichés. The e-English: E- Mail Communication, Internet Abbreviations, Blogging, Challenges of English Language Online.

(7 Hrs)

UNIT 2: Technical Writing Skills: Letter Writing, Letter of Application Content, Format, Report Writing – Types, Structures, Data Collection, Content, Form, Writing a Proposal, Recommendations, Instructions, Business Communication. Creative Writing Skills: Free Writing, Biographical Writing, Autobiographical Writing, Process Description, Bar Charts and Flowcharts, Descriptive Writing, Argumentative Writing, Essay Writing, Précis Writing, Paraphrasing, Poster Making.

(7 Hrs)

UNIT 3: Reading and Listening: Improving Reading Skills: Skimming and Scanning, Reading and Note-Making, Intensive Reading and Predicting Content, Reading and Interpretation, Reading – Critical Reading, Hints Development. Listening Skills: Listening Comprehension, Difference between Listening and Hearing, Types of Listening, Types of Listening Intensity, Effective Listening, Ways to Improve Listening Skills, Listening and Note-Taking, Barriers to Effective Listening.

(7 Hrs)**Section-B****UNIT 4:** Verbal Communication

Process of Communication and Effective Speaking: Communication Process, Barriers to Effective Communication, Flow of Organizational Communication, Language as a Tool of Communication, Pronunciation, Intonation, Stress and Rhythm, Introduction to Phonetics,

(5 Hrs)

UNIT 5: Non-Verbal Communication: Oral Communication, Communication at Workplace, Public Speaking, Persuasive Speaking, Impromptu Speaking - Extempore, Just a Minute, Debate, Conversations and Dialogues, Conversation over Telephone. Professional Etiquettes Meaning and Type, Seminar on a given topic.

(4 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Technical Communication	Wiley Editorial	Wiley	1 st (2019)
2	Technical Communication: Principles and Practice	Meenakshi Raman, Sangeeta Sharma	Oxford	2 nd (2011)
3	Technical Communication: A Reader-Centered Approach	Anderson	Cengage Learning	6 th (2007)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
5	ECE-211	Basic Electrical and Electronics Engineering Lab	PCC	1	0	0	2	50	-	50

Course Outcomes:

At the end of the course the student will be able to: -

CO1	Apply fundamental concepts to solve simple DC and AC electric circuits.
CO2	Verify the basic characteristics of transformers and electrical machines.
CO3	Design diode and rectifier circuits and analyze their characteristics.
CO4	Design and evaluate various transistor biasing configurations and circuits.
CO5	Design different voltage regulators

List of Experiments of Basic Electrical and Electronics Lab

S. No.	Experiment
1	Verify Characteristics of passive circuit elements (R, L, C).
2	Examine time and frequency responses of RC, RL and RLC circuits.
3	Verify and analyze network theorems.
4	Analyze single-phase transformers.
5	Perform the polarity test of the single phase transformer.
6	Perform open and short circuit tests on single phase transformers.
7	Measure three phase power using two Wattmeter methods.
8	Verify and plot V-I characteristics of p-n junction and Zener diodes.
9	Verify and plot Input and Output characteristics of BJT (CE).
10	Implement half wave and full wave rectifiers.
11	Design voltage regulator using series pass transistor.

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
6	ESC-212	Python Programming Lab	ESC	2	0	0	4	50	-	50

Course Outcomes:

At the end of the course the student will be able to: -	
CO1	Apply the knowledge to create applications using the Python Programming Language.
CO2	Classify various data structures available in Python programming language
CO3	Implement testing and debugging of code written in Python
CO4	Apply the different functions to show various kinds of plots
CO5	Create solution for practical applications working in a team

List of Experiments of Python Programming Lab

S. No.	Experiments
1	Installing Python; basic syntax, interactive shell, editing, saving, and running a script
2	Develop a simple programs to understand operators and input/output operations
3	Develop programs to understand the control structures of python
4	Develop programs to learn different types of structures (list, dictionary, tuples) in python
5	Develop programs to learn concepts of functions scoping, recursion and list mutability.
6	Develop programs to understand working of exception handling and assertions.
7	Develop programs for data structure algorithms using python – searching, sorting and hash tables.
8	Develop programs to learn regular expressions using python.
9	Learn to plot different types of graphs using PyPlot.
10	Write a program with a function called rate_score() that rates a player's score. The function should have one parameter that receives a score , and should return a string based on the score, as follows: If the score is <100, the function should return "Nothing to be proud of." If the score is < 500 and >100, the function should return "Not Bad." If the score is > 500, the function should return "Great !"
11	Develop the Tic-Tac-Toe game where two players are playing. The program will check for the winning condition. If the whole board gets filled and no one wins, the result should be declared as "Tie" and the user can restart the game or quit the game.
Mini Projects	
1	Develop a basic python project – Alarm clock
2	Develop a python based project for number system conversion using Tkinter library
3	Create a simple Hangman game in python
4	Control Arduino Development Board using python using PySerial Lib.
5	Development of Weather App
6	Development of Article Reader
7	Data Visualization model

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
7	COM-212	Business Process Automation with RPA Lab	ESC	2	0	0	4	50	-	50

Course Outcomes:

At the end of the course the student will be able to: -	
CO1	Develop RPA bots for performing simple business processes using UiPath Studio.
CO2	Design RPA bots to automate data collection from multiple web sources.
CO3	Develop competencies in designing RPA bots for manipulating data across documents.
CO4	Manage the developed UiPath RPA robots using UiPath Orchestrator.
CO5	Troubleshoot problems in existing RPA bots.

List of Activities in Lab

S. No.	Activity
1	Familiarity with UiPath Studio Academic Alliance Edition: <ul style="list-style-type: none"> Configure UiPath Academic Alliance Edition. Design a bot that prints "Hello World" on the screen. Design a bot to generate mathematical tables.
2	Designing basic RPA bots: <ul style="list-style-type: none"> Design a bot to display messages using Sequence and Flowchart activities. Design a bot to display the sum of two variables by taking two variables as input and produce the output.
3	Working with Microsoft Excel: <ul style="list-style-type: none"> Design a bot to open a Microsoft Excel sheet and read data into a datatable. Design a bot to compare two columns in an excel sheet. The output should display 'Match/Not Match' against the corresponding cell in the sheet.
4	Working with Desktop Automation: <ul style="list-style-type: none"> Design a bot to create a text file, write "Hello World" into it and save it at the desired location using the 'Recorder' feature. Design a bot for automating disk clean-up processes.
5	Working with Websites: <ul style="list-style-type: none"> Design a bot to scrape data from a website and store it in a Microsoft Excel sheet. Design a bot to fill a webform from the data stored in a Microsoft Excel sheet.
6	Working with Documents: <ul style="list-style-type: none"> Design a bot to read a true PDF file and fill the webform. Design a bot to read a word file and then create a list of unique words in an excel sheet.
7	Working with Images: <ul style="list-style-type: none"> Design a bot to read a scanned image of an invoice and store the extracted data in a .CSV file. Design a bot to perform Optical Character Recognition (OCR) on a saved image using OCR activities.
8	Working with Emails: <ul style="list-style-type: none"> Design a bot to read unread emails from inbox. Design a bot to send email with attachments to multiple receivers.
9	Handling Exceptions: <ul style="list-style-type: none"> Apply exception handling to previously developed automations.
10	Working with Orchestrator: <ul style="list-style-type: none"> Configure UiPath Orchestrator and setup tenant, machine, environment and robots. Design a bot to create a Queue in Orchestrator and store the subject of the email in .CSV. Configure Orchestrator to run a process as per a given schedule.
11	Mini Projects (choose one): <ul style="list-style-type: none"> RPA bot to send notifications to students when their attendance falls below 75%. RPA bot to extract and collate job openings from multiple job portals. RPA bot to extract and display news from Google News.
12	Deploy Mini Projects using Orchestrator.

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
8	NCC-201	Environment & Sustainability	NCC	0	2	0	0	-	-	S/NS*

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Describe the relationship between Humans, Environment and Sustainability.
CO2	Articulate different environmental risks and issues and potential interventions to tackle them.
CO3	Appraise sustainable energy systems through case-studies and real-world examples.
CO4	Articulate Sustainable Infrastructure Development plan.
CO5	Appreciate global sustainability best practices in diverse domains.

Detailed Syllabus**Section-A**

Unit 1: Introduction to Sustainability: Humanity and the Environment: What is Sustainability? The IPAT Equation, Human Consumption Patterns and the "Rebound" Effect, Challenges for Sustainability.

Climate and Global Change: Climate Processes; External and Internal Controls, Milankovitch Cycles and the Climate of the Quaternary, Modern Climate Change, Climate Projections.

(3 Hrs)

Unit 2: Biosphere: Introduction, Biogeochemical Cycles and the Flow of Energy in the Earth System. Biodiversity, Species Loss, and Ecosystem Function. Soil and Sustainability.

Physical Resources: Water, Pollution, and Minerals. Water Cycle and Fresh Water Supply. Water Pollution. Mineral Resources: Formation, Mining, Environmental Impact.

(4 Hrs)

Unit 3: Environmental and Resource Economics: Tragedy of the Commons. Environmental Valuation. Evaluating Projects and Policies. Solutions: Property Rights, Regulations, and Incentive Policies.

Modern Environmental Management: Systems of Waste Management. Case Study: Electronic Waste and Extended Producer Responsibility. Government and Laws on the Environment. Risk Assessment Methodology for Conventional and Alternative Sustainability Options.

(4 Hrs)**Section-B**

Unit 4: Sustainable Energy Systems: Environmental Challenges in Energy, Carbon Dioxide, Air, Water and Land Use. Energy Sources and Carriers. Electricity. Energy Uses. Applications of Phase Change Materials for Sustainable Energy. Problem-Solving, Metrics, and Tools for Sustainability.

(6 Hrs)

Unit 5: Sustainable Infrastructure: The Sustainable City. Sustainability and Buildings. Sustainable Energy Practices: Climate Action Planning. Sustainable Transportation: Accessibility, Mobility, and Derived Demand. Sustainable Stormwater Management.

(4 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Sustainability: A Comprehensive Foundation	Tom Theis and Jonathan Tomkin	Open Textbook Library	1 st (2015)
2	Energy, Environment, and Sustainability with MindTap	Saeed Moaveni	Cengage India Private Limited	1 st (2012)
3	Improving the Sustainable Development Goals: Strategies and the Governance Challenge (Routledge Focus on Environment and Sustainability)	Lars Niklasson	Routledge	1 st (2019)

Reference Book

S. No.	Name of the Book	Author	Publisher	Edition (Pub. Yr.)
1	Global Challenges to CSR and Sustainable Development: Root Causes and Evidence from Case Studies (CSR, Sustainability, Ethics and Governance)	Stephen Vertigans, Samuel O. Idowu	Springer	1 st (2021)

SEMESTER 3

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
1	ECE-301	Electronic Devices and Circuits	PCC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Understand the multistage amplifiers and different coupling methods.
CO2	Analyze different topologies of feedback amplifiers.
CO3	Understand the concepts to design various oscillators.
CO4	Classify different power amplifiers and analyze distortions
CO5	Illustrate various OP-AMP functions to design linear integrated circuits

Detailed Syllabus**Section-A**

Unit 1: Need of cascading for Single and Multistage Amplifiers, Techniques for improving input resistance (Darlington transistor, Bootstrap emitter follower amplifiers), method of coupling multistage amplifiers (RC coupling, DC coupling, transformer coupling), Frequency response of amplifiers, Effect of emitter and bypass capacitors on the bandwidth and frequency response of a cascaded amplifiers.

(12 Hrs)

Unit 2: Feedback Amplifier, Need for feedback, Feedback concept, Gain with and without feedback, negative feedback, output resistance and bandwidth of the amplifier, their respective analysis for feedback amplifiers, Procedure for analysis of feedback amplifiers, Analysis of different topologies.

(10 Hrs)

Unit 3: Sinusoidal Oscillators Introduction, Barkhausen Criteria, Requirements of oscillators, Types of oscillators (RC phase shift, Wien Bridge, LC, Crystal).

(8 Hrs)**Section-B**

Unit 4: Power Amplifiers Introduction, Classification of power amplifiers, crossover distortion, harmonic distortion in power amplifiers.

(7 Hrs)

Unit 5: Block Diagram of Op-Amp, Ideal & Practical Op-Amp & Characteristics, Op-Amp open loop configurations, Measurement of Op-Amp parameters, Op-Amp Applications, Inverting/Non-Inverting configuration, Differentiator, Integrator, Op-Amp Waveform generators (saw tooth, triangular, square, sine wave), Sample & hold circuit, Peak detector, Voltage Limiter, Comparator, Schmitt Trigger, Phase-Locked Loops & 555 Timers.

(9 Hrs)**Text Books**

S.No	Name of the Suggested Books	Name of Author	Publisher Name	Edition (Pub. Yr.)
1	Electronic Devices & Circuit Theory	Boylstead	Pearson Education	11 th (2015)
2	Electronic Principles	Malvino Leach	TMH	7 th (2017)
3	Microelectronic Circuits	Adel S. Sedra and Kenneth C. Smith	Oxford University Press	7 th (2014)
4	Op-Amps and Linear Integrated circuits	Ramakant A. Gayakwad	PHI	4 th (2002)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
2	BSC-302	Mathematics-III	BSC	5	4	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to: -	
CO1	Learn the basics of different numerical methods for solving differential equations.
CO2	Explain the concept of Laplace Transform of various functions and its applications and derivatives.
CO3	Use different methods of Inverse Laplace transform to solve ODE and PDE.
CO4	Understand the idea of Fourier series, odd and even functions and its Fourier expansions to solve second order ODEs.
CO5	Apply the concepts of Fourier transform and its properties to solve integral equations and PDEs

Detailed Syllabus**Section-A**

Unit 1: Numerical differentiation, numerical integration: trapezoidal rule and Simpson's 1/3rd rule. numerical solutions of algebraic and transcendental equations by Regula Falsi, Newton Raphson and direct iterative methods, solution of Differential Equations by Taylor's method, Picard's method, Euler and modified Euler's methods. Runge-kutta method of fourth order for solving first and second order equations.

(10 Hrs)

Unit 2: Definition and existence of Laplace transforms, Laplace transform, properties of Laplace transform, Unit step function, Impulse function, Applications to solve initial and boundary value problems. Laplace transform of periodic functions, Laplace transform of derivatives.

(8 Hrs)

Unit 3: Definition and existence of inverse Laplace transform Inverse Laplace transform by different methods, Convolution theorem. Evaluation of integrals by Laplace transform, Ordinary and Higher Order Differential Equations and Partial Differential Equations by Laplace transform methods.

(10 Hrs)**Section-B**

Unit 4: Fourier series: Introduction, Euler's formula, sufficient conditions for a Fourier expansion, functions having points of discontinuity, change of intervals. Odd and Even functions and Fourier expansion of odd and even periodic functions, half range series, typical waveforms, Parseval's formula. Power series, solutions of second order O.D.E.

(10 Hrs)

Unit 5: Fourier transform: Fourier integrals, Fourier transforms Fourier integral theorem, and their inverses. Properties of Fourier transforms, application of Fourier transform to solve integral equations. Fourier sine and cosine integrals, and their inverses. Solution of PDEs by Fourier transform.

(8 Hrs)**Text Books**

S.No	Name of the Suggested Books	Name of Author	Publisher Name	Edition (Pub. Yr.)
1	Engineering Mathematics	B.S. Grewal	Khanna Publications, New Delhi	44 th (2018)
2	Engineering Mathematics	N.P. Bali and M. Goyal	Laxmi Publications	10 th (2019)
3	Differential Equations and Laplace Transforms	Veerarajan T	Yes Dee Publishing	1 st (2020)

Reference Books

S.No.	Name of the Book	Name of Author	Publisher Name	Edition (Pub. Yr.)
1	Advanced Engineering Mathematics	Kreyszig E.	John Wiley	10 th (2011)
2	Engineering Mathematics	Babu R.	Pearson	2 nd (2012)
3	Schaum's Outline of Laplace Transforms (Schaum's outlines of theory and problems)	Murray R. Spiegel	McGraw-Hill	1 st (1965)
4	Complex analysis and Numerical Methods	Dr. Bhopinder Singh	Kirti Publishers	2 nd (2017)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
3	ECE-302	Digital Electronics	PCC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Understand various number systems to be used in digital circuit design
CO2	Solve boolean expressions using minimization techniques
CO3	Analyze and design combinational and sequential circuits
CO4	Formulate problems and simplify with state minimizing techniques
CO5	Analyze and compare various logic families

Detailed Syllabus**Section-A**

Unit 1: Data and number systems: Binary, Octal and Hexadecimal representation and their conversions; BCD, ASCII, EBDIC, Gray codes, Excess-3 and their conversions; Signed and unsigned binary number representation with 1's and 2's complement methods, Binary arithmetic, An overview of Boolean algebra, Simplification of logic variable using K-map method, Quine McCluskey method.

(12 Hrs)

Unit 2: Combinational circuits: Encoder, Decoder, Comparator, Binary Adder-Subtractor, Parallel Adder, Multiplexer, De-Multiplexer, Code converters and Parity Generator and checker, Memory Systems: RAM, ROM, EPROM, EEROM, Design of combinational circuits-using ROM, Programming logic devices and gate arrays (PLAs and PLDs).

(10 Hrs)

Unit 3: Logic families: TTL, ECL, MOS and CMOS, their operation and specifications.

(5 Hrs)**Section-B**

Unit 4: Sequential Circuits: Basic memory element-S-R, J-K (master-slave), D and T Flip Flops and their conversions with excitation table. Various types of Registers, Synchronous and Asynchronous Counters and their design. State Machine Design, State machine as a sequential controller, Moore and Mealy state machines.

(12 Hrs)

Unit 5: Analog and Digital Converters: Different types of A/D (flash, successive approx., delta encoded) and D/A (R-2R Ladder and binary weighted) conversion techniques.

(6 Hrs)**Text Books**

S.No	Name of the Suggested Books	Name of Author	Publisher Name	Edition (Pub. year)
1	Modern Digital Electronics	R.P.Jain	McGraw-Hill	4 th (2010)
2	Fundamentals of Digital Circuits	Anand Kumar	PHI	4 th (2016)
3	Digital Design	M. Morris Mano, and Michael D Ciletti Pearson	Pearson	3 rd (2012)

Reference Books

S.No	Name of the Suggested Books	Name of Author	Publisher Name	Edition (Pub. year)
1	Digital Electronics	A.K.Maini	Wiley India	1 st (2007)
2	Digital Electronics	Kharate	Oxford	1 st (2012)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Max. Marks
4	ECE-303	Network Analysis and Synthesis	PCC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Gain the knowledge of various laws governing electrical circuit design and networks.
CO2	Acquire knowledge about the application of differential equation method and Laplace transform in electrical circuits.
CO3	Explain the concept of pole-zero configuration and determine parameters of two port networks.
CO4	Design of K and M derived filters and analyze their operations.
CO5	Apply the concept for synthesis of circuits using Foster and Cauer forms.

Detailed Syllabus**Section-A**

Unit 1: Conventions for describing networks: Reference directions for currents and voltages, conventions for magnetically coupled circuits, circuit topology. First order differential equation: Differential equations as applied in solving networks, Application of initial conditions, evaluating initial conditions in networks.

(8 Hrs)

Unit 2: Laplace Transformations: Solution of network problems with Laplace transformation, Heaviside's Expansion theorem.

Waveform Analysis & Synthesis: The unit set up, ramp and impulse functions and their Laplace transforms, Initial and final value theorems, convolution integral, convolution as summation.

(9 Hrs)

Unit 3: Network Functions-poles and zeros : Ports or terminal pairs, Network functions for one port and two port networks (ladder and general networks), Poles and Zeros of network functions, Restriction on pole and Zero locations for driving point and transfer functions. Time domain behaviour from pole Zero plot.

(9 Hrs)**Section-B**

Unit 4: Two port parameters: Admittance, impedance, transmission and hybrid parameters, Relationship between parameter sets, parallel series & Cascade connection of two port Networks, Characteristics impedance of two port networks. Filters: Filter fundamentals- pass and stop band, filter classification, constant K & m derived filters, Behaviour of characteristics impedance over pass & stop bands, design of filters.

(10 Hrs)

Unit 5: Network Synthesis: Synthesis problem formulation, properties of positive real functions. Hurwitz polynomials properties of RC, LC and RL driving point functions. Foster and Cauer synthesis of LC, RL and RC circuits.

(8 Hrs)**Reference Books:**

S.No	Name of the Books	Author	Publisher Name	Edition (Pub. Yr.)
1	Network Analysis	Van Valkenberg	PHI	3 rd (2002)
2	Network Analysis & Synthesis	F.F. Kuo	Wiley	2 nd (2006)
3	Introduction to Circuit Synthesis and Design	La Patra	McGraw-Hill	1 st (1977)
4	Fundamentals of Network Analysis and Synthesis	Perikari	Jaico	1 st (2006)
5	Network Theory & Filter Design	V. Atre	New Age International	3 rd (2014)
6	Network analysis and Synthesis	Sudhakar Shyam Mohan	McGraw-Hill	5 th (2017)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
5	ECE-311	Electronic Devices and Circuits Lab	PCC	1	0	0	2	50	-	50

Course Outcomes:

At the end of the course the student will be able to: -

CO1	Apply the knowledge to design and implement power amplifiers.
CO2	Determine the output of Collpitt, Wein Bridge, Hartely oscillator
CO3	Design open loop and closed loop configurations using Op-Amp
CO4	Design various circuits using Op-Amp for different applications and observe their waveforms
CO5	Develop practical applications using 555 timer IC

List of Experiments of Electronic Devices & Circuits Lab

S. No.	Experiments
1	Examine the frequency response of signal amplifier (CE) and find gain and bandwidth with feedback and without feedback
2	Determine output power distortion for push pull class B amplifier
3	Evaluate frequency response for class C tuned amplifier.
4	Design RC Phase shift and Wein bridge oscillator for desired frequency and verify through output waveform.
5	Design Hartley Oscillator for desired frequency and verify through output waveform.
6	Design Colpits" Oscillator for desired frequency and verify through output waveform.
7	Design and Implement Op-Amp circuits as Inverting and Non-Inverting Amplifier
8	Apply the concepts to design Square Wave Generator.
9	Apply the concepts to design Triangular Wave Generator.
10	Design and implement Comparator using Op-Amp and also develop its application as Schmitt Trigger
11	Design and implement voltage follower using Op-Amp
12	Design sample and hold circuit and its application as Schmitt Trigger using IC-LF398.
13	Design and Implement Op-Amp circuits as Differentiator & Integrator.

Mini Projects

1	Regulated Power Supply
2	Obstacle Detector Stick for Blinds
3	Sound Activated Lights
4	Mobile Charger
5	Automatic Light Fence Circuit with Alarm

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
6	ECE-312	Digital Electronics Lab	PCC	2	0	0	4	50	-	50

Course Outcomes:

At the end of the course the student will be able to: -	
CO1	Implement and verify Boolean expressions using Logic Gates
CO2	Verify the truth table from a description for a combinational logic function.
CO3	Create a gate-level implementation of a combinational logic function.
CO4	Design and implement various sequential circuits using digital ICs.
CO5	Learn the formal procedures for the analysis and design of combinational and sequential circuits

List of Experiments of Digital Electronics Lab

S. No.	Experiments
1	Implement and verify the truth table of logic gates using Logisim and Digital Kit
2	Implement and verify the truth table of logic gates using Breadboard
3	Analyze universal gates using simulation.
4	Implement equivalence of various Boolean expressions using Logisim and Digital Kit.
5	Implement and verify truth tables of Adder and Subtractor
6	Implement and verify the truth table of MUX using NAND.
7	Implement and verify the truth table DEMUX using NAND.
8	Implement and verify truth tables of BCD-7 Segment Display
9	Implement and verify truth table of Flip-Flops.
10	Design Ring counter/ Johnson counter.
11	Design Ring up/ down counter.
12	Design and verify truth table Parity Encode.
13	Design of 4.bit Comparator
14	Implement and verify truth table of one bit comparators using logic gates.

Mini Projects

1	Digital stopwatch
2	Water level controller
3	3 to 8 decoder along with seven segment LED
4	Digital clock and timer circuit

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
7	ECE-313	Electronics Measurements and Instrumentation Lab	PCC	1	0	0	2	50	-	50

Course Outcomes:

At the end of the course the student will be able to: -

CO1	Demonstrate skills to handle and operate electronics instruments.
CO2	Analyze the performance characteristics of instruments.
CO3	Articulate the importance of signal generators and analyzers in measurement.
CO4	Demonstrate features of different types of oscilloscopes.
CO5	Apply the complete knowledge of various electronic instruments/transducers to measure physical quantities

List of Experiments of EMI Lab

S. No.	Experiments
1	Testing of discrete components using Analog Multimeter.
2	Testing of discrete components of Digital Multimeter.
3	Measurement of frequency of different Input signals on Frequency Counter.
4	Measurement of different parameters on CRO.
5	Measurement of frequency and phase of input signal in C.R.O using Lissajous pattern
6	Measurement of resistances by bridges such as Wheatstone Bridge and Kelvin's bridge method.
7	Measurement of load using strain Gauge.
8	Determination of output characteristics of LVDT and measurement of displacement.
9	Measurement of temperature using thermocouple and RTD.
10	Measurement of parameters of passive components using LCR Q meter.
11	Measurement of water flow sensor
12	Measurement of temperature using RTD.
13	Measurement of distortion in a signal using distortion meter.
14	Analysis and noise measurement using Spectrum analyzer

Mini Projects

1	Automatic fire alarm Circuit / High temperature alarm circuit
2	Automatic fan speed controller
3	Frequency counter
4	Air flow detector Circuit

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
8	HSMC-312	Placement Overview and Career Planning	HSMC	2	0	0	4	50	-	50

Course Outcomes:

After completion of this course the student will be able to	
CO1	Demonstrate proficiency in quantitative problem solving.
CO2	Reason logically and perform deductions on the given problem statement.
CO3	Comprehend and assimilate a variety of technical and non technical literature.
CO4	Communicate effectively for a wide variety of purposes and audiences.
CO5	Solve problems effectively in competitive exams.

List of Activities for Placement overview and Career Planning

S. No.	Activity Title
1	Practice Quantitative Aptitude: Vedic Mathematics concepts, Simplification, Quadratic Equations, Surds and Indices, Average and Weighted average, Mixtures and Allegations. Percentages, Profit and Loss, Simple and Compound Interest, Ratio and Proportion, Partnership, Age Problems, Word Problems. Time and Work; Time, speed and Distance; Mensuration- Cylinder, Cone, Sphere; Number Systems; Sequence and Series; Permutation and Combination; Probability; Logarithms; Functions; Data Interpretation. Data Arrangement, Clocks and Calendars, Different patterns of Puzzles – Quantitative Based, Data Sufficiency, order and Ranking, Direction sense.
2	Practice Logical Reasoning questions on following topics: Venn Diagram, Syllogisms / Deductions, Abstract Reasoning, Logical Connectives, Input Output, Attention to detail, Selection Decision table, Logical Sequence Words, Coding Decoding, Coded Inequalities, Number Series, Alpha Series, Analogy, Cryptarithmic, Blood Relations.
3	Verbal Ability: General Grammar Rules and Grammar Essentials: Nouns, Verbs and Pronouns; Subject-Verb Agreement; Pronoun-Antecedent Agreement; Punctuations. Concept Building for: Reading Comprehension, Passage Analysis, Vocabulary building, Confusing words, Sentence Completion, Verbal Analogy, Spotting errors in sentences. Jumbled Sentences, Sentence Improvisation, Writing Skills - Essay Writing, Writing Skills - Email Writing, Critical Reasoning, Reading Comprehension Advanced + Para Jumbles, Gap - Bridging.
4	Learn various effective communication skills: Word Power enhancement; Attention to Detail: spacing, punctuation, spelling, and other finer aspects; Verbal and non-verbal communication skills; Written English with emphasis on writing grammatically correct technical / official letters, applications and reports; Getting rid of inhibitions and building confidence; Assertive and Submissive communication; Using Language for Convincing and Persuasion; Art of asking Questions.
5	To participate in a national level aptitude test to assess the learners ability on quantitative, verbal, logical reasoning, soft skills and technical skills.
6	To prepare for group discussion and personal interviews and understanding your personality type.
7	Explore job roles and responsibilities of different job postings and prepare your resume accordingly.
8	Explore higher education opportunities in India and abroad and shortlist the possible universities.

Hons. /Minor Degree Course

Course Code	Specialization Track	Course Type	Cd	L	T	P	Marks		
							Mid-Semester	End-Semester	Total
MDC- AI/CS/CC/ IoT /DS- 301	Artificial Intelligence and Machine Learning/ Cyber Security/ IoT/Data Science/ Cloud Computing	MOOC	5	5	0	0	25	125	150

The students shall be required to complete a MOOC for duration 8-12 weeks corresponding to the opted specialization track. Such MOOCs shall be approved by the Departmental Academic Committee and updated from time to time.

The Departmental Academic Committee shall assess the student work based on the following criteria:

1. Submission of course completion certificate- **75 Marks**
2. Mid Semester Test - **25 Marks**
3. End- Semester Test- **50 Marks**

SEMESTER 4

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Max. Marks
1	ECE-401	Microcontroller and Applications	PCC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Understand the general architecture of Microprocessors and Microcontrollers.
CO2	Apply knowledge and demonstrate the program proficiency using the various addressing modes logics and commands.
CO3	Articulate the interrupts and serial communication of 8051 microcontroller.
CO4	Develop interfacing circuits for different peripheral devices.
CO5	Use microcontroller development board to solve the various engineering problems.

Detailed Syllabus**Section-A**

Unit 1: Introduction Microprocessor and Microcontroller: Block Diagram, Architecture of 8085 Microprocessor and 8051 Microcontroller, Comparison of Microprocessor and Microcontroller, Directives, Addressing Modes and Instructions Set of 8051 Microcontroller, 8051 Assembly Language Programming.

(10 hrs)

Unit 2: 8051 Programming In Embedded C: Data Types, Time Delay, Loop, Logic Operations, I/O programming and Data Conversion, Accessing Code Space, Data Serialization and Counter/Timer Programming in Embedded C.

(8Hrs)

Unit3: Serial port and Interrupts: Basics of serial communication, 8051 connection to RS232, serial port operations and programming, basics of 8051 interrupts, timer interrupts, external hardware interrupts, serial port interrupts, Interrupt priority in 8051, Interrupt programming using embedded C.

(6 Hrs)**Section-B**

Unit 4: Interfacing: LCD and Keyboard Interfacing, De-bouncing effect, ADC 0804 interfacing, DAC interfacing, Sensor and actuator interfacing, speed and direction control of DC and Stepper Motors

(10 Hrs)

Unit 5: Microcontroller Development Board: Introduction to Arduino, Programming Tools and Programming language for development board. Interfacing with analog and digital sensors, display devices and actuator, serial communication, wireless communication using RF module

(11 Hrs)**Text Books**

S.No	Name of the Books	Author	Publisher Name	Edition (Pub. Yr.)
1	Microprocessor Architecture, Programming, and Applications with the 8085	R.S. Ganorkar	Penram International	5 th (2011)
2	The Microcontroller and Embedded Systems Using Assembly and C	Muhammad Ali Mazidi	Pearson Education India	2 nd (2007)

Reference Books

S.No	Name of the Books	Author	Publisher Name	Edition (Pub. Yr.)
1	The 8051 Microcontroller, Architecture, Programming and Applications	Kenneth J. Ayala	Penram International	3 rd (1996)
2	Programming Arduino: Getting Started with Sketches	Simon Monk	McGraw-Hill Education	2 nd (2016)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Max. Marks
2	ECE-402	Analog and Digital Communication	PCC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Analyze the behavior of a communication system in presence of noise and compare different analog modulation schemes for their efficiency and bandwidth
CO2	Investigate pulsed modulation system and analyze their system performance
CO3	Analyze different digital modulation schemes and can compute the bit error performance
CO4	Describe different information coding techniques and compare the performance
CO5	Explain the concepts involved in optical fiber communication

**Detailed Syllabus
Section-A**

Unit 1: The essentials of communication systems, Noise in communication system, Signal to noise ratio & noise figure, Concept & need for modulation, Types of modulation, Amplitude Modulation and Demodulation, Generation of DSBSC waves, Coherent detection of DSBSC waves, Single side band modulation and demodulation, vestigial sideband modulation (VSB), Theory of FM, Representation & frequency spectrum of FM, Pre-Emphasis, De-Emphasis, Wide band & Narrow band FM, Generation & detection of FM signal, Comparison with PM & AM, Introduction to receivers, Super heterodyne receivers.

(15Hrs)

Unit 2: Basic model of digital communication system, Sampling Process, Quantization Process, Pulse-Amplitude Modulation and Other forms of Pulse Modulation, Pulse-Code Modulation, Delta Modulation, Linear Prediction, Differential Pulse-Code Modulation and Adaptive Differential Pulse-Code Modulation, Time division multiplexing.

(7Hrs)

Unit3: Introduction to Digital Modulation Techniques, Types of digital modulation techniques, FSK, ASK, BPSK, DPSK, QPSK generation and reception, Differentially encoded PSK (DEPSK), M-ary PSK, MSK, Comparison of digital modulation techniques.

(8 Hrs)**Section-B**

Unit 4: Information rate, Entropy, source coding & coding efficiency, Shannon Fanno coding, Huffman coding, channel capacity theorem, Block codes coding and decoding, Soft and hard decision, Convolution coding and decoding, State & Trellis diagrams, Viterbi Algorithm.

(8 Hrs)

Unit 5: Introduction to optical fiber communication, Nature of light, Advantages of Optical communication, Fiber Structures, Wave guiding, Basic optical laws and Definition, Optical fiber modes and Configuration, Mode theory for circular waveguides, Single mode fibers, Graded index fiber, Fiber materials and applications.

(8Hrs)**Text Books**

S.No	Name of the Books	Author	Publisher Name	Edition (Pub. Yr.)
1	Principles of Communication Systems	Taub and Schilling	Tata McGraw Hill	3 rd (2009)
2	Communication Signals and Systems	S. Haykins	Wiley-India	3 rd (2010)
3	Digital Communications: Fundamentals and Applications	Bernard Sklar	Prentice-Hall PTR	3 rd (2017)

Reference Books

S.No	Name of the Books	Author	Publisher Name	Edition (Pub. Yr.)
1	Digital Communications	J.G. Proakis,	Prentice Hall	2 nd (2002)
2	Communication Systems: Analog & Digital	RP Singh, S D Sapre	Tata McGraw Hill	2 nd (2008)
3	Optical Fiber Communications	Gerd Keiser,	Tata McGraw Hill	2 nd (2008)
4	Electronic Communication Systems	George Kennedy, Bernard Davis, S. R. M Prasanna	McGraw Hill	6 th (2017)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
3	ECE-403	Automation with PLC and SCADA	PCC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to: -

CO1	Compare conventional sequential control with programmable logic control system
CO2	Develop programs using PLC programming language for sequential and continuous process
CO3	Interface analog and digital input/ output devices with PLC using different communication protocol
CO4	Test the PLC based system and troubleshoot the errors associated with it
CO5	Apply the knowledge of PLC in developing industrial applications.

Detailed Syllabus**Section A**

Unit 1: Programmable Logic Controllers (PLCs): Introduction; definition & history of the PLC; Need of automations in industries; Principle of operation; various components of PLC: CPU & programmer/ monitors; PLC input & output modules; the processor; power supplies, PLC wiring. PLC advantages & disadvantages; PLC versus Computers, PLC Applications. Programming equipment; proper construction of PLC ladder diagrams; process scanning consideration, Introduction to PLC Trainer Device and PLC Software, Fundamental Commands of PLC

(8 Hrs)

Unit 2: PLC Hardware Components: The I/O section, Discrete I/O Modules, Analog I/O Modules, Special I/O Modules, I/O specifications, sourcing and sinking concept. CPU, Memory Types, Programming Devices. Fundamentals of Logic: The Binary Concept, AND, OR and NOT functions, Boolean Algebra, Developing circuits from Boolean expressions, Producing the Boolean equation from given circuits, Hardwired logic versus programmed logic, Programming word level logic instructions. Converting Relay schematics and Boolean equations into PLC Ladder Programs, Writing a ladder logic program directly from a narrative description.

(12 Hrs)

Unit 3: Programming Timers, Mechanical Timing relay, Timer instructions, ON delay timer instruction, Off-delay timer instruction, Retentive Timer, Cascading Timers, examples of timer function industrial application; industrial process timing application. PLC Networking: Introduction, Levels of Industrial Control, Types of Networking, Network communications. Analog PLC Operation, Analog PLC Application Examples

(8 Hrs)**Section-B**

Unit 4: Programming Counters: Up-counter, down counter, Up-Down counter, Cascading counters, Incremental encoder counter applications, combining counter and timer functions, examples of counter function with industrial application, Cascading of Timers and Counters. Various Brands of PLCs and their evaluation. Overview of Siemens PLC, Allen Bradley PLC, Schneider electric PLC, Omron PLC, Mitsubishi PLC. Comparison of various instructions.

(10 Hrs)

Unit 5: PLC Networking Introduction, Levels of Industrial Control, Types of Networking, Network communications. Analog PLC Operation, Types of Analog PLCs, PLC Analog Signal Processing, PLC Analog Application Examples. SCADA: Introduction, Fundamental Principles of Modern SCADA System, Advantages and Disadvantages, SCADA Hardware and Software, Remote Terminal Unit (RTU), Local Area Network & Modems, Emerging New Technologies in SCADA System.

(10 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Introduction to Programmable Logic Controllers	Gary Dunning	Thomson	2 nd (2002)
2	Programmable Logic Controllers: Principles and Application	John W. Webb, Ronald A. Reis,	PHI Learning, New Delhi	5 th (2002)
3	SCADA supervisory control and data acquisition	Stuart A Boyer	ISA	4 th (2016)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Programmable Controllers Theory and Implementation	L.A. Bryan, E. A. Bryan	Industrial Text Company Publication	2 nd (1998)
2	Programmable Logic Controllers	F.D. Petruzella,	Tata Mc-Graw Hill	3 rd (2004)
3	Programmable Logic Controllers	W. Bolton	Elsevier	5 th (2009)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
4	HSMC-401	Entrepreneurship and Business Strategies	HSMC	3	3	0	0	50	100	150

Course Outcomes:

After completion of this course the student will be able to	
CO1	Understand the importance of entrepreneurship as a career option.
CO2	Analyze the types of entrepreneurship as well as the players in the ecosystem.
CO3	Understand different types of business organizations.
CO4	Understand the stages of the entrepreneurship development process and the resources needed for the successful development of entrepreneurial ventures.
CO5	Formulate a business development plan for a given idea.

Detailed Syllabus**Section-A**

Unit 1: Entrepreneurship: Definition and Concept, Entrepreneurial Traits, Characteristics and Skills, Role of Innovation in Entrepreneurship, Types of Entrepreneurs, Entrepreneurship and Economic Development, Factors influencing Entrepreneurship, Myths and realities of entrepreneurship.

(6 Hrs)

Unit 2: Entrepreneurship and Intrapreneurship: Similarities and variance, India's start up revolution–Trends, Imperatives, benefits, the players involved in the ecosystem, Business Incubators, Rural entrepreneurship, Social Entrepreneurship, Women Entrepreneurs, Entrepreneurial success stories.

(5 Hrs)

Unit 3: Legal Forms of Industrial Ownership: Sole Proprietorship, Partnership, Joint Stock Company (Features, Merits and Demerits).

(5 Hrs)**Section-B**

Unit 4: Project Proposal: Project Identification, Developing Business Idea, Preparing Feasibility Report, Project Formulation Feasibility Analysis Techno-Economic Analysis, Financial Analysis, Profitability Analysis, Social Cost Benefit Meaning, Significance of a business plan, components of a business plan, Business Excellence Model.

(7 Hrs)

Unit 5: Small Scale Industries and policies for entrepreneurship development: Definition of small-scale industries, objectives. Role of SSI in economic Development of India. SSI registration, NOC from Pollution Board, Machinery and equipment selection, Schemes and Policies for entrepreneurship development.

(7 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition(Pub. Yr.)
1	Fundamentals of Entrepreneurship	H. Nandan	Prentice Hall India	3 rd (2013)
2	Business model generation	Alexander Osterwalder and Yves Pigneur	Wiley	1 st (2010)
3	Small scale industries and Entrepreneurship	Vasant Desai	Himalaya Publishing House	9 th (2017)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition(Pub. Yr.)
1	Management of small scale Industries	Vasant Desai	Himalaya Publishing House	1 st (2015)
2	Entrepreneurial Development	Khanka S.S.	S Chand and Company	1 st (2006)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
5	ECE-411	Microcontroller Lab	PCC	1	0	0	2	50	-	50

Course Outcomes:

At the end of the course the student will be able to: -

CO1	Analyze the problem and set up programming strategies to solve it
CO2	Develop the program solve a problem in Assembly and Embedded C language
CO3	Develop testing, debugging and experimental procedures for software , 8051, and Arduino board
CO4	Design simple microcontroller based applications using various interfacing devices
CO5	Display the ability to work in a team to complete the Mini Projects

List of Experiments of Microcontroller Lab

S. No.	Experiments
1	Familiarization with 8051 development kit.
2	Write a program for different Arithmetic Operations. <ul style="list-style-type: none"> ● Addition of two 8bit/16bits numbers. ● Subtraction of two 8bit/16bits numbers. ● Multiply of two 8bit numbers. ● Divide of two 8bit numbers.
3	Write a Program for Data transfer and branch operation. <ul style="list-style-type: none"> ● WAP to move data block from one memory location to another memory location ● WAP to use conditional and unconditional jump
4	Write a Program for logical operation <ul style="list-style-type: none"> ● WAP to realize the logical operation OR, AND, XOR, NOT ● WAP to realize the rotate left and rotate right operation
5	Write a program for Square Wave generation <ul style="list-style-type: none"> ● WAP for generation of a square wave on Port pin 1.0 with 50% duty cycle ● WAP for generation of a square wave of 2Khz frequency on Port pin 1.0
6	Interfacing Push-button switch and display its status on LED
7	Interfacing 16x2 LCD to 8051 microcontroller and display "MIET, JAMMU" on LCD
8	Interfacing DC motor using L293D motor driving IC with 8051
9	Installation of Arduino software and write program for blinking LED.
10	Read Push-button switch and display its status on LED.
11	Interfacing of 16x2 LCD with Arduino board and display message on it.
12	Read analogue voltage using an Arduino board and display it on a serial monitor.
13	Interface 4x4 matrix keyboard with Arduino development board. Display value of pressed switch on LCD.
14	Interfacing Ultrasonic sensor with Arduino development board to measure the distance on serial window
15	Interfacing temperature sensor LM35 with Arduino development board and display on LCD
Mini Projects	
1	Design a data logger system using temperature sensor LM35 and humidity with Arduino board
2	Development of Maximum Power Point Tracker using Arduino and LDR
3	Develop an obstacle/edge detection robot using DC Motor with ultrasonic sensor and Arduino board

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
6	ECE-412	Analog and Digital Communication Lab	PCC	1	0	0	2	50	-	50

Course Outcomes:

At the end of the course the student will be able to: -

CO1	Implement amplitude modulation and demodulation techniques.
CO2	Determine frequency modulation and demodulation techniques.
CO3	Analyze and implement various analog to digital converters like PAM, PWM, PCM, DM.
CO4	Design and implement different modulation and demodulation techniques.
CO5	Recognize FDM & TDM concepts in real time engineering applications.

List of Experiments of Analog and Digital Communication Lab

S. No.	Experiments
1	Hardware realization of amplitude modulation and demodulation technique and also calculate modulation index.
2	Perform the AM DSB-SC signal Generation and Detection
3	Perform the AM SSB-SC signal Generation and Detection
4	Examine frequency modulation and demodulation technique.
5	Construct sampling and reconstruction circuits to study the sampling theorem and plot waveforms for different sampling rates.
6	Evaluate the pulse amplitude modulator circuits and observe the waveforms.
7	Evaluate the pulse amplitude demodulator circuits and observe the waveforms.
8	Evaluate the pulse width modulator circuits and observe the waveforms.
9	Evaluate the pulse width demodulator circuits and observe the waveforms.
10	Evaluate the pulse position modulator circuits and observe and plot the waveforms.
11	Evaluate the pulse position demodulator circuits and observe and plot the waveforms.
12	Evaluate the PCM modulator circuit and observe the waveforms.
13	Construct frequency division multiplexing circuits and observe the waveforms.
14	Construct frequency division demultiplexing circuits and observe the waveforms.
15	Construct time division multiplexing circuits and observe the waveforms.
16	Construct time division demultiplexing circuits and observe the waveforms.
17	Analyze a delta modulation system and interpret the modulated and demodulated waveforms.
18	Evaluate ASK, FSK, PSK techniques and verify the waveforms.

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
7	ECE-413	Automation with PLC and SCADA Lab	PCC	2	0	0	4	50	-	50

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Demonstrate skill and knowledge of PLC system
CO2	Demonstrate the hardware and software functioning of PLC
CO3	Apply the programming knowledge of PLC
CO4	Apply a combination of hardware and software to implement applications.
CO5	Design and create real time applications using PLC.

List of Experiment of PLC and SCADA Lab

S. No.	Experiments
1	Introduction to Hardware modules and components of PLCs (iQR series)
2	Wiring and connections with PLC (iQR series)
3	Programming of PLCs using GXWork3
4	Implementation of Timer operation on GXWorks3
5	Implementation of Cascaded Timers operation on GXWorks3
6	Implementation of Counter operation on GXWorks3
7	Implementation of Cascaded Counter operation on GXWorks3
8	Implementation of Cascaded timer and Counter operation on GXWorks3
9	Sequential operation of ON/OFF of a set of lights.
10	Implementations of basic boolean logic operations using PLC
11	Demonstrate the functionality of different type of switches using PLC
12	Speed control of servo motor using PLC
13	Water level controlling using PLC
14	Implementation of PID Controller
15	Smart Power Monitoring using PLC
16	Characterize the robotic arm using PLC
17	Demonstrate the functionality of IoT with PLC
Mini Projects	
1	Pick and place of an object using robotic arm
2	Smart Traffic Control using PLC
3	Water bottle filling using conveyor belt
4	Monitoring & Control of E-Appliances at home using PLC
5	PLC based auto door control system

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
8	HSMC-412	Corporate Etiquette and Personality Development	HSMC	2	0	0	4	50	-	50

Course Outcomes:

After completion of this course the student will be able to

CO1	Appreciate social etiquettes, norms for professional and personal behaviour.
CO2	Use modern tools for making effective presentations.
CO3	Develop competence in professional verbal and non-verbal communication.
CO4	Develop self-awareness and articulate a personal vision.
CO5	Gain insights into emotional intelligence and work effectively in teams.

List of Activities for Corporate Etiquette and Personality Development

S. No.	Activity
1	Polishing Business Manners: Handshake, gifts, visiting cards, humour, office behaviour etc.
2	Power Dressing: Wardrobe Etiquette, Grooming for Success.
3	Body Language, Poise, and Eye Contact.
4	Prepare effective presentations using different modern tools.
5	Understanding the Art of Entertaining: Playing a Gracious Host.
6	Work on Importance of Self Grooming and Personal Hygiene, Gestures and Postures.
7	Language Lab Effective Communication Skills: Word Power enhancement; Attention to Detail: spacing, punctuation, spelling, and other finer aspects; Verbal and non-verbal communication skills; Getting rid of inhibitions and building confidence; Assertive and Submissive communication; Using Language for Convincing and Persuasion; Art of asking Questions.
8	Handling difficult situations with grace, style, and professionalism.
9	To carry out a personal SWOT Analysis.
10	Gender Sensitization.
11	Develop empathy towards customers and colleagues by listening to their problems and understanding them emotionally.
12	Know your colleagues.
13	Apologizing the right way.

*The course would involve interactive sessions, individual and group exercises, role plays, situation-handling, and experience-sharing. Selected video films will complement these.

Minor Degree Course

Course Code	Specialization Track	Course Type	Cd	L	T	P	Marks		
							Mid-Semester	End-Semester	Total
MDC-AI/CS/CC/IoT/DS-401	Artificial Intelligence and Machine Learning/ Cyber Security/ IoT/Data Science/ Cloud Computing	MOOC	5	5	0	0	25	125	150

The students shall be required to complete a MOOC for duration 8-12 weeks corresponding to the opted specialization track. Such MOOCs shall be approved by the Departmental Academic Committee and updated from time to time.

The Departmental Academic Committee shall assess the student work based on the following criteria:

1. Submission of course completion certificate- **75 Marks**
2. Mid Semester Test - **25 Marks**
3. End- Semester Test- **50 Marks**



SYLLABUS FOR B.E ECE

5th & 6th Semester

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Max. Marks
1	ECE-504	Professional Industrial Training/Internship	Summer Internship	3	0	0	0	100

*Note: Students are required to complete the professional industrial training/ internship during summer semesterbreaks.

Semester 5

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks			
								Sessional	Final Exam	Total	
1	ECE-501	Internet of Things	ESC	4	3	1	0	50	100	150	
2	ECE-502	Digital Signal Processing	PCC	4	3	1	0	50	100	150	
3	ECE-503	Microwave Devices & Systems	PCC	4	3	1	0	50	100	150	
4	HSMC-501	Open Elective-1	OEC	3	2	1	0	50	100	150	
5	ECE-511	Internet of Things Lab	ESC	2	0	0	4	50	0	50	
6	ECE-512	Digital Signal Processing Lab	PCC	1	0	0	2	50	0	50	
7	ECE-513	Microwave Lab	PCC	1	0	0	2	50	0	50	
8	HSMC-511	Placement Preparation-I	HSMC	2	0	0	4	50	0	50	
Total				24*	29						900*

* Note: Summer Internship Credits/Marks are also added in this semester's marks sheet.

Hons. /Minor Degree Course

Course Code	Specialization Track	Course Type	Cd	L	T	P	Marks		
							Mid-Semester	End-Semester	Total
MDC-AI/CS/CC/IoT/DS-501	Artificial Intelligence and Machine Learning Cyber Security IoT Data Science Cloud Computing	MOOC	5	5	0	0	25	125	150

*Note: Student can enroll in only one course from chosen Hons./Minor Degree Course. Total Marks is 150 for anyone of the chosen course in the Hons. / Minor Degree Course.

Semester 6

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks			
								Sessional	Final Exam	Total	
1	ECE-601	Wireless and Mobile Communication	PCC	4	3	1	0	50	100	150	
2	ECE-602	VLSI Circuit Design	PCC	4	3	1	0	50	100	150	
3	ECE-603	Computer Networks	ESC	4	3	1	0	50	100	150	
4	ECE-604	Control System	PCC	3	2	1	0	50	100	150	
5	ECE-611	PCB Design Lab	PCC	1	0	0	2	50	0	50	
6	ECE-612	Verilog HDL Programming Lab	PCC	1	0	0	2	50	0	50	
7	ECE-613	Computer Networks Lab	ESC	2	0	0	4	50	0	50	
8	NCC-601	MOOC	NCC	0	2	0	0	-	-	S/NS*	
9	HSMC-611	Placement Preparation-II	HSMC	2	0	0	4	50	0	50	
Total				21	27						800

Hons. / Minor Degree Course

S. No.	Course Code	Specialization Track*	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
1	MDC-AI/CS/CC/IoT/DS-601	Artificial Intelligence and Machine Learning Cyber Security IoT Data Science Cloud Computing	MOOC	5	5	0	0	25	125	150
Total										150*

*Note: Student can enroll in only one course from chosen Hons. / Minor Degree Course. Total Marks is 150 for anyone of the chosen course in the Hons. / Minor Degree Course.

Annexure 1: Open Electives Course List

S. No.	Semester	Course Code	Course Name
1	5	HSMC-501	(A) Business Environment and Ethics
2			(B) Organizational Behavior
3			(C) Managerial Economics
4			(D) Introduction to Human Psychology

SEMESTER 5th

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
1	ECE-501	Internet of Things	ESC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Explain the architecture and foundational protocols of IOT.
CO2	Develop expertise in the Arduino ecosystem for IoT applications.
CO3	Formulate IoT applications integrating appropriate components.
CO4	Assimilate data transmission, storage and management protocols for IoT applications.
CO5	Understand integration of IoT applications and the cloud.

Detailed Syllabus**Section A**

Unit 1: IoT Architecture: – Introduction, Understanding IoT fundamentals, IOT Architecture and protocols, Real-time Examples of IoT, Various Platforms for IoT, Overview of IoT components and IoT Communication Technologies, M2M and WSN Vs IOT, Recent developments and Challenges in Internet of Things.

(10 Hrs)

Unit 2: Arduino Simulation Environment: Setup the IDE, writing Arduino Software, Arduino Libraries, Embedded C programming for Arduino. Interfacing LED, push-button, buzzer and LCD with Arduino. Developing IoT Solutions: Introduction to Raspberry Pi, Raspberry Architecture and Pin Configuration, Basic Setup, Cloud Computing, Sensor-Cloud, Fog Computing, Connected Vehicles, Data Aggregation in IoT.

(12 Hrs)

Unit 3: Interfacing of Sensor & Actuators: Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino, Interfacing of Actuators with Arduino. Interfacing of Arduino with Relay switch, Servo Motor, and Communication with Electrical Machines.

(10 Hrs)**Section B**

Unit 4: Basic Networking with Wi-Fi module: Basics of Wireless Networking, Introduction to ESPXX, ESP8266, and NodeMCU. Various Wi-Fi libraries, Web server- introduction, installation, configuration, posting sensor(s) data to web server. IEEE802.15.4- BACNet Protocol, Modbus, KNX, Zigbee, Network layer, APS layer, Security.

(8 Hrs)

Unit 5: IoT Applications and Cloud Platforms: Virtualization concepts and Cloud Architecture, Cloud computing, benefits, Cloud services - SaaS, PaaS, IaaS, Cloud providers & offerings, Study of IOT Cloud platforms-ThingSpeak API and MQTT, Interfacing ESP8266 with Web services. IOT Applications for Industry: Future Factory Concepts, Brownfield IoT, Smart Applications- Wearable, Agriculture, IoT- A, Hydra, PloT.

(12 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition(Pub. Yr.)
1	IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things	Hanes David, Salgueiro Gonzalo, Grossetete Patrick, Barton Rob	Cisco Press	1 st (2017)
2	Internet of Things: A Hands-on Approach	Arsheep Bagha, Vijay Madiseti	Orient Blackswan Private Limited - New Delhi	1 st (2015)
3	Internet of Things. IoT Infrastructures	Mandler, B., Barja, et all	Springer International Publication	1 st (2016)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Foundational Elements of an IOTSolution - The Edge, Cloud and Application Development	Joe Biron & Jonathan Follett	Oreilly Media, Inc	1 st (2016)
2	Internet of Things A to Z	Qusay F. Hassan	Wiley-IEEE Press	1 st (2018)
3	Internet of Things with RaspberryPi and Arduino	Rajesh Singh, Anita Gehlot, LoviRaj Gupta, Bhupendra Singh, Mahendra Swain	CRC Press	1 st (2021)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
2	ECE-502	Digital Signal Processing	PCC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to :	
CO1	Describe the discrete nature of the signals and its importance.
CO2	Realize a digital system with the help of mathematical relations.
CO3	Evaluate response of a system using frequency transformation technique.
CO4	Implement the basic structures for digital linear systems.
CO5	Design FIR and IIR filters with different specifications.

Detailed Syllabus**Section A**

Unit 1: Representation/ Classification of Signals and Systems: Introduction, Classification of continuous time and discrete time signals, Classification of Systems, Properties of system. Discrete Time Signal Representation: Analysis of linear time Invariant system, Properties of Linear time invariant systems. Recent developments in Digital Signal Processing.

(10 Hrs)

Unit 2: Discrete Transforms: Z- transform and its properties, Inversion of Z-transform, one sided Z-transform and solution of differential equations. Relationship between Z-transform and Fourier transform. Frequency Selective Filters: All pass filters, minimum-phase, maximum-phase and mixed- phase systems, applications of Z-Transform.

(12 Hrs)

Unit 3: Frequency Domain Sampling and DFT: DTFT, DFT, properties, Linear filtering using DFT, radix 2 FFT- Decimation in time FFT algorithms & decimation in frequency FFT algorithms. Implementation Structures of Discrete Time Systems: Direct form, cascade, transposed form structures for FIR systems. Direct forms, transposed form, cascade and parallel form structures for IIR systems.

(12 Hrs)**Section B**

Unit 4: Design of FIR Filters: Characteristics of practical frequency selective filters, types of FIR filters, filter design specifications such as peak pass band ripple, minimum stop band attenuation etc. Design of FIR filters using windowing method, frequency sampling method.

(10 Hrs)

Unit 5: Design of IIR Filters: Design of IIR filters from analog filters, Impulse invariance method, bilinear Z transformation method, QMF filter, Butterworth filter and Chebyshev analog filters.

(10 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Digital Signal Processing: Principle, Algorithms and Applications	John G Proakis, D G Manolakis	Pearson	5 th (2021)
2	Digital Signal Processing	S. Salivahanan	McGraw Hill	4 th (2019)
3	Digital Signal Processing	A Anand Kumar	PHI	2 nd (2015)

Reference Book

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Digital Signal Processing: A computer based approach	S. K. Mitra	McGraw Hill	4 th (2013)
2	Theory and Application of Digital Signal Processing	L. R. Rabiner and B. Gold	Pearson	1 st (2015)
3	Digital Signal Processing	Alan V. Oppenheim and Ronald W. Schafer	Pearson	1 st (2015)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
3	ECE-503	Microwave Devices and Systems	PCC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Describe the concept of transmission line and propagation of low frequency signals.
CO2	Classify various parameters of waveguides and compute dominant modes.
CO3	Calculate various parameters of microwave passive components.
CO4	Explain various microwave solid state devices, amplifiers and tubes.
CO5	Derive VSWR, frequency, power, attenuation for a microwave device.

Detailed Syllabus**Section-A**

Unit 1: Transmission lines: Circuit model for transmission lines, loss less and lossy lines, field analysis, impedance matching, characteristics impedance (Z_0), propagation constant, attenuation constant, phase constant, open and short circuits transmission line, distortion in line, reflection and its coefficient. Line equation at high frequencies, characteristic of $\lambda/2$ and $\lambda/4$ lines, and principle of impedance matching.

(8 Hrs)

Unit 2: Introduction to Microwaves: Maxwell's equations in static & time varying fields, Maxwell's equation in phasor form, Wave equation in an isotropic homogeneous medium and its solution, polarization of waves, Poynting vector. Transmission lines v/s waveguides, applications of Microwaves Waveguides. Mathematical analysis of rectangular and circular waveguides, Waveguide Resonators-Rectangular and Cylindrical, Resonant frequencies.

(12 Hrs)

Unit 3: Microwave Passive Components: Low frequency parameters- Impedance, Admittance, Hybrid and ABCD parameters; High Frequency parameters-S parameters, Formulation and Properties of S (Scattering matrix) parameters, Reciprocal and lossless Network E-plane, H-plane Tees, Magic Tee, Hybrid ring, Directional couplers, Power dividers, Attenuators, Phase shifter, propagation in ferrites, Faraday rotation: Circulators and Isolators.

(10Hrs)**Section-B**

Unit 4: Microwave Tubes: Limitations of conventional tubes in microwaves; Multi cavity Klystron, Reflex Klystron; Magnetron; Travelling Wave Tube; Backward Wave Oscillator- working principles and characteristics.

(8Hrs)

Unit 5: Microwave Solid State Devices: PIN diode, Tunnel diode, Gunn diode, Avalanche transit time devices: IMPATT, TRAPATT, BARITT diodes, and parametric amplifiers. Varactor diode, Schottky diode, Microwave Measurements: Measurement of frequency, impedance, SWR, Power, phase shift, Attenuation

(10 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition(Pub. Yr.)
1	Microwave Devices and Circuits	S.M. Liao	Pearson	3 rd (2007)
2	Microwave Engineering: Passive Circuits	Peter A. Rizzi	PHI	1 st (2009)
3	Electromagnetic Waves & Radiating Systems	E. C. Jordan & K. G. Balman	Pearson Education	2 nd (2015)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Microwave Engineering	D.M. Pozar	Wiley India Pvt. Ltd	4 th (2012)
2	Foundations for Microwave Engineering	RE Collin, Wiley India Pvt. Ltd	Wiley India Pvt. Ltd	2 nd (2007)

Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
HSMC-501(A)	Business Environment and Ethics	OEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Articulate the types of business environments and their importance in overall business sustenance and growth.
CO2	Apply the process of Environmental Scanning in different settings using different models for analysis.
CO3	Appreciate the overall economic environment and analyze different global economic systems and policies.
CO4	Examine significant contemporary ethical issues and challenges in business environments and their implications.
CO5	Appreciate different models of corporate social responsibility and the roles and responsibilities of different stakeholders.

Detailed Syllabus**Section-A**

Unit 1: The concept of Business Environment, Significance and Nature; Types of Business Environment: Internal and External Environment, micro and macro environment. Impact of business environment on business decision.

(8 Hrs)

Unit 2: Environment Scanning: Meaning, Nature and Scope; The process of Environmental Scanning; PEST Analysis; Competitor's Analysis: Porter's Five Force Model; SWOT Analysis.

(8 Hrs)

Unit 3: Concept and nature of economic environment; Critical elements of economic environment; Basic economic systems: Capitalism, socialism, mixed; New economic policies: Liberalization, privatization and globalization; FEMA; Monetary and fiscal policies.

(8 Hrs)**Section-B**

Unit 4: Introduction to Business ethics, Definition, Need, Importance, Nature, Scope, Objectives of Business Ethics, Factors Influencing Business Ethics, Characteristics of Business Ethics, Ethical Aspects in Marketing, Finance, HR, Ethical Decision Making.

(8 Hrs)

Unit 5: Corporate Social Responsibility: Concept, Scope & Relevance and Importance of CSR in Contemporary Society. CSR towards - Share holders, Creditors and Financial Institutions, Government, Consumers, Employees and Society.

(8 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Essentials of Business Environment	Aswathapa, K	Himalaya Publishing House	8 th (2011)
2	Business Ethics Text & Cases	C.S.V Murthy	Himalaya Publishing House	8 th (2018)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Business Environment	Francis Cherunilam	Himalaya PublishingHouse	28 th (2019)
2	Business Ethics: An Indian Perspective	A.C Fernando, K. P Muralidheeran, E. K Satheesh	Pearson Education	3 rd (2019)

Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
HSMC-501(B)	Organizational Behavior	OEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to: -

CO1	Illustrate the nature and skills required for managerial work.
CO2	Appreciate and articulate important Management Functions including Planning, Organizing, Staffing, Directing and Controlling.
CO3	Analyze individual and group behavior using existing theories and framework to appreciate its implications on organizational behavior.
CO4	Appreciate group/team dynamics and evaluate the appropriateness of various conflict management strategies used in organizations.
CO5	Analyze different leadership and motivational theories in affecting organizational change and development.

Detailed Syllabus**Section A**

Unit 1: The Management Process and the nature of managerial work: Managerial skills and roles, Development of management thoughts, Contemporary challenges in management, Difference between Management and Administration.

(8 Hrs)

Unit 2: Organization Structure & Culture: Meaning of Organization Design and Structure, Basic elements of Organization Structure, Types of Organization Design, Meaning and Nature of Organization Culture - Types of Culture, Creating and Maintaining Organization Culture, Managing Cultural Diversity.

(8 Hrs)

Unit 3: Organizational Behavior: Personality-Trait Theory, Big Five Models, Perception, Attitudes, Johari Window, Transactional Analysis: Ego states, Life positions, Transactions.

(8 Hrs)**Section B**

Unit 4: Group Behavior: Types of Groups, Stages of Group Development, Group conflict and Resolution strategies, Group Cohesiveness & Group Decision Making, Effective Team Building. Work Stress: Concepts, Nature, Causes and Coping Strategies.

(8 Hrs)

Unit 5: Leadership: Approaches and Styles, Gender and Leadership, Leadership effectiveness, Motivation: Types, Importance and Theories. Organizational Change and Development.

(8 Hrs)**Text Books**

S. No.	Name of the Suggested Books	Name of Author	Publisher Name	Edition (Pub. Yr.)
1	Organizational Behavior	Stephen P. Robbins	Prentice-Hall of India	11 th (2015)
2	Essential of Management	Koontzo Donnel	Mc Graw Hill	11 th (2020)

Reference Books

S. No.	Name of the Books	Name of the Author	Publisher Name	Edition (Pub. Yr.)
1	Principles of Management.	Tripathi P.C & Reddy, P. N	Tata Mc Graw Hill	9 th (2012)
2	Principles and Practices of Management	L.M.Prasad	Sultan Chand & Sons	20 th (2017)

Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
HSMC-501(C)	Managerial Economics	OEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Understand and articulate the concepts of managerial economics and its relationship to business operations.
CO2	Apply marginal analysis and demand forecasting under different market conditions.
CO3	Analyze the market structure including causes and consequences of different market conditions.
CO4	Apply the process of calculating national income; analyze its components including circular flow of income and income identities.
CO5	Analyze different fiscal and monetary policies and the implications.

Detailed Syllabus**Section-A**

Unit 1: Characteristics of Managerial Economics – Nature and Scope of Managerial Economics – Importance of Managerial Economics – Basic Economic Tools in Managerial Economics – Managerial Economist's Role and Responsibility.

(6 Hrs)

Unit 2: Demand Estimations for Major Consumer Durables and Non-durable Products – Demand Forecasting Techniques: Statistical and Non-statistical Techniques.

(7 Hrs)

Unit 3: Definition of Market – Market Structure (Perfect Competition, Imperfect Competition) – Price Determination – Firm's Equilibrium in Perfect Competition, Monopoly, Monopolistic, Oligopoly and Duopoly.

(7 Hrs)**Section-B**

Unit 4: National Income – Concepts – Methods – Measurement of National Income – GDP and GVA – Business Cycles – Nature – Phases – Causes – Inflation – Causes and Control – Deflation and Stagflation.

(7 Hrs)

Unit 5: Fiscal Policy – Deficits – Budgetary Deficit – Primary Deficit – Revenue Deficit – Fiscal Deficit – Objectives of FRBM Act – Monetary Policy – Objectives – Repo Rate – Reverse Repo Rate – CRR – SLR – Finance Commission – Role and Objectives.

(8 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Managerial Economics	Maheshwari	PHI Learning	3 rd (2013)
2	Managerial Economics	Peterson, Lewis Jain	Pearson	4 th (2009)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Managerial Economics	Amit Ahuja	Vikas Publishing House	9 th (2020)
2	Managerial Economics	DN Dwivedi	Vikas Publishing House	8 th (2015)

Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
HSMC-501(D)	Introduction to Human Psychology	OEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Illustrate the various perspectives and theories in the field of modern psychology.
CO2	Understand the perspectives of learning theories and motivation.
CO3	Articulate the applicability of psychology in ensuring overall human well-being.
CO4	Appreciate the complexities in the decision-making process and change management in organizations.
CO5	Demonstrate understanding of organizational culture, strategies for culture building and relevant issues.

Detailed Syllabus**Section-A**

Unit 1: Introduction, Definition and Scope of Psychology; Psychology as a science, methods of psychology; Subfields of psychology; Psychology in modern India.

(6 Hrs)

Unit 2: Principles and applications of Classical conditioning, Operant conditioning, and Observational learning; Cognitive influences on learning; Perspectives on motivation.

(8 Hrs)

Unit 3: Application of Psychology: Stress-management, Burnout: Causes, effect and coping well-being; Self-development: Application of Psychology in building memory and creativity.

(5 Hrs)**Section-B**

Unit 4: Decision making process, individual influences, group decision process; Forces for change in Organization, Resistance to change, Lewin's Change Model.

(8 Hrs)

Unit 5: Characteristics of the Workplace: Organizational Culture and climate; Strategies for reinforcement of culture, Functions of organizational culture, Organizational Socialization, Assessing Cultural Values and Fit, Cross-Cultural issues

(8 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Industrial Psychology	H. L. Kalia	The Associated Publishers	1 st (2006)
2	Industrial and Organizational Psychology	Cary, L. Cooper and Edwin, A. Locke,	Blackwell Publishing	1 st (2000)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Industrial and Organizational Psychology	Spector	Pearson Education, Inc.	6 th (2010)
2	Organizational Behavior	Robbins, Stephen	Prentice Hall, India	11 th (2012)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
5	ECE-511	Internet of Things Lab	ESC	2	0	0	4	50	-	50

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Analyze the components of IoT system.
CO2	Develop an application with Node MCU and Arduino Nano.
CO3	Develop a sensor interface for IOT application.
CO4	Develop an interface between sensor and cloud to capture the real time data.
CO5	Design an application which can control an actuator using internet.

List of Experiments of IoT Lab

S. No.	Experiments
1	Study of Arduino Uno, Raspberry Pi, ESP8266 and Arduino IDE
2	Interfacing of Analog sensor with Arduino and display the value in serial monitor
3	Interfacing of DHT-11 with Arduino Uno to acquire the temperature and humidity data
4	Communicate two XBEE modules in AT mode using Arduino Uno/Raspberry Pi
5	Controlling LED from remote location and publish the status on ThingSpeak cloud
6	Interfacing of ultrasonic sensor with Arduino Uno /Raspberry pi and display the distance in LCD
7	To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to Smartphone using Bluetooth.
8	Write a program on Arduino/Raspberry Pi to upload and retrieve temperature and humidity data to/from ThingSpeak cloud.
9	Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
10	Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.
11	Read Cloud data with ESP8266 using Web Client/Server and control the actuator according to the Parameter
12	Upload the DHT-11 sensor data to MQTT cloud service using Node MCU

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
6	ECE-512	Digital Signal Processing Lab	PCC	1	0	0	2	50	-	50

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Generate elementary signals and perform arithmetic operations on signals.
CO2	Plot frequency response of a given system and verify the properties of the signals.
CO3	Demonstrate and convolute various continuous and discrete time varying signals.
CO4	Design FIR and IIR filters.
CO5	Evaluate the digital filter circuits with desired time variant signals.

List of Experiment of DSP Lab

S. No	Experiments
1	Introduction to MATLAB.
2	Write a MATLAB program to indicate the precedence of arithmetic and logical operations
3	Write a MATLAB program to read and write : data, audio and image file
4	Write a MATLAB program to generate elementary signals in discrete time: Unit Impulse, Unit Step, Ramp, Exponential, Sine and Cosine Sequences.
5	Write a MATLAB program to generate an elementary signal from a) Addition of two sequences. b) Multiplication of two sequences.
6	Write a MATLAB program to evaluate the frequency response of a system.
7	Write a MATLAB program to implement: a) Auto-correlation function. b) Cross-correlation function.
8	Write a MATLAB program to Convolute two sequences: Linearly and Circularly.
9	Write a MATLAB program to plot the response of low pass and high pass FIR filters.
10	Write a MATLAB program to design a IIR filter using Bilinear Transformation.

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
7	ECE-513	Microwave Lab	PCC	2	0	0	4	50	-	50

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Plot and understand the impact of change in reflector voltage on current and frequency in reflex klystrontube.
CO2	Evaluate the parameters (frequency, wavelength) of rectangular waveguide for a particular mode.
CO3	Calculate reflection coefficient and VSWR of electromagnetic field.
CO4	Verify the impedance measured using klystron tube with Smith Chart.
CO 5	Determine attenuation using isolator and circulator

List of Experiments of Microwave Lab

S. No.	Experiments
1.	Verify the characteristics of Reflex Klystron tube and to determine its electronic tuning range.
2.	Determine the frequency and wavelength in Rectangular waveguide.
3.	Determine the standing-wave ratio & reflection coefficient.
4.	Measure unknown impedance with smith chart.
5.	Verify the characteristics of Gunn diode.
6.	Verify V-I Characteristics.
7.	Determine output power & frequency as a function of voltage.
8.	Calculate the coupling factor & directivity using a directional coupler.
9.	To study the following Tees: -E-Plane H-Plane Magic Tee
10.	To study the Isolator & Circulators.
11.	Examine and demonstrate the radiation pattern of Horn antenna.

S.No	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
8	HSMC-511	Placement Preparation-I	HSMC	2	0	0	4	50	0	50

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Apply programming constructs to solve puzzles/problems from a placement perspective.
CO2	Develop problem solving skills on online coding platforms.
CO3	Demonstrate logical reasoning and aptitude in online tests.
CO4	Solve complex problems in data structures and algorithms.
CO5	Demonstrate confidence and poise in personal interviews.

List of Activities for Placement Preparation

S. No	Activities
1.	Practice Computer Fundamentals Introduction to DBMS, SQL Basics, Joins, Normalization, Subquery, Searching and Sorting, Transactions, NoSQL Databases
2.	Programming Basics Introduction to Python, Algorithms, Variables, Datatypes & Operators in Python, Control Structure, Tuple, Unit Testing, Collection, Function, OOPS Concept, Introduction to Java, Polymorphism, OOP Basics, Arrays and String, Abstract, final and Interface, Recursion.
3.	Pseudo Code and Data StructureCode snippet on C, C++, and Java Understanding of programming logic (tested through Pseudo Code QuestionsQueue, Array, Stacks, Tree, Graphs, Time complexity, Hashing Code Debugging Automata fix
4	Game-Based Aptitude Grid Challenge, Deductive-logical Thinking, Inductive-logical Reasoning, Motion Challenge, SwitchChallenge, Digit Challenge
5.	Verbal Ability Reading Comprehension, Sentence Correction, Spotting Error, Speech, and Tenses, Sentence Selection, Sentence Arrangement, word completion
6.	Industry Ready - Foundation Resume Building, Group Discussion, Personal Interviews, Big 5 Personality Tests, LinkedIn ProfileBuilding. Domain Specific Industry Oriented Certification
7.	Participation in Branch specific technical assessments, Coding Competitions, and Hackathons.
8.	Higher Education Explore higher education opportunities in India and abroad, the Scholarship process for international universities, and the competitive entrance examination process.

Course Code	Specialization Track	Course Type	Cd	L	T	P	Marks		
							Mid-Semester	End-Semester	Total
MDC-AI/CS/CC/IoT/D S-501	Artificial Intelligence and Machine Learning Cyber Security IoT Data Science Cloud Computing	MOOC	5	5	0	0	25	125	150

The students shall be required to complete a MOOC for duration 8-12 weeks corresponding to the opted specialization track. Such MOOCs shall be approved by the Departmental Academic Committee and updated from time to time.

The Departmental Academic Committee shall assess the student work based on the following criteria:

1. Submission of course completion certificate- **75 Marks**
2. Mid Semester Test - **25 Marks**
3. End- Semester Test- **50 Marks**

SEMESTER 6th

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
1	ECE-601	Wireless and Mobile Communication	PCC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Discuss the major cellular Communication standards (1G/2G/3G/4G/5G).
CO2	Characterize the tradeoffs among frequency reuse, signal to interference ratio, capacity and spectral Efficiency.
CO3	Illustrate characteristics of different modulation techniques and multiple access techniques.
CO4	Establish the concepts for different models of mobile radio propagations.
CO5	Articulate the wireless communication systems and standards like GSM, IS-95.

**Detailed Syllabus
Section-A**

Unit 1: Introduction to Wireless Communication System: Evolution of mobile communications, Mobile Radio System around the world, Types of Wireless communication System, Comparison of Common wireless system, Trends in Cellular radio and personal communication. Second generation Cellular Networks, Generations of Mobile (3G, 4G, 5G & 6G) Wireless Networks.

(9 Hrs)

Unit 2: The Cellular Concept: Introduction, Hexagonal geometry cell and concept of frequency reuse, Handoff strategies, Co-channel interference and system capacity, Adjacent channel capacity, Improving Coverage and capacity- Cell splitting, Sectoring.

(9 Hrs)

Unit 3: Advanced Mobile Communication Standards, IEEE 802.11 WLAN standard and its variants – PHY layer technologies – MAC mechanism – Security, Qos and handover Issues – IEEE 802.15 WPAN standard – Bluetooth Architecture and Protocol stack – IEEE 802.16 Wireless broadband access standards – PHY and MAC layer overviews– WiMAX network architecture – Initialization and handover procedures.

(11 Hrs)**Section-B**

Unit 4: Mobile Network, Transport and Application Layers, Mobile IP – Packet delivery process – Routing optimization – Mobile ad-hoc networks and routing protocols – Mobile TCP –Wireless Application Protocols.

(8 Hrs)

Unit 5: Wireless System & Standards: GSM-Features, Architecture, Channel types, CDMA Digital Cellular standard (IS-95) - CDMA forward channels, CDMA reverse channels, soft handoff, CDMA features, Introduction to Bluetooth, Wi-Fi, Wi-Mac.WLAN Standard IEEE 802.10, IEEE 802.11

(10 Hrs)**Textbooks**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Wireless Communication Principles and Practice	Theodore S. Rappaport	PHI	2 nd (2018)
2	Mobile Communication Engineering	W.C.Y Lee	TMH	2 nd (2017)
3	Wireless Communication	William Stallings	Pearson	2 nd (2009)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Wireless Communication	T L Singal	TMH	1 st (2017)
2	Wireless Communications and Networking	Vijay Garg	Morgan Kaufmann	1 st (2008)
3	Personal & Mobile Communication	Raj Pandaya	Wiley Blackwell	2 nd (2004)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
2	ECE-602	VLSI Circuit Design	PCC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Describe fundamentals of the VLSI circuit Design using Verilog HDL.
CO2	Recognize the Verilog HDL, contents, syntax of programming for the CMOS circuits.
CO3	Classify the combinational & sequential circuits using Verilog HDL.
CO4	Verify the simulation techniques and test bench creation.
CO5	Design any combinational & sequential logic circuits using Verilog HDL.

Detailed Syllabus
Section-A

Unit 1: Introduction to MOSFET: Basics structure and operation of MOS, MOS Symbol, MOS device design equations, MOS I-V characteristics, MOS Transistor as a Switch, Device Capacitances

(10 Hrs)

Unit 2: CMOS Logic: CMOS Inverter, DC characteristics, Beta ratio effects, Combinational Logic, the NAND gate, the NOR gate, compound gates, Pass Transistor and Transmission Gate.

(10 Hrs)

Unit 3: Hardware Description Languages: Data Types, Structure of Verilog Module, Operators, Types of descriptions, simulation and synthesis. Comparison of VHDL and Verilog.

(8 Hrs)

Section-B

Unit 4: Gate level and Data-flow Modeling: Verilog Gate primitives, Delay specification, rise, fall and turn-off delays, Data-flow Modeling, assignment statement, operators, operands, operator types

(16 Hrs)

Unit 5: Behavioral Modeling: Structured procedures, initial and always, blocking and non-blocking statements, delay control, generate statement, event control, conditional statements, loops statements

(8 Hrs)

Text Books

S. No	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	CMOS Digital Integrated Circuits	Sung Ms Kang, Yusuf Lablebici	Tata McGraw Hill	4 th (2018)
2	CMOS VLSI Design: A Circuits and Systems Perspective	Neil H.E. Weste, David Harris, Ayan Banerjee	Pearson	4 th (2015)
3	A Verilog HDL primer	J. Bhaskar	BSP	3 rd (2016)
4	A Guide to Digital Design and Synthesis	S. Palnitkar	Prentice Hall	2 nd (2003)

Reference Books

S. No	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Verilog Digital System Design	Z. Navabi	McGraw-Hill	2 nd (2017)
2	CMOS Circuit Design, Layout and Simulation	Jacob Backer	Wiley	3 rd (2010)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
3	ECE-603	Computer Networks	ESC	4	3	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Articulate the fundamental concepts in computer networks and justify their layered implementation.
CO2	Appreciate the challenges involved and available protocols for facilitating low-level data communication.
CO3	Analyze the design issues in ensuring error free data construction, deconstruction and transmission across devices.
CO4	Justify the application of appropriate routing algorithms in different scenarios based on through Understanding of prevalent routing algorithms.
CO5	Articulate the role of higher network layers in the OSI models and the working of common network Applications.

Detailed Syllabus
Section A

Unit 1: Introduction: Data Communication-communication system, synchronous and asynchronous systems, serial and parallel systems, dataflow-simplex, half-duplex, full-duplex, computer network-uses of computer network, categories of computer networks, protocol and standards, Reference Model-OSI and TCP/IP reference model, their comparison and critique, Network Topologies.

(12 Hrs)

Unit 2: Physical Layer: Data Transmission-Digital to Digital Conversion-Line Coding Scheme, Transmission Media, RS-232 Interface, Switching mechanisms and Comparison –circuit, packet, message, Modem and its types.

(11 Hrs)

Unit 3: Data Link Layer: Design Issues, Error Detection and Correction, Flow Control-Elements of data link protocol, Sliding Window Protocol, Example of Data Link Protocol (HDLC), Channel Allocation Problems, Multiple Access Protocol-ALOHA, Carrier Sense Multiple Access Protocols, Collision Free Protocols, IEEE standards-802.3, 802.4,802.5.

(9 Hrs)

Section B

Unit 4: Network Layer : Design Issues, Routing Algorithms–the optimality principle, shortest path algorithm, flooding, distance vector routing, link state routing and hierarchical routing, Congestion Control- principles prevention policies, congestion control in virtual circuit subnet and datagram subnets, Traffic shaping algorithm - leaky bucket algorithm, token bucket algorithm, QOS, IP protocol, IP addresses, Internet Multicasting, Introduction to IPV6, IPV4 vs. IPV6, Internetworking devices –concept of Internetworking, Repeaters, Hub, Bridges, Switches, Routers, Gateways.

(8 Hrs)

Unit 5: Transport, Session, Presentation and Application Layer: Transport Layer Services, Primitives, Issues, elements of transport protocol, Introduction to TCP and UDP, Design Issues, FTP, DNS, E-Mail, Introduction to WWW, Firewalls.

(8 Hrs)

Text Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Computer Networking with Internet Protocols and Technology	W. Stallings	Pearson Education	2 nd (2009)
2	Computer Networks: A System Approach	L.L. Peterson	Morgan Kauffman	6 th (2021)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Computer Networking: A Top-Down Approach Featuring the Internet	Kurose & Ross	Pearson Education	7 th (2017)
2	Computer Networks and Internets with Internet Applications	Coumar & Douglas	Pearson	4 th (2014)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
4	ECE-604	Control System	PCC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Explain the concept for modeling of physical systems in open loop and closed loop.
CO2	Determine the transfer function using block diagram technique and signal flow graph.
CO3	Illustrate the various linear feedback systems for frequency and time domain.
CO4	Design PID controller for linear time invariant system.
CO5	Analyze state space approach for discrete-time systems.

Detailed Syllabus
Section-A

Unit 1: Control systems, types of control systems, feedback and its effects, mathematical modeling of physical systems, block diagrams, representation of control systems, transfer functions, signal flow graphs, mason's gain formula, time domain analysis of control systems: time domain analysis of first and 2nd order control systems, typical test signals for time response of control systems, time domain performance of first and second order control systems.

(10Hrs)

Unit 2: AC and D.C. Servomotors, AC tachometer, synchro transmitter and receiver, synchro pair as control transformer, AC and DC position control system, stepper motor, magnetic amplifier and adaptive control.

(08Hrs)

Unit 3: Stability characteristic equation, stability of linear time invariant systems, Routh-Hurwitz stability Criterion, Root locus plot, Bode plot, Polar Plot, Nyquist Criterion.

(12Hrs)

Section-B

Unit 4: Design specifications in time domain and frequency domain, phase lead, and phase lag design using Bode-plot and root locus techniques, Introduction to P, PI and PID controllers, tuning of PID controllers.

(10 Hrs)

Unit 5: State Space Approach for discrete time systems: State space models of discrete systems, state space analysis. Lyapunov Stability, controllability and observability analysis, effect of pole zero cancellation on the controllability and observability.

(08 Hrs)

Text Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Modern Control System	C. Drof and Robert H. Bishop	Pearson International	14 th (2021)
2	Control System Engineering	Nagrath and Gopal	New Age International	5 th (2016)
3	Linear Control System	B. S. Manke	Khanna	12 th (2009)

Reference Book

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Modern Control Engineering	K. Ogatta	McGraw Hill Education	5 th (2010)
2	Automatic Control Systems	Fard Golnargi, B. C. Kuo,	Mcgraw Hill Education	1 st (2018)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
5	ECE-611	PCB Design Lab	PCC	1	0	0	2	50	-	50

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Develop schematic design using design CAD tool
CO2	Test the PCB for designed circuit.
CO3	Design PCB layout for SMD components
CO4	Implement design route checking
CO5	Demonstrate manufacturing setup for post-process

List of Experiments of PCB Design Lab

S. No.	Experiments
1	Introduction to PCB design tool
2	To design a PCB layout of full wave rectifier using PCB Design Editor
3	To design the schematic and PCB layout of 7805 regulator circuit and prepare the PCB design.
4	To design the schematic and PCB layout of Astable multivibrator using 555 timers IC circuit and prepare the PCB design.
5	To design the schematic and PCB layout of RC phase shift oscillator circuit and prepare the PCB design.
6	To design the schematic and PCB layout of summing amplifier circuit using Op-Amp
7	To design the schematic and PCB layout of 4-bit binary counter circuit and prepare the PCB design.
8	To design the schematic and PCB layout of Temperature sensor circuit
9	To design the schematic and PCB layout of 8051 development board and prepare the PCB design
10	Test the PCB by assembling the designed circuit

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
6	ECE-612	Verilog HDL Programming Lab	PCC	1	0	0	2	50	-	50

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Develop design flow for the given application using VLSI tools
CO2	Interpret CMOS technology circuits with their specifications.
CO3	Use relevant Verilog HDL model for given application.
CO4	Analyze Verilog HDL program for the given circuits.
CO5	Implement the combinational & sequential logic circuits using Verilog HDL.

List of Experiments of Verilog HDL Programming Lab:

S. No.	Experiments
1	Write a Verilog code to realize all the logic gates
2	Write Verilog codes for the following combinational designs
	a. 3:8 decoder
	b. 4: 1 Multiplexer
	c. parity generator
	d. 4 Bit comparator
	e. 4 bit binary to gray converter
	f. Write a Verilog code to describe the functions of a Full Adder using three modeling styles
3	Write Verilog code to model RS & JK Flip flop
4	Write Verilog code for 4 Bit Up / Down Counter
5	Write Verilog program for 8 bit shift register
6	Write a Verilog program to implement a 4 digit seven segment display
7	Write a Verilog code to model 32 bit ALU
8	Miscellaneous

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
7	ECE-613	Computer Networks Lab	ESC	2	0	0	4	50	-	50

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Apply the low-level computer networking concepts via standard hardware and software-based simulation tools so as to practically implement the understanding of standardized models.
CO2	Devise network topologies and emulate modern computer networks using Cisco packet tracer.
CO3	Evaluate the effectiveness of Link state and Distance Vector routing protocols in different real-world networking scenarios
CO4	Analyze different network configuration modes so as to effectively develop the best network practices.
CO5	Create basic client-server frameworks through the implementation of primitives of Socket programming.

List of Experiments of Computer Networks Lab

S. No.	Experiments
1	Fabrication of cables: Making Straight, Rollover and Cross-Over cables using RJ-45 connector and crimping tool.
2	Familiarization with Network Devices in Detail.
3	Configure a Router with Different VLANs and analyze the security of Individual VLANs.
4	Configure and implement IPv4 & IPv6 addressing.
5	Basic LAN Setup via Packet Tracer.
6	Familiarization with basic Network Commands along with different configuration modes.
7	Familiarization with different Subnetting Techniques.
8	Simulate Static Routing in a topology.
9	Simulate RIP protocol in a topology.
10	Simulate OSPF protocol in a topology.
11	Simulate EIGRP protocol in a topology.
12	Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
8	HSMC-611	Placement Preparation-II	HSMC	2	0	0	4	50	0	50

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Apply programming constructs to solve puzzles/problems from a placement perspective
CO2	Develop problem solving skills on online coding platforms
CO3	Demonstrate logical reasoning and aptitude in online tests
CO4	Solve complex problems in data structures and algorithms
CO5	Demonstrate confidence and poise in personal interviews

List of Activities for Placement Preparation

S. No	Activities
1.	Advanced Reasoning: Data Sufficiency, Syllogism, Number Series, Word pattern, Blood relations, Coding and Decoding, Distance and Direction, Visual Reasoning, Logical Venn Diagram based DI, Paper Cuts and folds, Seating Arrangement
2.	Advanced Quantitative Aptitude: Logarithms, Permutation and Combinations, Probability, Pipes and Cisterns Geometry, Coordinate Geometry, Clocks & Calendar Time Speed Distance, LCM & HCF, Series and Progressions, Sudoku, Mensuration, Data Interpretation, Simplification and Calculation
3.	Advanced Coding Problem Solving Sessions: C, C++, Python, and Java
4.	Competitive Coding and Data Structure Algorithms Problem Solving Sessions
5.	Industry Ready – Advanced: Professional networking through LinkedIn, Mock Interviews with External Experts, Group Discussions, Understanding and participation in Campus Hiring Process, Industry certification on Cloud Foundation and Computer Vision.
6.	Participation in a national level employability aptitude test to assess the learner's ability on quantitative, verbal, logical reasoning, soft skills, and technical skills.
7.	Participation in Branch specific technical assessments, Coding Competitions, and Hackathons.
8.	Career Counseling and Career Progression.

S.No	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
8	NCC-601	MOOC	NCC	0	2	0	0	-	-	S/NS*

*Note: S=Satisfactory, NS=Not Satisfactory

As part of this elective, student will undertake MOOC's pre-approved by the department in the following suggested areas:

- A. Metaverse
- B. IoT for Blockchain
- C. Data Science with Python
- D. Embedded Machine Learning
- E. Any other

Course Outcomes:

Defined by the online platform for the specific course chosen

Course Code	Specialization Track	Course Type	Cd	L	T	P	Marks		
							Mid-Semester	End-Semester	Total
MDC- AI/CS/CC/IoT /DS-601	Artificial Intelligence and Machine Learning/ Cyber Security/ IoT/ Data Science/ Cloud Computing	MOOC	5	5	0	0	25	125	150

The students shall be required to complete a MOOC for duration 8-12 weeks corresponding to the opted specialization track. Such MOOCs shall be approved by the Departmental Academic Committee and updated from time to time.

The Departmental Academic Committee shall assess the student work based on the following criteria:

1. Submission of course completion certificate- **75 Marks**
2. Mid Semester Test - **25 Marks**
3. End- Semester Test- **50 Marks**



**(AUTONOMOUS)
NAAC "A" GRADE**

SYLLABUS FOR B.E ECE

(7th & 8th semester)

Batch 2023

Onwards

**Semester 7
Scheme-1**

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Total Marks
1	ECE-704	Professional Industrial Training/ Internship	Summer Internship	4	0	0	0	150

Note: Students are required to complete the professional industrial training / Internship during summer semester breaks

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks			
								Sessional	Final Exam	Total	
1	ECE-701	Professional Elective 1	PEC	3	2	1	0	50	100	150	
2	ECE-702	Professional Elective 2	PEC	3	2	1	0	50	100	150	
3	ECE-703	Professional Elective3*(SWAYAM/NPTEL MOOC/Any Other Platform)	MCC*	3	0	0	0	-	100	100	
4	OEC-701	Open Elective	OEC	3	3	0	0	50	100	150	
5	ECE-705	Seminar	PEC	2	0	0	4	-	100	100	
6	ECE-711	Minor Project	PROJ	3	0	0	6	100	150	250	
7	NCC-701	Essence of Indian Knowledge and Tradition	NCC	0	0	0	2	Satisfactory/ Not Satisfactory		S/NS*	
Total				21*	21						1050*

***Note:** Summer Internship Credits/Marks are also added in this semester's marks sheet.

Scheme-2

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks			
								Mid Semester	Final	Total	
1	PII-701	Industry Internship-I	Professional Industry Internship	15	0	0	30	350	500	850	
2	ECE-703	Professional Elective 3* (SWAYAM/NPTEL MOOC/any otherPlatform)	MCC*	3	0	0	0	-	100	100	
3	ECE-706	Professional Elective 4* (SWAYAM/NPTEL MOOC/ any otherplatform)	MCC*	3	0	0	0	-	100	100	
Total				21*	30						1050*

Under Scheme 1: The students must opt for two Professional Electives & one open elective course out of the given Professional/Open elective courses. One of the Professional Elective courses must be a MOOC selected from the list of MOOCs mentioned in the MOOCs list published by the department.

Under Scheme 2: Professional Elective 3*/Professional Elective 4* courses must be a MOOC selected from the list of MOOCs mentioned in the MOOCs list.

Note: The Department will publish a list of MOOCs available on SWAYAM/NPTEL/ any other platform before the commencement of the Next semester.

**Semester 8
Scheme-1**

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
1	ECE-801	Professional Elective 1	PEC	3	2	1	0	50	100	150
2	ECE-802	Professional Elective 2	PEC	3	2	1	0	50	100	150
3	ECE-803	Professional Elective 3*(SWAYAM/NPTEL MOOC/Any Other Platform)	MCC*	3	0	0	0	-	100	100
4	ECE-811	Major Project	PROJ	6	0	0	12	200	300	500
Total				15	18					900

***Note:** One of the Professional Elective courses must be a MOOC selected from the list of MOOCs mentioned in the MOOCs list.

Department to publish list of available MOOCs on SWAYAM/NPTEL/Any Other platform before the Commencement of the Next semester.

Scheme-2

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Mid Semester	Final	Total
1	PII-801	Industry Internship-II	Professional Industry Internship	15	0	0	30	300	600	900
Total				15	30					900

Annexure 1: Open Electives Course List

S. No.	Semester	Course Code	Course Name
1	7	OEC-701	(A) Strategic Management
2			(B) Marketing Management
3			(C) Managerial Economics

Annexure 2: Professional Elective Courses List

S. No.	Semester	Course Code	Course Name
1	7	ECE-701	(A) Wireless Sensor Networks
2			(B) Advanced Mobile Technologies
3			(C) Optical Fiber Communication
1	7	ECE-702	(A) Introduction to AI with Machine Learning
2			(B) Introduction to Cyber security
3			(C) Fundamentals of Blockchain Technology
1	8	ECE-801	(A) Instrumentation and Biomedical Engineering
2			(B) Digital Image Processing
3			(C) Advanced Digital Signal Processing
1	8	ECE-802	(A) UAVs and Drone Technology
2			(B) Hybrid and Electric Vehicles
3			(C) Foundations of Internet of Things and Industry 4.0

7th SEMESTER**Scheme-1**

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
1	ECE-704	Professional Industrial Training/ Internship	Summer Internship	4	0	0	0	-	150	150

Internship Outcomes:

After completion of the internship the student will be able to	
CO1	Identify a relevant problem or functional area in consultation with industry expert or designated mentor and the expected outcomes.
CO2	Perform detailed analysis of the problem in line with expected outcomes.
CO3	Undertake the project work/field work to effectively attain the expected outcomes.
CO4	Demonstrate proficiency in professional communication, teamwork, and work ethics.
CO5	Prepare a formal report outlining the work done, outcomes and demonstrate deep understanding of the work done.

Students are required to undertake 4 to 6 weeks of Practical Training after the final examinations of 6th semester in the field of Electronics & Communication Engineering in a well-established and recognized organization. The Training and Placement Cell shall accord final approval to the internship request made by the student.

Guidelines for evaluation of Industrial Training:

The evaluation shall be done by the departmental committee by the end of 7th semester. The committee shall have a convener and at least two members. The distribution of marks is given below:

S. No.	Evaluation Component	Marks
1	Presentation (50%)	75
2	Report (50%)	75
Total Marks		150

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
2	ECE-701(A)	Wireless Sensor Networks	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to	
CO 1	Articulate the fundamental concepts associated with wireless sensor networks.
CO 2	Describe Mobile Ad Hoc Networks and its applications.
CO 3	Analyze MAC protocols for different communication standards used in wireless sensor networks.
CO 4	Explore effective data dissemination strategies suitable for different network topologies.
CO 5	Design gateway architectures to enable seamless integration of WSN data with the Internet.

Detailed Syllabus**Section-A**

Unit 1: Introduction to Sensor Networks: unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks, Localization and tracking of objects.

(8 Hrs)

Unit 2: Mobile Ad Hoc Networks (MANETs): Multi-hop networks and their advantages, Introduction to routing in AdHoc multi-hop networks, Applications of MANET.

(7 Hrs)

Unit 3: Enabling technologies for Wireless Sensor Networks: Issues and challenges in wireless sensor networks, routing protocols in sensor networks, energy aware schemes, etc.

MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee.

(8 Hrs)**Section-B**

Unit 4: Dissemination protocol for large sensor networks: Data dissemination, data aggregation, data accumulation and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

(6 Hrs)

Unit 5: Design Principles for WSNs: Gateway Concepts Need for gateway, WSN to Internet Communication, Internet to WSN Communication. Architecture: Single-node architecture, Hardware components & design constraints, operating systems and execution environments, introduction to TinyOS and nesC.

(9 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Mobile Computing Theory & Practice	Kum Kum Garg	Pearson Education	1 st (2014)
2	Fundamentals of Wireless Sensor Networks Theory and Practice	Christian Poellabauer and Walteneus Dargie	John Wiley & Sons Publications	1 st (2011)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Wireless sensor networks	Feng Zhao and Leonides Guibas	Elsevier publication	1 st (2005)
2	Wireless Communications and Networks	William Stallings	Pearson Education	2 nd (2013)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
3	ECE-701(B)	Advanced Mobile Technologies	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to	
CO1	Describe major cellular communication standards and wireless communications networks.
CO2	Explain 5G technologies for communication systems.
CO3	Differentiate 5G Networks for various frequency bands.
CO4	Analyze the current state-of-art and challenges for 5G technologies.
CO5	Explore the need and potential applications of 6G and Terahertz technology.

Detailed Syllabus**Section-A**

Unit 1: Evolution from 1G to 5G: Analog voice systems in 1G, digital radio systems in 2G, voice and messaging services, 2.5G (GPRS), 2.75G (EDGE), 3G UMTS (IMT 2000), 3G services and data rates, 4G (IMT Advanced), LTE, VoLTE, OFDM, LTE Advanced Pro (3GPP Release 13+), 5G (IMT 2020) 5G potential and applications, comparison of various generations. **(11 Hrs)**

Unit 2: Basics of 5G: Introduction to enhanced mobile broadband (eMBB), ultra-reliable low latency communications (URLLC), massive machine type communications (MMTC), D2D communications, V2X communications, Spectrum for 5G, spectrum access/sharing, millimeter wave communication. **(11 Hrs)**

Unit 3: 5G Network: New Radio (NR), Standalone and non-standalone mode, non-orthogonal multiple access (NOMA), massive MIMO, beam formation, flexible frame structure, Service Data Adaptation Protocol (SDAP), centralized RAN, open RAN, multi-access edge computing (MEC), network function virtualization (NFV). **(12 Hrs)**

Section-B

Unit 4: Current state and Challenges ahead: 5G penetration in developed countries, stronger backhaul requirements, dynamic spectrum access and usage of unlicensed spectrum, large cell usage, LMLC, possible solutions for connectivity in rural areas (BharatNet, TVWS, Long-range Wi-Fi, FSO). **(8 Hrs)**

Unit 5: Introduction to Terahertz and 6G Technology: Terahertz communication, need for THz Communication, applications, requirements, Challenges, Introduction to 6G Technology, features, Requirements, emerging applications, challenges. **(6 Hrs)**

Text Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Wireless Communication Principles and Practice	Theodore S. Rappaport	PHI	2 nd (2011)
2	4G, LTE-Advanced Pro and The Road to 5G	Erik Dahlman	Elsevier	3 rd (2016)
3	5G NR: Architecture, Technology, Implementation, and Operation of 3GPP New Radio Standards	Sassan Ahmadi	Elsevier	1 st (2019)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	6G Wireless Network	Yuleiwu	Springer	1 st (2022)
2	THz Communication Paving the way towards wireless Tbps	Thomas Kurner	Springer	1 st (2022)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
4	ECE-701(C)	Optical Fiber Communication	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Describe propagation of light in different types of optical fibers.
CO2	Explain different types of signal degradation and distortion in optical fibers.
CO3	Discuss the principles of optical sources and their characteristics.
CO4	Compare various optical detectors and identify suitable detector for different applications.
CO5	Explore different network topologies, multiplexing schemes, and protocols for optical fiber communication.

Detailed Syllabus**Section-A**

Unit 1: Introduction to Optical Fiber Waveguide: The general system, Advantages of optical fiber communication, elements of an optical fiber transmission link, Introduction to fibre waveguide, Ray theory transmission-Total internal reflection, acceptance angle, numerical aperture, skew rays, Mode Coupling-Step Index and Graded index.

(11 Hrs)

Unit 2: Signal degradation in optical fiber: Introduction, attenuation, intrinsic & extrinsic absorption losses, linear & nonlinear scattering losses, bending losses, intramodal and intermodal dispersion, distortion in optical wave guide and polarization.

(9 Hrs)

Unit 3: Optical sources: LED-Introduction, LED power and efficiency, LED structures, LED characteristics, LASER-Basic concepts of laser, Laser Diodes models and threshold conditions, laser diode rate equations, External quantum efficiency, resonant frequency, laser diode structures and radiation patterns, single mode lasers modulation of laser diodes, laser lines.

(10 Hrs)**Section-B**

Unit 4: Optical detectors: Introduction, Optical detection principle, Absorption, Quantum efficiency, Responsivity, Long-wavelength cutoff, Semi-conductor photodiodes with gain, Semi-conductor photodiodes without gain.

(8 Hrs)

Unit 5: Optical networks: Network concept, Network Topologies, SONET/SDH, Optical Add/Drop multiplexing, WDM. WDM network examples, Passive optical networks, Optical Ethernet.

(8 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Optical Fiber Communication	Gerd Keiser	McGraw Hill	5 th (2017)
2	Optical Fiber Communications Principle and Practice	John M. Senior	Pearson	3 rd (2014)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Fiber-Optic Communication Systems	Govind Agarwal	Wiley	5 th (2021)
2	Optical Networks: Architectures, Design, and Control	Thomas E. Stern, Georgios Ellinas, Krishna Bala	Cambridge University Press	2 nd (2008)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
5	ECE-702(A)	Introduction to AI with Machine Learning	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Explain basic concepts of artificial Intelligence and machine learning techniques.
CO2	Demonstrate proficiency in applying supervised learning models for specific use cases.
CO3	Implement unsupervised learning methods using various datasets.
CO4	Apply different machine learning models on application specific datasets.
CO5	Develop splitting criteria for Decision Trees and be able to define its parameters.

Detailed Syllabus**Section-A**

Unit 1: Introduction to Artificial Intelligence and Machine Learning: history of AI, Basics of AI, Artificial Neural Network Terminology, Model of a Neuron, Perceptron Model, Feature set, Dataset division, Introduction to Machine Learning Techniques and its applications, bias-variance trade off, overfitting-underfitting. Recent advancement in AI.

(10 Hrs)

Unit 2: Supervised learning: Classification and Regression- K-Nearest neighbours, Linear Regression, Logistic Regression, gradient descent algorithm, Support Vector Machine (SVM), Evaluation Measures: SSE, MME, R2, confusion matrix, precision, recall, F-Score, ROC-Curve.

(12Hrs)

Unit 3: Unsupervised learning: Introduction to clustering, Hierarchical clustering, K-means clustering, Density based clustering, Association rules, applications of Association Rule learning.

(6 Hrs)**Section-B**

Unit 4: Reinforcement learning and ensemble methods: Reinforcement learning through feedback network, function approximation, bagging, boosting, stacking, and learning with ensembles, Random Forest.

(8 Hrs)

Unit 5: Decision trees: Representing concepts as decision trees, Recursive induction of decision trees, best splitting attribute: entropy and information gain, Overfitting, noisy data, and pruning.

(8 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Machine Learning	Tom. M. Mitchell	McGraw Hill International	1 st (2014)
2	Introduction to Machine Learning	Ethern Alpaydin	Eastern Economy Edition, Prentice Hall of India	4 th (2016)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Pattern Classification	Richard O. Duda, Peter E. Hart, David G. Stork	Wiley	2 nd (2012)
2	Artificial Intelligence- A modern Approach	Stuart Russell & Peter Norvig	Prentice Hall	3 rd (2016)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
6	ECE-702(B)	Introduction to Cyber Security	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to	
CO1	Explain the key concepts and principles of identity management.
CO2	Differentiate the principles and methods for access control, authentication, authorization, and identification.
CO3	Analyze directory services and its requirement for storing data.
CO4	Evaluate potential risks and recommend ways to reduce risk.
CO5	Investigate the difference between authentication and authorization.

Detailed Syllabus
Section-A

Unit 1: Introduction to IAM, IAM For an Enterprise. LDAP Basics, LDAP Concepts and Architecture, LDAP Replication.

(9 Hrs)

Unit 2: Single Sign-On (SSO) Concepts, Single Sign-On Techniques, Access Control. Password Management, The Challenges of Password Management. Introduction to Single Sign-on Methods, Different SSO Methods.

(10 Hrs)

Unit 3: Introduction to Federation, Federation Protocols. Multi Factor Authentication (MFA), Origin Of MFA.

(8 Hrs)

Section- B

Unit 4: Auditing and Reporting. Identity Manager and User Provisioning. Identity Manager Structure and Components.

(9 Hrs)

Unit 5: IAM Governance, Identity and Access Management Governance. Privileged Identity Manager. IAM On Cloud.

(9 Hrs)

Text Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Cryptography and Information Security	V.K. Pachghare	PHI Learning	2 nd (2015)
2	Cryptography and Network Security	William Stallings	Pearson Education/PHI	7 th (2017)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Cryptography and Network Security	Atul Kahate	McGraw Hill	3 rd (2017)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
7	ECE-702(C)	Fundamentals of Blockchain Technology	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:

CO1	Articulate the history, types, and applications of Blockchain.
CO2	Explain the Blockchain architecture in context of different cryptocurrency.
CO3	Comprehend different consensus algorithms and justify their appropriateness for different applications.
CO4	Gain appreciation of different decentralized applications over Blockchain frameworks.
CO5	Formulate solutions using Blockchain technology for real world applications.

Detailed Syllabus**Section-A**

Unit 1: Introduction to Blockchain: Introduction to Block chain – History, Definition, Distributed Ledger, Blockchain Categories – Public, Private, Consortium, Blockchain Network and Nodes, Peer-to-Peer Network, Mining Mechanism, Generic elements of Blockchain, Features of Blockchain and Types of Blockchain, Uses of Blockchain.

(6 Hrs)

Unit 2: Blockchain Architecture: Abstract Models for Blockchain - GARAY model - RLA Model. Multichain: Objective of Multichain, Features, Operation of Bitcoin Blockchain, Blockchain Architecture – Block, Hash, Distributed P2P, Fundamentals of Bitcoin, Ethereum and other popular crypto currencies.

(8 Hrs)

Unit 3: Consensus: Importance of Consensus mechanism, Proof of Work (PoW), Proof of Stake (PoS), Byzantine Fault Tolerance (BFT), Proof of Authority (PoA) and Proof of Elapsed Time (PoET). Scalability aspects of Blockchain consensus protocols.

(7 Hrs)**Section-B**

Unit 4: Blockchain Decentralized Applications: Characteristics of Decentralized application, De-Fi (Decentralized Finance) Applications and use-cases, Smart contracts and decentralized oracle networks (DONs).

(8 Hrs)

Unit 5: Block Chain- Case Studies: Case studies on applications of Blockchain technology in real world applications

(6 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Blockchain Technology from Theory to Practice	Sudeep Tanwar	Springer	1 st (2022)
2	Blockchain Technology: Concepts and Applications	Kumar Saurabh, Ashutosh Saxena	Wiley	1 st (2020)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Bitcoin and Cryptocurrency Technologies	Arvind Narayanan, Joseph Bonneau, Edward Felten	Princeton University Press	1 st (2016)
2	Mastering Bitcoin: Unlocking Digital Cryptocurrencies	Andreas M. Antonopoulos	O'Reilly Media Inc	1 st (2015)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
8	ECE-703	Professional Elective 3* (SWAYAM/NPTEL MOOC/Any Other Platform)	MCC*	3	0	0	0	-	100	100

Course Outcomes: Defined by the online platform for the specific course chosen.

The department shall offer the SWAYAM / NPTEL course/Any other platform (12 weeks) out of the list of courses offered by these platforms around the time of commencement of the semester. However, the selected course should not be similar to the regular courses offered as a part of the department curriculum. The overall monitoring of the course will be under the supervision of the faculty in charge of the department.

The marks obtained by the student in the certification course will be tabulated by the concerned department.

Note: - In case the student does not pass the certification, exam or remains absent in the proctored examination, no certificate will be given to the candidate by the NPTEL/SWAYAM/Any other platform and the student will be deemed to have failed in the course. The student must appear again in the NPTEL/SWAYAM/Any other platform examination conducted for the same course or any other course as per the next semester schedule of NPTEL/SWAYAM/Any other platform and pass the examination.

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
9	OEC-701(A)	Strategic Management	OEC	3	3	0	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to	
CO1	Explain various perspectives and concepts in the field of Strategic Management.
CO2	Analyze the competitive situation and strategic dilemma in dealing with dynamic global business environments.
CO3	Develop knowledge in strategy formulation and implementation in organizations.
CO4	Articulate the knowledge of strategic evaluation and control.
CO5	Apply strategic management concepts in solving case studies

Detailed Syllabus**Section A**

Unit 1: Concept of Strategy: Strategic Decision Making, Strategic Management Process. Difference between Policy, Strategy and Tactics. Strategic Intent, Vision, Mission, Goals. and Objectives. Environmental Scanning: Factors, Approaches, Methods, Environmental Appraisal. Internal Analysis / Organizational Appraisal.

(9 Hrs)

Unit 2: Corporate Level Strategies: Expansion, Stability, Retrenchment, Combination Business Level Strategies; Strategic Analysis and Choice; Corporate Portfolio Analysis- SWOT Analysis, BCG Matrix, GE Nine Cell Matrix.

(10 Hrs)

Unit 3: Strategy Implementation: Procedural implementation, Structural implementation, Structure and strategy Organizational Design and Change, Behavioral implementation, Corporate Politics and Power in Strategic Management, Corporate Ethics and Personal Values for Strategic Management.

(11 Hrs)**Section B**

Unit 4: Strategic Evaluation and Control: Strategy Review, Strategic Evaluation and Control; Contemporary Issues in Strategic Management: Balanced Scorecard and Blue Ocean Strategy.

(10 Hrs)

Unit 5: Case Study Analysis: Applying Strategic Management through the Case Method on the topic related to Strategic Management for Sustainability, Environmental Scanning and Organizational Scanning, Corporate and Business level Strategies and Contemporary issues in Strategic Management.

(11 Hrs)**Textbooks**

S. No	Name of the Books	Author	Publisher Name	Edition (Pub. Yr.)
1	Strategic Management and Business Policy	Azhar Kazmi	Tata McGraw Hill	4 th (2012)
2	Strategic Management	Charles WL Hill and Gareth R Jones	Cengage Learning	11 th (2012)

Reference Books

S. No	Name of the Books	Author	Publisher Name	Edition (Pub Yr.)
1	Strategic Management	Hill, Ireland, Hoskisson, Manikutty	Cengage Learning	9 th (2016)
2	Strategic Management	Fred R David	PHI Learning	13 th (2008)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
10	OEC-701(B)	Marketing Management	OEC	3	3	0	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to	
CO1	Describe the core concepts of marketing.
CO2	Articulate the value creation process focusing on the concepts of segmentation, targeting and positioning.
CO3	Comprehend the concepts of product and price Mix.
CO4	Examine the importance of the channel distribution and promotion decisions.
CO5	Interpret the consumer behavior model and the recent trends in marketing.

Detailed Syllabus**Section A**

Unit 1: Fundamentals of Marketing: Marketing – Concept, Importance, Scope; Concept of needs, wants and demands; Key Markets; Orientations of Marketing; Shifts in Marketing. Marketing Environment; Market Research Process, Marketing Plan, Marketing Productivity.

(9 Hrs)

Unit 2: Identifying Customers and Connecting with Customers: Marketing and Customer Value, Value Chain, Value delivery Process, Building Customer Value, Satisfaction and Loyalty, Customer Lifetime Value, Customer Relationship Management – Concept and Components. Identifying Market segments and Targets, Levels of Market Segmentation, Segmentation of Consumer Markets, Bases of Segmentation, Market Targeting & Positioning.

(10 Hrs)

Unit 3: Product and Price Decision: Product Mix – Concept, Product line and Product Mix. Branding, Packaging and labeling. Product life cycle. New product development process. Price Mix – Concept of Price and Pricing, Significance of Pricing Decision, Factors affecting Price Determination, Pricing Methods and Techniques, Pricing Policies and Strategies.

(11 Hrs)**Section B**

Unit 4: Place and Promotion Decision: Distribution Mix – Nature, Functions, and Types of Distribution Channels. Distribution Channel Intermediaries. Channel Management Decisions and Channel design. Promotion Mix – Concept and Role of Promotion, Determining Promotion Mix. Advertising, Personal selling, Sales Promotion, Publicity and Public Relations, Sales Promotion.

(10 Hrs)

Unit 5: Analyzing the Demand and Trends in Marketing: Consumer Behavior – Concept and Factors Affecting. Buying Decision Process, Theories of Consumer Decision Making, Participants in Buying Process, Stages in Buying Process. Trends in Marketing – Digital Marketing, Mobile Marketing, Green Marketing, Social Media Marketing, Influencer Marketing, Affiliate Marketing, Omnichannel Marketing.

(10 Hrs)**Textbooks**

S. No	Name of the Suggested Books	Author	Publisher Name	Edition (Pub. Yr.)
1	Marketing Management	Kotler, Keller, Koshy & Jha	Pearson Education	16 th (2022)
2	Marketing management: Global perspective Indian context	Ramaswamy, V. S. & Namakumari, S	Macmillan, New Delhi	4 th (2009)

Reference Books

S. No	Name of the Book	Author	Publisher Name	Edition (Pub. Yr.)
1	MKTG - A South Asian Perspective	CW Lamb, J F Hair, Dheeraj Sharma, C McDaniel,	Cengage Learning, India	1 st (2016)
2	Marketing Management	Rajan Saxena	Tata McGraw Hill	6 th (2019)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
11	OEC-701(C)	Managerial Economics	OEC	3	3	0	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to	
CO1	Describe the demand concept as the basis of economic activity.
CO2	Articulate the various laws of production in both short and long run work for designing the optimum level output.
CO3	Analyze the various types of market structures.
CO4	Interpret the various pricing methods and strategies.
CO5	Evaluate the various macroeconomic concepts affecting the overall economy and undertake economic analysis.

Detailed Syllabus**Section A**

Unit 1: Introduction to Managerial Economics: Circular Flow of Economic Activity, Demand Analysis and Estimation- Individual, Market and Firm Demand; Determinants of Demand; Demand Estimation; Business and Economic Forecasting; Elasticity of Demand.

(9 Hrs)

Unit 2: Law of Variable Proportions: Theory of Firms, Production Theory and Analysis- The Production Function; Economies of scale and Scope; Estimating the Production Function; Cost Theory and Analysis- The Economic Concept; Production and Cost; Short-run and long-run Cost Functions; Estimating Cost Functions.

(10 Hrs)

Unit 3: Market Structure: Price and Output determination under different market structures-Perfect Competition and Monopoly; Relevance of Perfect Competition and Monopoly; Monopolistic Competition, Oligopoly- Sweezy Model.

(9 Hrs)**Section B**

Unit 4: Pricing of Goods and Services: Pricing Factors, Pricing of Multiple Product, Product Bundling; Peak-load Pricing; Cost-plus or Mark-up Pricing; Cyclical Pricing; Price Discrimination; Degrees of Price Discrimination.

(10 Hrs)

Unit 5: Introduction to National Income: National Income Concept, Models of National Income Determination; Economic Indicators; Business Cycles; Management of Cyclical Fluctuations, Monetary and Fiscal Policies; Economic Indicators; National Income; Inflation and Deflation.

(11 Hrs)**Textbooks**

S. No.	Name of the Books	Author	Publisher Name	Edition (Pub. Yr.)
1.	Managerial Economics: Economic tool for today decision makers	Paul G Keat Philip Young, Stephen Erfle	Pearson, Prentice Hall	7 th (2013)
2.	Managerial Economics and Business Strategy	Michael Baye, Jeffrey T. Prince	McGraw Hill	10 th (2022)

Reference Books

S. No	Name of the Book	Author	Publisher Name	Edition (Pub. Yr.)
1.	Managerial Economics	Craig H. Peterson, W, Cris Lewis, Sudhir k Jain	Pearson Education	4 th (2005)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
12	ECE-705	Seminar	PEC	2	0	0	4	-	100	100

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Identify a relevant topic for the seminar from an emerging domain from the branch of study.
CO2	Conduct deep literature review from diverse sources including journals, whitepapers, credible web sources, industry reports, patent databases, books etc.
CO3	Put together material from diverse sources in the form of an engaging presentation with new insights.
CO4	Prepare a short whitepaper on the seminar topic providing a broad overview of the domain.
CO5	Make a high-quality presentation on the seminar topic and demonstrate competence in addressing queries from experts and the audience.

Guidelines and evaluation of Seminar

Students shall individually prepare and submit a seminar report on a topic of current relevance related to the field of Electronics & Communication Engineering. The reference shall include standard journals, conference proceedings, reputed magazines and textbooks, technical reports, and URLs. Each student shall be evaluated by a team of at least three faculty members constituted by the Head of the Department based on presentation, technical content, adequacy of references, depth of knowledge and overall quality of the seminar report.

Distribution of Marks:

S. No.	Evaluation Component	Marks
1	Seminar Report	40
2	Presentation	40
3	Attendance	20
Total Marks		100

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
13	ECE-711	Minor Project	PROJ	3	0	0	6	100	150	250

Project Outcomes:

At the end of the project the student will be able to:	
CO1	Identify applied or research projects in consultation with the designated faculty/industry mentor addressing a relevant problem.
CO2	Critically examine work done in the domain to identify gaps if any.
CO3	Carry out detailed design of the project to help attain the final outcomes.
CO4	Implement the project as per the formulated design using modern tools and techniques.
CO5	Prepare a formal report and demonstrate deep understanding of all aspects of the project.

The project will be assigned to the students towards the end of 6th semester and will start working on these projects at the commencement of their 7th semester. The topic of the project will be decided as per the developments taking place in the field of Electronics & Communication Engineering.

This may require a complete literature survey, design, fabrication, simulation of models and/or some preliminary laboratory experiments etc. The same project can be extended to the 8th semester also.

Distribution of Marks:

S. No.	Evaluation Component	Marks
1	Demonstration of Project	100
2	Viva-Voce	100
3	Project Report	50
	Total Marks	250

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
4	NCC-701	Essence of Indian Knowledge and Tradition	NCC	0	0	0	2	Satisfactory/ Not Satisfactory		S/NS*

Course Outcomes:

After completion of this course the student will be able to	
CO1	Explain the Vedic theism and Upanishadic concepts of Atman & Brahman
CO2	Acquire thorough knowledge about Carvaka, Jainism
CO3	Acquire thorough knowledge about Buddhism and comprehend the yoga philosophy
CO4	Comprehend epistemology of Nyaya-Vaisesika.
CO5	Analyse Sankhya's Theory of Evolution

Detailed Syllabus**Section-A**

Unit 1: Introduction to Indian Philosophy, Basic concepts of Vedic and the Upanishadic World Views: ṛta (The Cosmic Order); ṛṇa (Duty/Obligation) ātman; jāgrat,svapna , suṣupti , turīya; śreyas ,preyas ,karma.

(8Hrs)

Unit 2: Cārvāka -Carvaka School: It's epistemology, Jainism: Concepts of sat, dravya, guṇa, paryāya, jīva, and ajīvaAnekāntavāda, syādvāda and saptabhangīnaya

(6Hrs)

Unit 3: Buddhism-Four Noble Truths, pratīyasamutpāda, kṣaṇabhangavāda, nairātmyavāda Yoga Philosophy: Organization of the Yoga Sutras, Psychology of Yoga. Kinds of Klesas.

(10Hrs)**Section-B**

Unit 4: Nyāya – Vaisesika -Nyāya -Epistemology: Four pramāṇa-s: Perception, Inference, Comparison and Testimony; Nature of Cause, Classification of Causes: samavāyi ,asamavāyi , nimitta , asatkāryavāda ? The Idea of God and proofs for His Existence.

(8Hrs)

Unit 5: Sāṃkhya Duality: prakṛiti and its constituents, proofs for the existence of prakṛiti, puruṣa: It's nature and arguments for its existence, plurality of puruṣa.

(6 Hrs)**Text Books**

S. No	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	An Introduction to Indian Philosophy	S. C. Chatterjee & D. M.Dutta	Calcutta University Press, Kolkata	7 th (1968)
2	Outline of Indian Philosophy	M. Hiriyanna	Motilal Banarsidass. New Delhi	5 th (2014)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	A Critical Survey of Indian Philosophy	Chandradhar Sharma	Motilal Banarsidass, New Delhi	14 th (2016)
2	Indian Philosophy	Sarvepalli Radhakrishnan	Oxford University press	2 nd (2008)

Scheme-2

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Mid Semester	Final	Total
1	PII-701	Industry Internship-I	Professional Industry Internship	15	0	0	30	350	500	850

Internship Outcomes:

After completion of the internship the student will be able to:

CO1	Identify a relevant problem or functional area in consultation with industry expert or designated mentor and the expected outcomes.
CO2	Perform detailed analysis of the problem in line with expected outcomes.
CO3	Undertake the project work/field work to effectively attain the expected outcomes.
CO4	Demonstrate proficiency in professional communication, teamwork, and work ethics.
CO5	Prepare a formal report outlining the work done, outcomes and demonstrate deep understanding of the work done.

The internship will be assigned to the students towards the end of the 6th semester, and they will start working on those projects at the commencement of the 7th semester. The students shall submit the details of the company/Industry where they intend to do their project work along with the company consent letter in the 7th semester. The departmental academic Committee will finalize and approve the project and provide the allotment of internal guide to each project who will periodically monitor and evaluate the student performance during the project.

The topic of the projects will be decided as per the development taking place in the field of Electronics & Communication Engineering. This may require a complete literature survey along with design, fabrication, simulation of the models and/or preliminary laboratory experiments etc. The students will have to submit a detailed project report individually to their internal guide and a copy of the certificate, if awarded, should also be appended to the report. They should also submit a progress report of their project duly signed by the concerned Authority via mail to the respective guide.

Note: Students are also allowed to start their start up provided they submit a DPR with a detailed proposal of their startup that would define the action plan and idea to the start-up cell. Only after the submitted proposal has been approved by the start-up cell the students will be allowed to work on their project.

Guidelines for Evaluation of the Industry Internship in 7th semester:

The evaluation shall be carried out once in mid-semester and once at the end of the semester. The distribution of marks is given below:

Sr. No.	Distribution	Mid Semester	Final
1	Viva-Voce	150	150
2	Presentation	200	200
3	Report	-	150
Marks		350	500
Total Marks		850	

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Mid Semester	Final	Total
2	ECE-703	Professional Elective 3* (SWAYAM/NPTEL MOOC/Any other Platform)	MCC*	3	0	0	0	-	100	100

Course Outcomes: Defined by the online platform for the specific course chosen.

The department shall offer the SWAYAM / NPTEL course/Any other platform (12 weeks) out of the list of courses offered by these platforms around the time of commencement of the semester. However, the selected course should not be similar to the regular courses offered as a part of the department curriculum. The overall monitoring of the course will be under the supervision of the faculty in charge of the department.

The marks obtained by the student in the certification course will be tabulated by the concerned department.

Note: - In case the student does not pass the certification, exam or remains absent in the proctored examination, no certificate will be given to the candidate by the NPTEL/SWAYAM/Any other platform and the student will be deemed to have failed in the course. The student must appear again in the NPTEL/SWAYAM/Any other platform examination conducted for the same course or any other course as per the next semester schedule of NPTEL/SWAYAM/Any other platform and pass the examination.

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Mid Semester	Final	Total
3	ECE-706	Professional Elective 4* (SWAYAM/NPTEL MOOC/Any other platform)	MCC*	3	0	0	0	-	100	100

Course Outcomes: Defined by the online platform for the specific course chosen.

The department shall offer the SWAYAM / NPTEL course/Any other platform (12 weeks) out of the list of courses offered by these platforms around the time of commencement of the semester. However, the selected course should not be similar to the regular courses offered as a part of the department curriculum. The overall monitoring of the course will be under the supervision of the faculty in charge of the department.

The marks obtained by the student in the certification course will be tabulated by the concerned department.

Note: - In case the student does not pass the certification, exam or remains absent in the proctored examination, no certificate will be given to the candidate by the NPTEL/SWAYAM/Any other platform and the student will be deemed to have failed in the course. The student must appear again in the NPTEL/SWAYAM/Any other platform examination conducted for the same course or any other course as per the next semester schedule of NPTEL/SWAYAM/Any other platform and pass the examination.

8th SEMESTER**Scheme-1**

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
1	ECE-801(A)	Instrumentation and Biomedical Engineering	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Articulate the reliable biomedical signal acquisition for medical diagnostics.
CO2	Explain the functional organization of human system and its relevance in coordinating physiological responses.
CO3	Analyze the nature of electro-physiological measurement techniques in recording bioelectric signals.
CO4	Describe the basic operation of diagnostic radiology and therapeutic equipments.
CO5	Identify various safety standards for biomedical instruments.

Detailed Syllabus**Section- A**

Unit 1: Fundamentals of Medical Instrumentation: Introduction to human physiology, physiological systems of the body, Sources of Biomedical signals, Basic Medical Instrumentation system, performance requirements, general constraints. Problems encountered in measuring a living system, Sources of Bioelectric Potentials.

(8 Hrs)

Unit 2: Physiology and Human subsystems: Cell and its structure, Sources of Bioelectric Potentials, Resting and Action Potential, Nervous system: Functional organization of the nervous system, Structure of nervous system, neural communication, Cardiovascular system, respiratory system.

(8 Hrs)

Unit 3: Electro– Physiological measurements: Electrodes types: Limb electrodes, floating electrodes, pre-gelled disposable electrodes, Micro needle and surface electrodes. Human Body Subsystems: Brief description of neuronal, muscular, cardiovascular, and respiratory systems, Physiological potentials-ECG, EEG, EMG, phonocardiograph.

(8 Hrs)**Section-B**

Unit 4: Medical Imaging and Therapeutic Equipment: Fundamentals of imaging, Diagnostic Radiology, X-Ray Machine Computed tomography, MRI, Ultrasonography, and pulse echo system. Pacemakers, Defibrillators, Artificial Ventilators, Emerging trends in medical diagnostics and therapy Clinical laboratory instrumentation and Biomaterials

(12 Hrs)

Unit 5: Medical Safety: Electrical Safety, Electrical safety codes and standards; Radiation safety, Chemical safety, biological safety, Fire and explosive safety, Environmental Safety.

(4 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Bio Medical Instrumentation and Measurements	L. Cromwel, F. J. Weibell & E. A. Pfeiffer	Pearson	2 nd (2014)
2	Principles of Applied Biomedical Instrumentation	L.A Geddes, L.E Baker	Wiley	3 rd (2008)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Medical instrumentation application & design	J.G Webster	Wiley	4th (2010)
2	Handbook of Biomedical Instrumentation	R. S. Khandpur	Tata McGraw	2 nd (2011)

No.	Course Code	CourseName	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
2	ECE-801(B)	Digital Image Processing	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to	
CO1	Explain the fundamentals of digital image processing, including image representation in spatial and transform domain.
CO2	Perform image enhancement and filtering techniques in spatial and frequency domain.
CO3	Evaluate the image restoration and filtering techniques for image analysis.
CO4	Describe image segmentation and morphological image processing techniques for image analysis.
CO5	Apply image compression and recognition techniques for image processing.

Detailed Syllabus**Section-A**

Unit 1: Digital Image fundamentals: Steps in Digital Image Processing, Components, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms, DFT, DCT.

(7 Hrs)

Unit 2: Image Enhancement, Spatial Domain: Gray level transformations, Histogram processing, Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform,

Smoothing and Sharpening frequency domain filters, Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

(8 Hrs)

Unit 3: Image Restoration, degradation model, Properties, Noise models, Mean Filters, Order Statistics, Adaptive filters, Band reject Filters, Band pass Filters, Notch Filters, Optimum Notch Filtering, Inverse Filtering, Wiener filtering.

(6 Hrs)**Section-B**

Unit 4: Image Segmentation: Edge detection, Edge linking via Hough transform, Thresholding, Region based segmentation, Region growing, Region splitting and merging, Morphological processing, erosion and dilation.

(6 Hrs)

Unit 5: Image Compression and Recognition: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Regional Descriptors, Topological feature, Texture, Recognition based on matching.

(8 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Digital Image Processing	Rafael C. Gonzalez, Richard E. Woods	Pearson	4 th (2018)
2	Digital Image Processing	William K. Pratt	John Wiley, New York	4 th (2010)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Digital Image Processing	Kenneth R. Castleman	Pearson	2 nd (2008)
2	Digital Image processing using MATLAB	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins	Pearson Education, Inc.	5 th (2009)

S.No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
3	ECE-801 (C)	Advanced Digital Signal Processing	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the students will be able to	
CO1	Explain the scope of the digital signal processing domain with an abstract framework.
CO2	Describe multirate signal processing techniques and its applications.
CO3	Apply algorithms of normal equations for filtering and prediction.
CO4	Design adaptive filters for digital signal processing applications.
CO5	Estimate the spectrum using parametric and non-parametric methods

**Detailed Syllabus
Section-A**

Unit 1: Overview of DSP, Characterization in time and frequency, FFT Algorithms, Digital filter design and structures: Basic FIR/IIR filter design & structures, design techniques of linear phase FIR filters, IIR filters by impulse invariance, bilinear transformation, FIR/IIR Cascaded lattice structures, parallel realization of IIR.

(9 Hrs)

Unit 2: Multi-rate DSP, Decimators and Interpolators, Sampling rate conversion, multistage decimator & interpolator, polyphase filters, QMF, digital filter banks, and Applications in sub-band coding.

(9 Hrs)

Unit 3: Linear prediction & optimum linear filters, stationary random process, forward-backward linear prediction filters, solution of normal equations, AR Lattice and ARMA Lattice-Ladder Filters, and Wiener Filters for Filtering and Prediction.

(10 Hrs)

Section-B

Unit 4: Adaptive Filters, Applications, Gradient Adaptive Lattice, Minimum mean square criterion, LMS algorithm, Recursive Least Square algorithm.

(8 Hrs)

Unit 5: Estimation of Spectra from Finite-Duration Observations of Signals. Nonparametric Methods for Power Spectrum Estimation, Parametric Methods for Power Spectrum Estimation, Minimum Variance Spectral Estimation, Eigen analysis Algorithms for Spectrum Estimation.

(10 Hrs)

Textbooks

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Digital signal processing: Principles, Algorithm, and Applications	J. G. Proakis and D.G. Manolakis	Prentice Hall	4 th (2007)
2	Multirate Digital Signal Processing: Multirate Systems -Filter Banks – Wavelets	N. J. Fliege	John Wiley and Sons	2 nd (2005)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Statistical Digital Signal Processing and Modeling	M. H. Hayes	John Wiley and Sons	3 rd (2002)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
4	ECE-802(A)	UAVs and Drone Technology	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Articulate the basic principles, components, and applications of drone technology.
CO2	Demonstrate knowledge of drone hardware components and their functionality.
CO3	Appreciate drone flight dynamics, control systems, and navigation techniques.
CO4	Develop knowledge of drone navigation and synchronization techniques.
CO5	Formulate algorithms for drone operations, control, and intelligence.

Detailed Syllabus**Section-A**

Unit 1: Introduction to Drones: Basics of drone technology and its historical background, Types of drones and their applications in different industries, Current trends, and prospects of drone technology. Drone applications in industries such as agriculture, construction, cinematography.

(6 Hrs)

Unit 2: Drone Components and Systems: Understanding drone hardware components: frame, motors, propellers, and batteries, Introduction to drone sensors like GPS, accelerometers, gyroscopes, and camera.

(9 Hrs)

Unit 3: Overview of drone software and control: Drone Flight Dynamics and Control, Principles of flight including aerodynamics, lift, drag, and thrust, Drone stabilization and control mechanisms, Introduction to flight modes and maneuvers.

(11 Hrs)**Section-B**

Unit 4: Drone Navigation and Synchronization: Global Positioning System (GPS) and its role in drone navigation, Autonomous flight and obstacle avoidance systems, Sensor technologies for mapping, imaging, and data collection, Drone Operation and Flight Planning, Practical Implementation of application-based Drone Model.

(9 Hrs)

Unit 5: Algorithms: Flight Control Algorithms, Navigation Algorithms, Path Planning Algorithms, Obstacle Detection and Avoidance, Target Tracking Algorithms, Swarm Algorithms, Image, and Video Processing.

(8 Hrs)**Textbooks**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Introduction to UAV Systems	Paul Fahlstrom and Thomas Gleason	Wiley	4 th (2012)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Drone Technology: Future Trends and Practical Applications	Sachi Nandan Mohanty	Wiley	1 st (2023)
2	Drone Technology in Architecture, Engineering and Construction	Daniel Tal, John Altschuld	Wiley	1 st (2021)

S.No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
5	ECE-802(B)	Hybrid and Electric Vehicles	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Explain the concept and working principle of electric vehicles.
CO2	Describe the working principle of traction and its utilization.
CO3	Identify and evaluate the significance of Lithium batteries and battery management systems for vehicles.
CO4	Analyze various energy management techniques in hybrid and electric vehicles.
CO5	Develop the charging stations for electric vehicles.

Detailed Syllabus**Section-A**

Unit 1: History of hybrid and electric vehicles, Social and environmental importance of hybrid and electric vehicles, Basics of vehicle performance, Vehicle power source characterization, Transmission characteristics, Mathematical models to describe vehicle performance.

(10 Hrs)

Unit 2: Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Basic concept of electric traction, Fuel efficiency analysis. Fundamentals of Drives and Control of EV Using DC motor, Induction Motor, Permanent Magnet Motor, Switched Reluctance Motor, BLDC motor, Design and Sizing of Traction Motors.

(8 Hrs)

Unit 3: Introduction to lithium batteries and their applications, working principle, advantages, and disadvantages. Evaluation of various battery parameters: State of charge, Depth of discharge, charging rate, etc. current and voltage variation as per different loads. Issues and remedies for battery balancing. Government policies to fulfill the demands of lithium batteries for e-vehicles.

(10 Hrs)**Section-B**

Unit 4: Energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

(8 Hrs)

Unit 5: Introduction to various charging techniques and schematic of charging stations, classification of different charging technology for EV charging station, introduction to Grid-to-Vehicle, Vehicle to Grid (V2G) or Vehicle to Buildings (V2B) or Vehicle to Home (V2H) operations, bi-directional EV charging systems, Wireless power transfer (WPT) technique for EV charging.

(10 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Electric and Hybrid Vehicles: Design Fundamentals	Iqbal Hussein	CRC Press	1 st (2012)
2	Fundamentals and Applications of Lithium-Ion Batteries in Electric Drive Vehicles	Jiuchun Jiang and Caiping Zhang Beijing	Wiley	1 st (2015)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Electric Vehicle Technology	Larminie, James, and John Lowry.	John Wiley and Sons	1 st (2012)

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
6	ECE-802(C)	Foundations of Internet of Things and Industry 4.0	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to:	
CO1	Describe the importance of Industry 4.0 for meeting future societal needs.
CO2	Develop critical understanding on cyber-physical systems amalgamating sensors, AI, Big Data analytics and cyber security and their applications.
CO3	Explain the architecture of Industrial Internet-of-Things.
CO4	Evaluate the structure operations of Industrial Internet-of-Things through supporting technologies such as SDNs and Big Data Analytics.
CO5	Appraise the diverse application of Industry 4.0 and related management concepts.

Detailed Syllabus**Section-A**

Unit 1: Introduction: Sensing & actuation, Industry 4.0: Globalization and Emerging Issues, The Fourth Revolution, LEAN Production Systems, Smart and Connected Business Perspective, Smart Factories.

(9 Hrs)

Unit 2: Industry 4.0: Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis. Cybersecurity in Industry 4.0, Basics of Industrial IoT: Industrial Processes, Industrial Sensing & Actuation, Industrial Internet Systems.

(9 Hrs)

Unit 3: Industrial IoT: Business Model and Reference Architecture: IIoT-Business Models, IIoT Reference Architecture, Industrial IoT- Layers: IIoT Sensing, IIoT Processing, IIoT Communication, Industrial IoT-Layers: IIoT Communication, IIoT Networking.

(9 Hrs)**Section B**

Unit 4: Industrial IoT: Big Data Analytics and Software Defined Networks: IIoT Analytics - Introduction, Machine Learning and Data Science, Data Management with Hadoop, Industrial IoT: Big Data Analytics, Software Defined Networks: SDN in IIoT, Data Center Networks, Industrial IoT: Security and Fog Computing: Cloud Computing, Security in IIoT, Industrial IoT- Application Domains: Factories and Assembly Line, Food Industry.

(9 Hrs)

Unit 5: Industrial IoT- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management, Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies like Milk Processing and Packaging Industries, Manufacturing Industries.

(9 Hrs)**Text Books**

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Introduction to Industrial Internet of Things and Industry 4.0	S. Misra, C. Roy, and A. Mukherjee	CRC Press	1 st (2020)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Introduction to IIoT	S. Misra, A. Mukherjee, and A. Roy	Cambridge University Press	1 st (2020)

S.No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
7	ECE-803	Professional Elective 3* (SWAYAM/NPTEL MOOC/ Any Other Platform)	MCC*	3	0	0	0	-	100	100

Course Outcomes: Defined by the online platform for the specific course chosen.

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The marks obtained by the student in the certification course will be tabulated by the concerned department.

Note: - In case the student does not pass the certification, exam or remains absent in the proctored examination, no certificate will be given to the candidate by the NPTEL/SWAYAM/Any other platform and the student will be deemed to have failed in the course. The student must appear again in the NPTEL/SWAYAM/Any other platform examination conducted for the same course or any other course as per the next semester schedule of NPTEL/SWAYAM/Any other platform and pass the examination.

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
8	ECE-811	Major Project	PROJ	6	0	0	12	200	300	500

Project Outcomes:

After completion of this project the student will be able to	
CO1	Identify and formulate the project outline addressing a relevant problem.
CO2	Perform detailed literature survey of the solutions pertaining to the identified problem and identify gaps.
CO3	Undertake the design and development of the project applying formal design and implementation techniques.
CO4	Prepare a formal report describing the project in sufficient technical detail as per prescribed format.
CO5	Demonstrate the project proficiently and display deep understanding of the concepts and technology used.

The project will be assigned to the students towards the end of the 7th semester, and they will start working on those projects at the commencement of their 8th semester. The students will submit the synopsis of their project work in the 7th semester. The departmental level committee will finalize and approve the projects. However, a departmental guide will be allocated to each project who shall periodically evaluate the student's performance during the project.

The topic of the project will be decided as per the developments taking place in the field of Electronics & Communication Engineering. This may require a complete literature survey, design, fabrication, simulation of some models and/or some preliminary laboratory experiments etc. The student will have to submit a detailed project report individually to the internal guide and a copy of the certificate should also be appended to the report:

Guidelines for Evaluation of the Major Project in 8th semester:

The evaluation shall be carried out once in mid-semester and once at the end of the semester. The distribution of marks is given below:

Sr. No.	Distribution	Mid Semester	Final
1	Project Demonstration	100	100
2	Project Design	100	NA
3	Implementation and Functionality	-	100
4	Documentation and Technical Writing	-	100
Marks		200	300
Total Marks		500	

Scheme-2

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Mid Semester	Final	Total
1	PII-801	Industry Internship-II	Professional Industry Internship	15	0	0	30	300	600	900

Course Outcomes:

After completion of the course the student will be able to:	
CO1	Identify a relevant problem or functional area in consultation with industry expert or designated mentor and the expected outcomes.
CO2	Perform detailed analysis of the problem in line with expected outcomes.
CO3	Undertake the project work/field work to effectively attain the expected outcomes.
CO4	Demonstrate proficiency in professional communication, teamwork, and work ethics.
CO5	Prepare a formal report outlining the work done, outcomes and demonstrate deep understanding of the work done.

The internship will be assigned to the students towards the end of 7th semester, and they will start working on those projects at the commencement of the 8th semester. The students shall submit the details of the company/Industry where they intend to do their project work along with the company consent letter in the 8th semester. The departmental academic Committee will finalize and approve the project and provide the allotment of internal guide to each project who will periodically monitor and evaluate the student performance during the project.

The topic of the projects will be decided as per the development taking place in the field of the Electronics & Communication Engineering This may require a complete literature survey along with design, fabrication, simulation of the models and/or preliminary laboratory experiments etc.

The students will have to submit a detailed project report individually to their internal guide and a copy of the certificate, if awarded, should also be appended to the report. They should also submit a progress report of their project duly signed by the concerned Authority via mail to the respective guide.

Note: Students are also allowed to start their start up provided they submit a DPR with a detailed proposal of their startup that would define the action plan and idea to the start-up cell. Only after the submitted proposal has been approved by the start-up cell the students will be allowed to work on their project.

Guidelines for Evaluation of the Industry Internship in 8th semester:

The evaluation shall be carried out once in mid-semester and once at the end of the semester. The distribution of marks is given below:

Sr. No.	Distribution	Mid Semester	Final
1	Viva-Voce	150	150
2	Presentation	150	150
3	Report	-	300
Marks		300	600
Total Marks		900	