DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

3rd SEMESTER

2021-2025

Sl. No.	Type	Paper Code	Paper Name	L	T	P	Total	Credit
1.	CC	PCCEC301	Electronic Devices	3	0	0	3	3
2.	CC	PCCEC302	Digital Electronics	3	0	0	3	3
3.	CC	PCCEC303	Signals and Systems	3	0	0	3	3
4.	CC	PCCEC304	Network Theory	3	0	0	3	3
5.	BSC	BSC301	Mathematics III	3	0	0	3	3
6.	CC	PCCEC391	Electronic Devices Laboratory	0	0	2	2	1
7.	CC	PCCEC392	Digital Electronics Laboratory	0	0	2	2	1
8.	CC	PCCEC393	Signals and Systems Laboratory	0	0	2	2	1
9.	CC	PCCEC394	Network Theory Laboratory	0	0	2	2	1
10.	GE	PCCEC381	Data Structure & Algorithm	1	0	1	2	2
11.	GSC	HSMC(ECE)302	ESP III	2	0	0	2	0.5
12.	GSC	HSMC382	SDP III	0	0	2	2	0.5
13.	MC	MC(ECE)301	Constitution of India	1	0	0	1	0
14.	MC	MAR(ECE)381	Mandatory Additional Requirement (MAR)	0	0	0	0	0
15.	IFC	IFC(ECE)384	International Foreign Certification Course	1	0	0	1	0
16.	ECP	ECP381	Mini Project - III	0	0	2	1	1
							Total Credit Points =	**23**

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

4th SEMESTER

2021-2025

Sl. No.	Type	Paper Code	Paper Name	L	T	P	Total	Credit
1.	CC	PCCEC401	Analog & Digital Communication	3	0	0	3	3
2.	CC	PCCEC402	Analog Electronic Circuits	3	0	0	3	3
3.	CC	PCCEC403	Microcontrollers	3	0	0	3	3
4.	BSC	BSC401	Mathematics & Statistics - IV	3	0	0	3	3
5.	CC	PCCEC491	Analog & Digital Communication Laboratory	0	0	2	2	1
6.	CC	PCCEC492	Analog Electronic Circuits Laboratory	0	0	2	2	1
7.	CC	PCCEC493	Microcontrollers Laboratory	0	0	2	2	1
8.	GE	OECEC481	Object Oriented Programming	1	0	1	2	2
9.	GSC	HSMC(ECE)402	ESP IV	2	0	0	2	0.5
10.	GSC	HSMC482	SDP IV	0	0	2	2	0.5
11.	MC	MC(ECE)401	Environmental Science	1	0	0	1	0
12.	MC	MAR(ECE)481	Mandatory Additional Requirement (MAR)	0	0	0	0	0
13.	IVC	IVC(ECE)483	Industry Value Added Course	1	0	0	1	0
14.	IFC	IFC(ECE)484	International Foreign Certification Course	1	0	0	1	0
15.	ECP	ECP481	Mini Project - IV	0	0	2	1	1
							Total Credit Points =	19

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

5th SEMESTER

2021-2025

Sl. No.	Type	Paper Code	Paper Name	L	T	P	Total	Credit
1.	CC	PCCEC501	Electromagnetic Waves	3	0	0	3	3
2.	CC	PCCEC502	Digital Signal Processing	3	0	0	3	3
3.	CC	PCCEC503	Computer Architecture	3	0	0	3	3
4.	PEC	PECEC504	**Program Elective-1** A. Information Theory & Coding B. CMOS Design	3	0	0	3	3
5.	OEC	OECEC505	**Open Elective-1** A. Data Base Management System B. Design & Analysis of Algorithm	3	0	0	3	3
6.	CC	PCCEC591	Electromagnetic Waves Laboratory	0	0	2	2	1
7.	CC	PCCEC592	Digital Signal Processing Laboratory	0	0	2	2	1
8.	GSC	HSMC(ECE)502	ESP V	2	0	0	2	0.5
9.	GSC	HSMC582	SDP V	0	0	2	2	0.5
10.	GSC	HSMC503	Economics for Engineers	2	0	0	2	2
11.	MC	MAR(ECE)581	Mandatory Additional Requirement (MAR)	0	0	0	0	0
12.	IFC	IFC(ECE)584	International Foreign Certification Course	1	0	0	1	0
13.	ECP	ECP581	Mini Project - V	0	0	2	1	1
							Total Credit Points =	**21**

INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

6th SEMESTER

2021-2025

Sl. No.	Type	Paper Code	Paper Name	L	T	P	Total	Credit
1.	CC	PCCEC601	Control System	3	0	0	3	3
2.	CC	PCCEC602	Computer Network	3	0	0	3	3
3.	PEC	PEC-EC603	**Program Elective-2** A. Power Electronics B. Nano electronics C. Introduction to MEMS	3	0	0	3	3
4.	OEC	OEC-EC604	**Open Elective-2** A. Artificial Intelligence B. Operating Systems	3	0	0	3	3
5.	CC	PCCEC691	Control System Laboratory	0	0	2	2	1
6.	CC	PCCEC692	Computer Network Laboratory	0	0	2	2	1
7.	CC	PCCEC693	Electronic Measurement Laboratory	0	0	2	2	1
8.	CC	PCCEC694	Mini Project/Electronic Design Workshop	0	0	4	4	2
9.	GSC	HSMC(ECE)602	ESP VI	2	0	0	2	0.5
10.	GSC	HSMC682	SDP VI	0	0	2	2	0.5
11.	GSC	HSMCEC603	Principles of Management	2	0	0	2	2
12.	MC	MAR(ECE)681	Mandatory Additional Requirement (MAR)	0	0	0	0	0
13.	IFC	IFC(ECE)684	International Foreign Certification Course	1	0	0	1	0
							Total Credit Points =	**20**

INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

7th SEMESTER

2021-2025

Sl. No.	Type	Paper Code	Paper Name	L	T	P	Total	Credit
1.	PEC	PECEC701	**Program Elective-3** A. Microwave Theory and Techniques B. Embedded systems	3	0	0	3	3
2.	PEC	PECEC702	**Program Elective-4** A. Mobile Communication and Networks B. VLSI Circuits	3	0	0	3	3
3.	PEC	PECEC703	**Program Elective-5** A. Satellite Communication B. High Speed Electronics	3	0	0	3	3
4.	OEC	OECEC704	**Open Elective-3** A. Internet of Things B. Machine Learning	3	0	0	3	3
5.	PEC	PECEC791A	Microwave Laboratory	0	0	2	2	1
		PECEC791B	Embedded Systems Laboratory	0	0	2	2	1
6.	GSC	HSMC(ECE)702	ESP VII	2	0	0	2	0.5
7.	GSC	HSMC782	SDP VII	0	0	2	2	0.5
8.	GSC	HSMC702	Organizational Behavior	2	0	0	2	2
9.	ECP	ECP781	Project Work - I	0	0	10	10	5
10.	MC	MAR(ECE)781	Mandatory Additional Requirement (MAR)	0	0	0	0	0
11.	IFC	IFC(ECE)784	International Foreign Certification Course	1	0	0	1	0
							Total Credit Points =	**22**

INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

8th SEMESTER

2021-2025

Sl. No.	Type	Paper Code	Paper Name	L	T	P	Total	Credit
1.	PEC	PEC-EC801	**Program Elective-6** a. Fiber Optic Communication b. Antenna and Propagation Theory	3	0	0	3	3
2.	PEC	PEC-EC802	**Program Elective-7** a. Materials Engineering b. Digital Image and Video Processing	3	0	0	3	3
3.	OEC	OEC-EC803	**Open Elective-4** a. Block Chain Technology b. Error correcting codes	3	0	0	3	3
4.	OEC	OEC-EC804	**Open Elective-5** a. Cloud Computing b. Optimization Technique	3	0	0	3	3
5.	GSC	HSMC(ECE)802	ESP VIII	2	0	0	2	0.5
7.	GSC	HSMC882	SDP VIII	0	0	2	2	0.5
8.	ECP	ECP881	Project Work – II & Dissertation	0	0	10	10	5
9.	CC	EC891	GRAND VIVA	-	-	-	-	4
10.	MC	MAR(ECE)881	Mandatory Additional Requirement (MAR)	0	0	0	0	0
11.	IFC	IFC(ECE)884	International Foreign Certification Course	1	0	0	1	0
							Total Credit Points =	**22**

CUMULATIVE CREDIT POINTS

A. B.Tech Course (Electronics & Communication Engineering) 2021-2025

SEMESTER	CREDIT POINTS FOR ALL SUBJECTS (EXCEPT MOOCs)
1	22.5
2	22.5
3	23
4	19
5	21
6	20
7	22
8	22
TOTAL CREDIT = 172	

MOOCs 20 credits has to be earned to obtain B.Tech Honours Degree

IVC/IFC courses has to be done as per the instruction/guidance from the Placement Dept.

2nd Year Curriculum Structure for B.Tech courses in Engineering &Technology

Course Code: BSC-301	**Category:** Basic Science Course
Course Title: Mathematics- 3	**Semester :** Third (All streams)
L-T-P: 3-1-0	**Credits: 3**
Pre-Requisites: BSC-103 and BSC-104	

Detailed Contents:

Module 1: Basic Statistics (lecture Hours 8) Measures of Central tendency and dispersion: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

Module 2: **Random variables and Probability Distributions (14 lectures)**
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. Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Module 3: Bivariate Distributions: (lecture Hours 4) Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

Module 4: Complex analysis (Lecture Hours 16)
Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.
Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Recommended Books:
Text Book:
1. A Course on Probability & Statistics
by Dr. Saktipada Nanda and Sibashis Nanda
Mindprobooks Academic Series.
Seller: Flipkart.com/Amazon.in

2. A Textbook of Engineering Mathematics
III by Gurupada Samanta
New Age International Publishers

Reference Books:
1. Statistical Methods
by N.G. Das
Tata McGraw Hill Education Private Limited

2. Engineering
Mathematics by Grewal
Khanna Publishers

GATE Preparation Book:
A Complete Guide to GATE Engineering Mathematics and General Aptitude for ECE/EE/EEE/ME students.
by Dr. Saktipada Nanda and Sibashis Nanda
Mindprobooks Academic Series.
Seller: Flipkart.com/Amazon.in

Course Outcomes:

CO 1	Ability to recall of information like facts, conventions, definitions, technical terms, methodology and procedures, principles, and theories in the field of Mathematics.
CO 2	Understanding information, predict consequences and interpreting facts to translate knowledge into new context to engineering Mathematics problems.
CO 3	Apply required skills, methods, concepts, laws and new theories to solve physical and engineering problems.
CO 4	Analyse the relationships and interaction between the different parts of a complex engineering mathematics problem.
CO 5	Evaluate value of theories, compare and discriminate between ideas to verify value of evidence in modelling of systems and problems of engineering sciences.
CO 6	Create and generalize new ideas by combining old given facts to predict and draw conclusions in Engineering fields related to Mathematics.

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)

Subject Code: PCCEC301	**Category** : C C
Subject Name: Electronic Devices	**Semester** : 3rd
L-T-P : 3-0-0 (Total Contact Hrs.3)	**Credit:** 3
Pre-Requisites: Basic Electronics, Basic Physics	

Course Objective:

1. To understand the basics of different electronic devices being used by Electronics Engineers.
2. To learn different Physical and mathematical concept within the operation of these electronic devices and apply this knowledge in various applications.
3. To understand operations of different opto-electronic and microwave devices and to apply this knowledge in various applications.
4. To learn the basics of Semiconductor physics.

Course Outcomes:

CO1: Student will be able recall facts and remember fundamentals of electronic devices and working of basic electronics components.

CO2: Student will be able to explain ideas and concepts of working principle and operations of basic Diode, BJT, JFET, MOSFET, different optoelectronic devices, different special devices which are normally used in different electronic applications.

CO3: Student will be able to apply knowledge of Diode, MOSFET and CMOS in the new problem solving situations.

CO4: Student will be able to design circuits using optoelectronic components for various applications and analyze their performance.

CO5: Student will be able to evaluate proper types of special devices in proper situations.

CO6: Student will be able to create new idea from the knowledge of basic electronic, optoelectronic and special devices.

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
PCCEC 301.1	**Semiconductor Electronics and Statistics :** Fermi-Dirac Statistics, Fermi and Quasi-Fermi Level, Drift and Diffusion, Conductivity and mobility, Density of states and carrier concentration, Generation and recombination of carriers, Semiconductor equations, Poisson and Continuity equations, Hall effect, IC fabrication (Elementary discussion of different steps)	8	L2 (Understand) L4 (Analyse)	PO1, PO2, PO8,PO12

INSTITUTE OF ENGINEERING & MANAGEMENT SUBJECT: ELECTRONIC DEVICES SUBJECTCODE: PCCEC301

PCCEC 301.2.a	**Junctions and Contacts:** p-n junction:- operation and energy band diagram, junction capacitance and frequency limitation; Zener diode and breakdowns, Heterojunction:- operation and band diagram, Ohmic and Schottky contacts.	6	L3 (Apply) L4 (Analyze)	PO1,PO2, PO3, PO4, PO5,PO12
PCCEC 301.2.b	**Bipolar junction transistors (BJT)**: Construction, operation and band diagram,BJT configurations, load line and Q-point, Amplification, Leakage currents, Early effect, Small signal-low frequency hybrid parameter model, Ebers-Moll equivalent circuit model, frequency limitation.	5	L2 (Understand) L4 (Analyze)	PO1,PO2, PO3,PO8, PO12
PCCEC 301.3	**Field effect diode and transistors**: JFET:- structure, operation and Pinch-off voltage; MIS diode, MOSFET :- structure and operation of concept of accumulation, depletion and inversion with band bending, Threshold voltage: expression and dependencies, drain current equation in terms of W/L (no derivation), drain current characteristics, small signal model, C-V characteristic of ideal MOS capacitor, channel length modulation, MOS scaling and short channel effects (brief introduction), Substrate bias effect, CMOS working principle and switching, frequency limitations.	8	L3 (Apply) L4 (Analyze)	PO1,PO2, PO3, PO4, PO5,PO8, PO12
PCCEC 301.4	**Opto Electronic Devices**: Optical absorption:- absorption coefficient and cut-off wavelength, Luminescence, photovoltaic effects, p-n junction solar cell (operating principle only) , Photoconductors, Photodiode, PIN photodiode, avalanche photodiode, phototransistor,LED, semiconductor junction Laser, Fibre Optic:- construction and principle of action (elementary discussion only)	6	L2 (Understand) L3 (Apply)	PO1,PO2,. PO3, PO4, PO5,PO12
PCCEC 301.5	**Special type of Devices:** Structure, Characteristics, Operation:- PIN diode, Varactor diode, Tunnel Diode, MESFET, HEMT, Charge Coupled Devices (CCD), Gunn Diode, IMPATT diode	4	L2 (Understand) L4 (Analyze)	PO1,PO2, PO3,PO12

Text books:

1. Ben G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices", PHI Learning Pvt. Ltd., 6th edition, 2011.
2. Michael Shur "Physics of Semiconductor Devices", Prentice Hall, India
3. D A Neamen and D. Biswas "Semiconductor Physics and Devices," McGraw-HillEdition, 4th.Edition.
4. B.L.Anderson and R.L.Anderson, " Fundamentals of Semiconductor Devices"
5. P.Bhattacharya, "Semiconductor optoelectronic devices", Prentice Hall India

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT – DIGITAL ELECTRONICS
SUBJECT CODE: (PCCEC302)

Subject Code : PCCEC302	**Category**: Professional Core &ourses
Subject Name : Digital ElectronicV	**Semester** : 3rd
L-T-P : 3-0-0	**Credit:3**
Pre-Requisites: Analog Electronics, Basic Computing	

Course Objective:

1. To introduce basic postulates of Boolean algebra and to introduce the methods for simplifying Boolean expressions.
2. To study formal procedures for the analysis and design of combinational and sequential circuits.
3. To introduce the concept of logic families, semiconductor memories and implementation of digital circuits using programmable logic devices.
4. To illustrate the concept of synchronous and asynchronous sequential circuits.

Course Outcome:

CO1: Students will have a thorough knowledge of number system and different codes and also they will be able to apply that knowledge while required.
CO2: After completing this course, the students will be able to design and analyze combinational logic circuits.
CO3: Students will acquire knowledge about sequential circuits and memory systems.
CO4: They will be able to design ADC and DACand also they will acquire knowledge on logic families.

Course Content:

Module No.	Description of Topic	Blooms Level	PO (1..12) MAPPING	Contact Hrs
1	**Number systems and Boolean algebra:** Introduction to number system and Boolean algebra; Binary, Octal and Hexadecimal representation and their conversions; BCD,ASCII, EBCDIC, Gray codes and their conversions; Signed binary number representation with 1's and 2's complement methods ,Boolean identities, basic logic functions, standard forms of logic expressions, simplification of logic expressions using K Map and Boolean theorems.	L1 (Remember) L2 (Understand)	PO1, PO2, PO3, PO4, PO12	6

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT – DIGITAL ELECTRONICS
SUBJECT CODE: (PCCEC302)

2	**Logic families:** TTL, ECL, MOS and CMOS, their operation and specifications.	L2 (Understand) L3 (Apply)	PO1, PO2, PO3, PO4, PO12	3
3	**Combinational logic:** Arithmetic circuits (ADDER and SUBTRACTOR), Comparators, decoders, encoders, multiplexers, de-multiplexers, and their use in logic synthesis; Hazards in combinational circuits.	L3 (Apply) L4 (Analyse)	PO1, PO2, PO3, PO4, PO12	6
4	**Sequential Circuits:** Basic memory element-S-R, J-K, D and T Flip Flops, various types of Registers and counters and their design, Irregular counter, State table and state transition diagram, sequential circuits design methodology.	L3 (Apply), L4 (Analyse)	PO1, PO2, PO3, PO4, PO12	6
5	Introduction of ROM and RAM, PLA, PAL and FPGA.	L3 (Apply)	PO1, PO2, PO3, PO4, PO12	4
6	Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type. A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type.	L3 (Apply)	PO1, PO2, PO3, PO4, PO12	5
Total Hours:				30

Learning Resources:

1. A. Anand Kumar, Fundamentals of Digital Circuits, PHI
2. R.P. Jain,Modern Digital Electronics, Tata McGraw Hill, 4th edition, 2009.
3. S. Salivahanan and S. Arivazhagan,Digital Circuits and Design,Oxford University Press, fifthedition.
4. M. Morris Mano ,"Digital Design" , Pearson
5. W.H. Gothmann, "Digital Electronics – An introduction to theory and practice", PHI, 2nd edition, 2006.
6. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
7. Charles H. Roth and Lizy Kurian John, "Digital System Design using VHDL", second edition, Cenage Learning.

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: SIGNALS AND SYSTEMS SUBJECT CODE: PCCEC303

Subject Code : PCCEC303	**Category** : Professional Core courses
Subject Name : Signals and Systems	**Semester** : 3rd
L-T-P : 3-0-0 (Total Contact Hrs. 3)	**Credit:** 3
Pre-Requisites: School level mathematics: Sequence and series, algebra of complex numbers, basic trigonometry. Calculus: Differential and Integral calculus (single variable). Knowledge of differential equations is helpful but not required. Co-requisites: Basic circuit analysis – ohm's law, KVL, KCL.	

Course Objective:

1. To explain signals and systems representations/classifications and also describe the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms.
2. To understand Sampling theorem, with time and frequency domain analysis of continuous time signals with Fourier series, Fourier transform and Z transform.
3. To present the concepts of convolution and correlation integrals and also understand the properties in the context of signals/systems and lay down the foundation for advanced courses.
4. To understand the basic concepts of state space representation of a system and conversion of transfer function model into state space and vice versa.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	Signals and systems as seen in everyday life, and in various branches of engineering and science. Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift- invariance, causality, stability, realizability. Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs. Characterization of causality and stability of linear shift invariant systems. System representation through differential equations.	10
2	Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases. Evolution of Transforms: Fourier Transform, Laplace Transform, Z-transform (single sided and Double sided).	8

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT: SIGNALS AND SYSTEMS
SUBJECT CODE: PCCEC303

	The Laplace Transform, notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, poles and zeros of system, solution to differential equations and system behavior using Laplace Transformation.	
3	The z-Transform for discrete time signals and systems- Eigen functions, region of convergence, z-domain analysis. The Sampling Theorem and its implications, Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.	12
4	State-space representation of systems. State-Space analysis, Multi-input, multi-output representation. State Transition Matrix and its role.	10

Books Recommended:

1. B. P. Lathi, "Signal Processing and Linear Systems", Oxford Universiy Press, c1998.
2. Douglas K.Lindner, "Introduction to Signals and Systems", McGrawill International Edition.
3. Simon Haykin, Barryvan Veen, "Signals and Systems", John Wiley and Sons (Asia).
4. Robert A. Gabel, Richard A. Roberts,"Signals and Linear Systems", John Wiley and Sons,1995.
5. M. J. Roberts, "Signals and Systems Analysis using Transform methods and MATLAB",TMH.
6. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi,2001.
7. Ashok Ambardar, "Analog and Digital Signal Processing", 2nd Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company),1999.
8. R. Anand, Signals and Systems, Khanna Publishing House,2018.

Course Outcomes:

Sl. No.	DESCRIPTION Students will be able to:	Blooms Level
PCCEC 303A.1	Ability to Infer the different types of CT and DT signals from their mathematical / graphical representations and classify them into various categories. Ability to characterize random signals using their statistical properties	L1 (Remember) L3 (Apply)
PCCEC 303A.2	Ability to analyze the CT and DT signals in time domain and frequency domain to infer their characteristics. Ability to apply the acquired knowledge to classify CT and DT systems into various categories	L2 (Understand)
PCCEC 303A.3	Ability to determine the response of a system for a given input using time domain and frequency domain techniques	L3 (Apply)
PCCEC 303A.4	Ability to select the appropriate transform technique for the analysis of a given CT or DT system.	L2 (Understand)

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION) SUBJECT
NETWORK THEORY SUBJECT CODE-(PCCEC304)

Subject Code : PCCEC304	**Category**: Theory (GE)
Subject Name :Network Theory	**Semester** : 3rd
L-T-P : 3-0-0 (Total Contact Hrs. 3)	**Credit:**3
Pre-Requisites: Mathematics,Basic Electronics and Electrical	

Course Objectives:

1. To learn about different types of network theorem and to apply this knowledge in circuit analysis.
2. To learn about transient response of a circuit.
3. To understand the application of Laplace transform and graph theory in circuits.
4. To learn about the resonating nature of a circuit.
5. To learn the Two pot parameters and their applications in circuit

Course Outcomes:

1. After completing this course, the students will be able to analyse a circuit with respect to node voltages and currents.
2. They will be able to understand the transient and steady state response of the circuit.
3. They will be able to analyse resonating and coupled circuits.
4. They will be able to analyze simple two-port circuit and analyze circuits using graph theory.

Course Content:

Module no and CO mapping	Description	Bloom's level	PO (1..12) MAPPING
1 (**PCCEC304.1)**	**Network Theorems:** Basic nodal and mesh analysis, linearity, superposition and source transformation, Thevinin's Theorem, Norton's and maximum power transfer theorem and useful circuit analysis techniques, Tallegen's theorem, network topology	1,2,3,4	1,2,3
2 (**PCCEC304.2)**	**Transient Analysis:** Natural response-Forced response - Transient response of RC, RL and RLC circuits to excitation by Step Signal, Impulse Signal and exponential sources - Complete response of RC, RL and RLC Circuits to sinusoidalexcitation	3,4	1,2,3,4

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION) SUBJECT
NETWORK THEORY SUBJECT CODE-(PCCEC304)

3 (**PCCEC304.2**)	**Laplace Transform and Its Circuit Applications:** a) Laplace transform, initial and final value theorem, circuit analysis in sdomain, frequencyresponse. b) Waveform synthesis, analysis of RC, RL, and RLC networks with and withoutinitial conditions with Laplace transforms evaluation of initialconditions. Concept of pole, zero and transferfunction	2,3,4	1,2,3,4,5
4 (**PCCEC304.3**)	**Resonanceand Coupled Circuits:** a) **Resonance** - Series resonance - Parallel resonance - Variation of impedance with frequency - Variation in current through and voltage across L and C with frequency Bandwidth - Q factor -Selectivity. b) **Self-inductance** - Mutual inductance - Dot rule - Coefficient of coupling - Analysis of multi winding coupled circuits - Series, Parallel connection of coupled inductors - Single tuned and double tuned coupledcircuits.	2,3,4	1,2,3,4
5 (**PCCEC304.4**)	**TwoPort Networks:** Two port networks, Z parameters, Y parameters, Transmission (ABCD) parameters, Hybrid (H) Parameters,Interconnection of twoportnetworks, Symmetricityand reciprocity conditions.	2,3,4	1,2,3,4
6 (**PCCEC304.4**)	**Graph Theory in Circuits:** Graph of a network - Incident and reduced incident matrices – Trees – Cut sets - Fundamental cut sets – Cut set matrix– Tie set matrix	3,4	1,2,3,4

Learning Resources:

Text Books:

1. V. Valkenbeg, Network Analysis, Pentice Hall India
2. D Roy Chowdhury,Networks and Systems,New Age InternationalPublishers
3. Sudhakar, A., Shyammohan, S. P.; "Circuits and Network"; Tata McGraw-Hill New Delhi,1994.
4. A William Hayt, "Engineering Circuit Analysis" 8th Edition, McGraw-HillEducation

Reference Books:

5. Fundamentals of Electric Circuits, Charles K. Alexander,McGraw Hill
6. Network Analysis and Synthesis, S Ghosh, A. Chakraborty

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT – ESSENTIAL STUDIES FOR PROFESSIONALS – III
SUBJECT CODE: HSMC(ECE)302

Subject Code : HSMC(ECE)302	**Category**: Theory
Subject Name : Essential Studies For Professionals - III	**Semester** : 3rd
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit: 0.5**
Pre-Requisites: Basic Social Science from primary to high school, NCERTs	

Course Objective:

1. To learn about basic of history to know about our past and to implement it in our daily life.
2. To learn about the political system of our country.
3. To learn the concepts of Basics of Geography and Economics from which Students will acquire knowledge for Competitive exams.

Course Outcomes:

1. To inculcate human values and ethical thinking among students.
2. To prepare the stage for facing different levels of civil service and other competitive examinations.
3. To prepare the ground for making them aware of the happenings, cultural historical and developmental aspects of the country as well as global affairs
4. Learning current affairs with technique.

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1.	**GK & CA and National income**: Concept of GDP, GNP, NNP both in FC & MP, PCI	6	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO4
2.	**Tax, Inflation & Deflation and Market structure:** Concept of TAX, objective of TAX, Direct & Indirect Tax, Progressive, Regressive & Proportional tax. Inflation & its impact, Deflation & its impact, WPI, CPI, GDP deflator. -Perfect competition, monopoly, oligopoly, duopoly, monophony, duopoly, Oligopoly. SEBI, IRDA, NHB Working & Policies, Money Market & Capital Market, functions of Banks & Types of accounts, cheques & loans, Mutual Fund, Banking Terminologies..	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4

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3.	**Constitution of India:** Supreme Court, High Court, Local Self Government. 1. Science & technology (with currentupdates). 2. Monuments, sculptures 3. Literature, Languages 4. Visual arts –paintingsetc. 5. Performing arts –classical and folk dances, puppetryetc. 6. Religiousdiversity	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4
4.	**History:** Ancient & Medieval History at a glance-From Indus valley civilization to Pre-Foreign (British, Dutch, French) Invasion.	6	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4

Learning Resources:

Text Books:

1. NCERT Books from class 8-12.

Reference Books:

1. Indian Constitution-M.Laxmikant
2. Indian Economy-RameshSingh
3. History of Modern India- BepanChandra
4. Geography of India- MajidHussain
5. Current Affairs Magazine ofIEM-UEM

INSTITUTEOFENGINEERING&MANAGEMENT
(AUTONOMOUSINSTITUTION) SUBJECT:
ELECTRONIC DEVICES LABORATORY
SUBJECTCODE: PCCEC391

SubjectCode: PCCEC391	**Category** : Core Course
SubjectName: Electronic Devices Laboratory	**Semester** : 3rd
L-T-P :0-0-2 (Total Contact Hrs.2)	**Credit:** 1
Pre-Requisites: 1. Basic Electronics 2. Basic Physics	

Course Objective:

1. To get practical experience with the different electronic devices being used by Electronics Engineers.
2. To get practical experience of the basic characteristics of different opto-electronic devices and to be able to apply this knowledge in various other applications.
3. To learn hand on experience such that students can work as professionals in the area of Electronics and other Engineering fields.

Course Outcomes:

1. An ability to verify the working of different diodes, transistors, CRO probes and measuring instruments. Identifying the procedure of doing the experiment.
2. Ability to understand the characteristics of BJT and FET and how to determine different parameters for designing purpose.
3. Ability to understand properties of photoelectric devices
4. Ability to measure and record the experimental data, analyze the results, and prepare a formal laboratory report.

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1	Identifying and study of different components like resistor, capacitors, diodes, LED, Transistors, FET(JFET & MOSFET)etc	2	L2 (Understand) L4 (Analyse)	PO1,PO5
2	Study of different instruments used in the laboratories like, power supply, Oscilloscope, Multi-meter etc.	2	L3 (Apply) L4 (Analyze)	PO1, PO5
3	**Characteristics of PN junction diode:** a)To Plot the Volt Ampere Characteristics of PN Junction Diode under Forward and Reverse Bias Conditions. b) To find the Cut-in voltage, Static Resistance, Dynamic Resistance for Forward Bias & Reverse Bias.	2	L2 (Understand)	PO1,PO5

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ELECTRONIC DEVICES LABORATORY
SUBJECTCODE: PCCEC391

4	**Characteristics Of Zener Diode & Load regulation:** a) To Obtain the Forward Bias and Reverse Bias characteristics of a Zener diode. b) Find out the Zener Break down Voltage from the Characteristics. c)To Obtain the Load Regulation Characteristics.	2	L3 (Apply) L4 (Analyze)	PO1, PO3, PO5
5	**Common Base Bipolar Transistor Characteristics:** a) To plot the Input and Output characteristics of a transistor connected in Common Base Configuration b) To find the h – parameters from the characteristics.	2	L3 (Apply) L4 (Analyze)	PO1, PO5
6	**Common Emitter Bipolar Transistor characteristics:** a) To plot the Input and Output characteristics of a transistor connected in Common Emitter Configuration b) To find the h – parameters from the characteristics	2	L3 (Apply) L4 (Analyze)	PO1, PO5
7	Design Self Bias Bjtcircuit	2	L3 (Apply) L4 (Analyze)	PO1, PO3, PO5
8	**JFET Drain & Transfer Characteristics (Common Source):** a) Drain characteristics b) Transfer Characteristics. c) To find rd, gm, and μ from the characteristics.	2	L2 (Understand) L4 (Analyze)	PO1, PO3, PO5
9	Study Characteristics of Phototransistor	2	L2 (Understand) L4 (Analyze)	PO1, PO5
10	Study Characteristics of LED &LDR	2	L2 (Understand) L4 (Analyze)	PO1, PO5

Text books:

1. Ben G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices", PHI Learning Pvt. Ltd., 6th edition, 2011.
2. Michael Shur "Physics of Semiconductor Devices", Prentice Hall, India
3. D A Neamen and D. Biswas "Semiconductor Physics and Devices," McGraw-HillEdition, 4th. Edition.
4. B.L.Anderson and R.L.Anderson, " Fundamentals of Semiconductor Devices"
5. P.Bhattacharya, "Semiconductor optoelectronic devices", Prentice Hall India

DIGITAL ELECTRONICS LAB

Subject Code: PCC-EC392	**Category** : Professional Core courses
Subject Name : **DIGITAL ELECTRONICS LAB**	**Semester** : Fourth
L-T-P : 0-0-2	**Credit:** 2
Pre-Requisites: Basic Computing	

Course Objective:

COE1: To learn about different types of Digital ICs.
COE2: To learn how to minimize the complexity of digital logic circuits.
COE3: To understand the basic difference between sequential and combinational logic circuits and to learn the analysis of these circuits.
COE4: To learn the design of sequential and combinational logic circuits.
COE5: To learn about CMOS Inverter and its importance.

Proposed Syllabus:

Module No.	Description	Lecture Hours
1	Introduction to Digital Electronics Lab- Nomenclature of Digital Ics, Specifications, Study of the Data Sheet, Concept of Vcc and Ground, Verification of the Truth Tables of Logic Gates using TTL ICs. Implementation of the Given Boolean Functions using Logic Gates in Both Sop and Pos Forms.	3
2	Simplification of logic functions using K Map and Boolean algebra and then design using basic gates and universal gates.	3
3	Design of Adder and Subtractor using basic gates and use of IC 7483 as BCD adder.	3
4	Design of MUX and DEMUX using basic gates and also study the available ICS of MUX and DEMUX. Implement logic functions using these ICs.	3
5	Design of R-S, J-K, D and T Flip flops using universal gates and also study master slave J-K flip flop IC.	3
6	Design of synchronous and asynchronous counter using flip flop IC.	3
7.	Simulation of MOS Inverter with different loads using SPICE software.	3
8.	Simulation of CMOS Inverter for different parameters Kn, Kp as a design variable in suitable circuit simulator software.	3

Course Outcomes:

CO1: Understand the pin description of digital ICs.
CO2: **Implement** Arithmetic logic circuits using digital ICs.
CO3: Implement combinational logic circuits using digital ICs.
CO4: Implement sequential logic circuits using digital ICs.
CO5: Apply concept of universal logic gates for digital circuit designing.
CO6: Examine the behavior of sequential and combinational logic circuits using digital ICs.

Mapping Matrix of COs and POs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	2	-	2	-	2	-	1	3	3	3	3	-	2
CO2	-	2	2	2	-	2	-	1	3	3	2	2	-	2
CO3	-	2	2	2	-	2	-	1	3	3	3	3	-	2
CO4	-	2	2	2	-	2	-	1	3	3	2	2	-	2
CO5	-	2	2	2	-	2	-	1	3	3	3	3	-	2
CO6	-	2	2	2	-	2	-	1	3	3	3	3	-	2
AVG	-	2	1.7	2	-	2	-	1	3	3	2.7	2.7	-	2

Learning Resources:

1. R.P. Jain,Modern digital Electronics, Tata McGraw Hill, 4th edition, 2009.
2. S. Salivahanan and S. Arivazhagan,Digitaircuits and Design, Oxford fifth eition
2. M. Morris Mano ,"Digital Design" , Pearson
3. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition, 2006.
4. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989
5. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION) SUBJECT:
SIGNALS & SYSTEMS LAB SUBJECT CODE:
(PCCEC393)

Subject Code : PCCEC393	**Category** : Professional Core course
Subject Name : Signals & Systems Lab	**Semester** : 3rd
L-T-P : **0-0-2 (Total Contact Hrs. 2)**	**Credit :** 1
Pre-Requisites: Mathematics, Network Theory	

Course Objective:

1. Understanding of Signals and Systems is essential for a proper appreciation and application of other parts of electronics engineering, such as Digital Signal Processing, Analog and Digital Communication systems to be taught in the forthcoming semesters.
2. The course lays the mathematical foundation for the study of signals and systems, classification of signals - continuous time and discrete time signals and properties of systems.
3. Helps the students in dealing with signals in both time and frequency domains and responses of the LTI systems in both time and frequency domains.
4. This subject, which consolidates and expands student knowledge from basic mathematics, constitutes an essential conceptual framework from which to understand a variety of engineering systems.
5. The subject also deals with introductory ideas on the topics of filtering, sampling, Z Transform and Laplace Transform.

Course Content:

Module No.	Description of Topic	Contact Hrs.	Blooms Level	PO(1..12) Mapping
1.	Study to identify the basic differences between continuous and discrete time signals & systems.	2	L2 (Understand)	PO1, PO5
2.	Study to simulate the signals (sinusoidal, impulse, ramp and step signals) in Matlab/Octave.	2	L2 (Understand) L3 (Apply)	PO1, PO5
3.	To study Linear convolution theorem in time and frequency domain in Matlab / Octave.	2	L2 (Understand) L3 (Apply)	PO1, PO5
4.	Fourier & Laplace transform of different signals.	2	L3 (Apply) L4 (Analyze)	PO1, PO2, PO5

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SIGNALS & SYSTEMS LAB SUBJECT CODE:
(PCCEC393)

5.	Verification of sampling theorem .To study of sampling of an analog Signal and it s effects with different sampling rates(over, under and critical sampling cases)	2	L3 (Apply) L4 (Analyze)	PO1, PO2,PO5
6.	Z-transform of different discrete time signals. Correlation of two signals (auto correlation & cross correlation).	2	L2 (Understand) L3 (Apply)	PO1, PO2 PO5
7.	Design of a first order low-pass filter with given cut- off frequency.	2	L3 (Apply) L4 (Analyze)	PO1, PO3
8.	Design of a first order high-pass filter with given cut- off frequency.	2	L3 (Apply) L4 (Analyze)	PO1, PO3
9.	Design of a first order band-pass filter with given cut- off frequency.	2	L3 (Apply) L4 (Analyze)	PO1, PO3
10.	Design of a first order band-reject filter with given cut- off frequency.	2	L3 (Apply) L4 (Analyze)	PO1, PO3

Course Outcomes:

1. Ability to identify the basic differences between continuous and discrete time signals & systems and analyze it both time and frequency domain.
2. Ability to apply Laplace transform and Z transform in the analysis of continuous time and discrete time signals and systems.
3. Ability to compute the output of a LTI system (both continuous and discrete time) by convolution and sampling of continuous time signals and verification of the same.
4. Ability to design suitable active filters of first order(LPF,HPF and BPF) required for signal processing applications.

Learning Resources:

1. Laboratory manual provided from the organization.
2. a)Signals and Systems:Allen Opphenium,Wilsky,
   b)Signals and Systems:Simon Haykin,Vary Veen.
3. MATLAB/https://octave-online.net.

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT: DATA STRUCTURES AND ALGORITHMS
(SESSIONAL)
SUBJECT CODE: OECEC381

Subject Code: OEC-EC381	**Category**: Engineering Sciences
Subject Name : Data Structures and Algorithms	**Semester** : 3rd
L-T-P : **1-0-2**	**Credit: 2**
Pre-Requisites: Mathematics-I & II, Programming with C	

Course Objectives

1. To learn fundamental data structures, which allow one to store collections of data with fast updates and queries. The student will be able to design, analyse, and implement data structures and algorithms using computer programs, and to solve engineering problems.
2. Topics include elementary data structures (including arrays, stacks, queues, and lists), advanced data structures (including trees and graphs), the algorithms used to manipulate these structures, searching and sorting techniques and their comparative time and space complexities, and their application to solving practical engineering problems
3. Students are expected to be capable of understanding the data structures, their advantages and drawbacks, how to implement them in C, how their drawbacks can be overcome and what the applications are and where they can be used. students should be able to learn about the data structures/ methods/algorithms mentioned in the course with a comparative perspective so as to make use of the most appropriate data structure/ method/algorithm in a program to enhance the efficiency (i.e. reduce the run-time) or for better memory utilization, based on the priority of the implementation.
4. Students will be able to understand the efficiency aspects of the graph and sorting algorithms covered in this course, and be able to convert an inefficient program into an efficient one using the knowledge gathered from this course.

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Course Contents:

Module	Topics	Contact Hours
1	**Basic Terminologies:** Elementary Data Organizations. Why we need data structure? Concepts of data structures: a) Data and data structures b) Abstract Data Type and Data Type. **Algorithms and programs**: basic idea of pseudo-code. . **Algorithm efficiency and analysis**: time and space analysis of algorithms – Order notations, Asymptotic Notations, Time-Space trade off. **Text Book** (1), Chapter 2; **Text Book** (2), Chapters 1 & 2; **Text Book** (3), hapter 1	4
2	**Linear Data Structures - I** **Array**s: Different representations – row major, column major.Sparse matrix - its implementation and usage. Array representation of polynomials. **Text Book** (1), Chapter 3; **Text Book** (2), Chapter 4; **Text Book** (3), Chapter 2 **Linked Lists:** Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list:operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis. **Text Book** (1), Chapter 6; **Text Book** (2), Chapter 5; **Text Book** (3), Chapter 4	8
3	**Linear Data Structures –II** Stacks and Queues: Stack and its implementations (using array, using linked list), applications. Queue, circular queue, dequeue. Implementation of queue- both linear and circular (using array, using linked list),applications. Recursion: Principles of recursion – use of stack, differences between recursion and iteration, tail recursion. Applications - The Tower of Hanoi, Eight Queens Puzzle. **Text Book** (1), Chapters 7 & 8; **Text Book** (2), Chapter 6; **Text Book** (3), Chapter 3	8

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4	**Non-Linear Data Structures:** **Graphs:** Graph definitions and concepts (directed/undirected graph, weighted/un - weighted edges, sub-graph, degree, cutvertex/articulation point, pendant node, clique, complete graph, connected components –strongly connected component, weakly connected component, path, shortest path, isomorphism). Graph representations/storage implementations –adjacency matrix, adjacency list, adjacency multi-list. Graph traversal and connectivity –Depth-first search (DFS), Breadth-first search (BFS) - concepts of edges used in DFS and BFS (tree-edge, backedge, cross-edge, forward-edge), applications. Minimal spanning tree – Prim's algorithm (basic idea of greedy methods). **Text Book** (1), Chapter 13; **Text Book** (2), Chapter 8; **Text Book** (3), Chapter 6 **Trees**: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree,Tree operations on each side of the trees and their algorithms with complexity analysis, Applications of Binary Trees, B Tree, B+ Tree: definitions, algorithms and analysis **Text Book** (1), Chapter 9; **Text Book** (2), Chapter 7	**8**
5	**Searching, Sorting and Hashing** **Searching and Sorting**: Linear Search and Binary Search Techniques and their complexity analysis. Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods. **Text Book** (1), Chapter 14; **Text Book** (2), Chapter 9; **Text Book** (3), Chapter 7 **Hashing:** Hashing functions, Hashing for insert, search, delete, collision resolution techniques **Text Book** (1), Chapter 15; **Text Book** (2), Chapter 9; **Text Book** (3), Chapter 8	**8**

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SUBJECT: DATA STRUCTURES AND ALGORITHMS
(SESSIONAL)
SUBJECT CODE: OECEC381

Text Books:

1. **Data Structures Using C (2nd edn) – ReemaThareja**(publ.: Oxford University Press)
2. **Data Structures With C – Seymour Lipschutz**(publ.: McGraw Hill Education)
3. **Fundamentals of Data Structures In C (2nd edn) – Horowitz, Sahni, and Anderson-Freed** (publ.: Universities Press)

Reference Books:

1. Data Structures In C – A. Tenembaum, Y. Langsam, and M. J. Augenstein (publ.: Pearson)
2. Classic Data Structures (2nd edn) – DebasisSamanta (publ.: PHI)
3. Data Structures & Algorithms – Aho, Hopcroft, and Ullman (publ.: Pearson)

Lab Course Contents:

S. No.	Description of Topic	Contact Hrs.
1	Implementation of array operations.	2
2	Stacks and Queues: adding, deleting elements Circular queue: Adding and deleting elements merging problem.	2
3	Implementation of singly and double Linked list: inserting, deleting, and inverting a linked list.	2
4	Implementation of stack and queues using linked list:	2
5	Polynomial addition and multiplication.	2
6	Sparse Matrices: Multiplication and Addition.	2
7	Recursive and Non-recursive traversal of Trees. Threaded binary tree traversal. AVL tree implementation	2
8	Application of Trees. Application of sorting and searching algorithms.	2
9	Hash tables implementation: searching, inserting and deleting, searching & sorting techniques.	2

INSTITUTE OF ENGINEERING & MANAGEMENT
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(SESSIONAL)
SUBJECT CODE: OECEC381

Course outcomes (CO):

COURSE OUTCOMES: S.NO.	DESCRIPTION	Blooms Level	PO (1..12) MAPPING
OECEC381.1	For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness	L4 Analyze	PO1, PO2, PO3, PO4, PO5, PO12
OECEC381.2	For a given problem of Arrays,Linked Lists, Stacks, and Queues, student will be able to implement it and analyze the same to determine the computation time complexity.	L4 Analyze	PO1, PO2, PO3, PO4, PO5, PO12
OECEC381.3	Students will able to implement Graph search and traversal algorithms and determine the time and computation complexity error detection and correction in linear block codes	L4 Analyze	PO1, PO2, PO3, PO4, PO5, PO12
OECEC381.4	For a given Search problem (Linear Search and Binary Search) student will able to implement and analyze the same to determine the computation time complexity. For Sorting, student will able to select and write the appropriate optimized algorithms from among Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity	L4 Analyze	PO1, PO2, PO3, PO4, PO5, PO12

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT - SKILL DEVELOPMENT FOR– PROFESSIONALS III SUBJECT CODE - HSMC382

Subject Code : HSMC382	**Category**:
Subject Name : Skill Development for Professionals - III	**Semester** : 3rd
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit: 0.5**
Pre-Requisites: Basic Mathematics, General English from primary to high school.	

Course Objective:

1. To enhance the aptitude & analytical skill of students with multiple tricky approaches.
2. To prepare the students for various competitive examinations & professional exams

Course Outcomes:

1. To enhance their problem solving skills, to improve the basic mathematical & Logical Skills for any type of competitive examinations.
2. To get best possible training for the them students through continuous training module.
3. To find themselves sound for the campus recruitment program's aptitude Test.
4. To enhance problem solving skill using fast track techniques without using calculator.

Course Content:

Module No.	Description	Hours	BloomsLevel	PO(1..12) Mapping
1.	**Quantitative Aptitude** Simple & Compound Interest, Data Interpretation, Indices & Surds, Number System, Quadratic Equations	6	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO4
2.	**Logical Reasoning: Syllogism,** Logical Venn diagram, If Else Statement**Puzzles**Seating Arrangement, Classification, Seating Arrangement with Blood Relations**Machine Input-Output**Pattern Based I/O**Inequality** a) Coded Inequality, b) Jumbled Inequality, c) Conditional inequality.	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4
3.	**Verbal English** **Sentence Corrections,** Fill the **blanks** with appropriate words/articles/preposition/verbs/adverbs/conjunction.**Reading Comprehension** (Advance Level) **Vocabulary**.	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT - SKILL DEVELOPMENT FOR– PROFESSIONALS III SUBJECT CODE - HSMC382

4.	**Data interpretation:** Advanced Level.	6	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4

Learning Resources:

Reference Books:

1. Objective General English- S.P Bakshi
2. English Grammar and Competition-S.C Gupta
3. Fast Track Objective Arithmetic- Rajesh Verma
4. Advance Maths- Rakesh Yadav
5. Verbal and Non-Verbal Reasoning- R.S Agarwal
6. A new approach to Reasoning- BS Sijwali
7. Quantitative Aptitude-R.S Agarwal

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION)
SUBJECT: ANALOG & DIGITAL COMMUNICATION SUBJECT CODE: PCCEC401

Subject Code: PCCEC401	**Category:** CC
Subject Name: Analog & Digital Communication	**Semester** : 4th
L-T-P : 3-0-0	**Credit:** 3
Pre-Requisites: Signals and Systems, Mathematics	

Course Objective:

1. To learn about Analog Modulation
2. To learn about Digital Modulation
3. To learn impact of Noise in communication
4. To learn about Digital Data Transmission
5. To learn about Superheterodyne Receiver

COURSE OUTCOMES:

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth
2. Understand the behavior of a communication system at receiver in presence of noise
3. Investigate pulsed modulation system, baseband transmission and analyze their system performance
4. Analyze different digital modulation schemes and can compute the bit error performance, trade off issues, equalization, carrier recovery

S.NO.	DESCRIPTION	Blooms Level	PO(1..12) MAPPING	HOURS
PCC-EC401 A.1	Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB, Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals	L2 (Understand) L3 (Apply) L4 (Analyse)	PO1, PO2, PO3, PO5, PO7, PO12	6
PCC-EC401 A.2	Super heterodyne receivers: Super heterodyning principle, Intermediate frequency, Local oscillator frequency, Image frequency	L2 (Understand) L3 (Apply) L4 (Analyse)	PO1, PO2, PO3, PO5, PO7, PO12	6
PCC-EC401 A.3	Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De- emphasis, Threshold effect in angle modulation	L2 (Understand)	PO1, PO2, PO3, PO5, PO7, PO12	6
PCC-EC401 A.4	Pulse modulation, Sampling process, Pulse Amplitude and Pulse code modulation (PCM), Differential pulse code modulation, Delta modulation, Noise considerations in PCM, Time Division multiplexing, Digital Multiplexers	L2 (Understand) L3 (Apply) L4 (Analyse))	PO1, PO2, PO3, PO5, PO7, PO12	8
PCC-EC401	Elements of Detection Theory, Optimum detection of signals in noise, Coherent	L2 (Understand)	PO1, PO2, PO3, PO5,	8

A.5	communication with waveforms- Probability of Error evaluations, Baseband Pulse Transmission- Inter symbol Interference and Nyquist criterion, Pass band Digital Modulation schemes- Phase Shift Keying, Frequency Shift Keying, Quadrature Amplitude Modulation, Continuous Phase Modulation and Minimum Shift Keying	L3 (Apply) L4 (Analyse)	PO7, PO12	
PCC-EC401 A.6	Digital Modulation tradeoffs, Optimum demodulation of digital signals over band-limited channels- Maximum likelihood sequence detection (Viterbi receiver), Equalization Techniques, Synchronization and Carrier Recovery for Digital modulation	L2 (Understand) L3 (Apply)	PO1, PO2, PO3, PO5, PO7, PO12	6

Learning Resources:

1. Modern Digital and Analog Communication Systems: B.P. Lathi, Zhi Ding, Hari M Gupta, 4th Edition Oxford University Press.
2. Principles of Communication Systems: Taub and Schilling, 2nd ed., Mc-Graw
3. Hill Haykin S., "Communications Systems", John Wiley and Sons, 2001
4. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
PROPOSED SYLLABUS
SUBJECT NAME–ANALOG ELECTRONIC CIRCUITS
SUBJECT CODE: PCCEC402

Course Code: PCCEC402	**Category:** Professional Core courses
Course Title: Analog Electronic Circuits	**Semester :** Fourth
L-T-P: 3-0-0	**Credit:** 3
Pre-Requisites: Basic knowledge about components Resistors, Inductors, Capacitors; Network Theorems (Kirchoff's law, Thevenin's theorem, Miller theorem etc.); Basic knowledge about the operation of semiconductor devices (Transistor, Diode etc.); Ohms Law, Voltage-current equations; Basic knowledge of Differentiation, Integration, Differential equation.	

Course Objective:

1. To understand the methods of biasing of transistors.

2. To design and analyse single stage and multistage amplifier circuits.

3. To analyse the frequency response of small signal amplifiers and design of voltage and power amplifiers using ac models of transistor.

4. To analyse and design active filters.

5. To analyse and design regulated DC power supplies.

6. To impart knowledge on Oscillators, feedback amplifiers and tuned amplifiers.

Course Outcome:

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

CO1: Acquire knowledge on different configurations and biasing of bipolar junction transistor (BJT) and FET and their applications.

CO2: Acquire knowledge on analysis and design of transistor voltage and power amplifiers using their ac models.

CO3: Acquire knowledge on tuned amplifiers and application of feedback in amplifiers and oscillators.

CO4: Acquire knowledge on linear power supplies, regulators, operational amplifiers and their applications.

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Course Content:

Module No.	Description of Topic	Blooms Level	PO (1..12) MAPPING	Contact Hrs.
1	**Diode Circuits:** Rectifiers, Clipper, Clamper. **Biasing for BJT and FET**: Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features. **Amplifier models:** Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. **Small signal analysis:** Low frequency transistor models, estimation of voltage and current gain, input resistance, output resistance etc. using each model, design procedure for particular specifications, low frequency analysis of multistage amplifiers.	L2 (Understand) L3 (Apply)	PO1, PO2, PO3, PO4, PO12	10
2	**High frequency transistor models:** Functions of all parameters of high freq. model, equivalent circuit, Frequency response of single stage and multi stage amplifier, RC coupled amplifier, derivation of voltage gain, current gain, input impedance and output impedance, frequency response characteristics, lower and upper half frequencies, bandwidth, and concept of wide band-amplifier. **Feedback Amplifiers:** Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin. **Power Amplifiers:** Various classes of operation (e.g., Class A, B, AB, C etc.), their power efficiency and linearity issues.	L3 (Apply) L4 (Analyse)	PO1, PO2, PO3, PO4, PO12	10
3	**Oscillators:** Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitts, Clapp etc.), non- sinusoidal oscillators. **Current mirror:** Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (V_{ON}), maximum usable load.	L3 (Apply) L4 (Analyse)	PO1, PO2, PO3, PO4, PO12	6

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4	**Differential amplifier:** Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. **Operational Amplifier:** Basic structure and characteristics, inverting and non- inverting amplifiers. **Operational Amplifier applications:** Integrator and differentiator, summing amplifier, Schmitt trigger, Instrumentation Amplifier, Log & Anti-log amplifiers, Transconductance multiplier, Precision Rectifier. **Active filters:** Low pass, high pass, band pass and band stop, design guidelines.	L2 (Understand) L3 (Apply)	PO1, PO2, PO3, PO4, PO12	8
5	**Multivibrators:** Astable, monostable and bistable circuits, bistable circuit as memory element, generation of square, triangular waveforms and standardized pulse using Astable multivibrator and Monostable multivibrator **Linear Power Supplies:** Rectifiers and different passive filters (e.g., Capacitor filter, LC- filter, π-section filter etc.), regulators.	L3 (Apply) L4 (Analyse)	PO1, PO2, PO3, PO4, PO12	8
Total				42

Learning Resources:

Text books:

1. Sedra & Smith-Microelectronic Circuits- Oxford UP.
2. Franco—Design with Operational Amplifiers & Analog Integrated Circuits, 3/e, McGraw Hill.
3. Boylested & Nashelsky- Electronic Devices and Circuit Theory- Pearson/PHI.
4. Electronics fundamental—D Chattopadhaya & P. C. Rakshit.
5. Linear integrated circuits-D. Roy Choudhury, Shail B. Jain.

Reference Books:

1. Millman & Halkias–Integrated Electronics, McGraw Hill.
2. Rashid-Microelectronic Circuits-Analysis and Design- Thomson (Cenage Learning).
3. Schilling & Belove–Electronic Circuit: Discrete & Integrated, 3/e, McGraw Hill.
4. Razavi- Fundamentals of Microelectronic s- Wiley.
5. Malvino–Electronic Principles, 6/e, McGraw Hill.

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6. Horowitz & Hill- The Art of Electronics; Cambridge University Press.
7. Bell- Operational Amplifiers and Linear ICs- Oxford UP.
8. Tobey & Grame–Operational Amplifier: Design and Applications, Mc GrawHill.
9. Gayakwad R.A– Op Amps and Linear IC's, PHI.
10. Coughlin and Driscol–Operational Amplifier and Linear Integrated Circuits– Pearson Education.

CO-PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PCC-EC402.1	3	3	2	2	2	-	-	-	-	-	-	2
PCC-EC402.2	3	3	-	2	2	-	3	-	-	-		2
PCC-EC402.3	3	2	-	2	-	2	-	2	-	-	1	2
PCC-EC402.4	3	2	1	1	-	2	2	-	1	2	2	2
PCC-EC402*	3	2.5	0.75	1.75	1	1	1.25	0.5	0.25	0.5	0.75	2
1: Low (Slight)			*2: Moderate (Medium)*					*3: Substantial (High)*				

INSTITUTE OF ENGINEERING &
MANAGEMENT (AUTONOMOUS INSTITUTION)
SUBJECT MICROCONTROLLERS SUBJECT
CODE- PCCEC403

Subject Code : PCCEC403	**Category** : Professional Core courses
Subject Name : Microcontrollers	**Semester** : Four
L-T-P : 3-0-0	**Credit:3**
Pre-Requisites: Digital Electronics	

Course Objective:

On successful completion of the course students will be able to:

1. Do assembly language programming on 8085, 8086 microprocessor
2. Do interfacing design of peripherals like, I/O, A/D, D/A, timer etc.
3. Develop systems using different microcontrollers and Arduino
4. Understanding RSIC processors and ARM microcontroller based system design

Course Outcome:

COE1: To learn 8 bits, 16 bits microprocessor

COE2: To learn different peripheral devices

COE3: To learn basic microcontroller

COE4: To learn Arduino

COE5: To know about advance microprocessors

COE5: Basic concept of Arm processor

Course Content:

Module No.	Description of Topic	Blooms Level	Contact Hrs.
1	L1- Overview of microcomputer systems and their building blocks --- 1H L2- Microprocessors 8085, Memory, memory interfacing and Instruction sets of microprocessors (with programming examples) ----- 5H L3- Concepts of interrupts and Direct Memory Access (DMA)----- 1H L4- Microprocessors 8086 and Instruction sets of microprocessors (with programming examples) ----- 3H	L1 (Remember) L2,L3,L4 (Under stand)	10
2	Interfacing with : L1- Peripherals- timer---- 1H L2- Serial I / O----- 1H L3- Parallel I / O---- 1H L4- A/D and D/A converters----- 1H L5- Arithmetic coprocessors---- 1H L6- System level interfacing design--- 2H .	L1,L2 ,L3,L4,L5 (Under stand) L6 (Apply)	7
3	L1- Microcontrollers 8051 systems- pin and port description, interrupts, timers---- 6H L2- Introduction and application of Arduino with examples–4H	L1,L2 (Apply)	10
4	L1- Concepts of virtual memory, Cache memory---- 1H L2- Advanced coprocessor architectures- 286, 486, Pentium---- 1H L3- Introduction to RISC processors---- 1H L4- ARM microcontrollers interface design----- 2H .	L1,L2,L3, L4 (Understand)	5

Learning Resources:

1. R. S. Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing, 1996
2. The 8051 Microcontroller and Embedded Systems, Md. Ali Mazadi, Pearson publication
3. Learn Arduino Prototyping in 10 days, Kallol Roy Choudhuri, Packt
4. Microprocessors and Microcontrollers, N. Senthil Kumar, OXFORD
5.D A Patterson and J H Hennessy, "Computer Organization and Design The hardware and software interface. Morgan Kaufman Publishers.

CO-PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PCC-EC403.1	1	3	3	2	-	-	-	-	-	-	-	-
PCC-EC403.2	1	3	3	3	-	-	-	-	-	-	-	-
PCC-EC403.3	1	3	3	3	-	-	-	-	-	-		-
PCC-EC403.4	1	2	1	1	-	-	-	-	-	-	-	-

1: Low (Slight) *2: Moderate (Medium)* *3: Substantial (High)*

INSTITUTE OF ENGINEERING & MANAGEMENT
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SUBJECT ENVIRONMENTAL SCIENCE
SUBJECT CODE- MC(ECE)401

Subject Code : MC(ECE)401	**Category**: Mandatory Course
Subject Name : Environmental Science	**Semester** : 4th
L-T-P : 1L:0T:0P	**Credit:** 0
Pre-Requisites: Basic knowledge of Environmental Science	

Course Outcomes:

At the end of the course the students will be able to

CO1.	To understand the natural environment and its relationships with human activities.
CO2.	To apply the fundamental knowledge of science and engineering to assess environmental and health risk and to acquire skills for scientific problem-solving related to air, water, noise& land pollution.
CO3.	To develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations.
CO4.	To develop an idea about green chemistry for sustainable development

Course Content:

Module	Description	Hours	PO(1..12) Mapping
1	**Overview** Basic ideas of environment, basic concepts, man, society & environment, their interrelationship Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. Materials balance: Steady state conservation system, steady state system with non-conservative pollutants, step	4	PO1,PO2,P03,PO6,PO7

	function. Importance, scope and principles of EIA. Elements of ecology: System, open system, closed system, definition of ecology, species, population, community,definition of ecosystem-components types and function.Structure and function of the following ecosystem: Food chain and Food web. Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur].Biodiversity		
2	**Air Pollution** Simple global temperature model [Earth as a black body, earth as albedo], Problems. Green house effects. Earth's heat budget. Lapse rate. Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. Definition of pollutants and contaminants, Primary and secondary pollutants: Sources and effect of different air pollutants. Smog, Photochemical smog and London smog. Depletion Ozone layer, impact of other green-house gases, effect of ozone modification. Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury),	6	PO1,PO2,P03,PO6,PO7

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SUBJECT ENVIRONMENTAL SCIENCE
SUBJECT CODE- MC(ECE)401

3	**Water Pollution** Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. DO, 5-day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river [deoxygenation, reaeration], COD, Oil, Greases, pH. Lake: Eutrophication [Definition, source and effect]. Waste water standard [BOD, COD], Water Treatment system, primary and secondary treatments, tertiary treatment definition. Water pollution due to the toxic elements. USEPA and WHO guidelines for drinking water.	5	PO1,PO2,P03,PO6,PO7
4	**Green Chemistry** Basic principles of green chemistry with examples, matrices to explain greenness, R4M4model with specific reference to econo-burette, life cycle analysis **(Cradle-to-grave)**	3	PO1,PO2,P03,PO4,PO6,PO7
5	**Waste Management** Lithosphere; Internal structure of earth, rock and soil Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Landfilling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).	3	PO1,PO2,P03,PO6,PO7
6	**Noise Pollution**	3	PO1,PO2,P03,PO6,PO7

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SUBJECT ENVIRONMENTAL SCIENCE
SUBJECT CODE- MC(ECE)401

	Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise,neighbourhood noise]. Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level,L10 (18hr Index) ,n Ld.Noise pollution control.		
7	**Environmental Management** Emerging environmental issues and its impact on health, Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India. Different international environmental treaty/ agreement/ protocol.	3	PO1,PO2,P03,PO6,PO7

Learning Resources:	
T1.	Environmental Studies, M.P. Poonia & S.C. Sharma, Khanna Publishing House
Reference Books:	
R1.	Introduction to Environmental Engineering and Science, Masters, G. M., Prentice-Hall of India Pvt. Ltd
R2.	Environmental Chemistry, De, A. K., New Age International

INSTITUTE OF ENGINEERING & MANAGEMENT
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SUBJECT: Mathematics & Statistics - IV

SUBJECTCODE: BSC401

Subject Code :BSC401	**Category** : Theory
Subject Name :**Mathematics & Statistics - IV**	**Semester** : 4^{th}
L-T-P: : **3-0-0**	**Credit: 3**
Pr-Requisites: BSC-103, BSC-203, BSC301	

Course Objective:

1: Identify different tools for numerical solution of algebraic, transcendental, differential and difference equations along with interpolation and extrapolation. The constructive part of Mathematics deals with numerical differentiation and integration of functions where traditional method fails to give analytical solutions- used for solving engineering problems.
2: Illustrate the ideas of transform calculus to solve ordinary and partial differential equations for initial and boundary value problems and also integral equations and difference equations. These methods being totally different from the traditional methods described in calculus, they will open a new dimension in solving engineering problems.

3: **Express the relationship between variables by means of some mathematical equation - representing a geometrical curve for observations in respect of two variables. Apply probability theory meaningfully in the process of decision making under state of uncertainty and risk.**
4: Interpret the ideas of using *t*- distribution (instead of *z*-distribution) in testing the significance of the parameters of the population in the light of small samples drawn from the population.

COURSEOUTCOMES:

CO 1: Students will be able to deal with errors in computation, difference operators and method of separation of symbols. Also they will be able to detect the best method of solution of an engineering problem depending upon the desired accuracy level and available facilities such as hardware and software.

CO 2: Students will be able to solve engineering problems arising in circuit analysis, signal processing and dynamical system analysis arising in electrical/electronics/control engineering.

CO 3: Students will construct models for an engineering problems and the parameters in the model are determined by fitting experimental data. As fitting can not be done exactly so they will learn to apply method of least squares approach for fitting, to transform a given set of quantitative data into meaningful information to help in decision making. They will be able to study the characteristics of a whole population from which the data is obtained. They will learn to use probability theory for decision making in the context of uncertainty and risk,

CO 4: Students will be able to test some quantitative statement about a population when a small sample is drawn and will learn to use *t*- values instead of *z* -values for test statistic in small sample tests.

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SUBJECT: Mathematics - IV
SUBJECTCODE: BSC401

Course Contents:

Module No.	Description of Topic	Contact Hrs.	Blooms Level
1	**Numerical Methods :** Solution of polynomial and transcendental equations − Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Relation between operators, Interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Newton's divided difference and Lagrange's formulae. Numerical Differentiation,Numerical integration:Trapezoidal rule and Simpson's 1/3rd and 3/8 th rules. Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge - Kuttamethod of fourth order for solving first and second order equations. Milne's and Adam's predictor corrector methods.	22	**L2(Understand)** **L3 (Apply)** **L5 (Evaluate)**
2	**Transform Calculus** Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODE s by Laplace Transform method. Fourier transforms.	10	**L3 (Apply)L4(Analyze)L5** **(Evaluate)**
3	**Applied Statistics** Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	8	**L3(Apply)L4(Analyze) L5** **(Evaluate)**

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4	**Small samples** Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.	**4**	**L2(Understand)** **L3(Apply)** **L4(Analyze)**

Books Recommended:

(i) Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

(ii) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.

(iii) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

(iv) P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003(Reprint).

(v) S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

(vi) W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

(vii)Lipschutz S., and Lipson M.L.: Probability (Schaum's Outline Series), TMH.

(viii) C.Xavier: C Language and Numerical Methods.

(ix)J.B.Scarborough: Numerical Mathematical Analysis.

(x) John E. Freund, Ronald E. Walpole, Mathematical Statistics, Prentice Hall

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT – ESSENTIAL STUDIES FOR PROFESSIONALS - IV
SUBJECT CODE- HSMC(ECE)402

Subject Code : HSMC(ECE)402	C**ategory** : GSC
Subject Name : ESP-IV	**Semester** : 4th
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit: 0.5**
Pre-Requisites: Basic Social Science, NCERTs	

Course Objective:

1. To learn about basic of History to know about our past and to implement it in our daily life.
2. To learn about the Political System of Our Country.
3. To learn the concepts of Basics of Geography and Economics from which Students will acquire knowledge for Competitive exams.

Course Outcomes:

At the end of the course the students will be able

1. To inculcate human values and ethical thinking among students.
2. To prepare the stage for facing different levels of civil service and other competitive examinations.
3. To prepare the ground for making them aware of the happenings, cultural historical and developmental aspects of the country as well as global affairs
4. Learning current affairs with technique.

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1.	**Indian Geography at a glance (Physical, Regional & Economic)** Miscellaneous: calendar etc. capitals of countries, currency of countries, important dates, Sports football, hockey etc. recent events & awards too.	6	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO12
2.	**History** Modern History& National Movement.	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO12

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SUBJECT CODE- HSMC(ECE)402

3.	**Constitution of India** Central- Executive & Legislative, State-Executive & Legislative	6	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO12
4.	**GK &CA** Important books & authors, Important Hydropower dams, atomic power plant s, important national parks, Minster & portfolio & constituencies, Population census, Persons in news -most famous, popular recent only, Important dances & festivals of Indian states, International Head Quarters & world organization, Important president & pm elected from various countries, Important about banks like payment banks, small banks & license system, Awards, Sports, Books & author, National & International affairs.	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO12

Learning Resources:

Text Books:

1. NCERT Books from class 8-12.

Reference Books:

1. Indian Constitution- M.Laxmikant
2. Indian Economy-Ramesh Singh
3. History of Modern India- Bepan Chandra
4. Geography of India- Majid Hussain
5. Current Affairs Magazine of IEM-UEM

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT- ANALOG AND DIGITAL COMMUNICATION LAB SUBJECT CODE- PCCEC491

Subject Code: PCCEC491	**Category** : Program Core Courses
Subject Name: Analog and Digital Communication Lab	**Semester** : Fourth
L-T-P : 0-0-2	**Credit:** 1
Pre-Requisites: Signals and system, Fundamental of MATLAB, Basic electronics	

Course Objective:

COE1: To help students to perform Analog and Digital Communication experiments assigning design problems

COE2: To help students realize simulation results at the end of each experiment

Proposed Syllabus:

Module No.	Description	Lecture Hours
1	Measurement of Modulation Index of an Amplitude Modulated (AM) Signal	2
2	Study of Modulation and Demodulation of Double Side Band Suppressed Carrier (DSB-SC)	2
3	Study of Modulation and Demodulation of Single Side Band Suppressed Carrier (SSB-SC)	2.
4	Study of Modulation and Demodulation of Frequency Modulation (FM)	2
5	Measurement of SNR of an audio signal	2
6	Study and Design of Phase Locked Loop (PLL)	2

7	Study of Modulation and Demodulation of Pulse Amplitude Modulation (PAM)	2
8	Study of Modulation and Demodulation of Pulse Code Modulation (PCM)	2
9	Study of Modulation and Demodulation of Delta Modulation (DM)	2
10	Study of Modulation and Demodulation of Adaptive Delta Modulation (ADM)	2
11	Study of Modulation and Demodulation of Phase Shift Keying (PSK)	2
12	Study of Modulation and Demodulation of Frequency Shift Keying (FSK)	2
13	Study of Modulation and Demodulation of Amplitude Shift Keying (ASK)	2

Course Outcome:

CO1: Students will be able to demonstrate the ability to solve practical engineering problems
CO2: Students can realize about simulation outputs for different experiments (Preferably MATLAB)
CO3: Students can be able to analyze and interpret data obtained from different experiments

Learning Resources:

1. Laboratory manual (workbook)
2. www.mathworks.com
3. www.octave-online.net

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
PROPOSED SYLLABUS
SUB– ANALOG ELECTRONIC CIRCUITS LABORATORY
CODE: **PCC-EC492**

Subject Code : PCC-EC492	**Category** : Professional Core courses
Subject Name : Analog Electronic Circuits Laboratory	**Semester** : Fourth
L-T-P : 0-0-2	**Credit:1**
Pre-Requisites: Basic electronics, Analog electronics	

Course Objective:

1. To get practical experience with different electronic components.
2. To get practical experience of designing analog circuits using electronic devices.
3. To develop hands on experience with modern technology so that students can work as professionals in the area of Analog electronics and other Engineering fields.
4. To learn different tools to simulate different analog circuits.

Course Outcomes:

CO1: Students will have a thorough knowledge of different applications of diode.

CO 2: After completing this course, the students will be able to analyze and design analog circuits using Transistors.

CO 3: They will be able to design power amplifier and multi vibrator circuit.

CO 4: After completing this course, the students will be able to analyze and design Circuits using OP-AMP.

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PROPOSED SYLLABUS
SUB– ANALOG ELECTRONIC CIRCUITS LABORATORY
CODE: PCC-EC492

Course Content:

Module No.	Description of Topic	Blooms Level	PO (1..12) MAPPING	Contact Hrs.
1(CO1)	Design of different types of Rectifier circuits and calculate Vrms and Vdc.	L2,L3,L4	1…5, 8,9,12	2
1(CO1)	Design of positive and negative biased clipper circuit.	L2,L3,L4	1...5, 8,9,12	**2**
1(CO1)	Design of positive and negative biased clamper circuit.	L2,L3,L4	1…5, 8,9,12	**2**
2(CO2)	Design of series and shunt regulator circuit using Zener diode.	L2,L3,L4	1…5, 8,9,12	**2**
2(CO2)	Analysis of BJT with fixed bias, self-bias and voltage divider bias using simulation software	L2,L3,L4	1…5, 8,9,12	**2**
2(CO2)	Analysis of FET, MOSFET with fixed bias, self-bias and voltage divider bias using simulation software	L2,L3,L4	1…5, 8,9,12	**2**
3(CO2)	Design and set up the BJT common emitter voltage amplifier with and without feedback and determine the frequency response, gain- bandwidth product, input and output impedances.	L2,L3,L4	1…5, 8,9,12	**2**
3(CO2)	Design and setup the Common Source JFET/MOSFET amplifier and plot the frequency response.	L2,L3,L4	1…5, 8,9,12	**2**
4(CO3)	Design Monostable and astable Multivibrator using 555 Timer.	L2,L3,L4	1…5, 8,9,12	**2**

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CODE: PCC-EC492

4(CO3)	Design of Oscillator circuits.	L2,L3,L4	1…5, 8,9,12	**2**
5(CO4)	Design of Adder, Integrator and Differentiator circuits using Op-Amp.	L2,L3,L4	1…5, 8,9,12	**2**
5(CO4)	Design and study of power amplifier.	L2,L3,L4	1…5, 8,9,12	**2**
6	Project	L5		**4**
Total Hours:				**28**

Learning Resources:

1. Sedra & Smith-Microelectronic Circuits- Oxford UP.
2. Franco–Design with Operational Amplifiers & Analog Integrated Circuits, 3/e, McGraw Hill.
3. Boylested & Nashelsky- Electronic Devices and Circuit Theory- Pearson/PHI.
4. Electronics–fundamental –D Chattopadhaya & P. C. Rakshit.
5. Linear integrated circuits-D. Roy Choudhury, Shail B. Jain.

CO-PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PCC-EC492.1	3	3	2	2	2	-	-	2	2	-	-	2
PCC-EC492.2	3	3	2	2	2	-	-	2	2	-	-	2
PCC-EC492.3	3	3	3	2	2	-	1	2	2	-		2
PCC-EC492.4	3	2	3	2	2	2	2	2	2	2		2
PCC-EC492*	3	2.75	1.25	1.75	1.5	0.5	0.75	0.25	0.25	0.5	0.5	2

1: Low (Slight) ***2: Moderate (Medium)*** ***3: Substantial (High)***

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: MICROCONTROLLER LAB SUBJECT CODE: PCCEC493

Subject Code : PCCEC493	**Category**: Professional Core course
Subject Name : Microcontrollers Lab	**Semester** : 4th
L-T-P : **0-0-2 (Total Contact Hrs. 2)**	**Credit:**1
Pre-Requisites: Digital System Design Lab	

Course Objective:

1. To introduce the basic concepts of microprocessor and to develop in students the assembly language programming skills and real time applications of Microprocessor as well as microcontroller .
2. To Study the Architecture of 8051 microcontroller.

Module No.	Description of Topic	Contact Hrs.	Blooms Level
1.	Introduction to 8085 microprocessor architecture. Comparison between microprocessor and microcontroller. Students are introduced with the operation of microprocessor (8085) trainer kit and simulator 8085.	2	L2 (Understand)
2.	Study of basic instruction set used in 8085 microprocessor program (data tranfer,Load/store,Arithmetic,logical).	2	L2 (Understand) L3 (Apply)
3.	Study of 8085 microprocessor program (16-bit) for interchanging the nibbles, assemble, disassemble, 1's compliment and 2's compliment, multiplication, maximum, minimum.	2	L2(Understand) L3 (Apply)
4.	Study of 8085 program using LOOK UP TABLE,PUSH POP instruction.	2	L2 (Understand) L3 (Apply)
5.	Study of 8085 program for addition and substraction of BCD numbers.	2	L2 (Understand) L3 (Apply)
6.	Study of 8085 program for sorting of array in ascending and descending order, divition of 8-	2	L2 (Understand) L3 (Apply)

	bit nos,BCD multiplication,SUBROUTINE CALL,		
7.	Study of 8051 microcontroller IC and writing programs.	2	L2 (Understand) L3 (Apply)

Course Outcomes:

CO1: Student will be able to compare micro-processors (8085) and microcontroller (8051).

CO2: Student will be able to explain the architecture of microprocessor.

CO3: Student will be able to write program of different problems.

CO4: Student will be able to design real time apllications using micro-controllers.

CO-PO Mapping:

CO / PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PCC-EC493.1	1	3	3	2	-	-	-	-	-	-	-	-
PCC-EC493.2	1	3	3	3	-	-	-	-	-	-	-	-
PCC-EC493.3	1	3	3	3	-	-	-	-	-	-		-
PCC-EC493.4	1	2	1	1	-	-	-	-	-	-	-	-
PCC-EC493.5	1	3	3	3								
PCC-EC493.6	1	3	3	3								
PCC-EC493.7	1	3	3	3								

1: Low (Slight) 2: Moderate (Medium) 3: Substantial (High)

Learning Resources :

1. Microprocessor architecture, programming and application with 8085 –R. Gaonkar (Penram International) (strongly recommended)

2. Microprocessors & interfacing – D. V. Hall (Tata McGraw-hill)

3. Ray & Bhurchandi, Advanced Microprocessors & Peripherals, TMH

4. The 8051 microcontroller and Embedded systems - Mazidi, Mazidi and McKinley (PEARSON)

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT- OBJECT ORIENTED PROGRAMMING SUBJECT CODE- OECEC481

Subject Code: OECEC481	**Category**: Sessional Paper
Subject Name: Object Oriented Programming	**Semester** : 4th
L-T-P : 1-0-2	**Credit:** 2
Pre-Requisites: Introduction of C language, Basics of programming language.	

COURSE OBJECTIVES:

- To learn object oriented programming paradigms and various object oriented modeling.
- To learn basic concepts, structure syntax of C++.
- To learn & implement various programming problems in C++. To
- learn & implement advanced programming concepts in C++
- To learn error handling technique in C++ and improve problem solving ability.

Course Contents:

Module No.	Description	Lecture Hours
1	**Introduction:** Programming paradigms, Language translator, Basics of OOP, Structure of C++ program, Class and object, Abstraction and encapsulation, Polymorphism, Inheritance, Static and dynamic binding.	2
2	**Declaration, Expression and statements:** Data types, Variables, Constants, Operator and expression, Operator precedence and associativity. Statements: Labelled, Expression, Compound, Control, Jump, Declaration, Try-throw-catch. **Array, pointer and function**: Array, Addresses, Pointer. Function: Declaration, Definition and call, Inline function, Main function argument, Reference variable, Function overloading, Default argument, Parameter passing, Recursion, Scope of variable, Return-by-value and Return-by-reference, Pointer to function	4

3	**Data abstraction through classes and user defined data types**: Class, Members, Constructor and destructor, Copy constructor. Dynamic memory management: Operators new and delete, Malloc and free, Static member, Scope of class names, Scope of variables.	3
4	**Operator Overloading**: Overloading unary and binary operator, Overloaded function calls, Subscripting, class member access, Non-member operator, New and delete, Cast operator.	3
5	**Class relationships**: Introduction, Polymorphism, Coercion, Overloading, Parametric and inclusion polymorphism Inheritance: direct and indirect superclasses, Multiple inheritance, Virtual base class,Friend, Virtual function, Abstract class, Overriding and hiding, Dynamic binding of functions, Virtual destructor and operators.	3
6	**Template and Exception Handling**: Class template, Member function inclusion, Function template, Specialization, Inheritance, Namespace. Concept of exception handling, Catch block, Nested try-catch block, Condition expression in throw expression, Constructor & destructor, Runtime standard exception.	3
7	**Standard Library in C++**: Standard library function, Input and output, Iostream class hierarchy, Class ios, Other stream classes. **Object oriented design and modeling**: Software development, Qualities of software system, Software architecture, Process life cycle, phases, Modularity, OO methodology, Modeling, UML overview, Object oriented design patterns.	3
Total		21

Course Outcome:

After completion of this course, the learners will be able to

COURSE OUTCOME (CO)	DESCRIPTION	Blooms Level
OECEC481.1	Know basic knowledge of object oriented modeling and its application in computer science.	L1, L3 Remember and Apply
OECEC481.2	Understand basic concepts & structure of object oriented programming language using C++	L2 Understand
OECEC481.3	Design and develop various programming problems using basic concepts of C++	L3 Apply

OECEC481.4	Learn and implement advance programming concepts of C++ like Inheritance, operator overloading, etc	L2 Understand
OECEC481.5	Learn and implement exception handling mechanism for debugging in C++	L1, L2 Remember and Apply

Learning Resources:

Advanced OOPs using C++:

1. Schildt, H., The Complete Reference C++, McGraw– Hill.
2. C++ object oriented programming paradigm, Debasish Jana, PHI
3. Pooley, R and P. Stevens, Using UML , Addison-Wesley.
4. Programming In C++, Y.I. Shah and M.H. Thaker, ISTE/EXCEL BOOKS

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT SKILL DEVELOPMENT FOR PROFESSIONALS - IV SUBJECT CODE: HSMC482

Subject Code : HSMC482	**Category**: GSC
Subject Name : Skill Development for Professionals - IV	**Semester** : 4th
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit: 0.5**
Pre-Requisites: Basic Mathematics, General English.	

Course Objective:

1. To enhance the aptitude & analytical skill of students with multiple tricky approaches.
2. To prepare the students for various competitive examinations & professional exams

Course Outcomes:

At the end of the course the students will be able

1. To enhance their problem solving skills, to improve the basic mathematical & Logical Skills for any type of competitive examinations.
2. To get best possible training for the them students through continuous training module.
3. To find themselves sound for the campus recruitment program's aptitude Test.
4. To enhance problem solving skill using fast track techniques without using calculator.

Course Content:

Module No.	Description	Hours	Blooms Level
1.	**Quantitative Aptitude** Permutation & Combination, Probability, Geometry, Mensuration	6	L1 (Remember) L2 (Understand) L4 (Analyse)
2.	**Logical Reasoning** **1) Seating Arrangement** a) Circular seating arrangement b) Square seating Arrangement c) Line Arrangement **2) Calendar And Clock** **3) Miscellaneous Problems**	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT SKILL – DEVELOPMENT FOR PROFESSIONALS - IV SUBJECT CODE: HSMC482

3.	Verbal English 1) **Sentence Corrections** 2) Fill the **blanks** with appropriate words/articles/preposition/verbs/adverbs/conjunction**.** 3) **Reading Comprehension** (Advance Level) 4) **Vocabulary**	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)

Learning Resources:

Reference Books:

1. Objective General English- S.P Bakshi
2. English Grammar and Competition-S.C Gupta
3. Fast Track Objective Arithmetic- Rajesh Verma
4. Advance Maths- Rakesh Yadav
5. Verbal and Non-Verbal Reasoning- R.S Agarwal
6. A new approach to Reasoning- BS Sijwali
7. Quantitative Aptitude-R.S Agarwal

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: ELECTROMAGNETIC WAVES SUBJECT CODE: PCCEC501

Subject Code: PCCEC501	**Category:** CC
Subject Name: **Electromagnetic Waves**	**Semester** : 5th
L-T-P : 3-0-0 (Total Contact Hrs.3)	**Credit:** 3
Pre-Requisites: Mathematics, Physics, Signals and Systems	

Course Objective:

1. To understand basics of electromagnetism and to learn the formation of plane wave and be able to apply this knowledge in different applications.
2. To introduce the student to build concept of electromagnetic waves, transmission lines, waveguides and their practical applications.
3. To enrich strong foundation on systems in modern communication.
4. To develop a strong understanding on antennas.

COURSEOUT COMES:

On successful completion of the course students will be able to:

1. Acquire knowledge on Electromagnetic Theory & Transmission Line with respective application and implementation.
2. Understand the importance of electromagnetic waves with corresponding mathematical modeling.
3. Understand the physical and practical importance of transmission lines.
4. Understand basic concepts of waveguides.
5. Acquire knowledge about different antennas with corresponding physical and practical significances.

S.NO.	DESCRIPTION Students will be able to:	BLOOMS LEVEL	HOURS
PCCEC501.1	**Electromagnetics:** Vector calculus - orthogonal Coordinate System, Transformations of coordinate systems, Basic quantities of Electromagnetics, **Basic laws of Electromagnetics:** Coulomb's law, Gauss's law, Ampere's Circuital law, Faraday's law of Electromagnetic induction. Vector magnetic Potential, Maxwell's equations, Surface charge and surface current, Boundary conditions at media interface.	L2 (Understand) L4 (Analyse)	8

PCCE C501.2	**Uniform plane wave:** homogeneous unbound medium, Wave equation for time harmonic fields, Solution of the wave equation, Uniform plane wave, Wave polarization, Wave propagation in conducting medium, Phase velocity of a wave, Power flow and Poynting vector, Skin Depth. **Plane Waves at Media Interface:** Plane wave in arbitrary direction, Plane wave at dielectric interface, Reflection and refraction of waves at dielectric interface, Total internal reflection.	L2 (Understand) L4 (Analyze)	12
PCCE C501.3	**Transmission Lines:** Introduction, Concept of distributed elements, Equations of voltage and current, Standing waves and impedance transformation, Lossless and low-loss transmission lines, Power transfer on a transmission line, Analysis of transmission line in terms of admittances, Transmission line calculations with the help of Smith chart, Applications of transmission line, Impedance matching using transmission lines.	L3 (Apply) L4 (Analyze)	8
PCCE C501.4	**Waveguides:** Introduction of waveguide, Rectangular waveguides: Analysis of waveguide-general approach, Waveguide modes, Cut-off frequency, And Phase velocity.	L3 (Apply) L4 (Analyze)	6
PCCE C501.5	**Antennas:** Radiation parameters of antenna, Introduction of Hertz dipole, Total power radiated by a dipole, Radiation resistance and radiation pattern of Hertz dipole.	L2 (Understand) L3 (Apply)	6

Learning Resources:

Text Books:

1. Sadiku & Kulkarni, Principles of Electromagnetics, 6e, Asian edition, Copyright © 2015 by Oxford University Press
2. R. K. Shevgaonkar, "Electromagnetic Waves", Tata McGraw Hill, 2005.
3. Reference Books:
4. Electromagnetic Waves and Radiating Systems - E.C. Jordan and K. G. Balmain, PHI.
5. D. K. Cheng, "Field and Wave Electromagnetics", Addison-Wesley, 1989.
6. Engineering Electromagnetics, 7th Edition-W.H.Hayt & J. A. Buck, Tata-McGraw-Hill.
7. C. A. Balanis, "Advanced Engineering Electromagnetics", John Wiley & Sons, 2012
8. C. A. Balanis, "Antenna Theory: Analysis and Design", John Wiley & Sons, 2005.

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: Digital Signal Processing SUBJECT CODE: PCCEC502

Subject Code : PCCEC502	**Category** : Professional Core courses
Subject Name : **Digital Signal Processing**	**Semester** : 5th
L-T-P : 3-0-0 (Total Contact Hrs. 3)	**Credit:** 3
Pre-Requisites: Mathematics: Sequence and series, algebra of complex numbers, basic trigonometry. Calculus: Differential and Integral calculus (single variable). Knowledge of differential equations is helpful but not required.	

Course Objective:

COE1: Represent signals mathematically in continuous and discrete-time, and in the frequency domain.

COE2: Analyze discrete-time systems using z-transform.

COE3: Understand the Discrete-Fourier Transform (DFT) and the FFT algorithms.

COE4: Design digital filters for various applications. Apply digital signal processing for the analysis of real-life signals.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	Discrete time signals and systems: Sequences; representation of signals on orthogonal basis; Representation of discrete systems using difference equations, Sampling and reconstruction of signals - aliasing; Sampling theorem and Nyquist rate.	10
2	z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using z- transform, Properties of z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.	8
3	Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Connvolution of signals, Fast Fourier Transform Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.	12
4	Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Low-pass, Band-pass, Band- stop and High-pass filters. Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multi-rate signal processing. Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMA Model, Linear Mean-Square Estimation, Wiener Filter.	10

Books Recommended:

1. S. K. Mitra, "Digital Signal Processing: A computer based approach", McGraw Hill, 2011.
2. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall, 1989.
3. J. G. Proakis and D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms And Applications", Prentice Hall, 1997.
4. L. R. Rabiner and B. Gold, "Theory and Applicationof Digital Signal Processing" , Prentice Hall,1992.

5. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.
6. D. J. DeFatta, J. G. Lucas andW. S. Hodgkiss, "Digital Signal Processing", John Wiley & Sons, 1988.

Course Outcomes:

S.NO.	DESCRIPTION	Blooms Level
	Students will be able to:	
PCCEC 502A.1	Ability to Infer the different types of CT and DT signals from their mathematical / graphical representations and classify them into various categories. Ability to characterize random signals using their statistical properties	L1, L3 Remember and Apply
PCCEC 502A.2	Ability to analyze the CT and DT signals in time domain and frequency domain to infer their characteristics. Ability to apply the acquired knowledge to classify CT and DT systems into various categories	L2 Understand
PCCEC 502A.3	Ability to determine the response of a system for a given input using time domain and frequency domain techniques	L3 Apply
PCCEC 502A.4	Ability to select the appropriate transform technique for the analysis of a given CT or DT system	L2 Understand

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT: COMPUTER ARCHITECTURE
SUBJECT CODE: PCCEC503

Subject Code : PCCEC503	**Category**: Engineering Sciences
Subject Name : Computer Architecture	**Semester** : 5th
L-T-P : **3-0-0**	**Credit: 3**
Pre-Requisites: Digital System Design, Microprocessors and Microcontrollers	

Course Objective:

1. To learn how computer systems work & the basic principles.
2. To learn instruction level architecture and instruction execution.
3. To acquire knowledge the current state of art in memory system design.
4. To learn how I/O devices are accessed and its principles.
5. To impart the knowledge on micro programming.
7. To learn the principles of pipelining techniques, hazards, super-pipelines, interconnection networks.

Course Contents:

Module No.	Description of Topic	Contact Hours
1	**Basic structure of computers:** Computer organization and architecture overview, Basic functional units– hardware and software stack interfaces, Harvard and Von Neumann architecture, Performance issues in systems software, Machine instructions and applications programs, Types of instructions, and Instruction sets: Instruction formats, Assembly language, Stacks, Queues, Subroutines.	6
2	**Processor organization:** Information representation, number formats. Multiplication & division, ALU design, Floating point arithmetic, IEEE 754 floating point formats Control design, Instruction sequencing, Interpretation, Hard wired control - Design methods, and CPU control unit. Micro-programmed Control - Basic concepts, minimizing microinstruction size, multiplier control unit. Micro-programmed computers - CPU control unit. CISC vs RISC CPU architecture	10
3	**Memory organization:** Memory system overview, Hierarchical memory technology, Device characteristics, RAM, ROM, Memory management, Concept of cache & associative memories, Virtual memory organization.	8
4	**Input output systems and parallel processing**: Standard I/O interfaces, Programmed I/O, Interrupt-driven I/O, DMA	12

	Pipelining, pipeline hazards (data, control and structural hazards), techniques for handling hazards, Flynn's classification of computer architectures, overview of VLIW and superscalar processors, SIMD and vector processors, array processing, GPU Architecture, Symmetric multiprocessors (SMP), NUMA-MPs, Massively parallel processors (MPPs), interconnection networks, multiprocessing, multiplexing, multithreading	

Books Recommended:

1. William Stallings: "Computer Organization and Architecture", 10th Ed., Pearson.
2. A.S.Tanenbum, "Structured Computer Organisation", 6th Ed., Pearson.
3. V.Carl Hammacher, et al: "Computer Organisation and Embedded Systems", 6th Ed., McGraw Hil India.
4. M. Morris Mano, "Computer System Architecture", Revised 3rd Ed., Pearson.
5. David A. Patterson and John L. Hennessy: "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by, Elsevier.
6. John L. Hennessy, David A. Patterson: "Computer Architecture: A Quantitative Approach", 5th Ed., Morgan Kaufmann/Elsevier-India.
7. John Hayes: "Computer Architecture and Organization", McGraw Hill Education; 3rd edition.
8. Kai Hwang, Naresh Jotwani: "Advanced Computer Architecture: Parallelism, Scalability, Programmability", McGraw Hill Education; 3rd edition.

Course Outcomes:

Sl. No.	Description	Blooms Level
	Upon completion of the course, the students will be able to:	
PCCEC503.1	**Understand** basic structure of digital computer, concept of instruction sets and principles of computer's working.	Understand (L2)
PCCEC503.2	**Explain** numerous instruction formats, the various arithmetic operations for computers and concepts of micro-programmed control.	Understand (L2)
PCCEC503.3	**Identify** the fundamentals of memory system.	Understand (L2)
PCCEC503.4	**Describe** the concepts of I/O system and describe the concepts of parallel processing architecture and interconnection network.	Understand (L2)

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: INFORMATION THEORY&CODING SUBJECT CODE: PEC-EC504A

Subject Code : PEC-EC504A	**Category** : Program Elective-1
Subject Name : **Information Theory & Coding**	**Semester** : 5th
L-T-P : 3-0-0 (Total Contact Hrs. 3)	**Credit:** 3
Pre-Requisites: Mathematics, Communication Engineering	

Course Objective:

1. To introduce the basic concepts of information theory.
2. To give the idea of various coding theory and the importance of all in the information systems in communication engineering.
3. To understand the theoretical background for the implementation of error- control codes.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Information Theory:** Basics of information theory – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding, uniquely detectable codes, Joint and conditional entropies, Mutual information – Discrete memoryless channels – BSC, BEC – Channel capacity, Shannon limit.	8
2	**Error Control Coding: Block Codes** Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding Single parity codes, Hamming codes, Repetition codes Linear block codes, Cyclic codes – Syndrome calculation, Encoder and decoder – CRC Techniques of coding and decoding of Cyclic codes.	8
3	**Error Control Coding: Convolutional Codes** Convolutional codes – code tree, trellis, state diagram Encoding Decoding: Sequential search and Viterbi algorithm –Principle of Turbo coding	10
4	**BCH codes** Algebraic Description, Frequency Domain Description, Decoding Algorithms for BCH and RS Codes.	6

Books Recommended:

1. R. J. McEliece, The Theory of Information and Coding, Cambridge University Press
2. R. Bose, Information Theory Coding and Cryptography, Tata McGraw Hill
3. M. Cover, J. A. Thomas, Elements of Information Theory, Wiley
4. R. Togneri, C.J.S deSilva, Fundamentals of Information Theory and Coding Design, Taylor and Francis

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: INFORMATION THEORY&CODING SUBJECT CODE: PEC-EC504A

Course Outcomes:

S.NO.	DESCRIPTION Students will be able to:	Blooms Level
ECELEC504A.1	**Define and Calculate** information, entropy, mutual information and channel capacity for various channels.	L1, L3 Remember and Apply
ECELEC504A.2	**Understand**various source coding and various channel coding techniques.	L2 Understand
ECELEC504A.3	**Implement** various error control techniques for Convolutional codes.	L3 Apply
ECELEC504A.4	**Describe** decoding algorithms for BCH and RS Codes.	L2 Understand

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SYLLABUS
SUB – CMOS DESIGN (ECELEC504B)

Subject Code : ECELEC504B	**Category** : Program Elective course - I
Subject Name : CMOS Design	**Semester** : 5th
L-T-P : 3-0-0 (Total Contact Hrs. 3)	**Credit:** 3
Pre-Requisites: Electronic Devices, Analog Electronic Circuits, Digital Electronic Circuits	

Course Objective:

1. To learn about basic CMOS circuits both in analog and digital domain
2. To learn the art of layout of different CMOS circuits
3. To learn the concepts of designing VLSI subsystems

Course Outcomes:

At the end of the course the students will be able to

1. Know the small signal MOS models at low and high frequencies, the physics behind them and how to use them in different circuits to extract different circuit parameters
2. Know how to design different CMOS analog circuits from their specifications
3. Know how to design different CMOS digital circuits using various logic families
4. Know how to do layout of different CMOS circuits
5. Use different tools for VLSI IC Design

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1.	**MOS Devices and Modelling:** Basic MOS device physics; Review of MOS transistor models; Non-ideal behavior of the MOS transistor; Transistor as a switch	6	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO12
2.	**Analog CMOS Design:** Single stage amplifiers; Differential amplifiers; Active loads; Current mirrors; Current and voltage references; Switched capacitor circuits	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO12
3.	**Digital CMOS Design:** Inverter characteristics; Combinational circuit design: CMOS logic families including static, dynamic and dual rail logic; Sequential circuit design: design of latches and flip-flops; Delay	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO12

	in digital circuits : RC delay model, linear delay model, logical path efforts			
4.	**Integrated Circuit Layout:** Design rules; Parasitics in layout; Different types of layout matching; Power, interconnect and robustness in CMOS circuit layout	6	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO12

Learning Resources:

Text Books:

1. S. Mo. Kang and Y. Leblebici, CMOS Digital Integrated Circuits : Analysis & Design, 3rd Ed, Tata McGraw Hill, 2003
2. P. Allen and D. Holberg, CMOS Analog Circuit Design, 2nd Ed, Oxford University Press, 2002

Reference Books:

1. N.H.E. Weste and D.M. Harris, CMOS VLSI design: A Circuits and Systems Perspective, 4th Ed, Pearson Education India, 2011
2. C. Mead and L. Conway, Introduction to VLSI Systems, Addison Wesley, 1979
3. J. Rabaey, Digital Integrated Circuits: A Design Perspective, Prentice Hall India, 1997
4. B. Razavi, Design of Analog CMOS Integrated Circuits, Tata McGraw Hill, 2002
5. P. Douglas, VHDL: programming by example, McGraw Hill, 2013

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT: DATABASE MANAGEMENT SYSTEMS
SUBJECT CODE: (OEC-EC 505A)

Subject Code : OEC-EC 505A	**Category** : Engineering Sciences
Subject Name : Database Management Systems	**Semester** : 5th
L-T-P : **3-0-0**	**Credit: 3**
Pre-Requisites: Data Structures and Algorithms, Object Oriented Programming	

Course Objective:

1. To understand the different issues involved in the design and implementation of a database system.
2. To study the physical and logical database designs, database modelling, relational, hierarchical, and network models.
3. To understand and use data manipulation language to query, update, and manage a database.
4. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modelling, designing, and implementing a DBS.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Database system architecture:** Concepts & overview of Database Management System, Data abstraction, Data independence, Data Definition Language (DDL), Data Manipulation Language (DML). **Data models:** Entity-relationship model, design Issues, mapping constraints, keys, Entity-Relationship diagram, integrity constraints, data manipulation operations. Network model, Relational and Object oriented data models	9
2	**Relational query languages:** Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. **Relational database design:** Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design. **Query processing and optimization:** Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.	13
3	**Storage strategies:** Indices, B-trees, hashing	8

	Transaction processing: Concurrency control, ACID properties, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency control schemes, Database recover	
4	**Database Security:** Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection. **Advanced topics:** Object oriented and Object relational databases, Logical databases, Web databases, Distributed databases, ETL – Extraction-Transformation-Loading tools, Data Warehousing and Data Mining.	6

Books Recommended:

1. Database System Concepts, by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill, 6th Edition.
2. Fundamentals of Database Systems, by R. Elmasri and S. Navathe, Pearson Education, 5th Edition.
3. Database Management Systems by R. Ramakrishnan and Johannes Gehrke, McGraw Hill Education, 3rd Ed.
4. An Introduction to Database Management, by C. J. Date, Pearson. 8th edn.
5. Principles of Database and Knowledge − Base Systems, Vol 1 by Jeffrey D. Ullman, Computer Science Press.
6. Advanced Database Management System − by Rini Chakrabarti and Shilbhadra Dasgupta, Dreamtech Press.

Course Outcomes:

Sl. No.	Description	Blooms Level
	Upon completion of the course, the students will be able to:	
OEC-EC 505A.1	Explain basic aspects of Database Management System and implement ER model and Relational model concepts.	Understand (L2), Apply (L3)
OEC-EC 505A.2	Apply normalization process after designing the database using E-R Model and solve the given problem using Relational Algebra, Relational Calculus and SQL to design and manipulate a Database.	Apply (L3)
OEC-EC 505A.3	Explain transaction processing system and storage strategies.	Understand (L2)
OEC-EC 505A.4	Explain database security and understand the concepts of different advanced databases	Understand (L2)

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
Design and Analysis of Algorithms (OEC-EC505B)

Subject Code : (OEC-EC505B)	**Category**: Engineering Sciences
Subject Name : Design and Analysis of Algorithms	**Semester** : Fifth
L-T-P: **3-0-0**	**Credit: 3**
Pre-Requisites: Programming with C/C++, Data Structures and Algorithms	

Course Objectives:

COE1:. Analyze the asymptotic performance of algorithms.

COE2: Demonstrate a familiarity with major algorithms and data structures.

COE3: Apply important algorithmic design paradigms and methods of analysis.

COE4: Synthesize efficient algorithms in common engineering design situations.

Course Contents:

Module No.	Description of Topic	Contact Hours
1	**Introduction:** Characteristics of algorithms. Principles of recursion, differences between recursion and iteration, tail recursion. Analysis of algorithms: Asymptotic analysis of complexity bounds - best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters' theorem. **Text book (1)**: Chapter 1 (Sections 1.1 to 1.3); **Text book (2)**: Chapters 1, 2, 3; **Text book (3)**: Chapters 1, 2	4
2	**Fundamental Algorithmic Strategies**: 1. **Brute-Force algorithms**; 2. **Divide and Conquer algorithms**: Binary Search, Merge sort, Quick sort, Finding Minimum & Maximum simultaneously, Strassen's Matrix Multiplication 3. **Greedy algorithms:** Fractional Knap Sack, Job Sequencing with deadline, Activity selection problem 4. **Dynamic Programming algorithms**: Matrix chain multiplication, 0/1 Knapsack, Longest Common Subsequence, Travelling Salesman Program, 5. **Backtracking algorithms:** N-Queens Problem, Sum of Subsets problems, 0/1 Knapsack problem 6. **Branch and-Bound & Heuristic algorithms:** 8-Puzzles problem, 0/1 Knapsack Problem, TSP **Text book (1):** Sections 3.1 to 3.7, 4.1 to 4.7, 5.1 to 5.10, 7.1 to 7.6, 8.1 to 8.4;	12

	Text book (2): Chapters 4, 16, 15 **Text book (3):** Chapters 4,5,6	
3	**Graph & Tree Algorithms:** **1. Traversal algorithms**: Depth First Search (DFS) and Breadth First Search (BFS); Topological sorting, Employ graphs to model engineering problems, when appropriate. Synthesize new graph algorithms and algorithms that employ graph computations as key components, and analyze them. **2. Shortest path algorithms**: Djikstra's algorithm, Bellman-Ford, Floyd Warshall algorithm, Transitive closure **3. Minimum Spanning Tree**: Prim's and Kruskal's algorithms **Text book (1):** Chapter 6; **Text book (2):** Module VI – (Chapters 22,23, 24, 25, 26); **Text book (3):** Chapter 3;	8
4	**Tractable and Intractable Problems**: Computability of Algorithms, Computability classes - P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP complete, problems and Reduction techniques. Class of problems beyond NP - P SPACE **Text book (1):** Chapter 11; **Text book (2):** Chapter 34; **Text book (3):** Chapters 8, 9, 10 ; **Ref. Book (1):** Chapter 12	6
5	**Overview of Selected Advanced Topics**: **1. Computational Geometry**: Closest pair, Intersection of segments, Convex hull and Graham's scan **Text book (1):** Section 3.9; **Text Book (2):** Chapter 33; **Ref. Book (1):** Sections 7.1 to 7.4 **2. Approximation algorithms:** TSP algorithm **Text book (1):** Chapter 12; **Text book (2):** Chapter 35; **Text book (3):** Chapter11 **3. Randomized Algorithms:** Monte Carlo algorithm **Text book (1):** Section 1.4; **Text book (2):** Chapter 5 ; **Text book (3):** Chapter 13	6

Projects (some applications of Algorithms):

1. **FFT** – Divide & Conquer Algorithm

   (**Polynomials and the FFT**: ***Representing polynomials, the DFT and FFT, Efficient FFT implementations).***

   Text book (1): Chapter 9; **Text Book (2):** Chapter 30; **Ref. Book (1):** Chapter 9

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3. **Viterbi Code** – Dynamic Programming Algorithm
4. **Linear Programming algorithms:**
5. **DNA & RNA Structure** – Dynamic Programming Algorithm
6. **RSA Cryptography** – different algorithms
7. **Introduction to Parallel/Distributed Algorithms:** Multiprocessing, multithreading and multiprocessor computing
   Text book (1): Chapter 13; **Text book (2):** Chapter 27 ; **Ref. Book (1):** Chapter 14
8. **Algorithmic Stock-Market Trading**
9. **Algorithms for cryptocurrency**

Text Books:

1. **Fundamentals of Computer Algorithms (2nd edn) Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran** (publ.: Universities Press)

2. **Introduction to Algorithms (4th edn) - Thomas H Cormen, Charles E. Lieserson, Ronald L Rivest and Clifford Stein** (publ.: MIT Press/McGraw-Hill)
3. **Algorithm Design (1st edn): Jon Kleinberg and ÉvaTardos** (publ.: Pearson)

Reference Books:

1. **Design and Analysis of Algorithms – Sandeep Sen and Amit Kumar** (publ.: Cambridge University Press)
2. **Algorithms – Sanjoy Dasgupta, Christos Papadimitriou, and Umesh Vazirani** (publ. McGraw Hill)
3. **The Design and Analysis of Computer Algorithms – Alfred V. Aho, John E. Hopcroft, and Jeffrey D. Ullman** (publ.: Addison-Wesley)

Course Outcomes (CO):

COURSE OUTCOMES: S.NO.	DESCRIPTION	Blooms Level	PO (1..12) MAPPING
OEC-EC505B.1	Characteristics of and asymptotic analysis of algorithms. Select and apply mathematical techniques, such as asymptotic notation or recurrence relations, to obtain good upper and lower bounds on the running time of algorithms	L4 Analyze	PO1, PO2, PO3, PO4, PO5, PO12
OEC-EC505B.2	Recognize similarities between a new problem and problems that you have already encountered,and judge whether or not these similarities can be leveraged to design an algorithm for the new problem, for example, techniques of Divide and Conquer, Greedy strategies, Dynamic Programming, or the techniques of Computational Geometry, Approximation algorithms, Randomized Algorithms Recognize which algorithm design technique, such, is used in a given algorithm	L5 Evaluate	PO1, PO2, PO3, PO4, PO5, PO12
OEC-EC505B.3	For a given problem, evaluate which design techniques and/or data structures, such as stacks,queues,graphs, trees, etc.can be used to solve the problem efficiently	L5 Evaluate	PO1, PO2, PO3, PO4, PO5, PO12
OEC-EC505B.4	Apply the theory of NP-completeness to provide evidence that certain problems may not have algorithms that are efficient on all inputs	L5 Evaluate	PO1, PO2, PO3, PO4, PO5, PO12

CO-PO Mapping:

	3	3	3	3	2	-	-	-	-	-	-	2
	3	3	3	3	2	-	-	-	-	-	-	2
	3	3	3	3	2	-	-	-	-	-	-	2
	3	3	3	3	2	-	-	-	-	-	-	2

1: Low (Slight) 2: Moderate (Medium) 3: Substantial (High)

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT – ESSENTIAL STUDIES FOR PROFESSIONALS -V
SUBJECT CODE: HSMC(ECE)502

Subject Code : HSMC(ECE)502	**Category**: GSC
Subject Name : ESP-V	**Semester** : 5th
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit:** 0.5
Pre-Requisites: Basic Physics	

Course Objective:

1. To learn about basic of network theory and circuits for professional exams
2. To learn about fundamentals of electronics devices for various exams
3. To learn about details of analog electronics circuits for professional exams
4. To learn about fundamentals of signal and systems for various exams

Course Outcomes:

At the end of the course the students will be able

1. To develop an understanding of network theory and circuits and their applications.
2. To learn all types electronics devices principle of operation and applications.
3. To understand the analog circuit theory and integrated circuits elements' principles.
4. To utilize various signals operation for different systems effectively.

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1.	**Networks Theory** Network solution methods: Nodal and mesh analysis; Network theorems: superposition, Thevenin and Norton's, maximum power transfer; Wye-Delta transformation; Steady state sinusoidal analysis using phasors; Time domain analysis of simple linear circuits; Solution of network equations using Laplace transform; Frequency domain analysis of RLC circuits; Linear 2-port network parameters: driving point and transfer functions; State equations for networks	12	L1 (Remember) L2 (Understand) L4 (Analyze)	PO1,PO2, PO3,PO12
2.	**Electronic Devices** Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; Generation and recombination of carriers; Poisson and continuity equations; P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell; Integrated circuit fabrication	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO12

	process: oxidation, diffusion, ion implantation, photolithography and twin-tub CMOS process.			
3.	**Analog Circuits** Small signal equivalent circuits of diodes, BJTs and MOSFETs; Simple diode circuits: clipping, clamping and rectifiers; Single-stage BJT and MOSFET amplifiers: biasing, bias stability, mid frequency small signal analysis and frequency response; BJT and MOSFET amplifiers: multi-stage, differential, feedback, power and operational; Simple op-amp circuits; Active filters; Sinusoidal oscillators: criterion for oscillation, single-transistor and op- amp configurations; Function generators, wave-shaping circuits and 555 timers; Voltage reference circuits; Power supplies: ripple removal and regulation	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO12
4.	**Signals and Systems** Continuous-time signals: Fourier series and Fourier transform representations, sampling theorem and applications; Discrete-time signals: discrete-time Fourier transform (DTFT), DFT, FFT, Z-transform, interpolation of discrete-time signals; LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay, digital filter design techniques.	6	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO12

Learning Resources:

Ref. Books:

1. G.K publishers GATE ELECTRONICS & COMMUNICATIONS
2. Mcgraw hill GATE 2020 ELECTRONICS & COMMUNICATIONS
3. Wiley GATE 2020 ELECTRONICS & COMMUNICATIONS

INSTITUTE OF ENGINEERING and MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT: Economics for Engineers
SUBJECTCODE: HSMC503

Subject Code : HSMC503	**Category** : GSC
Subject Name : **Economics for Engineers**	**Semester** : 5th
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit:** 2
Pre-Requisites: Basics of Economics for Engineers.	

Course Objective (CO):

1. To understand economic decisions making and engineering Costs & Estimation - Overview, Problems, Role, Decision making process and different types of costs and estimation.
2. To understand Cash Flow, Interest & Equivalence and Rate of Return Analysis using diagrams, categories & computation, time value of money, debt repayment, nominal & effective interest.
3. To familiarize with Inflation & Price Change, Present Worth Analysis and Uncertainty In Future Events.
4. To analyze different types of Depreciation, Replacement Analysis and Accounting - Basic Aspects, Deterioration & Obsolescence, Depreciation and Expenses. Function, Balance Sheet, Income Statement and Financial Ratios Capital Transactions.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	1. Economic Decisions Making - Overview, Problems, Role, Decision making process. 2. Engineering Costs & Estimation - Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models – Per Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.	10
2	3. Cash Flow, Interest and Equivalence: Cash Flow - Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal & Effective Interest. 4. Cash Flow & Rate Of Return Analysis - Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.	10
3	5. Inflation And Price Change - Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates. 6. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of	10

INSTITUTE OF ENGINEERING and MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT: Economics for Engineers
SUBJECTCODE: HSMC503

	Economic Analysis Studies, Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives. 7. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.	
4	8. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation 10 Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances. 9. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems. 10. Accounting - Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.	

Books Recommended:

1. 1. James L.Riggs,David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle: Engineering Economics Analysis, OUP
3. John A. White, Kenneth E.Case,David B.Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub

Course Outcomes:

S.NO.	DESCRIPTION	Blooms Level
	Students will be able to:	
HSMC 503.1	**Relate** and understand economic decisions making and engineering Costs & Estimation.	Understandand Apply (level1 and2)
HSMC 503.2	**Explain** Cash Flow, Interest & Equivalence and Rate of Return Analysis.	Understand (level3)
HSMC 503.3	**Describe** Inflation & Price Change, Present Worth Analysis and Uncertainty In Future Events.	Knowledge (level2)
HSMC 503.4	**Analyze** different types of Depreciation, Replacement Analysis and Accounting.	Apply (level4)

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SYLLABUS OF
ELECTROMAGNETIC WAVES LAB (PCC EC – 591)

Subject Code : PCC EC591	**Category** : Professional Core course
Subject Name : Electromagnetic Waves Lab	**Semester** : 5th
L-T-P : **0-0-2 (Total Contact Hrs. 2)**	**Credit:**1
Pre-Requisites: Mathematics, Physics, Signals and Systems	

Course Objective:

1. To help students to perform Electromagnetic Waves, Transmission Lines and Antenna related experiments assigning design problems
2. To help students realize simulation results at the end of each experiment

Course Content:

Module No.	Description of Topic	Contact Hrs.
1. A	Plotting of Standing Wave Pattern along a transmission line when the line is open-circuited, short-circuited and terminated by a resistive load at the loadend	2
1. B	Input Impedance measurement of a terminated waveguide using shift in minima technique	2
1. C	Smith chart and its application for unknown impedance measurement	2
1. D	Determination of phase and group velocities in a waveguide carrying TE_{10} Wave from Dispersion diagram [$\omega-\beta$ Plot]	2
2. A	Measurement of Radiation Pattern of simple Dipole Antenna	2
2.B	Measurement of Radiation Pattern of Folded Dipole Antenna	2
2.C	Measurement of Radiation Pattern of Yagi - Uda Antenna	2
2.D	Introduction and Measurement of Radiation Pattern of Pyramidal Horn Antenna	2
3.	Study of Spectrum Analyzer	2
4.	One innovative experiment	2

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SYLLABUS OF
ELECTROMAGNETIC WAVES LAB (PCC EC – 591)

Course Outcomes:

1. Students will be able to demonstrate the ability to solve practical engineering problems related to Electromagnetic Waves, Transmission Lines and Antennas.
2. Students can realize about simulation outputs for different experiments.
3. Students can be able to analyze and interpret data obtained from different experiments.

Learning Resources:

1. Laboratory manual provided from the organization
2. Sadiku & Kulkarni, Principles of Electromagnetics, 6e, Asian edition, Copyright © 2015 by Oxford University Press
3. MATLAB/https://octave-online.net

INSTITUTE OF ENGINEERING & MANAGEMENT
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SYLLABUS OF
DIGITAL SIGNAL PROCESSING LAB (PCC EC592)

Subject Code : PCC EC592	**Category**: Professional Core course
Subject Name : Digital Signal Processing	**Semester** : 5th
L-T-P : **0-0-2 (Total Contact Hrs. 2)**	**Credit:**1
Pre-Requisites: Signals and Systems	

Course Objective:

To develop an understanding of digital signals and signal processors.

To develop an understanding of time and frequency domain signals and their interrelations.

3. To develop an understanding of various programming techniques for plotting discrete signals with Matlab/Scilab.
4. To develop the understanding of basic architecture, programming techniques of DSP Processors TMS320C 5416/6713 using Assembly Language and c.

Course Content:

Module No.	Description of Topic	Contact Hrs.
1. a	**Plotting of sampled sinusoidal signal, various sequences and different arithmetic operations**	2
1.b	**Linearity and Shift invariance properties checking of LTI system.**	2
2.	**Convolution of two sequences using graphical methods and using commands- verification of the properties of convolution.**	2
3.	**Z-transform of various sequences -verification of the properties of Z-transform.**	2
4.	**DFTs / IDFTs using matrix multiplication and also using commands,**	2
5.	**Circular convolution of two sequences using graphical methods and using commands, differentiation between linear and circular convolutions.**	2
6.	**Verifications of the different algorithms associated with filtering of long data sequences and Overlap-add and Overlap-save methods.**	2
7.	**FIR ,IIR filter design.**	2
8.	**Hardware Laboratory using either 5416 or 6713 Processor :** **1. Writing & execution of small programs related to arithmetic operations and convolution using Assembly Language of TMS320C 5416/6713 Processor,**	2

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SYLLABUS OF
DIGITAL SIGNAL PROCESSING LAB (PCC EC592)

	2. Writing of small programs in VHDL and downloading into Xilinx FPGA.	2

Course Outcomes:

1. Students would be able to analyze the time and frequency domain signals using Matlab/Scilab.

2. Students would be able to analyze properties of discrete-time systems such as timeinvariance, linearity and stability.

3. Students would be able to understand the basic architecture of DSP Processors TMS320C6713.

4. Students would be able to understand and perform the operations on DSP Processors in assembly language and C language programming.

5. Students would be able to understand the basic hardware feature on DSP Processors TMS320C6713 and interface many hardware peripherals to it.

Learning Resources:

1. Laboratory manual provided from the organization
2. **Digital Signal Processing using MATLAB** Robert J. Schilling, Sandra L Harris,
3. Digital Signal Processing by P.RAMESH BABU
4. MATLAB/https://octave-online.net

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT SKILL DEVELOPMENT FOR PROFESSIONALS-V SUBJECT CODE: HSMC582

Subject Code : HSMC582	**Category**: GSC
Subject Name : **SKILL DEVELOPMENT FOR PROFESSIONALS - V**	**Semester** : 5th
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit:** 0.5
Pre-Requisites: Basic Mathematics, General English from primary to high school.	

Course Objective:

1. To enhance the aptitude & analytical skill of students with multiple tricky approaches.
2. To prepare the students for various competitive examinations & professional exams

Course Outcomes:

1. The ability to communicate effectively with a range of audiences.
2. The ability to face the test and interview conducted by different companies and succeed
3. The ability to recognize the need for continuing professional development.
4. The ability to succeed in competitive exams

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1.	**Quantitative Aptitude & Data Interpretation**- Miscellaneous	12	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO4
2.	**Logical Reasoning** 1) Statement And Assumption, 2) Statement And Conclusion, 3) Statement And Course Of Action, 4) Cause And Effect, 5) Drawing Inference	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4
3.	**Verbal English** 1) **Sentence Corrections** 2) Fill the **blanks** with appropriate words/articles/preposition/verbs/ad verbs/conjunction. 3) **Reading Comprehension** (Advance Level)	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT SKILL – DEVELOPMENT FOR PROFESSIONALS-V SUBJECT CODE: HSMC582

	4) **Vocabulary** .			

Learning Resources:

Reference Books:

1. Objective General English- S.P Bakshi
2. English Grammar and Competition-S.C Gupta
3. Fast Track Objective Arithmetic- Rajesh Verma
4. Advance Maths- Rakesh Yadav
5. Verbal and Non-Verbal Reasoning- R.S Agarwal
6. A new approach to Reasoning- BS Sijwali
7. Quantitative Aptitude-R.S Agarwal

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: CONTROL SYSTEM ENGINEERING SUBJECT CODE: PCCEC601

Subject Code: PCCEC601	**Category** : Compulsory
Subject Name : Control System Engineering	**Semester** : 6th
L-T-P : 3-0-0	**Credit: 3**
Pre-Requisites: Transient analysis, electrical machines, Laplace transformation, calculus.	

Course Objective:

1. To learn basic linear control systems.
2. To learn how automatic control system is used in industrial sectors.
3. To learn about modelling of linear as well as nonlinear systems.

Course Outcomes:

1. Know the basic control system & it's applications in mechanical and electrical systems.
2. Know the stability analysis in time & frequency domains with solution of numerical problems.
3. Know how to design & model of different processes & systems.
4. Know the designing and modelling of discrete systems.

Course contents:

Module No.	Description	Hours	Bloom's Level	PO (1..12) Mapping
1	**Introduction to control system:** Types of control system, concept of feedback and automatic control systems, linear and nonlinear systems, examples of feedback control systems. Transfer function concept, pole and zeroes of a transfer function, properties of transfer function.Block diagram representation of control systems with block diagram reduction method, signal flow graph & Mason's gain formula.	6	L1, L3, L4	PO1,PO2, PO3
2	**Mathematical modelling of dynamic systems:** Translation & rotational systems, electrical analogy of	4	L2, L3, L4	PO1,PO2, PO3, PO11

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	spring–mass-dashpot system, transfer function model of mechanical & electrical systems, servomechanism. Control system components: Synchro's , tacho-generators, servomotors, actuators.			
3	**Time domain analysis:** Performance specifications in time-domain, concept of undamped natural frequency, damping, overshoot, rise time and settling time. Step and impulse response of first and second order systems, effects of pole and zeros on transient response. Steady state errors & error constants in control systems due to step, ramp and parabolic inputs.	8	L4, L5	PO1, PO2, PO3, PO4
4	**Stability Analysis:** Stability by pole location, Routh-Hurwitz criteria and applications. Root locus techniques, construction of root loci for simple systems, effects of gain on the movement of pole and zeros. **Frequency domain analysis of linear system:**Relationship between time & frequency response, Polar plots, Bode plots. Stability in frequency domain, Nyquist plots, Nyquist stability criterion, measure of relative stability, phase and gain margin.	12	L2, L4, L5	PO1, PO2, PO3, PO4
5	**Control system performance measure:** Improvement of system performance through lead, lag and lead-lag compensations. PI, PD and PID controllers.	4	L5, L6	PO1, PO2, PO5
6	**State variable analysis:** Concepts of state variable, state space model, solution of state equations, Diagonalization of transfer function, eigenvalues. Concept of Controllability & Observability.	6	L4, L5, L6	PO1, PO12

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Learning Resources:

Text Books:

1. Modern Control Engineering, K. Ogata, 5th Edition, Prentice Hall.
2. Control Systems Engineering, I. J. Nagrath& M. Gopal, New Age International Publishers.
3. Control Systems Engineering, R. Anandanatarajan& P. Ramesh Babu, Scientech Publications.
4. Linear Control Systems, B.S. Manke, Khanna Publishers, 11th Edition.

Reference Books:

1. Control Engineering Theory & Practice, Bandyopadhyaya, PHI.
2. Modeling & Control of dynamic system, Macia&Thaler, Thompson.
3. Control Systems Engineering, Dr. Rajeev Gupta, Wiley India Pvt. Ltd.
4. Control System: Principles and Design, M. Gopal, Tata McGraw-Hill.

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION) SUBJECT:
COMPUTER NETWORK SUBJECT CODE:
PCCEC602

Subject Code: PCCEC602	**Category**: Core Courses
Subject Name: Computer Network	**Semester** : 6th
L-T-P : 3-0-0 (Total Contact Hrs. 3)	**Credit:** 3
Pre-Requisites: Communication system.	

Course Objective:

1. To build an understanding of the fundamental concepts of computer networking.
2. To introduce the basic taxonomy and terminology of computer networking.
3. To introduce advanced networking concepts.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Overview of Data Communication and Networking:** Introduction; Data communications: components, data representation (ASCII,ISO etc.), direction of data flow (simplex, half duplex, full duplex); network criteria, physical structure (type of connection, topology), categories of network (LAN, MAN,WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative Study. Physical Level: Overview of data(analog & digital), signal(analog & digital), transmission (analog & digital) & transmission media (guided & unguided); Circuit switching: time division & space division switch, TDM bus; Telephone Network;	10
2	**Data link Layer:** Types of errors, framing(character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC; **Medium Access sub layer:** Point to Point Protocol, LCP, NCP, and Token Ring; Reservation, Polling, Multiple access protocols: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, and fast Ethernet (in brief).	10
3	**Network layer:** Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: IP addressing, sub netting; Routing: techniques, static vs. dynamic routing, Unicast Routing Protocols: RIP, OSPF, BGP; Other Protocols: ARP, IP, ICMP, and IPV6. **Transport layer:** Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm,	12

	Application Layer	
4	Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature, Firewalls. **Modern topics:** ISDN services & ATM, DSL technology, Cable Modem: Architecture & Operation in brief Wireless LAN: IEEE 802.11, Introduction to blue-tooth. Intruders, Viruses and Worms: Intruders, Viruses and Related threats. Fire Walls: Fire wall Design Principles, Trusted systems.	10

Books Recommended:

1. B. A. Forouzan - "Data Communications and Networking (3rd Ed.) " - TMH
2. A. S. Tanenbaum - "Computer Networks (4th Ed.)" - Pearson Education/PHI
3. W. Stallings - "Data and Computer Communications (5th Ed.)" - PHI/ Pearson Education
4. Zheng & Akhtar, Network for Computer Scientists & Engineers, OUP.
5. Kurose and Rose - "Computer networking -A top down approach featuring the internet" – Pearson Education

Course Outcomes:

S.NO.	DESCRIPTION	Blooms Level
	Students will be able to:	
PCCEC 602.1	**Visualize** the different aspects of networks, protocols and network design models.	L_1 Remember
PCCEC 602.2	**Examine** various Data Link layer design issues and Data Link protocols.	L_1 Remember
PCCEC 602.3	**Understand** and **analyze** different network and transport layer protocol.	L_2, L_4 Understand and Analyze
PCCEC 602.4	**Examine** the important aspect of cryptography in network security.	L_3 Apply

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT INTRODUCTION TO MEMS SUBJECT CODE- PEC-EC603C

Subject Code : PEC-EC603C	**Category** : Program Elective -2
Subject Name : Introduction to MEMS	**Semester** : 6th
L-T-P : 3-0-0 (Total Contact Hrs. 3)	**Credit:** 3
Pre-Requisites: None	

Course Objective:

1. To know what is MEMS and its importance in VLSI field
2. To know the different issues that come into play when you are designing MEMS structures.
3. To know different MEMS applications

Course Outcomes:

1. Appreciate the underlying working principles of MEMS and NEMS devices.
2. Design and model MEMS devices.

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1.	Introduction and Historical Background, Scaling Effects. Micro/Nano Sensors, Actuators	5	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO12
2.	Systems overview: Case studies. Review of Basic MEMS fabrication modules: Oxidation, Deposition Techniques, Lithography (LIGA), and Etching	10	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO12
3.	Micromachining: Surface Micromachining, sacrificial layer processes, Stiction; Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding.	10	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO12
4.	Mechanics of solids in MEMS/NEMS: Stresses, Strain, Hookes's law, Poisson effect, Linear Thermal Expansion, Bending	7	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO12
5.	Energy methods, Overview of Finite Element Method, Modeling of Coupled Electromechanical Systems	4	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO12

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT INTRODUCTION TO MEMS SUBJECT CODE- PEC-EC603C

Learning Resources:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalkrishnan K. N. Bhat, V. K. Aatre, Micro and Smart Systems, Wiley India, 2012.
2. S. E. Lyshevski, Nano-and Micro-Electromechanical systems: Fundamentals of Nano- and Microengineering (Vol. 8). CRC press, (2005).
3. S. D. Senturia, Microsystem Design, Kluwer Academic Publishers, 2001.
4. M. Madou, Fundamentals of Microfabrication, CRC Press, 1997.
5. G. Kovacs, Micromachined Transducers Sourcebook, McGraw-Hill, Boston, 1998.
6. M.H. Bao, Micromechanical Transducers: Pressure sensors, accelerometers, and Gyroscopes, Elsevier, New York, 2000.

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT POWER ELECTRONICS SUBJECT CODE- PEC-EC603A

Course Code:PEC-EC603A	**Category:** Program Elective-2
Course Title: Power Electronics	**Semester :** 6th
L-T-P: 3-0-0	**Credit:** 3
Pre-Requisites: Basic knowledge about components Resistors, Inductors, Capacitors; Network Theorems; Basic knowledge about the operation of semiconductor devices (Transistor, Diode etc.); Fourier Analysis.	

Course Objective:

1. Different types of power semiconductor devices and their switching.
2. Operation, characteristics and performance parameters of controlled rectifiers.
3. Operation, switching techniques and basic topologies of DC-DC converters and switching regulators.
4. Different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
5. Operation of AC and DC drives.

Proposed Syllabus:

Module No.	Description of Topic	Blooms Level	PO (1..12) MAPPING	Contact Hrs.
1	**Power Semiconductor Devices:** -Introduction, Operation, Ratings and Static and Dynamic Characteristics of Rectifier diodes, diode, Power BJT, Power MOSFET, SCR, TRIAC, IGBT and GTO. - Concept of Fast recovery diodes, Schottky diodes as freewheeling and feedback diode. -SCR turn −on and turn - off methods, Triggering circuits, SCR Commutation circuits, SCR Series and Parallel operation, Snubber Circuit.	L3 Apply	PO1, PO2, PO3, PO4, PO12	6

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT POWER ELECTRONICS SUBJECT CODE- PEC-EC603A

2	**Controlled Rectifiers:** -Single phase: Study of semi and full bridge converters for R, RL, RLE loads. Analysis of load voltage and input current- Derivations of load form factor and ripple factor. -Effect of source impedance, Input current, Fourier series analysis of input current to derive input supply power factor, displacement factor and harmonic factor.	L4 Analyze	PO1, PO2, PO3, PO4, PO12	6
3	**Choppers:** Quadrant operations of Type A, Type B, Type C, Type D and type E choppers, -Step up and Step down choppers, -Control techniques for choppers -Time ratio control and current limit control, -Buck, Boost, Buck-Boost and Cuk Converters, -Concept of Resonant Switching	L3 Apply	PO1, PO2, PO3, PO4, PO12	6
4	Single phase and three phase inverters: -Principle of operation of half-bridge and full-bridge square wave and quasi-square inverter, mathematical analysis for output voltage and harmonics. –PWM techniques, Single pulse PWM, Multipulse PWM, Sinusoidal PWM, modified Sinusoidal PWM, mathematical analysis for output voltage and harmonics, harmonic Control using PWM, Series resonant inverter. -Single phase Current Source Inverter.	L3 Apply	PO1, PO2, PO3, PO4, PO12	6
5	**Switching Mode Power Supplies**: -Analysis of fly back, forward converters for SMPS, -Resonant converters, -Concept of soft switching, switching trajectory and SOAR, Load resonant converter -Series loaded half bridge DC-DC converter.	L4 Analyze	PO1, PO2, PO3, PO4, PO12	5
6	**Applications:** -Power line disturbances, EMI/EMC, power conditioners. -Block diagram and configuration of UPS, salient features of UPS, selection of battery and charger ratings and sizing of UPS. -Separately excited DC motor drive. P M Stepper motor Drive.			6
Total				34

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Course Outcome:

CO1: Build and test circuits using power devices such as SCR, Power MOSFET, IGBT etc.
CO2: Analyze and design controlled rectifiers, DC to DC converters, DC to AC inverters.
CO3: Learn how to analyse these inverters and some basic applications.
CO4: Design SMPS.

Learning Resources:

Text /Reference Books:

1. Muhammad H. Rashid, "Power electronics" Prentice Hall of India.
2. Ned Mohan,Robbins, "Power electronics", edition III, John Wiley and sons.
3. P.C. Sen., "Modern Power Electronics", edition II, Chand& Co.
4. V.R.Moorthi, "Power Electronics", Oxford University Press.
5. Cyril W., Lander," Power Electronics", edition III, McGraw Hill.
6. G K Dubey, S R Doradla,: Thyristorised Power Controllers", New Age International Publishers. SCR manual from GE, USA.

INSTITUTE OF ENGINEERING & MANAGEMENT
AUTONOMOUS INSTITUTION
SUBJECT – NANOELECTRONICS
SUBJECT CODE - PEC-EC603B

Subject Code : PEC-EC603B	**Category** : Program Elective - 2
Subject Name : Nanoelectronics	**Semester** : 6^{th}
L-T-P : 3-0-0 (Total Contact Hrs. 3)	**Credit:** 3
Pre-Requisites: Engineering Physics, Electronic Devices	

Course Objective:

1.To know the physics behind nanoelectronic devices
2.To know different modern day nanoelectronic devices
3. To know different applications where nanoelectronic devices can be used
4.

Course Outcomes:

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

1. Understand various aspects of nano-technology and the processes involved in making nano components and material.
2. Leverage advantages of the nano-materials and appropriate use in solving practical problems.
3. Understand various aspects of nano-technology and the processes involved in making nano components and material.
4. Leverage advantages of the nano-materials and appropriate use in solving practical problems.

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1.	Introduction to nanotechnology, meso structures, Basics of Quantum Mechanics: Schrodinger equation, Density of States. Particle in a box Concepts, Degeneracy. Band Theory of Solids. Kronig-Penny Model. Brillouin Zones.	12	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO12
2.	Shrink-down approaches: Introduction, CMOS Scaling, The nanoscale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.)	10	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO12
3.	Resonant Tunneling Diode, Coulomb dots, Quantum blockade, Single electron transistors, Carbon nanotube electronics,	12	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO12

	Bandstructure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation			

Learning Resources:

1. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson, 2009.
2. W. Ranier, Nanoelectronics and Information Technology (Advanced Electronic
3. Material and Novel Devices), Wiley-VCH, 2003.
4. K.E. Drexler, Nanosystems, Wiley, 1992.
5. J.H. Davies, The Physics of Low-Dimensional Semiconductors, Cambridge University Press, 1998.
6. C.P. Poole, F. J. Owens, Introduction to Nanotechnology, Wiley, 2003

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
PROPOSED SYLLABUS
SUBJECT: MACHINE LEARNING
SUBJECTCODE: OECEC704B

Subject Code: OECEC704B	**Category** : Professional Core courses
Subject Name : Machine Learning	**Semester** :
L-T-P : **3-0-0**	**Credit: 3**
Pre-Requisites: (1) Design and Analysis of Algorithms, Data Structures and Algorithms (2) Basic concepts from Mathematics & Statistics (Linear Algebra, and Statistics and Probability, Calculus) (3) Programming in Python/R	

COE1: To understand how Machine learning techniques are used to make computers learn from from data and experience, a vast variety of application areas, from spam filters, medical imaging, analyze customer purchase data, or to detect fraud in credit card transactions. Automated driverless cars, robots and drones depend on machine learning algorithms for their control systems. Machine Learning is also being applied to industrial automation. Any area in which you need to make sense of data is a potential consumer of machine learning.

COE2: To discover patterns in your data and then make predictions based on often complex patterns to answer business questions, detect and analyse trends and help solve problems. To design and analyse the fundamental set of techniques and algorithms that constitute machine learning.

COE3: Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity. Have an understanding of the strengths and weaknesses of many popular machine learning approaches. etc.

COE4: To understand and appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning. Be able to design and implement various machine learning algorithms in a range of real-world application

Course Contents:

Module No.	Topics	Refer to the material in the corresponding chapter in the text-book	Contact Hours
1	Introduction, Learning Paradigms	Chapter 1 Tom Mitchell book (TM), Chapter 1 of Duda, Hart and Stork book (DHS)	1
2	Concept Learning	Chapter 2 of TM	2
3	Decision Tree	Chapter 3 of TM	2
4	Bayes Classifier	Chapter 6 of TM	2
5	Bayesian Networks	Chapter 6 of TM	3
6	Computational Learning Theory	Chapter 7 of TM	2

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SUBJECT: MACHINE LEARNING
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7	k-Nearest Neighbour Learnin	Chapter 8 of TM	2
Module No.	**Topics**	**Refer to the material in the corresponding chapter in the text-book**	**Contact Hours**
8	Support Vector Machines	Chapter 5.11 of DHS	3
9	Kernel Machines	Chapter 5.11 of DHS	2
10	Neural Networks, Perceptron	Chapter 4 of TM	3
11	Multilayered Perceptron	Chapter 6 of DHS	4
12	Classifier Evaluation	Chapter 5 of TM	2
13	Ensemble Learning, Boosting	Chapter 9 of DHS	2
14	Unsupervised Learning, Clustering	Chapter 10 of DHS	4
15	Dimensionality Reduction	Chapter 3.7 of DHS	2
16	Reinforcement Learning	Chapter 13 of TM	4

Text-Books:

1. Machine Learning - **Tom Mitchell (TM)** –(publ. by McGraw Hill)
2. Pattern Classification - **Duda, Hart and Stork (DHS)** –(Wiley, 2nd edn.)

Reference Books:

3. Indtroduction to Machine Learning - **E. Alpaydin (EA)** –(publ. MIT Press, 3rd edn.)
4. The Elements of Statistical Learning - **Hastie, Tibshirani, Friedman (HTF)** - (publ. Springer, 2nd edn.)
5. Understanding Machine Learning: From Theory to Algorithms - **Shai Shalev-Shwartz and Shai Ben-David**, (publ. Cambridge University Press)
6. Pattern Recognition and Machine Learning - **Christopher Bishop** (publ. Springer)

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
PROPOSED SYLLABUS
SUBJECT: MACHINE LEARNING
SUBJECTCODE: OECEC704B

COURSE OUTCOMES:

COURSE OUTCOMES: S.NO.	DESCRIPTION	Blooms Level	PO (1..12) MAPPING
OEC-EC604B.1	Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.	L3 Apply	PO1, PO2, PO3, PO4, PO5, PO12
OEC-EC604B.2	Have an understanding of the strengths and weaknesses of many popular machine learning approaches.	L4 Analyze	PO1, PO2, PO3, PO4, PO5, PO12
OEC-EC604B.3	Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.	L4 Analyze	PO1, PO2, PO3, PO4, PO5, PO12
OEC-EC604B.4	Be able to design and implement various machine learning algorithms in a range of real-world application	L3 Apply	PO1, PO2, PO3, PO4, PO5, PO12

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT: OPERATING SYSTEMS
SUBJECT CODE: OECEC604B

Subject Code : OECEC604B	**Category** : Engineering Sciences
Subject Name : Operating Systems	**Semester** : 6th
L-T-P : **3-0-0**	**Credit: 3**
Pre-Requisites: Computer Architecture	

Course Objective:

1. To learn the mechanisms of OS to handle processes and threads and their communication.
2. To learn the mechanisms involved in memory management in contemporary OS.
3. To gain knowledge on Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols.
4. To know the components and management aspects of concurrency management.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Introduction:** Operating system and functions, Evolution of operating system, Batch, Interactive, Time Sharing, Real Time System, Multi-Threading System. **Operating System Structure:** System Components, System structure, Operating System Services.	3
2	**Concurrent Processes:** Process concept, Principle of Concurrency, Critical Section problem, Semaphores, Classical problems in Concurrency, Inter Process Communication, Introduction to monitor, Process Generation, Process Scheduling. **CPU Scheduling:** Scheduling Concept, Performance Criteria Scheduling Algorithm, Evolution, Multiprocessor Scheduling. **Deadlock:** System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from deadlock combined, approach.	15
3	**Memory Management:** Resident monitor, Multiprogramming with fixed partition, Multiprogramming with variable partition, Multiple base register, Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Page replacement algorithms, Allocation of frames, Thrashing.	8

4	**I/O Management & Disk Scheduling:** I/O devices and organization of I/O function, I/O Buffering, DISK I/O, operating System Design Issues. **File System:** File Concept, File Organization and Access Mechanism, File Directories, File Sharing, Implementation Issues. **Operating system Protection & Security:** Introduction to distributed operating system, Case Studies - The UNIX operating system	8

Books Recommended:

1. Operating System Concepts, A. Silverschwatz, P. Galvin & G.Gange , Willey
2. Operating System Concepts, Milenekovic, McGraw Hill
3. An introduction to operating system, Dietel, Addision Wesley

Course Outcomes:

Sl. No.	Description	Blooms Level
	Upon completion of the course, the students will be able to:	
OEC-EC-604C.1	Understand the difference between different types of modern operating systems, virtual machines and their structure of implementation and applications.	Understand (L2)
OEC-EC-604C.2	Understand the difference between process & thread, issues of scheduling of user-level processes / threads and their issues & use of locks, semaphores, monitors for synchronizing multiprogramming with multithreaded systems and also understand the concepts of deadlock in operating systems and how they can be managed / avoided and implement them in multiprogramming system.	Understand (L2)
OEC-EC-604C.3	Understand the design and management concepts along with issues and challenges of main memory and virtual memory.	Understand (L2)
OEC-EC-604C.4	Understand the types of I/O management, file systems, disk scheduling, and protection and security problems faced by operating systems and how to minimize these problems.	Understand (L2), Level 3(apply)

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT – ESSENTIAL STUDIES FOR PROFESSIONALS -VI
SUBJECT CODE-HSMC(ECE)602

Subject Code : HSMC(ECE)602	C**ategory**: Gen. Sc.
Subject Name : ESP-VI	**Semester** : 6th
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit: 0.5**
Pre-Requisites: Basics Physics	

Course Objective:

1. To learn about the Basic Electromagnetics laws and their applications for professional exams
2. To learn about fundamentals of digital logics of electronics for various exams
3. To learn about various combinational and sequential circuits of devices for professional exams
4. To learn about fundamentals of transmission lines and antenna systems for various exams

Course Outcomes:

At the end of the course the students will be able

1. To develop an understanding of Basic of Electromagnetics.
2. To learn all types of Logics gates and their applications in circuits.
3. To understand various combinational and sequential circuits of devices and its applications.
4. To use fundamentals of transmission lines and antenna systems principles.

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1.	**Electromagnetics** Electrostatics; Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector; Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth; Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, Sparameters, Smith chart Waveguides: modes, boundary conditions, cut-off frequencies, dispersion relations; Antennas: antenna types, radiation pattern, gain and directivity, return loss, antenna arrays; Basics of radar; Light propagation in optical fibers.	18	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO12

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SUBJECT CODE-HSMC(ECE)602

2.	**Digital Circuits** Number systems; Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders and PLAs; Sequential circuits: latches and flip-flops, counters, shift-registers and finite state machines; Data converters: sample and hold circuits, ADCs and DACs; Semiconductor memories: ROM, SRAM, DRAM; 8-bit microprocessor (8085): architecture, programming, memory and I/O interfacing.	18	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO12

Learning Resources:

Reference Books:

1. G.K publishers GATE ELECTRONICS & COMMUNICATIONS
2. McGraw hill GATE 2020 ELECTRONICS & COMMUNICATIONS
3. Wiley GATE 2020 ELECTRONICS & COMMUNICATIONS

INSTITUTE OF ENGINEERING & MANAGEMENT
AUTONOMOUS INSTITUTION
SUBJECT – CONTROL SYSTEM LABORATORY
SUBJECT CODE: PCCEC691

Subject Code : PCCEC691	**Category** : Professional Core courses
Subject Name : Control System Laboratory	**Semester** : 6th
L-T-P : 0-0-2	**Credit: 1**
Pre-Requisites: Basic Control System, Controller, Servo Motors.	

Course Objective:

1. To get practical experience with different controlling system of first, second order.
2. To get practical experience of designing any control system circuit using simulation, coding and electronic controlling devices.
3. To learn hand on experience such that students can work as professionals in the area of Applied Control System and other Engineering fields.
4. To learn different tools to simulate different Control System circuits.

Course Outcomes:

CO 1: Students will have a thorough knowledge of different applications of Controller, Servo Motor.

CO 2: After completing this course, the students will be able to analyze and design of Control System circuits using different controlling system.

CO 3: They will be able to design PID Controller, Temperature Controller and DC Motor Speed Controller.

CO 4: After completing this course, the students will be able to analyze and design Circuits using First Order, Second Order, Type-I and Type-II system.

Course Content:

Module No.	Description of Topic	Blooms Level	PO (1..12) MAPPING	Contact Hrs.
1(CO1)	Familiarization with MATLAB Control System tool Box, MATLAB- SIMULINK tool box & pSPICE	L2,L3,L4	1… 6, 10-12	**2**
2(CO1)	Determination of step response for 1st order & 2nd order system with unity feedback on CRO & calculation of control system specifications for variations of system design.	L2,L3,L4	1…5, 8,9,12	**2**

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3(CO1)	Simulation of step response & impulse response for Type-I & Type-II system with unity feedback using MATLAB & pSPICE.	L2,L3,L4	1…5, 8,9,12	**2**
4(CO1)	Determination of root locus, Bode-plot, Nyquist Plot, using MATLAB control system toolbox for a given 2nd order transfer function & determination of different control system specifications.	L2,L3,L4	1…5, 8,9,12	**2**
5(CO2)	Determination of PI, PD, and PID controller action on 1st order simulated process using MATLAB /Instrument set up .	L2,L3,L4	1…5, 8,9,12	**2**
6(CO2)	Determination of approximate transfer function experimentally using Bode Plot	L2,L3,L4	1…5, 8,9,12	**2**
7(CO3)	Evaluation of steady-state error, setting time, percentage peak overshoots, gain margin, phase margin with addition of lead compensator in forward path transfer functions using MATLAB & pSPICE	L2,L3,L4	1…5, 8,9,12	**2**
8(CO2)	Study of position control system using servomotor.	L2,L3,L4	1…5, 8,9,12	**2**
9(CO4)	Design and hardware implementation of a temperature controller using microprocessor/microcontroller.	L2,L3,L4	1…5, 8,9,12	**2**
10	Project	L5		**6**
Total Hours:				**24**

Learning Resources:

1. Modern Control Engineering by Katsuhiko Ogata.
2. Linear Control Systems by B.S. Manke.
3. Automatic Control Systems by Benjamin C. Kuo.
4. Control Systems Engineering by I J Nagrath and M Gopal.
5. Control Systems Engineering by Norman S Nise.

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: COMPUTER NETWORK LAB SUBJECT CODE: PCCEC692

Subject Code: PCCEC692	**Category**: Core Courses
Subject Name: **Computer Network Lab**	**Semester** : 6th
L-T-P : 0-0-2 (Total Contact Hrs. 2)	**Credit:** 1
Pre-Requisites: Communication system.	

Course Objective:

1. To understand communication between two desktop computers.
2. Study about various types of cables used in guided media like coaxial cable, optical fiber cable, twisted pair cables and its categories.
3. Understand difference between straight cable and cross over cable.

Course Contents:

S. No.	Experiment Details
1	Study of different types of network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2	Study of different network devices.
3	Study of network IP.
4	Connect the computers in Local area network.
5	Study of basic network command and network configuration commands.
6	Configure a network topology using packet tracer software.
7	Configure a network using distance vector routing protocol.
8	Configure a network using link state vector routing protocol.

Software Required:

Packet Tracer, Cloonix, CORE, GNS3, IMUNES, Mininet and Netkit, NS-3 or any equivalent software's.

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(AUTONOMOUS INSTITUTION) SUBJECT:
COMPUTER NETWORK LAB SUBJECT CODE:
PCCEC692

Course Outcomes:

S.NO.	DESCRIPTION Students will be able to:	Blooms Level
PCCEC 692.1	**Implement** different network cables for communication between devices.	L_3 Apply
PCCEC 692.2	**Understand** various network devices and IP for networking.	L_1 Remember
PCCEC 692.3	**Understand** and **Apply** network configuration command.	L_2, L_3 Understand and Apply
PCCEC 692.4	**Apply** different routing protocol and tracer software to configure network.	L_3 Apply

INSTITUTE OF ENGINEERING & MANAGEMENT
AUTONOMOUS INSTITUTION SUBJECT ELECTRONIC MEASUREMENT LABORATORY SUBJECT CODE-PCCEC693

Course Code: PCCEC693	**Category:** Professional Core Courses
Course Title: Electronic Measurement Laboratory	**Semester :** 6th
L-T-P: 3-0-0	**Credit:** 1
Pre-Requisites: Basic knowledge about components and devices e.g., Resistors, Inductors, Capacitors; Op-amps, Active Filters; Sensors.	

Course Objective:

To impart practical knowledge on the following topics:

1. Analyse and design of DC bridge for Resistance Measurement (Quarter, Half and Full bridge).
2. Analyse and design of AC bridge Circuit for capacitance measurement.
3. Designing of signal conditioning circuit for Pressure, Temperature, Torque and Strain Measurement.
4. To study experimentally the characteristics of ADC and DAC.
5. Experimental study of Error compensation using Numerical analysis with MATLAB (regression).

Proposed Syllabus:

Experiment No.	Description of Topic	Blooms Level	PO (1..12) MAPPING	Contact Hrs.
1	Designing DC bridge for Resistance Measurement (Quarter, Half and Full bridge).	L2 (Remember) L3 (Apply)	PO1, PO2, PO3, PO4, PO12	3

INSTITUTE OF ENGINEERING & MANAGEMENT
AUTONOMOUS INSTITUTION
SUBJECT – ELECTRONIC MEASUREMENT LABORATORY
SUBJECT CODE-PCCEC693

2	Designing AC bridge Circuit for capacitance measurement.	L2 (Remember) L3 (Apply)	PO1, PO2, PO3, PO4, PO12	3
3	Designing signal Conditioning circuit for Pressure Measurement.	L2 (Remember) L3 (Apply)	PO1, PO2, PO3, PO4, PO12	3
4	Designing signal Conditioning circuit for Temperature Measurement.	L2 (Remember) L3 (Apply)	PO1, PO2, PO3, PO4, PO12	3
5	Designing signal Conditioning circuit for Torque Measurement.	L2 (Remember) L3 (Apply)	PO1, PO2, PO3, PO4, PO12	3
6	Designing signal Conditioning circuit for Strain Measurement.	L2 (Remember) L3 (Apply)		**3**
7	Experimental study for the characteristics of ADC and DAC.	L2(Remember) L3 (Apply)		**3**

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8	Error compensation study using Numerical analysis using MATLAB (regression).	L2 (Remembe r) L3 (Apply)		**3**
Total				24

Course Outcome:

After completion of these experiments students will be able
to **CO1:** Design and validate DC and AC bridges.
CO2:. Analyze the dynamic response and the calibration of few instruments. They also learn about various measurement devices, their characteristics, operations and limitations.
CO3:. Understand statistical data analysis
CO4. Understand computerized data acquisition.

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SUBJECT- SKILL DEVELOPMENT FOR PROFESSIONALS - VI
SUBJECT CODE-HSMC682

Subject Code : HSMC682	**Category**:
Subject Name : **SKILL DEVELOPMENT FOR PROFESSIONALS - VI**	**Semester** : 6th
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit:** 0.5
Pre-Requisites: Basic Mathematics, General English from primary to high school.	

Course Objective:

1. To enhance the aptitude & analytical skill of students with multiple tricky approaches.
2. To prepare the students for various competitive examinations & professional exams

Course Outcomes:

1. The ability to communicate effectively with a range of audiences.
2. The ability to face the test and interview conducted by different companies and succeed. And also preparation to appear different competitive exams starts.
3. The ability to recognize the need for continuing professional development.
4. The ability to succeed in competitive exams (BANK/IBPS/SSC/GATE / GRE / PSU's/Placement Aptitude etc.).

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1.	**Revision and Advanced Problems in Quantitative Aptitude:** 1)Numbers (+, -, x, etc), Percentages, Ratio, Partnership, Linear Equations, Profit & Loss 2)Averages, Mixtures & Allegations, Number System, Time and Work 3)Simple & Compound Interest, Other / Misc Quantitative Apt., Indices and Surds, Quadratic Equations 4)Permutations & Combinations, Probability, Geometry, Mensuration 5)Data Interpretation, Various Charts, Diagrams, Tables	12	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO4

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2.	**Revision and Advanced Problems in Reasoning** 1)Coding, Series & Numbers, Blood Relations, Analogy 2)Cubes, Data Sufficiency, Non-Verbal Reasoning 3)Syllogisms, Puzzles, Machine I/O, Inequality 4)Seating Arrangement, Calendar / Clock 5)Statements, Other / Misc Logical Reasoning, Decision Making (Ethics)	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4
3.	**Revision and Advanced Questions in Verbal English** 1)Grammar, 2)Clauses, 3)Spotting errors, 4)Sentence Correction, 5)Blanks, 6)Reading Comprehensions, 7)Vocabulary	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4

Learning Resources:

Reference Books:

1. Objective General English- S.P Bakshi
2. English Grammar and Competition-S.C Gupta
3. Fast Track Objective Arithmetic- Rajesh Verma
4. Advance Maths- Rakesh Yadav
5. Verbal and Non-Verbal Reasoning- R.S Agarwal
6. A new approach to Reasoning- BS Sijwali
7. Quantitative Aptitude-R.S Agarwal