DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

2019 – 2023 Batch

Autonomy Syllabus
3rd SEMESTER

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	Analog Electronic Circuits	3	0	0	3	3
3.	CC	PCCEC303	Network Theory	3	0	0	3	3
4.	GE	PCCEC304	Signals and Systems	3	0	0	3	3
5.	BSC	BSC301	Mathematics & Statistics – III	3	0	0	3	3
6.	MC	MC 301	Biology for Engineers	1	0	0	1	1
7.	GSC	HSMC302	Essential Studies for Professionals - ESP III	3	0	0	3	3
8.	CC	PCCEC391	Electronic Devices and Analog circuits Laboratory	0	0	2	2	1.5
9	CC	PCCEC394	Signals & Systems Lab	0	0	2	2	1
10.	GE	OECEC381	Data Structure & Algorithm (S)	1	0	2	3	2
11.	GSC	HSMC382	Skill Development for Professionals - SDP III	0	0	2	2	1
12.	ECP	ECP381	Project - I	-	-	-	1	1
13.	Mandatory Course	MC381	Mandatory Additional Requirement (MAR)	0	0	0	0	0
							Total Credit Points =	**25.5**

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

2019 – 2023 Batch

Autonomy Syllabus

4thSEMESTER

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	Digital system design	3	0	0	3	3
3.	CC	PCCEC403	Microcontrollers	3	0	0	3	3
4.	MC	MCEC401	Environmental Science	1	0	0	1	0
5.	BSC	BSC401	Mathematics – IV (Probability Theory & Statistics)	4	0	0	4	4
6.	GSC	HSMC402	Essential Studies for Professionals - ESP IV	2	0	0	2	2
7.	CC	PCCEC491	Analog & Digital Communication Laboratory	0	0	2	2	1
8	CC	PCCEC492	Digital system design lab	0	0	2	2	1
9.	CC	PCCEC493	Microcontrollers Laboratory	0	0	2	2	1
10.	GE	OECEC481	Object Oriented Programming	1	0	2	3	2
11.	GSC	HSMC482	Skill Development for Professionals - SDP IV	0	0	2	2	1
12.	ECP	ECP481	Mini Project - II	-	-	-	1	1
13.	Mandatory Course	MC481	Mandatory Additional Requirement (MAR)	0	0	0	0	0
						Total Credit Points =		**22**

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

2019 – 2023 Batch (Autonomy Syllabus) 5th SEMESTER

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.	ECEL	ECELEC504	**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.	GSC	HSMC502	Essential Studies for Professionals - ESP V	2	0	0	2	2
7.	GSC	HSMC503	Economics for Engineers	2	0	0	2	1
8.	CC	PCCEC591	Electromagnetic Waves Laboratory	0	0	2	2	1
9	CC	PCCEC592	Digital Signal Processing Laboratory	0	0	2	2	1
10.	GSC	HSMC582	Skill Development for Professionals - SDP V	0	0	2	2	1
11.	ECP	ECP581	Mini Project - III	-	-	-	1	1
12.	Mandatory Course	MC581	Mandatory Additional Requirement (MAR)	0	0	0	0	0
							Total Credit Points =	**22**

Discipline Specific Elective / Program Elective-1

A. Information Theory & Coding

B. CMOS Design

Generic Elective / Open Elective-1

A. Data Base Management System

B. Design & Analysis of Algorithm

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

2019 – 2023 Batch

Autonomy Syllabus
6thSEMESTER

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.	ECEL	ECELEC603	**Program Elective-2**	3	0	0	3	3
4.	OEC	OECEC604	**Open Elective-2**	3	0	0	3	3
5.	GSC	HSMC602	Essential Studies for Professionals - ESP VI	2	0	0	2	2
6.	GSC	HSMC603	Principles of Management	2	0	0	2	2
7.	CC	PCCEC691	Control System Laboratory	0	0	2	2	1
8	CC	PCCEC692	Computer Network Laboratory	0	0	2	2	1
9.	CC	PCCEC694	Electronic Measurement Laboratory	0	0	2	2	1
10.	GSC	HSMC682	Skill Development for Professionals - SDP VI	0	0	2	2	1
11.	ECP	ECP681	Mini Project – III / Electronic Design Workshop	-	-	-	1	1
12.	Mandatory Course	MC681	Mandatory Additional Requirement (MAR)	0	0	0	0	0
							Total Credit Points =	**21**

Discipline Specific Elective / Program Elective-2

A. Power Electronics

B. Nano electronics

Generic Elective / Open Elective-2

A. Machine Learning

B. Operating Systems

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

2019 – 2023 Batch (Autonomy Syllabus) 7thSEMESTER

Sl. No.	Type	Paper Code	Paper Name	L	T	P	Total	Credit
1.	ECEL	PECEC701	**Program Elective-3**	3	0	0	3	3
2.	ECEL	PECEC702	**Program Elective-4**	3	0	0	3	3
3.	ECEL	PECEC703	**Program Elective-5**	3	0	0	3	3
4.	OEC	OECEC704	**Open Elective-3**	3	0	0	3	3
5.	GSC	HSMC(ECE)702	Essential Studies for Professionals - ESP VII	2	0	0	2	0.5
6.	GSC	HSMC703	Organizational Behaviour	2	0	0	2	2
7.	CC	PECEC791A	Microwave Laboratory	0	0	2	2	1
		PECEC791B	Embedded System Lab					
8.	GSC	HSMC782	Skill Development for Professionals - SDP VII	0	0	2	2	0.5
9.	ECP	ECP781	Project Work - I	-	-	-	5	5
10.	Mandatory Course	MAR(ECE)781	Mandatory Additional Requirement (MAR)	0	0	0	0	0
						Total Credit Points =		**21**

Discipline Specific Elective / Program Elective-3

A. Microwave Theory and Techniques
B. Embedded System

Discipline Specific Elective / Program Elective-4

A. Mobile Communication and Networks
B. Mixed Signal Design

Program Elective-5

A. Satellite Communication
B. Adaptive Signal Processing

Generic Elective / Open Elective-3

A. Internet of Things
B. Software Engineering

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTE OF ENGINEERING & MANAGEMENT, KOLKATA

2019 – 2023 Batch

Autonomy Syllabus

8thSEMESTER

Sl. No.	Type	Paper Code	Paper Name	L	T	P	Total	Credit
1.	PEC	PECEC801	**Program Elective-6**	3	0	0	3	3
2.	PEC	PECEC802	**Program Elective-7**	3	0	0	3	3
3.	OEC	OECEC803	**Open Elective-4**	3	0	0	3	3
4.	OEC	OECEC804	**Open Elective-5**	3	0	0	3	3
5.	GSC	HSMC802	Essential Studies for Professionals - ESP VIII	2	0	0	2	0.5
6.	GSC	HSMC882	Skill Development for Professionals - SDP VIII	0	0	2	2	0.5
7	ECP	ECP881	Project Work - II& Dissertation	-	-	-	5	5
8.	CC	PCCEC891	GRAND VIVA	-	-	-	-	2
9.	Mandatory Course	MAR(ECE)881	Mandatory Additional Requirement (MAR)	0	0	0	0	0
				Total Credit Points =				**20**

Discipline Specific Elective / Program Elective-6

A. Fibre Optic Communication

B. Antennas and Propagation

Discipline Specific Elective / Program Elective-7

Generic Elective / Open Elective-4

A. Deep learning

B. Cloud Computing

Generic Elective / Open Elective-5

A. Mobile Computing

A. Wireless Sensor Networks

B. Digital Image and Video Processing

B. Optimization Technique

CUMULATIVE CREDIT POINTS

2019 – 2023 Batch

A. B.Tech Course (Electronics & Communication Engineering)

SEMESTER	CREDIT POINTS FOR ALL SUBJECTS (EXCEPT MOOCs)
3.	25.5
4.	22
5.	22
6.	21
7.	21
8.	20
	TOTAL = 131.5

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.

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: ELECTRONIC DEVICES
SUBJECTCODE: PCCEC301

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 to understand the fundamentals of electrical and electronic circuits and working of basic electrical instruments and electronic components.

CO2: Student will be able to explain the working principle and operations of basic diode, BJT, JFET, MOSFET, different optoelectronic devices, different microwave devices etc. which are normally used in different electronic applications.

CO3: Student will be able to compare, analyze and find suitable applications within the different electronic and optoelectronic devices in different fields of electronics. **CO4:** Student will be to develop the understanding regarding application of elementary ideas of electrical and electronics in modern technology.

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
PCCEC 301.2.a	**Junctions and Contacts:** p-n junction:- operation and energy band diagram, junction capacitance and frequency limitation; tunnel diode, Zener diode and	6	L3 (Apply) L4	PO1,PO2, PO3, PO4, PO5,PO12

	breakdowns, Heterojunction:- operation and band diagram, Ohmic and Schottky contacts.		(Analyze)	

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT: ELCTRONIC DEVICES
SUBJECTCODE: PCCEC301

PCC EC 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
PCC EC 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
PCC EC 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
PCC EC 301.5	**Microwave Devices:** Structure, Operation:- PIN diode, Varactor diode, MESFET, HEMT, Charge Coupled Devices (CCD), Gunn Diode, IMPATT diode Characteristics,	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. 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.Ande

5. harya, "Semiconductor optoelectronic devices", Prentice Hall India

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT NAME – ANALOG ELECTRONIC CIRCUITS SUBJECT CODE: PCCEC302

Course Code: PCCEC302	**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.

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT NAME – ANALOG ELECTRONIC CIRCUITS SUBJECT CODE: PCCEC302

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

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,summingamplifier,Schmitttrigger, 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.
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.

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: SIGNALS AND SYSTEMS SUBJECT CODE: PCCEC304

Subject Code : PCCEC304	**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, ba-sic trigonometry. Calculus: Differential and Integral calculus (single variable). Knowledge of dif-ferential equations is helpful but not required.

Course Objective:

1. To explain signals and systems representations/classifications and also de-scribe the time and frequency domain analysis of continuous time sig-nals 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	8

	of signal space and orthogonal bases. Evolution of Transforms: Fourier Transform, Laplace Transform, Z-transform (single sided and Double sided).	

	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	Blooms Level
	Students will be able to:	
PCCEC 304.1	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 304.2	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 304.3	Ability to determine the response of a system for a given input using time domain and frequency domain techniques	L3 (Apply)
PCCEC	Ability to select the appropriate transform technique for the	L2

304.4	analysis of a given CT or DT system.	(Understand)

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT NETWORK THEORY SUBJECT CODE- (PCCEC303)

Subject Code : PCCEC303	**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	level Bloom's	PO (1..12) MAPPING
1 (**PCCEC303.1)**	**Network Theorems:** Basic nodal and mesh analysis, linearity, superposition and source transformation, power transfer theorem and useful circuit analysis techniques, Tallegen's theorem, network topology Thevinin's Theorem, Norton's and maximum	1,2,3,4	1,2,3
2 (**PCCEC303.2)**	**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-(PCCEC303)

3 (**PCCEC303.2)**	**LaplaceTransform 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 (**PCCEC303.3)**	**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 (**PCCEC303.4)**	**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 (**PCCEC303.4)**	**Graph Theory in Circuits:** and reduced Graph of a network - Incident incident matrices – Trees – Cutsets - 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., -Hill New Delhi,1994.
4. 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: MATHEMATICS AND STATISTICS- III SUBJECT CODE: BSC301

Subject Code : BSC301	**Category** : Theory
Subject Name :Mathematics and Statistics- III	**Semester** : 3rd
L-T-P: : 3-0-0	**Credit:** 3
Pre-Requisites: BSC-103, BSC-203	

Course Objective:

1. Identify different tools of differentiation and integration of functions of a complex variable that are used with various other techniques for solving engineering problems.
2. Illustrate the ideas of probability and random variables, various discrete and continuous probability distributions with their properties and their applications in physical and engineering environment.
3. Categorize statistical tools for analyzing data samplesand apply linear regression models in practice, and identify situation where linear regression is appropriate.
4. Interpret the ideas of bi-variate distributions with their properties and the applications in physical and engineering environment.

Course Outcomes:

CO1: Students will be able to solve problems involving steady state heat flow, electrostatics, magnetism, current flow etc. by transforming an irregular domain, where it is difficult to study behavior, of a complex function onto a domain, where the analysis becomes relatively simple. Also they will be able to evaluate some complicated real integrals and study the behavior of the functions near singularities.

CO2: Students will be able to store the records in hash table in Data Structure having the knowledge of hash functions for chaining and open addressing. They will be able to learn empirical listing of outcomes and probabilities obtained from a mathematical model representing some phenomenon of interest.

CO3: Students will learn 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.

CO4: Students will be able to predict how well their designs will perform to their specifications before moving on to full scale production of the designs.

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: MATHEMATICS AND STATISTICS- III SUBJECT CODE: BSC301

Course Contents:

Module No.	Description of Topic	Contact Hrs.	Blooms Level	PO (1-12) Mapping
1	**Calculus of Complex Functions:** Differentiation, Cauchy- equations, Riemann 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 Maximum-Modulus theorem (without proof); singulariti Residue theorem (without proof), Evaluation of definite integral involving sine and cosine functions, Evaluation of certain improper integrals using the Bromwich contour.	16	L2 (Understand) L3 (Apply) L5 (Evaluate)	PO1, PO2, PO3, PO5, PO10
2	**Random Variable & Probability Distributions :** 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.	12	L2(Understand) L3 (Apply) L4 (Analyze)	PO1, PO2, PO3, PO5, PO12
3	**Basic Statistics:** Measures of Central tendency and dispersion : Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parametersfor these three distributions, Correlation and regression Rank correlation.	8	L2(Understand) L3 (Apply) L4 (Analyze)	PO1, PO2, PO3, PO6
	Bi-variate Distributions:		L2	PO1,

4	Bi-variateprobability distributions and their properties,distribution ofsums and quotients, conditional densities, Bayes' rule.	4	(Understand) L3 (Apply)	PO2, PO3, PO4, PO5

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: MATHEMATICS AND STATISTICS- III SUBJECT CODE: BSC301

Books Recommended:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill,2004.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
6. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003(Reprint).
7. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
8. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
9. Lipschutz S., and Lipson M.L.: Probability (Schaum's Outline Series), TMH.
10. John E. Freund, Ronald E. Walpole, Mathematical Statistics, Prentice Hall.

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT ESSENTIAL STUDIES FOR PROFESSIONALS III SUBJECT CODE: HSMC302

Subject Code : HSMC302	**Category** : Theory
Subject Name : Essential Studies For Professionals - III	**Semester** : 3rd
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit:** 2

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 in FC & MP, both 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	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4

	Market & Capital Market, functions of Banks & Types of accounts, cheques & loans, Mutual Fund, Banking Terminologies..			

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 AND ANALOG CIRCUIT LABORATORY

SUBJECTCODE: PCCEC391

SubjectCode: PCCEC391	**Category** : Core Course
SubjectName:Electronic Devices & Analog Circuit 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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SUBJECT CODE: PCCEC391

4	**Characteristics Of Zener Diode & Load regulation:** a) To the Forward Bias and Reverse Bias Obtain 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

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: SIGNALS & SYSTEMS LAB SUBJECT CODE: (PCCEC394)

Subject Code : PCCEC394	**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

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.

INSTITUTE OF ENGINEERING & MANAGEMENT
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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 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, Thread Binary Tree, Binary Search Tree, AVL Tree,Tree operations on ed 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 resoluti on techniques **Text Book** (1), Chapter 15; **Text Book** (2), Chapter 9; **Text Book** (3),	**8**

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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	2

	& sorting techniques.	

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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	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

PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12
error detection and correction in linear block codes
PO
OEC-EC381.1
OEC-EC381.2
OEC-EC381.3
OEC-EC381.4

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

Subject Code : HSMC382	**Category** :
Subject Name : Skill Development Professionals - III	for **Semester** : 3rd
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit:**1

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

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)	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4

	Vocabulary.			

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 heterodynin principle, Intermediate g frequency, Local oscillator frequency, Image frequenc y	L2 (Understand) L3 (Apply) L4 (Analyse)	PO1, PO2, PO3, PO5, PO7, PO12	6
PCC-EC401	Review of probability and random process. Gaussian and white noise characteristics, Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-	L2 (Understand)	PO1, PO2, PO3, PO5,	6

A.3	emphasis and De- emphasis, Threshold effect in angle modulation		PO7, PO12	
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 of signals in noise, Coherent Detection Theory, Optimum	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 Hill Haykin S., "Communications Systems", John Wiley and Sons, 2001

3. Proakis J. G. and Salehi M., "Communication Systems Engineering", Pearson Education, 2002

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT DIGITAL SYSTEM DESIGN SUBJECT CODE: (PCCEC402)

Subject Code : PCCEC402	**Category**: Professional Core courses
Subject Name : Digital System Design	**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 SYSTEM DESIGN SUBJECT CODE: (PCCEC402)

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

4.Press, fifthedition.

orris Mano ,"Digital Design" , Pearson

5.- An introduction to Digital Electronics d practice", PHI, 2nd edition, 2006.

6. ll, "Digital Circuits and Systems", Tata McGraw Hill, 1989

7. Charles H. Roth and Lizy Kurian John second edition, Cenage Learning.

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 (Understand)	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 (Understand) 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	L1,L2,L3, L4 (Understand)	5

	L4- ARM microcontrollers interface design----- 2H .		

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 (AUTONOMOUS INSTITUTION) SUBJECT ENVIRONMENTAL SCIENCE
SUBJECT CODE- MCEC401

Subject Code : MCEC401	**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	4	PO1,PO2,P03,PO6,PO7

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

	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. [illegible]n 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	6	PO1,PO2,P03,PO6,PO7

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),

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION) SUBJECT ENVIRONMENTAL – SCIENCE

SUBJECT CODE- MCEC401

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

	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

(AUTONOMOUS INSTITUTION)

SUBJECT: MATHEMATICS IV (Probability Theory & Statistics)

SUBJECT CODE: BSC401

Subject Code :BSC401	**Category** : Theory
Subject Name :**Mathematics IV(Probability Theory & Statistics)**	**Semester** : 4th
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.

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)

SUBJECT: MATHEMATICS IV (Probability Theory & Statistics)
SUBJECT CODE: BSC401

Course Contents:

Module No.	Description of Topic	Contact Hrs.	Blooms Level
1	**Numerical Methods :** Solution of polynomial and transcendental equations Bisectionmethod, Newton-Raphson method and Regula-Falsi method. Finite differences, Relationbetween operators, backward difference formulae. Interpolation with Numerical Differentiation,Numerical and 3/8 th rules. Euler and modified - Kuttamethod of fourth order for solving first and 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, convolutiontheorem. 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,	**8**	**L3(Apply)L4(Analyze) L5 (Evaluate)**

	single mean, difference of means, and difference of standard deviations.		

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- HSMC402

Subject Code : HSMC402	**Category** : GSC
Subject Name : ESP-IV	**Semester** : 4th
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit:** 2
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)**	6	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO12
2.	**History** Modern History& National Movement.	12	L1 (Remember) L2 (Understand)	PO1,PO2, PO3,PO12

			L3 (Apply) L4 (Analyze)	

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT ESSENTIAL STUDIES FOR PROFESSIONALS - IV SUBJECT CODE- HSMC402

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: PYTHON PROGRAMMING (MOOCS 3)
SUBJECT CODE: MOOCs(ECE)421

Subject Code : MOOCs(ECE)421	**Category** : Engineering Sciences
Subject Name : Python Programming	**Semester** : 4th
L-T-P : **2-0-0**	**Credit: 2**
Pre-Requisites: Basic knowledge of Programming	

Course Objective:

1. Describe the core syntax and semantics of Python programming language.
2. Discover the need for working with the strings and functions.
3. Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
4. Indicate the use of regular expressions and built-in functions to navigate the file system and infer the Object-oriented Programming concepts in Python.

Course Contents:

Module No.	Description of Topic	Contact Hrs.	
1	**Introduction, Types, Operator & Control Statements** History, Features, Setting up path, Working with Python, Basic Syntax, Variable, Data and Operators, Conditional Statements: If, If-else, Nested if-else, Looping, For, While, Nested loops, Control Statements: Break, Continue, Pass.		10
2	**String Manipulation & Handling Functions** Accessing Strings, Basic Operations, String slices, Function and Methods, Defining & calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables.	10	
3	**Collection Data Types** Lists: Introduction, Accessing list, Operations, Working with lists, Function and Methods, Tuple: Introduction, Accessing tuples, Operations, Working, Functions and Methods	10	

	Dictionaries: Introduction, Accessing values in dictionaries, working with dictionaries and its properties Set: Set Methods, Traversing of Sets, Frozenset.	
4	**Modules & Exception Handling** Importing module, Math module, Random module, Packages, Composition, Input-Output, Printing on screen, Reading data from keyboard, Opening and closing file, Reading and writing files,	6

Functions, Exception, Exception Handling, Except clause, Try? Finally clause, User Defined Exceptions.

Books Recommended:

1. Gowrishankar S, Veena A, 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372.
2. Jake VanderPlas, 1st Edition, O'Reilly Media, 2016. ISBN-13: 978-1491912058.
3. Saroj Kaushik, Artificial Intelligence, Cengage Learning, 1st Edition 2011.
5. Yuxi (Hayden) Liu, "Python Machine Learning by Example", Packet Publishing Limited, 2017.
6. Tom Mitchell, Machine Learning, McGraw Hill, 2017.
7. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2011.
8. T. Hastie, R. Tibshirani, J. Friedman. The Elements of Statistical Learning, 2e,2011.

Course Outcomes:

Sl. No.	Description	Blooms Level
	Upon completion of the course, the students will be able to:	
MOOCs(ECE)421.1	Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements and handling operators.	Understand (L2)
MOOCs(ECE)421.2	Express proficiency in the handling of strings and functions.	Understand (L2)
MOOCs(ECE)421.3	Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, dictionaries, tuples and sets.	Apply (L3)
MOOCs(ECE)421.4	Identify the commonly used operations involving file systems & modules and articulate the Object-Oriented Programming concepts such as encapsulation, inheritance and polymorphism as used in Python.	Understand (L2)

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) SUBJECT DIGITAL SYSTEM DESIGN LABORATORY
SUBJECT CODE: PCCEC492

Subject Code : PCCEC492	**Category**: Professional Core courses
Subject Name : Digital System Design	**Semester** : 3rd
L-T-P : 3-0-0	**Credit:** 3
Pre-Requisites: Digital Electronics	

Course Objective:

1. To get practical experience with the different basic and universal gates.

2. To get practical experience of designing any logic circuit using basic gates and universal gates.

3. To learn hand on experience such that students can work as professionals in the area of Digital electronics and other Engineering fields.

Course Outcomes:

CO1: Students will have a thorough knowledge of different types of gates and simplification technique.

CO 2: After completing this course, the students will be able to analyze and design any combinational logic circuits.
CO 3: After completing this course, the students will be able to analyze and design any sequential logic circuits.

CO 4: They will be able to design and analyze different types of inverter circuits.

Course Content:

Module No.	Description of Topic	Blooms Level	PO (1..12) MAPPIG	Contact Hrs.
1(CO1)	Introduction to Digital Electronics Lab- Nomenclature of Digital ICs, Specifications.	L2,L3	8,9,12	**2**
2(CO1)	Study of the Data Sheet, Concept of Vcc and Ground, Verification of the Truth Tables of Logic Gates using TTL ICs.	L2,L3	8,9,12	**2**
3(CO1)	Implementation of the Given Boolean Functions using Logic Gates in Both SOP and POS Forms.	L2,L3, L4	8,9,12	**2**

			…5,	
4(CO1)	Simplification of logic functions using K Map and Boolean algebra and then design using basic gates and universal gates.	L2,L3, L4	…5, 8,9,12	**2**
5(CO2)	Design of Half adder and Full adder circuits and also subtractor design.	L2,L3, L4	8,9,12	**2**

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT DIGITAL SYSTEM DESIGN LABORATORY SUBJECT CODE: PCCEC492

6(CO2)	Design of BCD Adder using IC 7483.	L2,L3, L4	8,9,12 …5,	**2**
7(CO2)	Design of MUX and DEMUX using basic gates.	L2,L3, L4	8,9,12 …5,	**2**
8(CO2)	Implement logic functions like Adder, Substractor using MUX, ICs.	L2,L3, L4	8,9,12 …5,	**2**
9(CO3)	Design of R-S,J-K,D,T Flip flop using universal gates and also study master slave JK flip flop IC.	L2,L3, L4	8,9,12 …5,	**2**
10(CO3)	Design of synchronous and asynchronous counter using flip flop.	L2,L3, L4	8,9,12 …5,	**2**
11(CO4)	Simulation of MOS Inverter with different loads using SPICE software.	L2,L3, L4	8,9,12 …5,	**2**
12(CO4)	Simulation of CMOS Inverter for different parameters Kn, Kp as a design variable in suitable circuit simulator software.	L2,L3, L4	8,9,12 …5,	**2**
Total Hours:				**24**

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

4.Press, fifthedition.

orris Mano ,"Digital Design" , Pearson

5.- An introduction to theory Gothmann, Digital Electronics d practice", PHI, 2nd edition, 2006.

6. ll, "Digital Circuits and Systems", Tata McGraw Hill, 1989

7. Charles H. Roth and Lizy Kurian John second edition, Cenage Learning.

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: ital 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, 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-bit nos, BCD multiplication SUBROUTINE CALL,	2	L2 (Understand) L3 (Apply)
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.

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**:	4

	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	

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:** 1

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 th

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)

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
PCCE C501.1	**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	L2 (Understand) L4 (Analyse)	8

	charge and surface current, Boundary conditions at media interface.		

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,Losslessandlow-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 Application of 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: PECEC503

Subject Code : PECEC503	**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	10

	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	
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	Understand (L2)

	concepts of parallel processing architecture and interconnection network.	

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: INFORMATION THEORY&CODING SUBJECT CODE: ECELEC504A

Subject Code : ECELEC504A	**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: ECELEC504A

Course Outcomes:

S.NO.	DESCRIPTION	Blooms Level
	Students will be able to:	
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	12	L1 (Remember)	PO1,PO2,

	characteristics; Combinational circuit design: CMOS logic families including static, dynamic and dual rail logic; Sequential circuit design: design of latches and flip-flops; Delay		L2 (Understand) L3 (Apply) L4 (Analyze)	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	13

	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.	
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 normalizationprocess after designing the database using E-R Model and solve the given problem using	Apply (L3)

	Relational Algebra, Relational Calculus and SQL to design and manipulate a Database.	
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	12

	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;	

	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

2. **Huffman Code** – Greedy Algorithm

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

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT – ESSENTIAL STUDIES FOR PROFESSIONALS -V SUBJECT CODE: HSMC502

Subject Code : HSMC 502	**Category** : GSC
Subject Name : ESP-V	**Semester** : 5th
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit:** 2
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,	12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO12

	BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell; Integrated circuit fabrication				

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 L2 L3 L4	(Remember) (Understand) (Apply) (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 L2 L3 L4	(Remember) (Understand) (Apply) (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	10

	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.	
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

4		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. 8. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation 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.	10

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 and MANAGEMENT

(AUTONOMOUS INSTITUTION)

SUBJECT: Economics for Engineers
SUBJECTCODE: HSMC503

3.2												
HSMC503.3			1									2
HSMC503.4		2	2	1	3							2

** For Entire Course, PO Mapping; 1 (Low); 2(Medium); 3(High) Contribution to PO*

INSTITUTE OF ENGINEERING & MANAGEMENT

(AUTONOMOUS INSTITUTION)
SUBJECT: BASIC COURSE ON DATA SCIENCE USING STATISTICS
SUBJECT CODE: MOOCs (ECE)521

Subject Code : MOOCs(ECE)521	**Category** : MOOCs
Subject Name : **Basic Course on Data Science using Statistics**	**Semester** : 5th
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit:** 2

Pre-Requisites: R and Python programming, Statistical techniques, Data visualization, Machine learning

Course Objective:

1. To acquire in-depth understanding of the theoretical concepts in statistics and other advanced data science techniques.
2. To gain practical experience in programming for data sciences.
3. To strengthen the analytical and problem solving skill through developing real time applications.
4. To understand the theoretical background for handling, managing, analyzing and interpreting data.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	Introduction to data science, Exploratory data analysis, Linear regression and regularization, Model selection and evaluation.	10
2	Classification: KNN, decision trees, SVM; Ensemble methods: random forests, Naive Bayes and logistic regression.	8
3	Feature engineering and selection, Clustering: k-means, hierarchical clustering, and dimensionality reduction: PCA and SVD.	7
4	Text mining and information retrieval, Network Analysis, Recommender systems.	7

Books Recommended:

Textbooks:

5. James, G., Witten, D., Hastie, T., Tibshirani, R. An introduction to statistical learning with applications in R. Springer, 2013.
6. Han, J., Kamber, M., Pei, J. Data mining concepts and techniques. Morgan Kaufmann, 2011.

7. Hastie, T., Tibshirani, R., Friedman, J. The Elements of Statistical Learning, 2nd edition. — Springer, 2009.

Reference books:

1. Murphy, K. Machine Learning: A Probabilistic Perspective. - MIT Press, 2012.
2. F. Provost, T Fawcett, “Data Science for business”, 2013.

INSTITUTEOFENGINEERING & MANAGEMENT

(AUTONOMOUSINSTITUTION)
SUBJECT: BASIC COURSE ON DATA SCIENCE USING STATISTICS
SUBJECT CODE: MOOCs(ECE) 521

Course Outcomes:

Sl. NO.	DESCRIPTION	Blooms Level
	Students will be able to:	
MOOCs 521.1	**Understand** relevant programming.	L2 Understand
MOOCs 521.2	**Implement** proficiency with statistical analysis of data.	L3 Apply
MOOCs521.3	**Demonstrate** the ability to build and assess data-based models.	L3 Apply
MOOCs521.4	**Execute** statistical analyses with professional statistical software using the skill of data management.	L3 Apply

INSTITUTE OF ENGINEERING & MANAGEMENT

(AUTONOMOUS INSTITUTION)
SUBJECT: Cyber Security
SUBJECT CODE: MOOCs(ECE)522

Subject Code : MOOCs(ECE)522	**Category** : MOOCS
Subject Name : **Cyber Security**	**Semester** : 5th
L-T-P : 1-0-0 (Total Contact Hrs. 1)	**Credit:** 1

Pre-Requisites: Basics of Algebra and Number Theory.

Course Objective:

1. To understand the basics of Cyber security- Challenges and Constraints.
2. To understand the security concerns and vulnerabilities.
3. To familiarize with different types of Intrusion.
4. To create an awareness Cyberspace and the Law.
5. To analyze different types of investigations on cyber-crime.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Introduction to Cyber Security:** Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace.	6
2	**Cyber Security Vulnerabilities:** Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.	6
3	**Security Considerations, Challenges:** Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Intrusion, Physical Theft, Abuse of Privileges, Unauthorized	4

	Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software.	
4	**Cyber Forensics:** Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.	4

INSTITUTE OF ENGINEERING & MANAGEMENT

(AUTONOMOUS INSTITUTION)
SUBJECT: Cyber Security
SUBJECT CODE: MOOCs(ECE)522

Books Recommended:

1. William Stallings and Lawrie Brown, "Computer Security: Principles and Practice", Prentice Hall, 2008.
2. Joseph M Kizza, "Computer Network Security", Springer Verlag, 2005.

3. Thomas Calabres and Tom Calabrese, "Information Security Intelligence: Cryptographic Principles & Application", Thomson Delmar Learning, 2004.

Course Outcomes:

S.NO.	DESCRIPTION	Blooms Level
	Students will be able to:	
MOOCs522.1	**Understand** the need for comprehensive cyber security policy.	Understand (level 2)
MOOCs522.2	**Identify** vulnerabilities in software and threat management.	Knowledge (level 1)
MOOCs522.3	**Describe** basic security and challenges for different applications.	Knowledge (level 1)
MOOCs522.4	**Analyze** investigation on information hiding and tracing memory in real time.	Apply (level 3)

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 [ω−β 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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(AUTONOMOUS INSTITUTION)
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
(AUTONOMOUS INSTITUTION)
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:

1. **To develop an understanding of digital signals and signal processors.**
2. **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:** 1

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**	12	L1 (Remember) L2 (Understand)	PO1,PO2, PO3,PO4

	1) **Sentence Corrections** 2) Fill the **blanks** with appropriate words/articles/preposition/verbs/ad 3) verbs/conjunction. **Reading Comprehension** (Advance Level)		L3 (Apply) L4 (Analyze)		

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

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

	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

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

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:	12

	techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm,	

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

Application Layer
Introduction to DNS, SMTP, SNMP, FTP, HTTP & WW
Cryptography (Public, Private Key based), Digital Signat
Modern topics:
ISDN services & ATM, DSL technology, Cable Modem:
Operation in brief Wireless LAN: IEEE 802.11, Introduct
tooth. Intruders, Viruses and Worms: Intruders, Viruses a
threats. Fire Walls: Fire wall Design Principles, Trusted s

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

MAP

S.NO	PO 1	PO2	PO 3	PO4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
PCCEC6 02.1	3	2	1	1								
PCCEC6	3	3	2	2	1							

02.2												
PCCEC602.3	3	3	2	2	1							
PCCEC602.4	3	2	2	2								

** For Entire Course, PO Mapping; 1 (Low); 2(Medium); 3(High) Contribution to PO*

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT – INTRODUCTION TO MEMS
SUBJECT CODE- ECELEC603A

Subject Code : ECELEC603A	**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

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(AUTONOMOUS INSTITUTION)
SUBJECT – INTRODUCTION TO MEMS
SUBJECT CODE- ECELEC603A

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- ECELEC603B

Course Code: ECELEC603B	**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

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SUBJECT – POWER ELECTRONICS
SUBJECT CODE- ECELEC603B

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

INSTITUTE OF ENGINEERING & MANAGEMENT
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SUBJECT – POWER ELECTRONICS
SUBJECT CODE- ECELEC603B

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 - ECELEC603C

Subject Code : ECELEC603C	**Category** : Program Elective - 2
Subject Name : Nanoelectronics	**Semester** : 6th
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	12	L1(Remember) L2(Understand) L4(Analyse)	PO1,PO2, PO3,PO12

	Theory of Solids. Kronig-Penny Model. Brillouin Zones.			
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: OECEC604A

Subject Code: OECEC604A	**Category** : Open Elec.
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	1

		book (DHS)	
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

INSTITUTE OF ENGINEERING & MANAGEMENT
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PROPOSED SYLLABUS
SUBJECT: MACHINE LEARNING

SUBJECTCODE: OECEC604A

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: OECEC604A

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: OECEC-604B

Subject Code : OECEC604B	**Category** : Open Elec.
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,	8

	Paging, Segmentation, Virtual memory concept, Demand paging, Performance, Page replacement algorithms, Allocation of frames, Thrashing.	

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	Understand (L2)

	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.	
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-HSMC602

Subject Code : HSMC602	**Category** :
Subject Name : ESP-VI	**Semester** : 6th
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit:** 2
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

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) PO1,PO2, L2 (Understand) PO3,PO12 L3 (Apply) L4 (Analyze)	

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**

INSTITUTE OF ENGINEERING & MANAGEMENT
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SUBJECT – CONTROL SYSTEM LABORATORY

SUBJECT CODE: PCCEC691

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.

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

Course Outcomes:

S.NO.	DESCRIPTION	Blooms Level
	Students will be able to:	
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

Category: Professional Core Courses
Semester : 6th

INSTITUTE OF ENGINEERING & MANAGEMENT AUTONOMOUS INSTITUTION SUBJECT – ELECTRONIC MEASUREMENT LABORATORY SUBJECT CODE-PCCEC694

Course Code: PCCEC694

Course Title: Electronic Measurement Laboratory

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

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SUBJECT – ELECTRONIC MEASUREMENT LABORATORY
SUBJECT CODE-PCCEC694

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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SUBJECT CODE-PCCEC694

8	Error compensation study using Numerical analysis using MATLAB (regression).	L2 (Remember) 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.

INSTITUTE OF ENGINEERING & MANAGEMENT
AUTONOMOUS INSTITUTION
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:** 1

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,	12	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO4

	Quadratic Equations 4)Permutations & Combinations, Probability, Geometry, Mensuration 5)Data Interpretation, Various Charts, Diagrams, Tables			

INSTITUTE OF ENGINEERING & MANAGEMENT
AUTONOMOUS INSTITUTION
SUBJECT – SKILL DEVELOPMENT FOR PROFESSIONALS - VI
SUBJECT CODE-HSMC682

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

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: MICROWAVE THEORY AND TECHNIQUE SUBJECT CODE: PECEC701A

Subject Code: PECEC701A	**Category:** Program Elective-3
Subject Name: Microwave Theory and Technique	**Semester:** 7th
L-T-P: 3-0-0 (Total 40 Hrs.)	**Credit:** 3

Pre-Requisites: Mathematics, Electromagnetic Waves

COURSE OBJECTIVES:

COE1. To learn about different microwave system components and their properties.

COE2. To learn about various modes of microwave transmission and network analysis.

COE3. To obtain knowledge on passive and active microwave devices along with microwave antenna.
COE4. To learn about microwave measurement techniques and microwave design principles for practical applications.

COURSE OUTCOMES:

At the end of the course, students will demonstrate the ability to:

CO1. Remember the concepts of EM waves, transmission line, microwave frequency ranges and applications of microwaves

CO2. Understand the concepts of various microwave transmission modes, working principles of various microwave devices, system components and their properties.

CO3. Apply the working principles of various microwave components for designing microwave systems.

CO4. Analyze the S-matrix to study the microwave transmission inside the microwave components.
CO5. Measurement of the microwave frequencies, noise, impedance, power using VSWR, Frequency meter, slotted line, Network analyzer.

CO6. Design of a unique microwave system using software.

COURSE CONTENT:

Module No. and CO Mapping	Description	Hours	Bloom's Level	PO Mapping
Module 1: (PECEC701A.1, PECEC701A.2)	**Introduction to Microwaves:** History of Microwaves, Microwave Frequency bands; Applications of Microwaves: Civil and Military, Medical, EMI/ EMC. **Brief introduction of EM waves:** wave equations, solution of wave equation, time	**1**	**1, 2**	**1, 12**

	harmonic fields. Distortion and Condition for minimum attenuation,			

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: MICROWAVE THEORY AND TECHNIQUE SUBJECT CODE: PECEC701A

Module 2: (PECEC701A.2 PECEC701A.4)	**Microwave Transmission Modes, Waveguides, Transmission Lines:** Concept of Mode, Features of TEM, TE and TM Modes, Brief introduction of transmission lines, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission.Coaxial line, Rectangular Waveguide, Cavity Resonator, Circular waveguide, Strip line, Micro strip line.	**8**	**2, 4**		**1,2,3,4,5**
Module 3: (PECEC701A.2 PECEC701A.4)	**Microwave Passive Components and their S-matrix Representation:** Equivalent voltages and currents for non-TEM lines, Network parameters for microwave circuits, Scattering Parameters. Isolator, Circulator, Gyrator, Directional Coupler, Power Divider, Magic Tee, Attenuator, Resonator.	**4**	**2, 4**		**1,2,3,4,5**
Module 4: (PECEC701A.2)	**Microwave Vacuum Tubes:** Klystron, Reflex Klystron, TWT, Magnetron, **Microwave Semiconductor Devices:** Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes.	**5**	**2**		**1, 2, 12**
Module 5: (PECEC701A.2 PECEC701A.3 PECEC701A.4)	**Microwave Design Principles:** Impedance Matching, Microwave Filter, RF and Microwave Amplifier, Microwave Power Amplifier, Low Noise Amplifier, Microwave Mixer, Microwave Oscillator.	**4**	**2,3,4**		**3, 4, 5, 12**
Module 6: (PECEC701A.4 PECEC701A.5)	**Microwave Measurements:** VSWR meter, Tunable detector, Slotted line and Probe detector, Frequency meter, Power, Frequency and impedance measurement at microwave frequency. Network Analyzer and measurement of scattering parameters, Spectrum Analyzer and measurement of spectrum of a microwave signal, Noise at microwave frequency and measurement of noise figure. Measurement of Microwave antenna parameters.	**5**	**4, 5**		**3, 4, 5, 12**
Module 7: (PECEC701A.2)	**Microwave Systems:** Introduction to EMI & EMC.	**6**	**2**		**1, 2, 12**
Module 8: (PECEC701A.3 PECEC701A.6)	**Software Session:** Power Divider, Hybrid Coupler, microwave propagation.	**4**	**3, 6**		**1, 5, 12**

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: MICROWAVE THEORY AND TECHNIQUE SUBJECT CODE: PECEC701A

Text/Reference Books:

1) R.E. Collins, Microwave Circuits, McGraw Hill

2) K.C. Gupta and I.J. Bahl, Microwave Circuits, Artech House

3) Kulkarni M, Microwave and Radar Engineering, UMESH Publications

4) David, M. Pozar, Microwave Engineering, Wiley India

5) Monojit Mitra, Microwave Engineering, Publisher: Dhanpat Rai

Program Outcomes (PO)

Engineering graduates will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: MICROWAVE THEORY AND TECHNIQUE SUBJECT CODE: PECEC701A

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

BLOOM'S LEVEL:

Level	Descriptor	Level of attainment
1	Remembering	Recalling from the memory of the previously learned material
2	Understanding	Explaining ideas or concepts
3	Applying	Using the information in another familiar situation
4	Analysing	Breaking information into the part to explore understandings and relationships
5	Evaluating	Justifying a decision or course of action
6	Creating	Generating new ideas, products or new ways of viewing things

Mobile Communication and Networks

Subject Code: **PECEC 702A**	**Category**: Program Elective Paper
Subject Name: Mobile Communication and Networks	**Semester** : 7th
L-T-P : 3-1-0 (Total Contact Hrs. 32)	**Credit:** 3

Pre-Requisites: Analog Communication systems, Digital Communication systems

COURSE OBJECTIVES:

- An understanding on functioning of different mobile communication system and evolution of different mobile communication systems and standards.

- An ability to explain the architecture, functioning, protocols, capabilities and applications of various mobile communication networks.

Course Contents:

Module No.	Description	CO	Lecture Hours
1	Cellular Mobile Wireless Networks: Systems and Design Fundamentals: Brief introduction to mobile wireless communication and systems, Description of cellular system, Cellular Structure, Frequency Reuse, Cell clustering, Capacity enhancement techniques for cellular networks, cell splitting, antenna sectoring, Co-channel and Adjacent channel interferences, Channel assignment schemes – Fixed channel, Dynamic channel and Hybrid channel, mobility management – location management and handoff management, handoff process, different types of handoff.	CO1	3
2	Characteristics of wireless channel and propagation path loss models: Different Multi-path propagation mechanisms, Multi-path effects on mobile communication, Fading, different types of fading, small and large scale fading, slow and fast fading, narrowband and wideband fading, Inter symbol interference, fast fading model, Doppler effect due to velocity of mobiles, Rayleigh envelop, free space propagation model, two ray ground reflection model, log distance path loss model, log normal shadowing model, macro and micro cell propagation models, types of base stations and mobile station antennas.	CO2	8
3	Path of evolution of cellular communication system architecture-1G, 2G, 3G, 4G and 4G beyond.	CO3	2
4	Multiple Access Technologies in cellular communication Time division multiple access (TDMA), narrowband and wideband TDMA, synchronous and asynchronous TDMA,	CO4	4

	Frequency division multiple access (FDMA), Code Division Multiple Access (CDMA), Direct sequence CDMA, spread spectrum technique, spectral efficiency of different		

	wireless access technologies: Spectral Efficiency in FDMA system, Spectral Efficiency in TDMA system, Spectral Efficiency for DS-CDMA system		
5	Cellular Communication Networks and Systems Second generation (2G) Network: Global system for mobile communication (GSM): Architecture and Protocols Air Interface, GSM spectrum, GSM Multiple Access Scheme, GSM Channel Organization, Traffic Channel multi-frame, Control (Signaling) Channel Multi-frame, Frames, Multi-frames, Super frames and Hyper-frames, GSM Call Set up Procedure, Location Update Procedure, Routing of a call to a Mobile Subscriber	CO5	4
6	Wireless Local Area Networks (WLAN): IEEE 802.11 Standards and Protocols IEEE 802.11 standards, WLAN family, WLAN transmission technology, WLAN system architecture, Collision Sense Multiple Access with Collision Detection (CSMA/CD) and CSMA collision avoidance (CSMA/CA), Frequency Hopping Spread Spectra, 802.11 PHY and MAC layers, IEEE 802.11	CO6	4
7	Wireless Broadband Networks and Access Evolution of broadband wireless, IEEE 802.16 standards: WiMAX , Spectrum Allocation, IEEE 802.16 Standard Architecture, Overview of WiMAX PHY, IEEE 802.16 MAC Layer.	CO6	2
8	Key Enablers for LTE features: OFDM, Single carrier FDMA, Multi-antenna techniques, LTE Network Architecture, Non-orthogonal multiplexing access.	CO6	5

Course Outcome:

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

COURSE OUTCOME (CO)	DESCRIPTION	Blooms Level
ECELEC702A.1	Demonstrate their understanding on functioning of wireless mobile communication system and evolution of different mobile communication systems and standards.	L1, L2 Remember and Understand
ECELEC702A.2	Explain the architecture and application of various mobile communication networks	L2, L3 Understand and Apply
ECELEC702A.3	Demonstrate an ability to evaluate design challenges, constraints and security issues associated with wireless networks.	L2, L3 Understand and Apply
ECELEC702A.4	Demonstrate an ability to explain multiple access techniques for Wireless mobile communication	L1, L2, L3 Remember,Understand and Apply
ECELEC702A.5	Apply the concept of GSM in real time	L1, L2, L3

	applications	

		Remember, Understand and Apply
ECELEC702A.6	Explain the wireless communication protocols and their application	L1, L2, L3 Remember, Understand and Apply

Learning Resources:

1. TheodoreS.Rappaport,Wirelesscommunications:principlesandpractice,PHI/Pearsoneducation.
2. J.Schiller,Mobilecommunications,Addison-Wesley.
3. William C.Y.Lee, Mobile cellular telecommunication–analog and digital systems, Mc Graw Hill,2nded.
4. Wang,WirelesscommunicationSystem,PearsonEducation
5. Talukdar, Mobile computing,TMH
6. J.W.Mark,W.Zhuang,Wireless Communication and Networking,PHI
7. Stallings,Wireless Communication & Networks, Pearson Education
8. K. Feher,Wireless digital communications, Prentice Hall of India.
9. Roy Blake, Wireless communication technology, Thomson Delmer.

INSTITUTE OF ENGINEERING & MANAGEMENT

(AUTONOMOUS INSTITUTION)

SUBJECT – EMBEDDED SYSTEM

SUBJECT CODE: PECEC701B

Subject Code : PECEC701B	**Category** : Program Elective-
Subject Name :Embedded System	**Semester** : 7th
L-T-P : 3-0-0	**Credit: 3**
Pre-Requisites: Microcontrollers	

Course Objective:

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

1. Design of embedded based system
2. Do interfacing design of peripherals like, I/O, A/D, D/A, timer etc.
3. Understanding RSIC processors and ARM microcontroller based system design

Course Outcome:

COE1: To learn Embedded systems

COE2: To learn different parallel and serial interfacing

COE3: To interrupts

COE4: To learn embedded soft-wares

COE5: To know interfacing with real time operating systems

COE6: Basic concept of advanced processor

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SUBJECT – EMBEDDED SYSTEM

Course Content:

Module No.	Description of Topic	Blooms Level	PO (1..1 MAPPIN	Contact Hrs.
1	L1- **Components of Embedded:** System, Brief introduction to Embedded software in system, Design Process in Embedded System.-5H L2- **Embedded Hardware:** Processor & Memory: Brief overview of 8051 Architecture and real world interfacing,--3H L3- **Introduction to advanced Processor Architectures:** ARM, Processor and Memory organization, Parallelism in instruction level, Processor and memory selection.-2H	L1 (Remember) L2,L3 (Understand)	PO1, PO2, PO3, PO4,	10
2	**I/O Types:** L1- Serial and Parallel communication Ports. -2H L2 Timer and Counting devices.-2H L3- Real time clock-1H L4- Serial bus Communication Protocols- I2C, CAN ---- 2H L5- Parallel Communication Protocol ISA. –1H .	L1,L2,L3,L4,L5 (Apply)	PO1, PO2, PO3, PO4,	8
3	L1- **Interrupt Service Mechanism**: Concept of ISR, different interrupt sources, Interrupt handling Mechanism, Multiple Interrupts, Interrupt Latency and deadline.-3H	L1 (Apply)	PO1, PO2, PO3, PO4,	3
4	L1-**Embedded Software Development**: Programming concept in ALP (assembly language programming) and High level language-C, Processor directives, functions and macros and other programming elements, Embedded C++ concept only.--3H	L1 (Understand)	PO1, PO2, PO3, PO4,	3

	-			

5	**L1-RTOS (Real time operating System)-** OS overview, Process, Interrupt and memory management, RTOS overview, Basic Design rule using RTOS, Task scheduling using Priority based scheduling, cyclic scheduling and round robin scheduling.—4H	L1 (Apply)	PO1, PO2, PO3, PO4,	4
6	**L1-Embedded system Design using PIC microcontroller:** Introduction to Microchip PIC16 family, PIC16F873- 2H	L1 (Understand)	PO1, PO2, PO3, PO4,	2
Total Hours:				30

Learning Resources:

1. Microcontrollers Theory and Application, Ajay V. Deshmukh, TMH, 2011.
2. Embedded Systems: Architecture, Programming & Design, Raj Kamal, TMH, 2011319
3. Embedded System Design: A unified Hardware/ Software Introduction, by Frank Vahid,Willey, 2011.
4. Design with PIC Microcontrollers , J. B. Peatman, Pearson India,2008

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SYLLABUS
SUB – MIXED SIGNAL DESIGN (PECEC702B)

Subject Code : PECEC702B	**Category** : Program Elective - 4
Subject Name : Mixed Signal Design	**Semester** : 7th
L-T-P : 3-0-0 (Total Contact Hrs. 3)	**Credit:** 3
Pre-Requisites: Analog Electronic Circuits	

Course Objective:

1.To know what is mixed signal design and how it is different from analog and digital design

2.To know about different mixed signal circuits that are present in modern VLSI chips

3.To know the different issues that come into play when designing mixed signal circuits in sub-micrometer nodes.

Course Outcomes:

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

1. Know about analog and discrete-time signal processing and filters
2. Know about switched capacitor circuits and filters
3. Know about different data converter topologies
4. Know about different issues in mixed signal layout
5. Know about different frequency synthesizers
6. Do industry level projects on mixed signal design

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1.	Analog and discrete-time signal processing, introduction to sampling theory; Analog continuous-time filters: passive and active	7	L1(Remember) L2(Understand) L3(Apply)	PO1,PO2, PO3,PO12

	filters; Basics of analog discrete-time filters		L4(Analyse) L5(Evaluate)		

	and Z-transform		L6(Create)	
2.	Switched-capacitor filters – Non-idealities in switched-capacitor filters; Switched-capacitor filter architectures; Switched-capacitor filter applications.	6	L1(Remember) L2(Understand) L3(Apply) L4(Analyse) L5(Evaluate) L6(Create)	PO1,PO2, PO3,PO12
3.	Basics of data converters; Successive approximation ADCs, Dual slope ADCs, Flash ADCs, Pipeline ADCs, Hybrid ADC structures, High-resolution ADCs, DACs and their different topologies.	8	L1(Remember) L2(Understand) L3(Apply) L4(Analyse) L5(Evaluate) L6(Create)	PO1,PO2, PO3,PO12
4.	Mixed-signal layout, Interconnects and data transmission; Voltage-mode signalling and data transmission; Current-mode signalling and data transmission	6	L1(Remember) L2(Understand) L3(Apply) L4(Analyse) L5(Evaluate) L6(Create)	PO1,PO2, PO3,PO12
5.	Introduction to frequency synthesizers and synchronization; Basics of PLL, Analog PLLs; Digital PLLs; DLLs	7	L1(Remember) L2(Understand) L3(Apply) L4(Analyse) L5(Evaluate) L6(Create)	PO1,PO2, PO3,PO12

Learning Resources:

Text Books:

1. Analog Integrated Circuit Design (second edition) – D. Johns and K. Martin (Wiley)

2. CMOS Mixed-Signal Circuit Design (second edition) – R. Jacob Baker (Wiley)

3. CMOS circuit design, layout and simulation (Revised second edition) R. Jacob Baker (IEEE press, 2008)

1. Phase Locked Loops (sixth edition) – Roland .E. Best (McGraw Hill)

2. RF Microelectronics (second edition) Behzad Razavi (Prentice Hall)

3. Design of Analog CMOS Integrated Circuits (second edition) Behzad Razavi (Tata McGraw Hill)
4. CMOS Analog Circuit Design (second edition) Phillip E. Allen and Douglas R. Holberg (Oxford)

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: SATELLITE COMMUNICATION SUBJECT CODE: PECEC703A

Subject Code: PECEC703A	**Category:** Program Elective-5
Subject Name: Satellite Communication	**Semester:** 7th
L-T-P: 3-0-0 (Total 31 Hrs.)	**Credit:** 3
Pre-Requisites: Mathematics, Communication	

COURSE OBJECTIVES:

COE1. To learn about brief architecture and various roles of subsystems in satellite communication.

COE2. To learn about orbital equations to solve numerical problems related to orbital motion.

COE3. To obtain knowledge on various signal modulation schemes used in satellite communication.

COE4. To learn about various satellite communication phenomena and signal power calculation process.

COURSE OUTCOMES:

At the end of the course, students will demonstrate the ability to:

CO1. Remember the concepts of various modulation techniques and multiple access schemes like CDMA, TDMA, FDMA etc.

CO2. Understand the working principles of satellite communication, orbital mechanics, various launch vehicles, satellite links and various phenomena of satellite communications.

CO3. Apply the concepts of orbital mechanics and principle of launch vehicles for designing a satellite communication network.

CO4. Analyze the satellite link design for betterment of the satellite communication network.
CO5. Evaluate the orbital period, angular velocity, satellite link budget, noise power of satellites.
CO6. Create a unique satellite communication network

COURSE CONTENT:

Module No. and CO Mapping	Description	Hours	Bloom's Level	PO Mapping
Module 1: (PECEC703A.2)	**Introduction to Satellite Communication:** Principles and architecture of satellite Communication, Brief history of Satellite systems,advantages, disadvantages, applications and frequency bands used for satellite communication.	**3**	**2**	**1, 2**
Module 2:	**Orbital Mechanics:**	**4**	**2,3,4,5**	**1,2,3**

(PECEC703A.2 PECEC703A.3 PECEC703A.4 PECEC703A.5)	Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day.			

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: SATELLITE COMMUNICATION SUBJECT CODE: PECEC703A

Module 3: (PECEC703A.2) PECEC703A.3)	**Launch Vehicles**: Launch Vehicles- principles of Rocket propulsion, powered flight, Launch vehicles for communication satellite. **Satellite sub-systems:** Satellite sub-systems, redundancy of sub-system, Bathtub curve and satellite link design- AOCS, TT&C, power system, spacecraft antenna, transponder.	**5**	**2, 3**	**1,2,3**
Module 4: (PECEC703A.2)	**Typical Phenomena in Satellite Communication:** Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift phenomena and expression for Doppler shift.	**5**	**2**	**1, 3**
Module 5: (PECEC703A.3 PECEC703A.4 PECEC703A.5)	**Link Design for Satellites:** RF Link, Friis transmission equation, G/T ratio of earth station Drafting of satellite link budget and C/N ratio calculations in clear air and rainy conditions, Calculation of System noise temperature for satellite receiver, noise power calculation.	**6**	**3,4,5**	**2,3,5**
Module 6: (PECEC703A.1 PECEC703A.2)	**Modulation and Multiple Access Schemes:** Various modulation schemes used in satellite communication, Meaning of Multiple Access, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.	**5**	**1, 2**	**1,3,5**
Module 7: (PECEC703A.2 PECEC703A.3 PECEC703A.6)	**Satellite Networks:** Low Earth Orbit (LEO) Satellite Networks, Geostationary (GEO) Satellite Networks,	**1**	**2,3,6**	**2,3,5**

Text/Reference Books:

1. Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications: Wiley India. 2nd edition 2002

2. Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill, 2009

3. Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill,2009

Program Outcomes (PO)

Engineering graduates will be able to:

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: SATELLITE COMMUNICATION SUBJECT CODE: PECEC703A

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: SATELLITE COMMUNICATION SUBJECT CODE: PECEC703A

BLOOM'S LEVEL:

Level	Descriptor	Level of attainment
1	Remembering	Recalling from the memory of the previously learned material
2	Understanding	Explaining ideas or concepts
3	Applying	Using the information in another familiar situation
4	Analysing	Breaking information into the part to explore understandings and relationships
5	Evaluating	Justifying a decision or course of action
6	Creating	Generating new ideas, products or new ways of viewing things

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUB – INTERNET OF THINGS (IOT) SUBJECT CODE: OECEC704A

Subject Code : OECEC704A	**Category** : Open Elective-3
Subject Name : **Internet of Things(IoT)**	**Semester** : 7th
L-T-P : 3-0-0	**Credit: 3**

Pre-Requisites: Pre-Requisite: Sensors & Actuators, Microcontrollers, Basic programming knowledge

Course Objective:

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

1.Able to understand the application areas of IOT
2. Able to understand building blocks of Internet of Things and characteristics
3. Able to realize the revolution of Internet in Mobile Devices & Sensor Networks

Course Outcome: At the end of the course, the students will be able to:

1. Understand the application areas of IOT.

2. Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.

3. Understand building blocks of Internet of Things and characteristics.

4. Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

5. Building state of the art architecture in IoT.

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUB – INTERNET OF THINGS (IOT) SUBJECT CODE: OECEC704A

Course Content:

Module No.	Description of Topic	Blooms Level	PO (1..1 MAPPI	Contact Hrs.
1	Introduction to IoT, Concept of Smart sensors and actuators	(Remember)	PO1, PO2, PO3, PO4,	6
2	L1- Basic of IoT networking Internet Communications: An Overview MQTT, CoAP, REST Api and gRPC, Different Communication protocols :(RFID, IEEE 802.15.4, Zigbee, 6LoWPAN, Bluetooth), LoRa, Machine-to-Machine (M2M) Communications, MQTT Broker	(Apply)	PO1, PO2, PO3, PO4,	3
3	L1-Introduction to Python programming with IoT modules .	(Apply)	PO1, PO2, PO3, PO4,	6
4	Introduction to Arduino Programming, integration of Sensors having analog and i2c. Connecting Arduino with ESP8266 WiFi module	(Apply)	PO1, PO2, PO3, PO4,	6
5	Introduction to Python Raspberry Pi, Implementation of IoT with Raspberry Pi.	(Apply)	PO1, PO2, PO3, PO4,	6
6	IoT application: Smart Cities and Smart Homes	(Apply)	PO1, PO2, PO3, PO4,	3
	Total Hours:			30

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUB – INTERNET OF THINGS (IOT) SUBJECT CODE: OECEC704A

Learning Resources

Text books:

1. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley publication, 1st Edition, November 2013.

2. Jeeva Jose, Internet of Things, Khanna Publishing House, New Delhi (AICTE Recommended – 2018)

3. Michale Miller, "The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities Are Changing the World", PearsonEducation

4. Hanes David ,Salgueiro Gonzalo, Grossetete Patrick, Barton Rob ,"IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things", Pearson Education

5. RMD Sundaram Shriram, K Vasudevan, Abhishek S Nagarajan,"Internet of Things" ,Wiley publication,

Reference books:

1. Yasuura, H., Kyung, C.-M., Liu, Y., Lin, Y.-L., Smart Sensors at the IoT Frontier, Springer International Publishing

2. Kyung, C.-M., Yasuura, H., Liu, Y., Lin, Y.-L., Smart Sensors and Systems, Springer

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SYLLABUS
SUB – ADAPTIVE SIGNAL PROCESSING (PECEC 703B)

Subject Code : PECEC 703B	**Category** : Program Elective Course
Subject Name : ADAPTIVE SIGNAL PROCESSING	**Semester** : 7th
L-T-P : 3-0-0 (Total Contact Hrs. 3)	**Credit:** 3

Pre-Requisites: Signals and Systems, Digital Signal Processing

Course Outcomes:

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

1. Comprehend design criteria and modeling adaptive systems and theoretical Performance evaluation.
2. Design a linear adaptive processor.
3. Apply mathematical models for error performance and stability.
4. Apply adaptive modeling systems for real time applications.
5. Comprehend the estimation theory for linear systems and modeling algorithms.
6. Design based on Kalman filtering and extended Kalman filtering.

Course Content:

Complex-Valued Adaptive Signal Processing: Optimization in the Complex Domain, Widely Linear Adaptive Filtering, Nonlinear Adaptive Filtering with Multilayer Perceptrons, Complex Independent Component Analysis **(L1, L2)**

Robust Estimation Techniques for Complex-Valued Random Vectors: Statistical Characterization of Complex Random Vectors, Complex Elliptically Symmetric (CES) Distributions, Tools to Compare Estimators, Scatter and PseudoScatter Matrices Array Processing Examples, MVDR Beamformers Based on M-Estimators **(L1, L2, L3, L4)**

Turbo Equalization: Communication Chain, Turbo Decoder: Overview, Forward-Backward Algorithm **(L1, L2, L3, L4, L5)**

Simplified Algorithm: Interference Canceler, Capacity Analysis, Blind Turbo Equalization, Convergence, Multichannel and Multiuser Settings **(L1, L2, L4)**

Subspace Tracking for Signal Processing: Linear Algebra Review, Observation Model and Problem Statement, Oja's Neuron, Subspace Tracking, Eigenvectors Tracking, Convergence and Performance Analysis Issues **(L1, L2, L5, L6)**

Particle Filtering: The Basic Idea, The Choice of Proposal Distribution and Resampling, Some Particle Filtering Methods, Handling Constant Parameters, Rao–Blackwellization, Prediction, Smoothing **(L1, L2, L4, L5)**

INSTITUTE OF ENGINEERING & MANAGEMENT
(AUTONOMOUS INSTITUTION)
SYLLABUS
SUB – ADAPTIVE SIGNAL PROCESSING (PECEC 703B)

Text Books

1. Simon Haykins, “Adaptive Filter Theory”, Pearson Education, Fifth Edition, 2013.

Resources

1. Todd K. Moon, Wynn C. Stirling, “Mathematical Methods and Algorithms for Signal Processing” Prentice Hall, First edition, 1999.

2. John. R. Triechler, C. Richard Johnson (Jr), Michael. G. Larimore, “Theory and Design of Adaptive Filters”, Prentice Hall India Private Limited, 2004

3. Bernard Widrow and Samuel. D. Stearns, “Adaptive Signal Processing”, Pearson Education, 2001.

INSTITUTE OF ENGINEERING & MANAGEMENT

(AUTONOMOUS INSTITUTION)

SUBJECT: SOFTWARE ENGINEERING

SUBJECT CODE: (OEC-EC-704B)

Subject Code : OEC-EC-704B	**Category : Open Elective-3**
Subject Name :Software Engineering Systems	**Semester : 7th**
L-T-P : 3-0-0	**Credit: 3**

Pre-Requisites: C and Data structure, Discrete mathematics

Course Objective:

1. To understand system analysis, design and business system concept.

2. To describe the process of software engineering, the technologies used for software engineering, and configuration management of software engineering.

3. To learn the basic software testing strategy.

4. To explain project management, risk management, managing people, teamwork, and configuration management

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Overview:** **Overview of System Analysis & Design , Business System Concept,** **System Development Life Cycle, Waterfall Model , Spiral Model,** **Feasibility Analysis, Technical Feasibility, Cost- Benefit Analysis,** **COCOMO model.**	10
2	**System Design :** **Context diagram and DFD, Problem Partitioning, Top-Down And** **Bottom-Up design; Decision tree, decision table and structured** **English; Functional vs. Object- Oriented approach.**	5
3	**Coding & Documentation :**	12

	Structured Programming, OO Programming, Information Hiding, **Reuse, System Documentation.** **<u>Testing:</u>** **Levels of Testing, Integration Testing, Test case Specification,** **Reliability Assessment, Validation & Verification**	
4	**<u>Software Project Management:</u>** **Project Scheduling, Staffing, Software Configuration Management, Quality Assurance, Project Monitoring.** **<u>System Modelling:</u>** **Static and dynamic models, why modelling, UML diagrams: Class diagram, interaction diagram: collaboration diagram, sequence diagram, state chart diagram, activity diagram, and implementation diagram.**	**10**

INSTITUTE OF ENGINEERING & MANAGEMENT

(AUTONOMOUS INSTITUTION)

SUBJECT: SOFTWARE ENGINEERING

SUBJECT CODE: (OEC-EC-704B)

Books Recommended:

1. Pressman, Software Engineering : A practitioner's approach– (TMH)
2. Pankaj Jalote, Software Engineering- (Wiley-India)
3. N.S. Gill, Software Engineering – (Khanna Publishing House)
4. Rajib Mall, Software Engineering- (PHI)
5. Agarwal and Agarwal, Software Engineering – (PHI)
6. Sommerville, Software Engineering – Pearson 7. Martin L. Shooman, Software

Course Outcomes:

Sl. No.	Description	Blooms Level
	Upon completion of the course, the students will be able to:	
OEC-EC-704B.1	Explore the various types of software process and their life cycle.	Understand(L2)
OEC-EC-704B.2	Elaborate the importance and stages of software development.	Understand (L2)
OEC-EC-704B.3	Explore the significance of software testing.	Understand (L2), Level 3(apply)
OEC-EC-704B.4	Apply the knowledge, techniques, and skills in the development of a software product.	Level 3(apply)

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SYLLABUS

SUB – ESSENTIAL STUDIES FOR PROFESSIONALS –VII (HSMC702)

Subject Code :HSMC 702 **Category : Sessional**

Subject Name :ESP-VII **Semester : 7th**

L-T-P : 2-0-0 (Total Contact Hrs. 2) **Credit: 2**

Pre-Requisites: Basics Physics

Course Objective:

1. To learn about the Basic of control systems and their applications for professional exams

2. To learn about fundamentals of communication engineering for various exams

3. To learn about various steady state and transient analysis of the systems for professional exams

4. To learn about advance systems of communication for various exams

Course Outcomes:

At the end of the course the students will be able

1. To develop an understanding of Basic of control systems.

2. To learn basic communication process and their applications in devices.

3. To understand steady state and transientstates of devices and their effects.

4. To use advance systems of communication and understand their operating principles.

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1.	Communication systems Random processes: autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems;	18	L1 (Remember) L2 (Understand) L4 (Analyze)	PO1,PO2, PO3,PO12

Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers, circuits for analog communications; Information theory: entropy, mutual information and channel capacity theorem; Digital communications: PCM, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation; Fundamentals of error correction, Hamming codes; Timing and

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SYLLABUS

SUB – ESSENTIAL STUDIES FOR PROFESSIONALS –VII (HSMC702)

	frequency synchronization, inter-symbol interference and its mitigation; Basics of TDMA, FDMA and CDMA			
2.	**Control Systems** **Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; Lag, lead and lag-lead compensation; State variable model and solution of state equation of LTI systems**	**18**	**L1 (Remember) PO1,PO2,** **L2 (Understand) PO3,PO12** **L3 (Apply)** **L4 (Analyze)**	

Learning Resources:
Reference Books:

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

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(AUTONOMOUSINSTITUTION)

SUBJECT: Organizational Behavior

SUBJECT CODE: (HSMC703)

Subject Code : HSMC703	**Category : Management - I**
Subject Name :Organizational Behavior	**Semester : 7th**
L-T-P : 3-0-0	**Credit: 3**
Pre-Requisites:	

Course Objective:

CO1: Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization.

CO2: Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization.

CO3: Analyze the complexities associated with management of the group behavior in the organization.

CO4: Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.

Course Contents:

Module No.	Description of Topic
1	**Organizational Behaviour: Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB. Personality and Attitudes: Meaning of personality, Personality Decision Making. Motivation: Definition, Theories of Motivation - Maslow's Hierarchy of Needs Theory, McGregor's Theory X & Y, Herzberg's Motivation-Hygiene Theory, Alderfer's ERG Theory, McClelland's Theory of Needs, Vroom's Expectancy Theory.**
2	**Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and**

		Contact Hrs.
		10
		10
3	**Group Behaviour : Characteristics of Group, Types of Groups, Stages of Group Development, Group Decision Making. Communication : Communication Process, Direction of Communication, Barriers to Effective Communication. Leadership : Definition, Importance, Theories of Leadership Styles.**	**10**
4	**Organizational Politics : Definition, Factors contributing to Political Behaviour.**	**10**

Conflict Management : Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, & Stress ;

	Negotiation – Bargaining Strategies, Negotiation Process. **Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Culture.**	

Books Recommended:

1. **Robbins, S. P. & Judge, T.A.: Organizational Behavior, Pearson Education, 15th Edn.**
2. **Luthans, Fred: Organizational Behavior, McGraw Hill, 12th Edn.**
3. **Shukla, Madhukar: Understanding Organizations – Organizational Theory & Practice in India, PHI**
4. **Fincham, R. & Rhodes, P.: Principles of Organizational Behaviour, OUP, 4th Edn.**
5. **Hersey, P., Blanchard, K.H., Johnson, D.E.- Management of Organizational Behavior Leading Human Resources, PHI, 10th Edn.**

Course Outcomes:

Sl. No.	Description Upon completion of the course, the students will be able to:	Blooms Level
Module 1	Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization.	Understand(L2),Level 3(apply)
Module 2	Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization.	Understand (L2)
Module 3	Analyze the complexities associated with management of the group behavior in the organization	Understand (L2), Level 3(apply)
Module 4	Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization	Understand (L2)

PO11 PO12

											3	2
											2	
											3	
											2	3

Microwave Engineering Laboratory

Paper Code: PCCEC791A
4th Year, ECE
7th Semester

Syllabus

1. **Determination of phase and group velocities in a waveguide carrying TE10 Wave from Dispersion diagram [ω−β Plot].**

2. **Measurement of unknown impedance using shift in minima technique using a waveguide test bench/ Measurement of the susceptance of an inductive and or a capacitive window using shift in minima technique using a waveguide test bench.**

3. **Study of the characteristics of a Reflex Klystron Oscillator.**

4. **Study of Gunn-oscillator Characteristics using X-band waveguide test bench.**

5. **Measurement of coupling factor, Directivity, Insertion loss and Isolation of a Directional coupler using X-band waveguide test bench set up.**

6. **Scattering matrix of a magic tee / E-plane tee / H-plane tee using waveguide test bench at X-band.**

7. **Measurement of phase shift of a microwave phase shifter.**

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SYLLABUS

SUB – SKILL DEVELOPMENT FOR PROFESSIONALS – VII (HSMC782)

Subject Code :HSMC782	**Category : Sessional**
Subject Name :SKILL DEVELOPMENT FOR PROFESSIONALS - VII	**Semester : 7TH**
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit:1**

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. **Revision of entire Syllabus along with specific type of Mock Tests for the competitive exams like UPSC, IBPS, SBI PO/SO, SSC,RAIL, INSURANCE etc.**
2. **Learning Advance quantitative Aptitude Techniques on Algebra, Geometry, Menstruation, Tretc which is very essential for appearing in different competitive Exams along withSSC.**
3. **Solving Puzzle based problems & learning different Analytical techniques.**
4. **Misc Practice sets on different Competitive Exams mains level papers.**

Course Content:

Module No.	Description
1.	Quantitative Aptitude Miscellaneous Problems on quantitative aptitude [CAT level-4].
2.	Logical Reasoning: Miscellaneous Problems on Logical Reasoning [CAT level 4].
3.	Verbal English Miscellaneous Problems on Verbal English [CAT level-4].

Hours	BloomsLevel	PO(1..12) Mapping
12	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO4
12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4
12	L1 (Remember) L2 (Understand) L3 (Apply) L4 (Analyze)	PO1,PO2, PO3,PO4

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SYLLABUS

SUB – SKILL DEVELOPMENT FOR PROFESSIONALS – VII (HSMC782)

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)
SYLLABUS OF
EMBEDDED SYSTEM LAB (PCCEC791B)

Subject Code : PCCEC791B	**Category** : Professional Core course
Subject Name : Embedded System Lab	**Semester** : 4th
L-T-P : **0-0-2 (Total Contact Hrs. 2)**	**Credit:**1
Pre-Requisites: Course on Embedded System	

Course Objective:

1. To introduce the basic concepts of embedded systems.

2. Analyze usage of various on-chip resources like GPIO, Timers, Interrupts, ADC, DAC, Comparator,

3. Design embedded systems to suit market requirements.

COURSE DESCRIPTION:

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

CO1. Demonstrate knowledge in designing complex energy efficient embedded systems.

CO2. Analyze usage of various on-chip resources like GPIO, Timers, Interrupts, ADC, DAC, Comparator,
SPI.

CO3. Design embedded systems to suit market requirements.

CO4. Solve engineering problems by proposing potential solutions using industry choice advanced
Microcontrollers.

CO5. Apply appropriate techniques, resources, and CCSV6 based IDE for modeling embedded systems

with understanding of limitations.

CO6. Provide embedded system solutions for societal needs.

CO7. Work individually and in a group to develop embedded systems.

CO8. Communicate effectively in oral and written form in the field of embedded systems.

Module No.	**Description of Topic**	**Contact Hrs.**	**Blooms Level**	**PO(1..12) Mapping**
1.	Introduction to trainer kit and Programming Environment .	2	(Underst and)	PO1, PO2, PO3, PO4,
2.	Read input from switch and Automatic control/flash	2	(Apply)	PO1, PO2, PO3,

	LED (soft-ware delay).			PO4,
3.	Interrupts programming	2	(Apply)	PO1, PO2, PO3, PO4,

	example using GPIO.			
4.	Configure watchdog timer in watchdog mode & interval mode	2	(Apply)	PO1, PO2, PO3, PO4,
5.	Configure timer block for signal generation (with given frequency)	2	L3 (Apply)	PO1, PO2, PO3, PO4,
6.	Read Temperature of MSP430 with the help of ADC.	2	(Apply)	PO1, PO2, PO3, PO4,
7.	PWM Generator	2	(Apply)	PO1, PO2, PO3, PO4,
8.	Use Comparator to compare the signal threshold level	2	(Apply)	PO1, PO2, PO3, PO4,
9.	Speed Control of DC Motor	2	(Apply)	PO1, PO2, PO3, PO4,
10.	Networking MSPs using Wi-Fi.	2	(Apply)	PO1, PO2, PO3, PO4,
11.	Mini Project	10	(Apply)	PO1, PO2, PO3, PO4,

	Total	30		

Learning Resources:

1. Microcontrollers Theory and Application, Ajay V. Deshmukh, TMH, 2011.

2. Embedded Systems: Architecture, Programming & Design, Raj Kamal, TMH, 2011319

3. Embedded System Design: A unified Hardware/ Software Introduction, by Frank Vahid, Willey, 2011.

4. Design with PIC Microcontrollers , J. B. Peatman, Pearson India,2008

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: ANTENNA THEORY AND PROPAGATION SUBJECT CODE: ECELEC801B

Subject Code: ECELEC801B	**Category : Program Elective-6**
Subject Name: Antenna Theory and Propagation	**Semester : 8th**
L-T-P : 3-0-0 (Total Contact Hrs. 3)	**Credit: 3**
Pre-Requisites: Electromagnetic Theory.	

Course Objective:

1. To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyze the radiation characteristics of thin wire dipole antennas and solve numerical problems.

2. To analyze the characteristics and design relations of UHF, VHF and Microwave Antennas.

3. To identify the antenna array requirements, to determine the characteristics of ULAs and estimate the patterns of BSA, EFA, and Binomial Arrays.

4. To understand the concepts and set-up requirements for microwave measurements, and familiarize with the procedure to enable antenna measurements.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Antenna Basics: Review of Maxwell's Equation; Radiation of E.M waves and introducing Antenna; Vector Potential and Retarded Vector Potential; Radiation fields of a Hertzian dipole(electric); Duality Principle, Radiation fields due to short magnetic dipole. Antenna Characteristics: Radiation Pattern, Beam Width; Radiation Resistance and efficiency; Directivity and Gain; Impedance, VSWR, Polarization; Effective height and Receive Aperture; Noise Temperature of Antenna.**	**10**
2	**Radiation fields and Characteristics of λ/2 dipole; discussion on λ/4 monopole antenna; Current distribution and Radiation patterns of center-fed dipoles of length λ, 3λ/2 and 2 λ. Horizontal and Vertical antennas over a plane ground.**	**10**

	Antenna Arrays: electric Field due to 2 element arrays, 3 element Arrays; Pattern Multiplication; Uniform Linear Array: End fire and Broad side; Phased array.	
3	**Characteristics and properties of different antennas: Travelling Wave Antenna, Helical Antenna, Folded Dipole, Yagi-Uda Array, Loop Antenna, Electrically Short Antennas, Broad Band Antenna (Log periodic Antenna), Microstrip Patch Antenna.**	**8**
	Radiation from an aperture: Sectoral and Pyramidal Horn Antennas, Design of Optimum Horn Antenna; Parabolic and Corner Reflectors and feed systems.	
4	**Methods of Propagation: Ground Wave Propagation, Components of ground wave, Field strength dependence on physical factors. Sky wave Propagation; Ionospheric Layers; Virtual Height, Critical Frequency, MUF, Skip distance, Sporadic Reflections. Space wave propagation: Tropospheric Scatter, Ducting Super refraction, Sub refraction.**	**10**

Friss Transmission Formula, SNR of a

effects on Radio wave Propagation: Absorption, Refraction and Radio Horizon, Diffraction, Multipath Propagation and fading, Noise, Doppler effect.

Books Recommended:

1. Antenna (for all application), John D. Kraus and Ronald J. Marhcfka; Tata-MacGraw Hill, 3rd Edition.

2. Antenna & Wave Propagation, K.D Prasad; Satya Prakashan, New Delhi, 3rd Edition.

3. Antenna Theory: Analysis & Design, Constantine A. Balanis; Willey, 3rd Edition

4. Electromagnetic Waves & Radiating Systems, EC Jordan & K.G. Balmain; Pearson Education, 2nd Edition (2009).

5. Microstrip Antenna Design Handbook- Ramesh Garg; Artech House (2001)

Course Outcomes:

S.NO.	DESCRIPTION	Blooms Level
	Students will be able to:	
ECELEC801B.1	Understandconcepts of EM radiation and antenna parameters.	L^1 Remember
ECELEC801B.2	Discussdifferent types of monopoles, dipole and array antenna structures and their radiation characteristics.	L_2 Understand
ECELEC801B.3	Describecharacteristic and properties of broad band antenna, microstrip patch antenna and horn antenna.	L_2 Understand
ECELEC801B.4	Illustrate theeffect ofpropagation of EM waves over different layers of atmosphere.	L_3 Apply

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: WIRELESS SENSOR NETWORKS SUBJECT CODE: ECELEC802A

Subject Code: ECELEC802A	**Category: Program Elective-7**
Subject Name: Wireless Sensor Networks	**Semester: 8th**
L-T-P: 3-0-0 (Total 40 Hrs.)	**Credit: 3**

Pre-Requisites: Mathematics, Communication Engineering

COURSE OBJECTIVES:

COE1. **To learn about wireless sensor networks for a given application.**

COE2. **Understand emerging research areas in the field of sensor networks.**

COE3. **To obtain knowledge on MAC protocols used for different communication standards.**

COE4. **To explore about new protocols for wireless sensor networks.**

COURSE OUTCOMES:

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

CO1. **Design wireless sensor networks for a given application.**

CO2. **Understand emerging research areas in the field of sensor networks.**

CO3. Understand MAC protocols used for different communication standards used in WSN. CO4. Explore new protocols for WSN

COURSE CONTENT:

Module No.	Description	Hours	Bloom's Level	PO Mapping
Module 1:	Introduction to Sensor Networks: Unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks.	2	1, 2,3	1, 2, 12
Module 2:	Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks: Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks.	8	2, 3,4	1,2,3

Module 3:	**Routing protocols, MAC protocols:** **Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee.**	**8**	**1,2,4**	**1, 2, 3, 12**
Module 4:	**Dissemination protocol for large sensor network:** **Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.**	**8**	**2,3,4**	**1, 2, 3, 12**

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: WIRELESS SENSOR NETWORKS SUBJECT CODE: ECELEC802A

Module 5:	**Design Principles for WSNs: Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication.**	**4**	**2,3,4**	**3, 4, 5, 12**
Module 6:	**Single-node architecture: Hardware components & design constraints.**	**4**	**2,3,6**	**1, 2, 12**
Module 7:	**Operating systems and execution environments: Introduction to TinyOS and nesC.**	**6**	**1,3,4**	**1, 2, 12**

Text/Reference Books:

1. **Waltenegus Dargie, Christian Poellabauer, "Fundamentals Of Wireless Sensor Networks Theory And Practice", By John Wiley & Sons Publications, 2011**
2. **Sabrie Soloman, "Sensors Handbook" by McGraw Hill publication, 2009**
3. **Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks", Elsevier Publications, 2004**
4. **Kazem Sohrby, Daniel Minoli, "Wireless Sensor Networks": Technology, Protocols and Applications, Wiley-Inter science**
5. **Philip Levis, And David Gay "TinyOS Programming" by Cambridge University Press 2009**

INSTITUTE OF ENGINEERING & MANAGEMENT

(AUTONOMOUS INSTITUTION)

SUBJECT: Digital Image and Video Processing

SUBJECT CODE: (ECELEC802B)

Subject Code : ECELEC802B	**Category : Program Elective-7**
Subject Name :Digital Image and Video Processing Systems	**Semester : 8th**
L-T-P : 3-0-0	**Credit: 3**
Pre-Requisites: Signals and systems	

Course Objective:

1. **To understand the basic representation of image and enhancement procedure.**
2. **To comprehend the concepts of color image processing and segmentation technique.**
3. **To describe different compression techniques and multi-resolution technique.**
4. **To illustrate quantitative models of video processing and video segmentation.**

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Overview:** **Digital Image Fundamentals-Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels - neighbourhood, adjacency, connectivity, distance measures.** **Image Enhancements:** **Image Enhancements and Filtering-Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters - linear and order-statistics, pixel-domain sharpening filters - first and second derivative, two-dimensional DFT and its inverse, frequency domain filters -low-pass and high-pass.** **Color Image Processing:**	**10**

2	Color models-RGB, YUV, HSI; Color transformations-formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation.	10
3	Image Segmentation: Detection of discontinuities, edge linking and boundary detection, thresholding - global and adaptive, region-based segmentation.	10
	Wavelets and Multi-resolution image processing: Uncertainty principles of FourierTransform, Timefrequency localization, continuous wavelet transforms, wavelet bases and multi-resolution analysis, wavelets and Sub-band filter banks, wavelet packets.	
	Image Compression: Redundancy-inter-pixel and psycho-visual; Losslesscompression -	

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SUBJECT: Digital Image and Video Processing

SUBJECT CODE: (ECELEC802B)

	predictive, entropy; Lossy compression-predictive and transform coding; Discrete Cosine Transform; Still image compression standards-JPEG and JPEG-2000.	
4	**Fundamentals of Video Coding:** **Inter-frame redundancy, motion estimationtechniques – fullsearch, fast search strategies, forward and backward motion prediction, frame classification - I, P and B; Video sequence hierarchy-Group of pictures, frames, slices, macro-blocks and blocks; Elements of a video encoder and decoder; Video coding standards - MPEG and H.26X.** **Video Segmentation:** **Temporal segmentation-shot boundary detection, hard-cutsand soft-cuts; spatial segmentation-motion-based; Video object detection and tracking.**	**10**

Books Recommended:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008.

2. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004.

3. Murat Tekalp , Digital Video Processing, Prentice Hall, 2nd edition 2015.

Course Outcomes:

Sl. No.	Description	Blooms Level
	Upon completion of the course, the students will be able to:	
ECELEC802B.1	**Mathematicallyrepresent the various types of images and apply a proper image enhancement technique for given a set of noisy images**	**Understand(L2),Level 3(apply)**

ECELEC802B.2	Understand color image processing technique and different segmentation techniques.	Understand (L2)
ECELEC802B.3	Apply algorithms for image compression and coding.	Understand (L2), Level 3(apply)
ECELEC802B.4	Comprehend different models methods, for video processing and motion estimation.	Understand (L2)

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: DEEP LEARNING SUBJECT CODE: OEC-EC803A

Subject Code: OEC-EC803A	**Category : Open Elective-4**
Subject Name : DEEP LEARNING	**Semester : 8th**
L-T-P : 3-0-0	**Credit: 3**

Pre-Requisites: (1) Machine Learning (OEC-EC604B)

(2) Design and Analysis of Algorithms, Data Structures and Algorithms

(3) Basic concepts from Mathematics & Statistics (Linear Algebra, and

Statistics and Probability)

Course Objectives:

COE1: To present the mathematical, statistical and computational challenges of building stable representations for high-dimensional data, such as images, text and data

COE2: To delve into selected topics of Deep Learning, discussing recent models from both supervised and unsupervised learning

COE3: To familiarize deep learning concepts with Convolutional Neural Network case studies

COE4: To introduce major deep learning algorithms, including invariance learning, unsupervised learning and non-convex optimization.the problem settings, and their applications to solve real world problems

Course Modules:

Module		Topics	Contact Hours
1	What is Deep Learning?	Artificial Intelligence, Machine Learning and Deep Learning Learning representations from Data The “deep” in deep learning Understanding how deep learning works	4

What deep learning has achieved so far
The promise of AI

Various paradigms of learning problems:

Perspectives and Issues in deep learning framework, review of fundamental learning techniques: Supervised Learning, Unsupervised Learning, Semi-Supervised Learning, Reinforcement Learning

2	**Deep Feedforward Networks:** **Learning XOR** **Gradient-Based Learning** **Hidden Units** **Architecture Design** **Back-Propagation and Other Differentiation Algorithms**	**4**
3	**Regularization for Deep Learning:** **Parameter Norm Penalties** **Norm Penalties as Constrained Optimization** **Regularization and Under-Constrained Problems** **Dataset Augmentation . .** **Noise Robustness .** **Semi-Supervised Learning .** **Multi-Task Learning** **Early Stopping** **Parameter Tying and Parameter Sharing .** **Sparse Representations** **Bagging and Other Ensemble Methods** **Dropout** **Adversarial Training** **Tangent Distance, Tangent Prop, and Manifold Tangent Classifier**	**6**
4	**Optimization for Training Deep Models:** **How Learning Differs from Pure Optimization** **Challenges in Neural Network Optimization** **Basic Algorithms** **Parameter Initialization Strategies** **Algorithms with Adaptive Learning Rates** **Approximate Second-Order Methods** **Optimization Strategies and Meta-Algorithms**	**6**
5	**Convolutional Neural Networks (CNNs):** **The Convolution Operation** **Motivation** **Pooling** **Convolution and Pooling as an Infinitely Strong Prior . . . . . .** **Variants of the Basic Convolution Function** **Structured Outputs**	**6**

Convolutional Networks and the History of Deep Learning		
6	**Sequence Modeling: Recurrent and Recursive Nets:** **Unfolding Computational Graphs** **Recurrent Neural Networks** **Bidirectional RNNs** **Encoder-Decoder Sequence-to-Sequence Architectures** **Deep Recurrent Networks** **Recursive Neural Networks** **The Challenge of Long-Term Dependencies** **Echo State Networks** **Leaky Units and Other Strategies for Multiple Time Scales** **The Long Short-Term Memory and Other Gated RNNs** **Optimization for Long-Term Dependencies** **Explicit Memory**	**6**
7	**Applications of Deep Learning – some domain examples:** **Large-Scale Deep Learning** **Computer Vision** **Speech Recognition** **Natural Language Processing** **Other Applications**	**4**

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Textbooks:

1. Ian Goodfellow, YoshuaBengio and Aaron Courville: Deep learning, (MIT Press, 2016). Also available online: http://www.deeplearningbook.org,

2. Francois Chollet: Deep Learning with Python (Manning Publications, 2018)

3. Antonio Gulli, et al:Deep Learning with TensorFlow 2.0 and Keras Regression, ConvNets, GANs, RNNs, NLP and more with TF 2.0 and the Keras API (Packt Publishing Ltd., 2nd edn., 2019)

References:

1. Umberto Michelucci: Advanced Applied Deep Learning Convolutional Neural Networks and Object Detection(Apress Media LLC, 2019)

2. SimonHaykin: Neural Networks and Learning Machines, (Prentice Hall of India, 2010)

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: DEEP LEARNING SUBJECT CODE: OEC-EC803A

3. Satish Kumar:Neural Networks - A Class Room Approach, Second Edition, (McGraw-Hill, 2013)

4. C.M. Bishop:Pattern Recognition and Machine Learning, (Springer, 2006)

COURSE OUTCOMES:

COURSE OUTCOMES: S.NO.	DESCRIPTION	Blooms Level	PO (1..12) MAPPING
OEC-EC803A.1	Describe the feedforward and deep networks	L3 Apply	PO1, PO2, PO3, PO4, PO5, PO12
OEC-EC803A.2	Design single and multi-layer feed-forward deep networks and tune various hyper-parameters.	L4 Analyze	PO1, PO2, PO3, PO4, PO5, PO12
OEC-EC803A.3	Explain the deep learning concepts using Back Propagation network, identifying all the given and intermediate quantities that are relevant	L4 Analyze	PO1, PO2, PO3, PO4, PO5, PO12
OEC-EC803A.4	Analyse performance of deep networks	L4 Analyze	PO1, PO2, PO3, PO4, PO5, PO12

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: CLOUD COMPUTING SUBJECTCODE: OECEC803B

Subject Code : OECEC803B	Category : Open Elective-4

Subject Name : Cloud Computing	**Semester : 8th**
L-T-P : 3-0-0 (Total Contact Hrs. 3)	**Credit: 3**

Pre-Requisites: Database Management System, Computer Network.

Coursedescription: **Thiscourseprovidesacomprehensivestudy ofCloudconceptsand capabilities across thevarious Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS),Software as a Service (SaaS). It consists of topics like cloud service models, virtualization and cloud infrastructure, and security and management of cloud.**

Course Objective:

1.To provide students with the fundamentals and essentials of Cloud Computing.

2.Understand the importance of virtualization in distributed computing and how

this has enabled the development of Cloud Computing.
3.Understand the importance of protocols and standards in computing.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	Introduction to Cloud Computing:Defining Cloud computing, Characteristics, Components, deployment model, service model, Applications, Benefits of cloud computing, Limitations of cloud computing. Grid Computing, Grid vs Cloud Computing.	10
2	Cloud architecture, Services and Applications: Exploring cloud computing stack– Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Defining Infrastructure as a Service (IaaS), Defining Software as a Service (SaaS), Defining Platform as a Service (PaaS), Defining Identity as a Service (IDaaS), Defining Compliance as a Service (CaaS).	12
3	Cloud Infrastructure and Virtualization: Hardware and Infrastructure – Clients, Security, Network and Services., use of Virtualization technology, Load Balancing and Virtualization, virtualization benefits, Hypervisors, porting application, Defining cloud capacity by defining baselines and Metrics. Exploring cloud services& Security Management:	10

4	**Software as a Service – Overview, advantages, limits, virtualization** **benefits, examples. Platform as a Service – overview, advantages and functionalities, PaaS application frameworks – Drupal, Long Jump. Case study – Google Apps and Web Services.** **SecurityVulnerability, Patch and Configuration Management, Security as a Service of cloud, Future of Security in Cloud computing.**	**10**

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SUBJECT: CLOUD COMPUTING SUBJECTCODE: OECEC803B

Books Recommended:

1. Barrie Sosinsky, "Cloud Computing Bible", Wiley India Edition.

2. Anthony Velte, tobyVelte, Robert Elsenpeter, "Cloud Computing – A Practical Approach", Tata McGraw-Hill Edition.

Course Outcomes:

S.NO.	DESCRIPTION	Blooms Level
	Students will be able to:	
OECEC 803B.1	Identify the appropriate cloud services for a given application.	L1 Remember
OECEC 803B.2	Describe the comparative advantages and disadvantages of Virtualization technology.	L2 Understand
OECEC 803B.3	Analyze authentication, confidentiality and privacy issues in cloud computing.	L3 Apply
OECEC 803B.4	Identify security implications in cloud computing.	L1 Remember

INSTITUTE OF ENGINEERING & MANAGEMENT

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SUBJECT: OPTIMIZATION TECHNIQUE

SUBJECT CODE: (OECEC804B)

Subject Code : OECEC804B	**Category : Open Elective-5**
Subject Name :Optimization Technique	**Semester : 8th**
L-T-P : 3-0-0	**Credit: 3**

Pre-Requisites: Mathematics, Object oriented programming

Course Objective:

1. To create an engineering design methodology using a mathematical formulation of a design problem.
2. To support selection of the optimal design among alternatives.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	**Introduction:** Optimal problem formulation, Design variables constraints, Objective function, Variable bounds, Engineering optimization problems, Optimization algorithms.	5
2	**Single-variable Optimization Algorithm:** Optimality Criteria, Bracketing methods: Exhaustive search methods, Region-Elimination methods; Interval halving method, Fibonacci search method, Point estimation method; Successive quadratic estimation method. **Gradient-based Methods:** Newton-Raphson method, Bisection method, Secant method, Computer programmes.	10
3	**Multivariable Optimization Algorithm:** Optimality criteria, unidirectional search, Direct search methods: Evolutionary optimization method, Simplex search method, Hooke-	10

	Jeeves pattern search method, Cauchy's (Steepest descent) method, **Newton's method, multi-objective optimization, Pareto optimization.** **<u>Constrained Optimization Algorithm:</u>** **Characteristics of a constrained problem. Direct methods: The complex method, Cuttingplane method, Indirect method:** **Transformation Technique, Basic approach in thepenalty function method, Interior penalty function method, Convex method.** **<u>Advanced Optimization Algorithms:</u>**	**10**
4	**Genetic Algorithm (GA), working principles, GAoperators, selection methods, advanced GAs, computerprogrammes, simulated annealing. Particle swarm optimization (PSO), differential evolution (DE) algorithm, bacterial foraging algorithm, ant colony optimization algorithm, cuckoo search algorithm, symbiotic organism search algorithm.**	

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SUBJECT: OPTIMIZATION TECHNIQUE

SUBJECT CODE: (OECEC804B)

Books Recommended:

1. Optimization for Engineering Design-Algorithms & Examples – K. Deb, PHI, 2nd Ed., 2012.

2. Multi-objective Optimization Using Evolutionary Algorithms-K. Deb, John Wiley & Sons, 1st Ed., 2001. Reference Book

3. Optimization: Theory and Applications - S.S. Rao, Wiley Eastern Ltd, 2nd Ed., 1979.

Course Outcomes:

Sl. No.	Description	Blooms Level
	Upon completion of the course, the students will be able to:	
OECEC804B.1	Formulate fitness functions and cost functions for engineering optimization problems and specify the constraints as required.	Understand(L2), Level 3(apply)
OECEC804B.2	Implement different single variable optimization algorithms including the gradient based methods	Level 3(apply)
OECEC804B.3	Analyze and implement different multi variable optimization algorithms and a multi objective technique optimization based on Pareto-Fronts.	Level 3(apply), Level 4(analyze)
OECEC804B.4	Implement Bio-inspired optimization algorithms for solving complex engineering problems.	Level 3(apply), Level 4(analyze)

INSTITUTE OF ENGINEERING & MANAGEMENT (AUTONOMOUS INSTITUTION) SYLLABUS

SUB –ESSENTIAL STUDIES FOR PROFESSIONALS –VIII (HSMC802)

Subject Code :HSMC 802	**Category : Sessional**
Subject Name :ESP-VIII	**Semester : 8th**
L-T-P : 2-0-0 (Total Contact Hrs. 2)	**Credit:2**

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:

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	BloomsLevel	PO(1..12) Mapping
1.	Mock tests of UPSC Prelims CSAT-I	18	L1 (Remember) L2 (Understand) L4 (Analyse)	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) SYLLABUS

SUB – SKILL DEVELOPMENT FOR PROFESSIONALS – VIII (HSMC882)

Subject Code :HSMC882 **Category : Sessional**

Subject Name :SKILL DEVELOPMENT FOR PROFESSIONALS - VIII **Semester : 8TH**

L-T-P : 2-0-0 (Total Contact Hrs. 2) **Credit:1**

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 make the students aware of all the nuances of various public sector examinations.
2. To motivate them hone their previously learnt skills necessary for cracking various exams like civil service examination (UPSC and State PSC), Staff Selection Commission, Railway Services and other exams.
3. This part of the syllabus will also expertise them to boost their conversational skills by allowing them to speak on a variety of topics with ease.
4. Appearing mock tests of different competitive exams both prelims & mains.

Course Content:

Module No.	Description	Hours	Blooms Level	PO(1..12) Mapping
1.	Mock tests OF UPSC CSAT-II.	12	L1 (Remember) L2 (Understand) L4 (Analyse)	PO1,PO2, PO3,PO4

Learning Resources:

Reference Books:

1. **Verbal and Non-Verbal Reasoning- R.S Agarwal**
2. **Quantitative Aptitude-R.S. Agarwal**
3. **GK PUBLICATION –for UPSC Civil Services**