DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

UNIVERSITY OF ENGINEERING & MANAGEMENT, KOLKATA

Program Outcomes (POs) –

PO-1	ECE graduates possess the ability to apply knowledge of mathematics, science and basic engineering to solve complex Electronics & communication engineering problems.
PO-2	ECE graduates possess the ability to design and conduct experiments as well as to analyze and interpret experimental or collected data, simulate and fabricate electronic circuits and systems and make own projects utilizing latest software tools and techniques. They also possess the ability to identify, formulate, research literature and analyze complex engineering problems to reach logical conclusions.
PO-3	ECE graduates possess the ability to design a system, component or process to meet the desired specifications, performance and capabilities; compatible with health, safety, legal, societal and environmental considerations.
PO-4	ECE graduates possess the ability to use research based knowledge and research methods including design of experiments, analyze and data interpretation and the synthesis of the same to come to valid conclusion.
PO-5	ECE graduates possess the ability to apply appropriate techniques, resources and modern attitudes, IT tools (linking hardware and software) including prediction and modeling to complex engineering activities and research.
PO-6	ECE graduates possess the ability to demonstrate knowledge and understanding of contemporary and emerging issues relevant to their domain, business practices and principles of management and understand their limitations.
PO-7	ECE graduates possess broad education necessary to understand and correctly interpret the impact of engineering solutions in global, societal and environmental contexts and demonstrate the knowledge of a need for sustainable development.
PO-8	ECE graduates possess the ability to understand ethics in life and professions and abide by them.
PO-9	ECE graduates possess the ability to function effectively as an individual or as a productive leader or member in multi-disciplinary teams, which considers multiple aspects of an engineering problem.
PO-10	ECE graduates possess the ability to communicate and present effectively both orally and in writing such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
PO-11	ECE graduates possess the ability to demonstrate knowledge and understanding of the engineering finance and management principles as a member and leader in a team to manage projects in multi-disciplinary environments.
PO-12	ECE graduates possess the ability to recognize the need for and an ability to develop confidence for self-education and engage in life-long learning.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Program Educational Objectives (PEOs) –

PEO-1	**Preparation: transition to a successful professional career**
	To prepare the students to excel in undergraduate programmes, in applied research or in PG programmes to succeed in industry/technical profession anywhere in the world through rigorous teaching-learning.
PEO-2	**Core Competence: development of the fundamental prerequisites**
	To provide students with a solid foundation in mathematical, scientific and electronics and communication engineering fundamentals required to solve engineering problems – thus generating core competence. This serves them lifelong in their professional domain as well as higher education.
PEO-3	**Design Competence: aiding the students in the R & D competency**
	To inculcate a strong flavour of research activities among the students and impart them with good scientific and engineering depth and breadth of knowledge including proficiency in hardware languages, use of latest software tools, ability to apply engineering experience in designing and conducting experiments and analyze the significance of experimental data so as to comprehend, analyze, design and create novel products and provide solutions to the real life problems facing the society and humanity at large.
PEO-4	**Professionalism: developing lifelong and world class employability**
	To inculcate in students the finest professional attributes, ethics, a positive attitude, effective communication and presentation skills, ownership, responsibility and accountability – aptitude to work in multi-cultural/national and multi-disciplinary ambience, develop in one adaptability to different situations, ability to work in teams, take independent decisions and ability to integrate engineering issues to broader social contexts.
PEO-5	**Career Development: equipping the students to succeed in a variety of career options**
	To prepare the students for successful and productive career choices in both public and private sectors in the field of electronics & communication engineering or other allied engineering or other fields. Also equipping the students by imparting professional development courses and industrial trainings, preparing students to crack various national level competitive examinations like GATE, IES, etc and providing encouragement to pursue higher studies or to become successful entrepreneurs in life.
PEO-6	**Learning Environment: inculcate a lifelong learning culture**
	To provide students with an academic environment that ignites in one the spirit of excellence, develop the urge of discovery, creativity, inventiveness, leadership and a passion to be the best by providing state-of-the-art facility and an overall ambience that fosters brilliance.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Program Specific Outcomes (PSOs) –

PSO-1	**Knowledge and Analysis**
	To understand and analyze the principles and working of different electronic systems using analytical knowledge and applying foundational concepts of Electronics and Communication engineering.
PSO-2	**Product Development**
	To adapt to emerging technologies to innovate ideas and solutions and applying design principles and adopting best practices for developing quality products for scientific and business applications through use of modern hardware and software tools.
PSO-3	**Problem Solving**
	To offer real time and efficient solutions to problems that are directly or indirectly related to Electronics and Communication Engineering areas that would contribute towards the development of society.
PSO-4	**Skill Development**
	To develop skills by collaborating different fields of science and technology with right blend of attitude and aptitude for placements and higher education, assess social and environmental issues with ethics and to manage different projects in multidisciplinary areas for becoming a successful Entrepreneur and a worthy global citizen.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus based on AICTE Model Curriculum for Undergraduate Courses

FIRST SEMESTER - Total Credit Points = 22

SECOND SEMESTER - Total Credit Points = 28

Cumulative Credit Points Total = 50

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	Digital System Design	3	0	0	3	3
3.	CC	PCCEC303	Signals and Systems	3	0	0	3	3
4.	GE	PCCEC304	Network Theory	3	0	0	3	3
5.	BSC	BSC303	Mathematics – III	3	0	0	3	3
6.	MC	MCEC301	Constitution of India	1	0	0	1	0
7.	GSC	HSMC302	Essential Studies for Professionals - ESP III	2	0	0	2	2
8.	MOOC	MOOC301	MOOCs	-	-	-	3	3
9.	CC	PCCEC391	Electronic Devices Laboratory	0	0	2	2	1
10.	CC	PCCEC392	Digital System Design Laboratory	0	0	2	2	1
11.	CC	PCCEC393	Signals and Systems Laboratory	0	0	2	2	1
12.	GE	OECEC381	Data Structure & Algorithm	1	0	2	3	2
13.	GSC	HSMC381	Skill Development for Professionals - SDP III	0	0	2	2	1
14.	ECP	ECP381	Mini Project - I	-	-	-	1	1
15.	Mandatory Course	MC381	Mandatory Additional Requirement (MAR)	0	0	0	0	0.5
							Total Credit Points =	**27.5**
							Cumulative Credit Points Total =	**77.5**

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus based on AICTE Model Curriculum for Undergraduate Courses

4th SEMESTER

Sl. No.	Type	Paper Code	Paper Name	L	T	P	Total	Credit
1.	CC	PCCEC401	Analog & Digital Communication	3	0	0	3	3
2.	CC	PCCEC402	Analog Electronic Circuits	3	0	0	3	3
3.	CC	PCCEC403	Microcontrollers	3	0	0	3	3
4.	MC	MCEC401	Environmental Science	1	0	0	1	0
5.	BSC	BSC404	Mathematics – IV	3	0	0	3	3
6.	GSC	HSMC401	Essential Studies for Professionals - ESP IV	2	0	0	2	2
7.	MOOC	MOOC401	MOOCs	-	-	-	3	3
8.	CC	PCCEC491	Analog & Digital Communication Laboratory	0	0	2	2	1
9.	CC	PCCEC492	Analog Electronic Circuits Laboratory	0	0	2	2	1
10.	CC	PCCEC493	Microcontrollers Laboratory	0	0	0	2	1
11.	GE	OECEC481	Object Oriented Programming	1	0	2	3	2
12.	GSC	HSMC481	Skill Development for Professionals - SDP IV	0	0	2	2	1
13.	ECP	ECP481	Mini Project - II	-	-	-	1	1
14.	Mandatory Course	MC481	Mandatory Additional Requirement (MAR)	0	0	0	0	0.5
Total Credit Points =								**24.5**
Cumulative Credit Points Total =								**102**

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus based on AICTE Model Curriculum for Undergraduate Courses

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** Information Theory & Coding	3	0	0	3	3
5.	OEC	OECEC505	**Open Elective-1** Data Base Management System	3	0	0	3	3
6.	GSC	HSMC501	Essential Studies for Professionals - ESP V	2	0	0	2	2
7.	GSC	HSMC502	Economics for Engineers	2	0	0	2	1
8.	MOOC	MOOC501	MOOCs	-	-	-	3	3
9.	CC	PCCEC591	Electromagnetic Waves Laboratory	0	0	2	2	1
10.	CC	PCCEC592	Digital Signal Processing Laboratory	0	0	2	2	1
11.	GSC	HSMC581	Skill Development for Professionals - SDP V	0	0	2	2	1
12.	ECP	ECP581	Mini Project - III	-	-	-	1	1
13.	Mandatory Course	MC581	Mandatory Additional Requirement (MAR)	0	0	0	0	1
							Total Credit Points =	**26**
							Cumulative Credit Points Total =	**128**

Discipline Specific Elective / Program Elective-1

- **A.** Information Theory & Coding
- **B.** Bio-Medical Electronics
- **C.** Scientific Computing

Generic Elective / Open Elective-1

- **A.** Probability Theory & Stochastic Processes
- **B.** Data Base Management System
- **C.** Design & Analysis of Algorithm

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus based on AICTE Model Curriculum for Undergraduate Courses

6th SEMESTER

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** Antennas and Propagation	3	0	0	3	3
4.	OEC	OECEC604	**Open Elective-2** Data Analytics / Machine Learning	3	0	0	3	3
5.	GSC	HSMC601	Essential Studies for Professionals - ESP VI	2	0	0	2	2
6.	GSC	HSMC602	Principles of Management	2	0	0	2	1
7.	MOOC	MOOC601	MOOCs	-	-	-	3	3
8.	CC	PCCEC691	Control System Laboratory	0	0	2	2	1
9.	CC	PCCEC692	Computer Network Laboratory	0	0	2	2	1
10.	CC	PCCEC693	Data Analytics / Machine Learning Laboratory	0	0	2	2	1
11.	CC	PCCEC694	Electronic Measurement Laboratory	0	0	2	2	1
12.	GSC	HSMC681	Skill Development for Professionals - SDP VI	0	0	2	2	1
13.	ECP	ECP681	Mini Project – III / Electronic Design Workshop	-	-	-	1	1
14.	Mandatory Course	MC681	Mandatory Additional Requirement (MAR)	0	0	0	0	1
							Total Credit Points =	**25**
							Cumulative Credit Points Total =	**153**

Discipline Specific Elective / Program Elective-2

- **A.** Antennas and Propagation
- **B.** Wavelets
- **C.** Speech and Audio Processing

Generic Elective / Open Elective-2

- **A.** Data Analytics
- **B.** Machine Learning
- **C.** Advanced Operating Systems

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus based on AICTE Model Curriculum for Undergraduate Courses

7th SEMESTER

Sl. No.	Type	Paper Code	Paper Name	L	T	P	Total	Credit
1.	ECEL	ECELEC701	**Program Elective-3** Microwave Theory & Techniques	3	0	0	3	3
2.	ECEL	ECELEC702	**Program Elective-4** Embedded System	3	0	0	3	3
3.	ECEL	ECELEC703	**Program Elective-5** Satellite Communication	3	0	0	3	3
4.	OEC	OECEC704	**Open Elective-3** Internet of Things	3	0	0	3	3
5.	GSC	HSMC701	Essential Studies for Professionals - ESP VII	2	0	0	2	2
6.	GSC	HSMC702	Organizational Behaviour	2	0	0	2	1
7.	MOOC	MOOC701	MOOCs	-	-	-	3	3
8.	CC	PCCEC791	Microwave Laboratory	0	0	2	2	1
9.	CC	PCCEC792	Embedded System Laboratory	0	0	2	2	1
10.	GSC	HSMC781	Skill Development for Professionals - SDP VII	0	0	2	2	1
11.	ECP	ECP781	Project Work - I	-	-	-	5	5
							Total Credit Points =	**26**
							Cumulative Credit Points Total =	**179**

Discipline Specific Elective / Program Elective-3

- **A.** Microwave Theory and Techniques
- **B.** Power Electronics
- **C.** Introduction to MEMS

Discipline Specific Elective / Program Elective-4

- **A.** Embedded System
- **B.** CMOS Design
- **C.** Mixed Signal Design

Program Elective-5

- **A.** Satellite Communication
- **B.** Adaptive Signal Processing
- **C.** Error Correcting Codes

Generic Elective / Open Elective-3

- **A.** Internet of Things
- **B.** Software Engineering
- **C.** Cryptography & Network Security

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus based on AICTE Model Curriculum for Undergraduate Courses

8th SEMESTER

Sl. No.	Type	Paper Code	Paper Name	L	T	P	Total	Credit
1.	ECEL	ECELEC801	**Program Elective-6** Fibre Optic Communication	3	0	0	3	3
2.	ECEL	ECELEC802	**Program Elective-7** Mobile Communication and Networks	3	0	0	3	3
3.	OEC	OECEC803	**Open Elective-4** Neural Network and Application / Artificial Intelligence	3	0	0	3	3
4.	OEC	OECEC804	**Open Elective-5** Cloud Computing	3	0	0	3	3
5.	GSC	HSMC801	Essential Studies for Professionals - ESP VIII	2	0	0	2	2
6.	MOOC	MOOC801	MOOCs	-	-	-	3	3
7.	GSC	HSMC881	Skill Development for Professionals - SDP VIII	0	0	2	2	1
8.	ECP	ECP881	Project Work - II & Dissertation	-	-	-	5	5
9.	CC	PCCEC891	GRAND VIVA	-	-	-	-	2
							Total Credit Points =	**25**
							Cumulative Credit Points Total =	**204**

Discipline Specific Elective / Program Elective-6

- **A.** Fibre Optic Communication
- **B.** High Speed Electronics
- **C.** Nano Electronics

Discipline Specific Elective / Program Elective-7

- **A.** Mobile Communication and Networks
- **B.** Wireless Sensor Networks
- **C.** Digital Image and Video Processing

Generic Elective / Open Elective-4

- **A.** Neural Network and Application
- **B.** Artificial Intelligence
- **C.** Cyber Law and Ethics

Generic Elective / Open Elective-5

- **A.** Cloud Computing
- **B.** Mobile Computing
- **C.** Internet Security

Total Course Credit Points = 184, MOOCs = 20

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus based on AICTE Model Curriculum for Undergraduate Courses

3rd SEMESTER

PCCEC301: ELECTRONIC DEVICES

Course Outcomes (COs) –

1. Understanding the concept of carrier transport phenomena in semiconductors, E-k diagrams and Fermi energy level position variation with doping
2. Justify the V-I characteristics of different diodes along with their working principles.
3. Explain the working mechanism of Bipolar Junction Transistor in various configurations with characteristics.
4. Examine working of MOS transistor and finding out its various small signal model parameters.
5. Analyze the behavior of FET devices with respect to its construction, operation, voltage-current characteristics.
6. Understanding the fabrication steps involved in design of ICs.

Module 1:

Introduction to Semiconductor Physics: Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors. Generation and recombination of carriers.

Module 2:

Poisson and continuity equation P-N junction characteristics, I-Characteristics, and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode. LED, photodiode and solar cell.

Module 3:

Bipolar Junction Transistor, I-V characteristics, Ebers-Moll Model

Module 4:

MOS capacitor, C-V characteristics, MOSFET, I-V characteristics and small signal models of MOS transistor.

Module 5:

Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process.

Text/Reference Books:

1. J. V. Wait, L. P. Huelsman and G. A. Korn, Introduction to Operational Amplifier theory and applications, McGraw Hill, 1992.
2. J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.

3. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.
4. A. S. Sedra and K. C. Smith, Microelectronic Circuits, Saunder's College11 Publishing, Edition IV
5. Paul R. Gray and Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rd Edition

PCCEC302: DIGITAL SYSTEM DESIGN

Course Outcomes (COs) –

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 working of combinational and sequential circuits.
3. To develop concepts of design and implementation of combinational circuits using basic digital logic.
4. To illustrate the concept and design of synchronous and asynchronous sequential circuits.
5. To introduce the concept of logic families and their implementation using basic electronic elements.
6. To introduce the concept of semiconductor memories and implementation of digital circuits using programmable logic devices.

Module 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.

Module 2:
Logic families- TTL, ECL, MOS and CMOS, their operation and specifications

Module 3:
Combinational logic: Arithmetic circuits (ADDER and SUBTRACTOR), Comparators, decoders, encoders, multiplexers, de-multiplexers, and their use in logic synthesis; Hazards in combinational circuits.

Module 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.

Module 5:
Introduction of ROM and RAM, PLA, PAL and FPGA.

Module 6:
Analog and Digital Data Conversions: D/A Converters – specifications - weighted resistor type, R-2R Ladder type. A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type.

Text/Reference Books:

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

PCCEC303: SIGNALS AND SYSTEMS

Course Outcomes (COs) –

1. Classify different types of signals and systems
2. Understand the concept of Random Variable and analysis of systems using convolution technique
3. Apply sampling phenomenon of continuous signal to convert into digital signal
4. Illustrate spectral analysis of continuous and discrete time signals using Fourier Series
5. Apply Fourier Transform technique to analyze continuous-time and discrete-time systems
6. Apply Laplace Transform technique to analyze continuous-time systems

Module 1:
amplitude signals. System properties: linearity: additively and homogeneity, shift-invariance, causality, stability, reliability.

Module 2:
Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input output behavior with a periodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.

Module 3:
Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases.

Module 4:
The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior.

Module 5:
The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.

Module 6:
State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. 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.

Text Books:

1. A.V.Oppenheim, A.S.Willsky and S.H.Nawab -Signals & Systems, Pearson
2. S.Haykin & B.V.Veen, Signals and Systems- John Wiley
3. A.Nagoor Kani- Signals and Systems- McGraw Hill

References:

1. J.G.Proakis & D.G.Manolakis- Digital Signal Processing Principles, Algorithms and Applications, PHI.
2. C-T Chen- Signals and Systems- Oxford
3. E WKamen &BS Heck- Fundamentals of Signals and Systems Using the Web and Matlab- Pearson B.P.Lathi- Signal Processing & Linear Systems- Oxford
4. P.Ramesh Babu & R.Anandanatarajan- Signals and Systems 4/e- Scitech
5. M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH
6. S Ghosh- Signals and Systems- Pearson
7. M.H.Hays- Digital Signal Processing ", Schaum's outlines, TMH
8. Ashok Ambardar, -Analog and Digital Signal Processing- Thomson.
9. Phillip, Parr & Riskin- Signal, Systems and Transforms- Pearson

PCCEC304: NETWORK THEORY

Course Outcomes (COs) –

1. Apply the concept of Basic Nodal and Mesh Analysis.
2. Apply the concept of graph theory on network topologies.
3. Apply the concept Network Theorems & Useful Circuit Analysis Techniques.
4. Utilize the characteristics & parameters of two port networks.
5. Analyze the network in the time domain and frequency domain for different singular functions.
6. Illustrate the concept of Reactance, Impedance Susceptance and Admittance-Power Factor and significance-Real and Reactive power, Complex Power.
7. Design the series resonance, Parallel resonance

Module 1:
Basic Nodal and Mesh Analysis: Network reduction techniques- star-to-delta & delta-to-star transformation, Source transformation. Nodal analysis, mesh analysis, super node and super mesh,

Nodal Versus Mesh Analysis for D.C excitations.Node and Mesh Analysis, matrix approach of network containing voltage and current sources, and reactance, source transformation and duality.

Module 2:

Network Theorems & Useful Circuit Analysis Techniques: Definitions of branch, node, graph, directed graph, connected graph, planar graph, non planar Graph, tree, co tree, twigs, links. Incidence matrix, properties of incidence matrix, incidence Matrix and KCL, Tie set Matrix, Cut-set & Tree branch voltages.Network theorems: Linearity Property, Superposition, reciprocity, The venin's, Norton's, Maximum power Transfer and compensation theorem as applied to AC circuits.Maximum Power Transfer Theorem, Millman's theorem, Tellegen's, Reciprocity and compensation theorems for D.C Excitation.

Module 3:

Two Port Networks: Two port network parameters – Z, Y, ABCD and hybrid parameters and their relations, Interconnection of Two-Port networks.

Module 4:

Single Phase A.C Circuits: Sinusoidal alternating quantities – Phase and Phase difference – Complex and polar forms of representations, J-notation, R.M.S, Average values and form factor for different periodic wave forms.

Module 5:

Different Network Functions: Time Response of Circuits (DC Excitation): Time(Transient) response of R-L, R-C, R-L-C series circuits for Zero input, Step input ,pulse input - Initial conditions-solution method using differential equation and Laplace transforms.

Module 6:

Steady State Analysis: Steady state analysis of R,L and C (in series, parallel and series parallel combinations) with sinusoidal excitation-Concept of Reactance, Impedance Susceptance and Admittance-Power Factor and significance-Real and Reactive power, Complex Power.

Module 7:

Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, general case- resistance present in both branches, anti resonance at all frequencies.

Text Books:

1. Valkenburg M. E. Van, "Network Analysis", Prentice Hall./Pearson Education
2. Hayt "Engg Circuit Analysis" 6/e Tata McGraw-Hill
3. D.A.Bell- Electrical Circuits- Oxford

BSC303: MATHEMATICS-III

Course Outcomes (COs) –

1. Create, interpret and analyze problems related to complex field.
2. Understand Mobius transformations and their applications.
3. Understand the uses of Fourier Series and Transform in their domain.

4. Solve problems by applying Fourier Series and Fourier Transform.
5. Learn application of Laplace transforms for differential equation & improper integrals.
6. Understand the concepts of Probability Distributions.
7. Use discrete and continuous probability distributions, mean and variance, and make decisions.

Module 1: Complex Variables

Differentiation (8 hours):
Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

Integration (8 hours):
Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (Without proof), Evaluation of definite integral involving sine and cosine.

Module 2: Transform Calculus

Transform Calculus-1 (10 hours):
Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method.

Transform Calculus-2 (10 hours):
Fourier transforms, Z-transform and Wavelet transforms: properties, methods, inverses and their applications.

Module 3: Probability Theory

Basic Probability: (8 hours)
Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, Expectation of Discrete Random Variables, Moments, Correlation coefficient.

Continuous Probability Distributions: (6 hours)
Continuous random variables and their properties, distribution functions and densities, normal, exponential and gamma densities.

Textbooks/References:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
6. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
7. Veerarajan T., Engineering Mathematics, Tata McGraw-Hill, New Delhi, 2008

MCEC301: DISASTER MANAGEMENT/ CONSTITUTION OF INDIA

DISASTER MANAGEMENT

Module 1:

Understanding Disasters

Understanding the Concepts and definitions of Disaster, Hazard, Vulnerability, Risk, Capacity – Disaster and Development, and disaster management

Module 2:

Types, Trends, Causes, Consequences and Control of Disasters

Geological Disasters (earthquakes, landslides, tsunami, mining); Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hail storms, avalanches, droughts, cold and heat waves) Biological Disasters (epidemics, pest attacks, forest fire); Technological Disasters (chemical, industrial, radiological, nuclear) and Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters) Global Disaster Trends – Emerging Risks of Disasters – Climate Change and Urban Disasters.

Module 3:

Disaster Management Cycle and Framework

Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development; Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR,Yokohama Stretegy, Hyogo Framework of Action

Module 4:

Disaster Management in India

Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005 – Institutional and Financial Mechanism National Policy on Disaster Management, National Guidelines and Plans on Disaster Management; Role of Government (local, state and national),Non-Government and Inter Governmental Agencies

Module 5:

Applications of Science and Technology for Disaster Management

Geo-informatics in Disaster Management (RS, GIS, GPS and RS) Disaster Communication System (Early Warning and Its Dissemination) Land Use Planning and Development Regulations Disaster Safe Designs and Constructions Structural and Non Structural Mitigation of Disasters S&T Institutions for Disaster Management in India

Module 6:

Suggested Areas for Project and Assignments

Study of Recent Disasters (at local, state and national level) And Preparation of Disaster Risk Management Plan of an Area or Sector Role of Engineers in Disaster Management.

Text Books:

1. Coppola D P, 2007. Introduction to International Disaster Management, Elsevier Science (B/H), London.
2. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
3. An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
4. World Disasters Report, 2009. International Federation of Red Cross and Red Crescent, Switzerland
5. Encyclopedia of disaster management, Vol I, II and IIIL Disaster management policy and administration, S L Goyal, Deep & Deep, New Delhi, 2006

References:

1. Encyclopedia of Disasters – Environmental Catastrophes and Human Tragedies, Vol. 1 & 2, Angus M. Gunn, Greenwood Press, 2008
2. Disasters in India Studies of grim reality, Anu Kapur & others, 2005, 283 pages, Rawat Publishers, Jaipur
3. Management of Natural Disasters in developing countries, H.N. Srivastava & G.D. Gupta, Daya Publishers, Delhi, 2006, 201 pages
4. Natural Disasters, David Alexander, Kluwer Academic London, 1999, 632 pages
5. Disaster Management Act 2005, Publisher by Govt. of India
6. Publications of National Disaster Management Authority (NDMA) on Various Templates and Guidelines for Disaster Management
7. NIDM Publications
8. High Power Committee Report, 2001, J.C. Pant
9. Disaster Mitigation in Asia & Pacific, Asian Development Bank
10. National Disaster Management Policy, 2009, GoI
11. Disaster Preparedness Kit, American Red Cross

CONSTITUTION OF INDIA

Course Outcomes (COs) –

1. Able to understand historical background of the constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, the local Administration.
2. Able to apply the knowledge on directive principle of state policy, the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
3. Able to analyze the History, features of Indian constitution, the role Governor and Chief Minister, role of state election commission, the decentralization of power between central, state and local self-government.
4. Able to evaluate Preamble, Fundamental Rights and Duties, Zilla Panchayat, block level organization, various commissions of viz SC/ST/OBC and women.
5. To understand the autonomous nature of constitutional bodies like Supreme Court and high court, controller and auditor general of India and election commission of India.
6. To understand the central and state relation, financial and administrative.
7. To enable the student to understand the importance of constitution.

Module 1:

Meaning of the constitution law and constitutionalism. Historical perspective of the Constitution of India. Salient features and characteristics of the Constitution of India. Scheme of the fundamental rights.

Module 2:

The scheme of the Fundamental Duties and its legal status. The Directive Principles of State Policy – Its importance and implementation. Federal structure and distribution of legislative and financial powers between the Union and the States. Parliamentary Form of Government in India – The constitution powers and status of the President of India. Amendment of the Constitutional Powers and Procedure.

Module 3:

The historical perspectives of the constitutional amendments in India. Emergency Provisions: National Emergency, President Rule, Financial Emergency . Local Self Government – Constitutional Scheme in India. Scheme of the Fundamental Right to Equality.

Module 4:

Scheme of the Fundamental Right to certain Freedom under Article 19 15. Scope of the Right to Life and Personal Liberty under Article 21.

PCCEC391: ELECTRONIC DEVICES LABORATORY

1. To verify the I-V characteristics of PN junction diode under both forward and reverse bias conditions.
2. To verify the I-V characteristics of Zener diode under both forward and reverse bias conditions.
3. To setup and study a Zener diode shunt regulator and plot its line and load regulation characteristics.
4. To study the input characteristics of a Bipolar Junction Transistor in Common emitter configuration.
5. To study the output characteristics of a Bipolar Junction Transistor in Common emitter configuration.
6. To study the input characteristics of a Bipolar Junction Transistor in Common base configuration.
7. To study the output characteristics of a Bipolar Junction Transistor in Common emitter configuration.
8. To study the output characteristics of an N channel MOSFET using Ng spice.
9. To verify the I-V characteristics of a light emitting diode.
10. To study and verify the distance vs photocurrent characteristics of LDR, Photodiode and Phototransistor

PCCEC392: DIGITAL SYSTEM DESIGN LABORATORY

1. Realization of basic gates using Universal logic gates.
2. Code conversion circuits- BCD to Excess-3 and vice-versa.
3. Four-bit parity generator and comparator circuits.
4. Construction of simple Decoder and Multiplexer circuits using logic gates.
5. Design of combinational circuit for BCD to decimal conversion to drive 7-segment display using multiplexer.
6. Construction of simple arithmetic circuits-Adder, Subtractor.
7. Realization of RS-JK and D flip-flops using Universal logic gates.
8. Realization of Universal Register using JK flip-flops and logic gates.
9. Realization of Universal Register using multiplexer and flip-flops.
10. Construction of Adder circuit using Shift Register and full Adder.
11. Realization of Asynchronous Up/Down counter.
12. Realization of Synchronous Up/Down counter.
13. Design of Sequential Counter with irregular sequences.
14. Realization of Ring counter and Johnson's counter.
15. Construction of adder circuit using Shift Register and full Adder.

PCCEC393: SIGNALS AND SYSTEMS LABORATORY

1. To study Z- transform of: a) Sinusoidal signals b) Step function
2. To compare Fourier and Laplace transformations of a signal.
3. To study convolution theorem in time and frequency domain.
4. To Study Signal Synthesis via sum of harmonics.
5. To study LPF &HPF, band pass and reject filters using RC circuits.
6. To demonstrate how analog signals are sampled and how different sampling rates affect the outputs.
7. To study sampling theorem for low pass signals and band pass signals .
8. To determine the components of: a) Square wave b) Clipped sine wave.

OECEC381: DATA STRUCTURE & ALGORITHM

Course Outcomes (COs) –

1. For a given algorithm in C programming language, student will able to analyze the algorithm to determine the time and computation complexity and justify the correctness.
2. Students should be able use Big 'O' notation to express algorithmic running time.
3. For a given Search problem (Linear Search and Binary Search) student will able to implement it using C programming.
4. For a given problem of Stacks, Queues and linked list student will able to implement it using C programming and analyze the same to determine the time and computation complexity.
5. Student will able to write an algorithm using C programming for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
6. Student will able to implement using C programming, Graph search and traversal algorithms and determine the time and computation complexity.
7. Students will be able to apply algorithms and data structures in various real-life software problems.

MODULE 1

Basics & Introduction to Data Structure:

Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.

MODULE 2

Linear Data Structure

Array: Representation of arrays, Applications of arrays, sparse matrix and its representation,

Stack: Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis.

Queue: Representation of Queue, Operations on Queue, Circular Queue, Priority Queue, Array

representation of Priority Queue, Double Ended Queue, Applications of Queue,
Linked List: Singly linked lists: Representation in memory, Algorithms of severa loperations: 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.

MODULE 3

Non-linear Data Structure:
Tree: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree : definitions, algorithms and analysis.

MODULE 4

Sorting and Searching
Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Linear Search, Binary Search

Suggested books:

1. "Fundamentals of Data Structures", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
2. Data Structure with C, Seymour Lipschutz, TMH
3. Classic Data Structures, 2/e, Debasis , Sarnanta,PHI,2009

Suggested reference books:

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. "How to Solve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus based on AICTE Model Curriculum for Undergraduate Courses

4th SEMESTER

PCCEC401: ANALOG AND DIGITAL COMMUNICATION

Course Outcomes (COs) –

1. Describe basic theories of communication systems and modulation process
2. Illustrate, classify and compare various AM and FM transmission and reception techniques and analyze their voltage, power and current relations
3. Analyze the importance of noise in communication system
4. Classify the different pulse modulation techniques and evaluate their performances
5. Evaluate and compare various digital modulation techniques.
6. Analyze various channel coding and error-correcting techniques

MODULE : 1

Review of signals and systems, Frequency domain representation of signals, Principles of Amplitude Modulation Systems- DSB, SSB and VSB modulations. Angle Modulation, Representation of FM and PM signals, Spectral characteristics of angle modulated signals.

MODULE : 2

Review of probability and random process. Gaussian and white noise characteristics ,Noise in amplitude modulation systems, Noise in Frequency modulation systems. Pre-emphasis and De-emphasis, Threshold effect in angle modulation.

MODULE : 3

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.

MODULE : 4

Elements of Detection Theory, Optimum detection of signals in noise, Coherent communication with waveforms- Probability of Error evaluations. Base band 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.

MODULE : 5

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.

Text Books:

1. Taub and Schilling , "Principles of Communication Systems", 2nd ed., Mc-Graw Hill
2. B.P.Lathi -Communication Systems- BS Publications
3. V Chandra Sekar – Analog Communication- Oxford University Press

References:

1. Carlson—Communication System,4/e , Mc-Graw Hill
2. Proakis & Salehi Fundamentals of Communication Systems- Pearson
3. Singh & Sapre—Communication Systems: 2/e, TMH
4. P K Ghosh- Principles of Electrical Communications- University Press
5. L.W.Couch Ii, "Digital and Analog Communication Systems", 2/e, Macmillan Publishing
6. Blake, Electronic Communication Systems- Cengage Learning
7. S Sharma, Analog Communication Systems- Katson Books

PCCEC402: ANALOG ELECTRONIC CIRCUITS

Course Outcomes (COs) –

1. Illustrating the basics concept of electronics components and their practical applications.
2. Interpreting operating conditions for semiconductors and analyzing different parameters.
3. Implementation of transistor circuit for various signal models.
4. Feedback amplifier analysis for input and output impedances.
5. Analysis and implementation of OP-AMP circuits.
6. Use modeling/simulation parameters with standard equivalent circuit models to predict correctly the expected performance of various general-purpose electronic circuits.

Module-1

a) Filters and Regulators: Capacitor filter, π-section filter, ripple factor, series and shunt voltage regulator, percentage regulation, 78xx and 79xx series, concept of SMPS.

b) Transistor Biasing and Stability: Q-point, Self Bias-CE, Compensation techniques, h-model of Transistors. Expression for voltage gain, current gain, input and output impedance, trans-resistance & trans-conductance; Emitter follower circuits, High frequency model of transistors.

Module -2

1. Transistor Amplifiers: RC coupled amplifier, functions of all components, equivalent circuit, 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.

2. Feedback Amplifiers & Oscillators: Feedback concept, negative& positive feedback, voltage/ current, series/shunt feedback, Berkhausen criterion, Colpitts, Hartley's, Phase shift, Wein bridge and crystal oscillators.

Module -3

1. Operational Amplifier: Ideal OPAMP, Differential Amplifier, Constant current source (current mirror etc.), level shifter, CMRR, Open & Closed loop circuits, importance of feedback loop (positive & negative), inverting & non- inverting amplifiers, voltage follower/buffer circuit.

2. Applications of Operational Amplifiers: adder, integrator & differentiator, comparator, Schmitt Trigger. Instrumentation Amplifier, Log & Anti-log amplifiers, Trans-conductance multiplier, Precision Rectifier, voltage to current and current to voltage converter, free running oscillator.

Module -4:

1. Power amplifiers – Class A, B, AB, C, Conversion efficiency, Tuned amplifier
2. Multivibrator – Monostable, Bistable, Astable multivibrators; Monostable and astable operation using 555 timer.
3. Special Functional Circuits: VCO and PLL.

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

Reference Books:

1. Millman & Halkias – Integrated El;ectronics, 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 – OperationalAmplifier: Design and Applications, Mc GrawHill.
9. Gayakwad R.A-- OpAmps and Linear IC's, PHI
10. Coughlin and Driscol – Operational Amplifier and Linear Integrated Circuits – Pearson Education

PCCEC403: MICRO-CONTROLLERS

Course Outcomes (COs) –

1. Understanding the internal organization of microprocessors 8085, 8086and their instructions set.
2. Able to do interfacing design of peripherals like, I/O, A/D, D/A, timer etc.
3. Able to develop systems using microcontroller 8051 and Arduino.
4. Understanding Raspberry pi, RSIC processors and ARM microcontroller-based system design.

Module-1:

Overview of microcomputer systems and their building blocks, memory interfacing, concepts of interrupts and Direct Memory Access, instruction sets of microprocessors (with examples of 8085 and 8086);

Assembly language programming:
Addition, Multiplication, Block Transfer, Ascending order, Descending order, Finding largest & smallest number, Look-up table etc. Interrupts of 8085 processor: classification of interrupts, Programming using interrupts (programming using INTR is not required) Serial and parallel data transfer – Basic concept of serial I/O, DMA, Asynchronous and synchronous serial transmission using SID and SOD pins of 8085 Microprocessor.

Module-2:

8051 architecture:

8051 micro controller hardware, input/output pins, ports, external memory, counters and timers, instruction set, addressing modes, serial data i/o, interrupts.

Assembly language Programming using 8051

Moving data:

External data moves, code memory read only data moves, PUSH and POP opcodes, data exchanges.

Logical operations:

Byte-level, bit-level, rotate and swap operations. Arithmetic operations: Flags, incrementing and decrementing, addition, subtraction, multiplication and division, decimal arithmetic.

Jump and call instructions:

Jump and call program range, jumps, calls and subroutines, interrupts and returns.

Module-3:

Concepts of virtual memory, Cache memory, Advanced coprocessor Architectures- 286, 486, Pentium; Microcontrollers: 8051 systems.

Module-4:

Introduction to RISC processors; ARM microcontrollers interface designs.

Module-5:

Block Diagram, Pin Details, Modes of operation, control word(s) format. Interfacing of support IC chips with 8051. Memory interfacing with 8051. ADC / DAC interfacing with 8051.

Text Books:

1. Microprocessor architecture, programming and application with 8085 – R. Gaonkar (Penram International) (strongly recommended)
2. The 8051 microcontroller - K. Ayala (Thomson)
3. Microprocessors & interfacing – D. V. Hall (Tata McGraw-hill)
4. Ray & Bhurchandi, Advanced Microprocessors & Peripherals, TMH
5. The 8051 microcontroller and Embedded systems - Mazidi, Mazidi and McKinley (PEARSON)
6. An Introduction toMicroprocessor and Applications –Krishna Kant (Macmillan)

References:

1. Microprocessors and microcontrollers - N. Senthil Kumar, M. Saravanan and Jeevananthan, (Oxford university press).
2. 8086 Microprocessor –KAyala (Cengage learning)

3. Microprocessors – The 8086/8088, 80186/80386/80486 and the Pentium family – N. B. Bahadure (PHI). The 8051 microcontrollers – Uma Rao and Andhe Pallavi (PEARSON).

MCEC401: ENVIRONMENTAL SCIENCE

General

Basic ideas of environment, basic concepts, man, society & environment, their interrelationship.
Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development.
Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function.
Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering.

Ecology

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: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain [definition and one example of each food chain], Food web.
Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur].
Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.

Air pollution and control

Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause.
Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems.
Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget.
Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion).
Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model.
Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant.
Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN.
Smog, Photochemical smog and London smog.
Depletion Ozone layer: CFC, destruction of ozone layer by CFC, 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), Statement with brief reference).

Water Pollution and Control

Hydrosphere, Hydrological cycle and Natural water.

Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds.

River/Lake/ground water pollution: River: 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].

Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only).

Standard and control: Waste water standard [BOD, COD, Oil, Grease],

Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening]

Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition.

Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic

Land Pollution

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, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).

Noise Pollution

Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighborhood noise]

Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L_{10} (18hr Index) , Ld_n. Noise pollution control.

Environmental Management:

Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/agreement/ protocol.

References/Books

1. Masters, G. M., “Introduction to Environmental Engineering and Science”, Prentice-Hall of India Pvt. Ltd., 1991.
2. De, A. K., “Environmental Chemistry”, New Age International.

BSC404: MATHEMATICS-IV

Course Outcomes (COs) –

Upon successful completion of this course, students will be able to:

1. Understand the discrete, continuous, and joint random variables, compute the mean, variance and covariance of random variables, and be able to find the marginal density and distribution functions from the joint density function.
2. Interpret the correlation between two variables, calculate the simple linear regression equation for a set of data, and know the association between the attributes.
3. Estimate population parameters from data sets and use the sampling distributions to compute confidence intervals for these population parameters.
4. Learn the basic components of hypothesis testing and perform hypothesis tests on population means, variances and proportions.
5. Use rounding off techniques to approximate the solution. Students will be able to solve interpolation problems via several numerical methods.
6. Find the roots of difficult algebraic equations using numerical techniques. They will be able to solve system of linear equations using various iterative and non-iterative methods.
7. Solve difficult integration problems approximately using numerical algorithms and use several numerical methods to solve 1st order Ordinary Differential Equations.

Module 1: Numerical Methods (14 hours)

Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors. Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation. Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms. Numerical solution of a system of linear equations: Gauss elimination method, LU Factorization method, Gauss-Seidel iterative method. Numerical solution of Algebraic equation: Bisection method, Regula-Falsi method, Newton-Raphson method. Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods.

Module 2: Bivariate Distribution & Regression Analysis (8 hours)

Bivariate Probability Distributions: (4 hours)

Bivariate distributions and their properties (discrete & continuous), marginal distribution, distribution of sums and quotients, conditional densities & independence. Related problems.

Concept of Regression: (4 hours)

Regression Lines. To find the regression equations. Properties of Regression coefficients. Principle of Least Squares, Method of fitting a straight line & a parabola to a given set of observations. Related Problems.

Module 3: Inferential Statistics (16 hours)

Basic Statistics: (8 hours)

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

Applied Statistics: (4 hours)

Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Small samples: (4 hours)

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.

Textbooks/References:

1. S. Ross, A First Course in Probability, Pearson Education India
2. Miller & Freund's, Probability and Statistics for Engineers, Pearson Education.
3. Spiegel M R., Schiller J.J. and Srinivasan R.A.: Probability and Statistics (Schaum's Outline Series), TMH
4. Gupta & Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand & Sons
5. John E. Freund, Ronald E. Walpole, Mathematical Statistics, Prentice Hall.
6. B.S. Grewal, Numerical Methods, Khanna Publishers
7. Jain, Iyengar, & Jain: Numerical Methods (Problems and Solution), New Age International
8. Balagurusamy: Numerical Methods, Scitech.
9. Baburam: Numerical Methods, Pearson Education
10. Veerarajan, Numerical Methods, Tata McGraw Hill

PCCEC491: ANALOG AND DIGITAL COMMUNICATION LABORATORY

1. Introduction to Analog Communication and Study of Advanced Function Generator, Power Supply
2. Study of single polarity Pulse Amplitude Modulation and Demodulation
3. Study of double polarity Pulse Amplitude Modulation and Demodulation
4. Study of Pulse Width Modulation
5. Study of Amplitude Modulation
6. Study of Frequency Modulation
7. Modulation & Demodulation of an ASK waveforms.
8. Modulation & Demodulation of FSK waveforms.
9. Generation & Demodulation of Pulse Amplitude Modulation (PAM)
10. Generation of Pseudo Noise Binary Sequence using Shift Registers.
11. Modulation & Demodulation of PSK waveform

PCCEC492: ANALOG ELECTRONIC CIRCUITS LABORATORY

1. Study of Diode as clipper & clamper
2. Study of Zener diode as a voltage regulator
3. Study of ripple and regulation characteristics of full wave rectifier without and with capacitor filter
4. Study of characteristics curves of B.J.T & F.E.T .
5. Design a two-stage R-C coupled amplifier & study of it's gain & Bandwidth.
6. Study of class A& class B power amplifiers.
7. Study of class C & Push-Pull amplifiers.
8. Realization of current mirror & level shifter circuit using Operational Amplifiers.
9. Study of timer circuit using NE555 & configuration for monostable & astable multivibrator.
10. Design a Bistable multivibrator using NE 555.
11. Study of Switched Mode Power Supply & construction of a linear voltage regulator using regulator IC chip.
12. Design a simple function generator using IC.
13. Realization of a V-to-I & I-to-V converter using Op-Amps.
14. Realization of a Phase Locked Loop using Voltage Controlled Oscillator (VCO).
15. Studyof D.A.C &A.D.C.

PCCEC493: MICRO-CONTROLLERS LABORATORY

Study of prewritten programs on trainer kit using the basic instruction set (data transfer, Load/Store, Arithmetic, Logical)
Assignments based on above.
Familiarization with 8051 simulator on PC.
Study of prewritten programs using basic instruction set (data transfer, Load/Store, Arithmetic, Logical) on the simulator. Assignments based on above

Programming using kit and simulator for:
Table look up
Copying a block of memory
Shifting a block of memory
Packing and unpacking of BCD numbers, Addition of BCD numbers
Binary to ASCII conversion
String Matching, Multiplication using shift and add method and Booth's Algorithm
Study of 8051 Microcontroller kit and writing programs as mentioned in S/L3. Write programs to interface of Keyboard, DAC and ADC using the kit.
Serial communication between two trainer kits

OECEC481: OBJECT ORIENTED PROGRAMMING

Course Outcomes (COs) –

1. Explain the basic concepts of object oriented programming language and their representation.
2. Illustrate dynamic memory allocation functions, access specifiers and the friend functions.
3. Demonstrate the use of constructors, destructors and also the behaviour of inheritance and its implementation.
4. Implement polymorphism and overloading of operators.
5. Apply the I/O operations to handle backup system using files and to develop general purpose templates.
6. Handle raised exception while implementing various object oriented concepts.

Module 1: Object oriented design

Concepts of object oriented programming language, Major and minor elements, Object, Class, relationships among objects, aggregation, links, relationships among classes-association, aggregation, using, instantiation, meta-class, grouping constructs.

Module 2: Object oriented concepts

Difference between OOP and other conventional programming – advantages and disadvantages. Class, object, message passing, inheritance, encapsulation, polymorphism

Module 3: Basic concepts of object oriented programming using Java

Implementation of Object oriented concepts using Java.

Module 4: Language features to be covered: Class & Object properties

Basic concepts of java programming – advantages of java, byte-code & JVM, data types, access specifies, operators, control statements & loops, array, creation of class, object, constructor, finalize and garbage collection, use of method overloading, this keyword, use of objects as parameter & methods returning objects, call by value & call by reference, static variables & methods, garbage collection, nested & inner classes, basic string handling concepts- String (discuss charAt() , compareTo(), equals(), equalsIgnoreCase(), indexOf(), length() , substring(), toCharArray() , toLowerCase(), toString(), toUpperCase() , trim() , valueOf() methods) & StringBuffer classes (discuss append(), capacity(), charAt(), delete(), deleteCharAt(), ensureCapacity(), getChars(), indexOf(), insert(), length(), setCharAt(), setLength(), substring(), toString() methods), concept of mutable and immutable string, command line arguments, basics of I/O operations – keyboard input using Buffered Reader & Scanner classes.

Module 5: Reusability properties

Super class & subclasses including multilevel hierarchy, process of constructor calling in inheritance, use of super and final keywords with super() method, dynamic method dispatch, use of abstract classes & methods, interfaces. Creation of packages, importing packages, member access for packages.

Module 6: Exception handling & Multithreading

Exception handling basics, different types of exception classes, use of try & catch with throw, throws & finally, creation of user defined exception classes. Basics of multithreading, main thread, thread life

cycle, creation of multiple threads, thread priorities, thread synchronization, inter-thread communication, deadlocks for threads, suspending & resuming threads.

Module 7: Applet Programming (using swing)

Basics of applet programming, applet life cycle, difference between application & applet programming, parameter passing in applets, concept of delegation event model and listener, I/O in applets, use of repaint(), get Document Base(), get Code Base() methods, layout manager (basic concept), creation of buttons (JButton class only) & text fields.

Textbooks/References:

1. Rambaugh, James Michael, Blaha – "Object Oriented Modelling and Design" – Prentice Hall, India
2. Ali Bahrami – "Object Oriented System Development" – Mc Graw Hill
3. Patrick Naughton, Herbert Schildt – "The complete reference-Java2" – TMH
4. R.K Das – "Core Java For Beginners" – VIKAS PUBLISHING
5. Deitel and Deitel – "Java How to Program" – 6th Ed. – Pearson
6. Ivor Horton's Beginning Java 2 SDK – Wrox
7. E. Balagurusamy – " ProgrammingWith Java: APrimer" – 3rd Ed. – TMH

5th SEMESTER

PCCEC501: ELECTROMAGNETIC WAVES

Course Outcomes (COs) –

1. Recapitulate the concept of Vector Calculus and Coordinate Geometry along with transformation methods
2. Develop understanding and capability to analyze static electric and magnetic fields, boundary conditions, the relevant theorems and their applications
3. Analyze the time-varying electric and magnetic fields, Maxwell's equations and their physical interpretation
4. Develop the understanding and ability to apply Maxwell's equations to determine field waves, and realize the wave propagation in different mediums
5. Acquire knowledge of techniques for the measurement of basic transmission line parameters, such as the reflection coefficient, standing wave ratio, and impedance
6. Develop knowledge of fundamental antenna parameters such as reflection coefficient, gain directivity, efficiency to differentiate between antennas in different applications

Module 1:

Vector Calculus

Basics of vectors, vector calculus, co-ordinate systems, vector operators-Gradient, Divergence and Curl- their physical significance, relevant theorems of vector calculus- their applications

Module 2:

Electrostatics

Coulomb's law, Gauss's law- physical interpretation, applications for various charge distributions, corresponding Maxwell's equation, Continuity equation and relaxation time, Boundary conditions at various interfaces

Module 3:

Magnetostatics

Biot-Savart's law, Ampere's law- physical interpretation, application for various currents, force due to magnetic field, magnetic boundary conditions, relevant Maxwell's equation

Module 4:

Wave propagation

Maxwell's equations for time-varying fields- physical interpretation and applications, Uniform Plane Wave and Wave propagation in various mediums, Wave polarization, phase and group velocity, Power

flow andPoynting vector, Reflection and refraction of plane waves at interface of different mediums, total internal reflection and reflection from conducting medium

Module 5:

Transmission lines

Transmission Line parameters- Propagation constant, characteristic impedance, reflection coefficient and VSWR, lossless and distortion-less transmission lines, Power transfer, Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.
A brief introduction to waveguides- modes in rectangular waveguide, cut-off frequency, wave velocity

Module 6:

Antenna fundamentals

Radiation: Principle of radiation from antennas, Radiation from the Hertz dipole, Powerradiated byhertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna.

Text Books

1. Principles of Electromagnetics, 4th Edition, Matthew O H Sadiku, Oxford University Press.
2. Electromagnetic Field Theory & Transmission Lines, G.S.N. Raju, Pearson Education
3. Electromagnetic Waves Shevgaonkar, Tata-McGaw-Hillr –R K

Reference Books

1. Engineering Electromagnetics, 2ed Edition - Nathan Ida, Springer India
2. Fields &Waves in Communication Electronics, S. Ramo, J. R. Whinnery & T. Van Duzer, John Wiley
3. Electromagnetic Theory & Applications, A. K. Saxena, Narosa Publishing House Pvt. Ltd.
4. Electromagnetics, 2ed Edition – JAEdminister, Tata-McGraw-Hill.
5. Engineering Electromagnetics, 7thEdition-W.H.Hayt & J.A.Buck, Tata-McGraw-Hill
6. Electromagnetic Waves and Transmission Lines- by G.Prasad, J.Prasad and J.Reddy- Scitech

PCCEC502: DIGITAL SIGNAL PROCESSING

Course Outcomes (COs) –

1. Implement concepts of trigonometry, complex algebra, Fourier transform, z-transform to analyze the operations on signals and acquire knowledge about Systems.
2. Classify systems based on linearity, causality, shift-variance, stability criteria and represent transfer function of the selected system.
3. Design and implement digital filters for processing of discrete time signals.
4. Analyze and compare various filter designing techniques.
5. Utilize signal processing strategies at multidisciplinary team activities.
6. Develop creative and innovative designs that achieve desired performance criteria and understand the need for lifelong learning of processors.

Module 1: Discrete-time signals and systems

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.

Module 2: Z-transform

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.
Discrete Fourier Transform
Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Convolution of signals, Fast Fourier Transform Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.

Module 3: Design of Digital filters

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.

Module 4: Applications of Digital Signal Processing

Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMA Model, Linear Mean-Square Estimation, Wiener Filter.

Text/Reference Books:

1. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH
2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.
3. John 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.

PCCEC503: COMPUTER ARCHITECTURE

Course Outcomes (COs) –

1. Describe the fundamental organization of a computer system.
2. Explain addressing modes, instruction formats and program control statements.
3. Distinguish the organization of various parts of a system memory hierarchy.
4. Describe fundamentals concepts of pipeline and vector processing.
5. Understand the theory and architecture of central processing unit.
6. Learn the concepts of parallel processing, pipelining and interprocessor communication.

7. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

MODULE 1

Basic Structure of Computers, Functional units, software, performance issues software, machine instructions and programs.

MODULE 2

Types of instructions, Instruction sets: Instruction formats, Assembly language, Stacks, Ques, Subroutines. Processor organization, Information representation, number formats.

MODULE 3

Multiplication & division, ALU design, Floating Point arithmetic, IEEE 754 floating point formats Control Design, Instruction sequencing, Interpretation, Hard wired control - Design methods, and CPU control unit. Microprogrammed Control - Basic concepts, minimizing microinstruction size, multiplier control unit.

MODULE 4

Microprogrammed computers - CPU control unit Memory organization, device characteristics, RAM, ROM, Memory management, Concept of Cache & associative memories, Virtual memory.

MODULE 5

System organization, Input - Output systems, Interrupt, DMA, Standard I/O interfaces Concept of parallel processing, Pipelining, Forms of parallel processing, interconnect network

Text/Reference Books:

1. V.Carl Hammacher, "Computer Organisation", Fifth Edition.
2. A.S.Tanenbum, "Structured Computer Organisation", PHI, Third edition
3. Y.Chu, "Computer Organization and Microprogramming", II, Englewood Chiffs, N.J., Prentice Hall Edition
4. M.M.Mano, "Computer System Architecture", Edition
5. C.W.Gear, "Computer Organization and Programming", McGraw Hill, N.V. Edition
6. Hayes J.P, "Computer Architecture and Organization", PHI, Second edition

ECELEC504: INFORMATION THEORY & CODING

Course Outcomes (COs) –

1. Calculate information, entropy, mutual information and channel capacity for various channels.
2. Compare various source coding techniques like Huffman Coding and Shannon Fano Coding in terms of their efficiency.
3. Inspect error detection and correction in linear block codes.
4. Develop encoding circuits for cyclic codes.

5. Construct convolutional codes.
6. To study various data compression methods and describe the most common such methods.
7. To calculate entropy, joint entropy, relative entropy, conditional entropy, and channel capacity of a system

MODULE 1

Basics of information theory, entropy for discrete ensembles;

MODULE 2

Shannon's noiseless coding theorem; Encoding of discrete sources. Markov sources; Shannon's noisy coding theorem and converse for discrete channels;

MODULE 3

Calculation of channel capacity and bounds for discrete channels; Application to continuous channels.

MODULE 4

Techniques of coding and decoding; Huffman codes and uniquely detectable codes;

MODULE 5

Cyclic codes and convolution arithmetic codes.

Text/Reference Books:

1. N. Abramson, Information and Coding, McGraw Hill, 1963.
2. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.
3. R.B. Ash, Information Theory, Prentice Hall, 1970.
4. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.

OECEC505: DATABASE MANAGEMENT SYSTEM

Course Outcomes (COs) –

1. Students will be able to know about database, database languages, architecture, different data models, their design and mapping.
2. Students will be able to know about relational algebra and modification of database.
3. Students will be able to know about SQL and its application.
4. Students will be able to know about relational database design and normalization.
5. Students will be able to know about query optimization, joining, transaction processing.
6. Students will be able to know about File organization and indexing etc.

MODULE 1:

Introduction: Concept & Overview of DBMS, Data Models, Database Languages, Database Administrator, Database Users, Three Schema architecture of DBMS.

Entity-Relationship Model: Basic concepts, Design Issues, Mapping Constraints, Keys, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R features.
Relational Model: Structure of relational Databases, Relational Algebra, Relational Calculus, Extended Relational Algebra Operations, Views, Modifications of the Database.

MODULE 2:
SQL and Integrity Constraints: Concept of DDL, DML, DCL. Basic Structure, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, assertions, views, Nested Subqueries, Database security application development using SQL, Stored procedures and triggers.

MODULE 3:
Relational Database Design: Functional Dependency, Different anomalies in designing a Database., Normalization using functional dependencies, Decomposition, Boyce-Codd Normal Form, 3NF, Normalization using multi-valued dependencies, 4NF, 5NF

MODULE 4:
Internals of RDBMS: Physical data structures, Query optimization: join algorithm, statistics and cost bas optimization. Transaction processing, Concurrency control and Recovery Management: transaction model properties, state serializability, lock base protocols, two phase locking.
File Organization & Index Structures: File & Record Concept, Placing file records on Disk, Fixed and Variable sized Records, Types of Single-Level Index (primary, secondary, clustering), Multilevel Indexes, Dynamic Multilevel Indexes using B tree and B+ tree .

Text Books:

1. Henry F. Korth and Silberschatz Abraham, “Database System Concepts”, McGraw Hill.
2. Elmasri Ramez and Novathe Shamkant, “Fundamentals of Database Systems”, Benjamin Cummings Publishing Company.
3. Ramakrishnan: Database Management System , McGraw-Hill
4. Gray Jim and Reuter Address, “Transaction Processing: Concepts and Techniques”, Moragan Kauffman Publishers.
5. Jain: Advanced Database Management System CyberTech
6. Date C. J., “Introduction to Database Management”, Vol. I, II, III, Addison Wesley.
7. Ullman JD., “Principles of Database Systems”, Galgottia Publication. Reference:
8. James Martin, “Principles of Database Management Systems”, 1985, Prentice Hall of India, New Delhi
9. “Fundamentals of Database Systems”, Ramez Elmasri, Shamkant B.Navathe, Addison Wesley Publishing Edition
10. “Database Management Systems”, Arun K.Majumdar, Pritimay Bhattacharya, Tata McGraw Hill

HSMC501: ESSENTIAL STUDIES FOR PROFESSIONALS - V

Advance Professional Knowledge-1

Module-1

Networks, Signals and Systems

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.

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

Module-2

Electronic Devices

Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; Generation and recombination of carriers; Poisson and continuity equations; P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED, photo diode and solar cell; Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography and twin-tub CMOS process.

Module-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.

Reference books:

1. G.K Publishers Gate Electronics & Communications
2. McGraw Hill Gate 2017 Electronics & Communications
3. Wiley Gate 2017 Electronics & Communications

HSMC502: ECONOMICS FOR ENGINEERS

Course Outcomes (COs) –

1. Apply knowledge of mathematics and economic principles to solve economic decision making problems in engineering fundamentals
2. Develop the value of economic factors and formulae for engineering economy as well as the implications and importance of considering different types of cost, depreciation, and inflation.
3. Create and interpret financial statements.
4. Analyze financial statements using standard financial ratios of liquidity, activity, debt and profitability.

5. Understand and use basic cost accounting tools and techniques like Economic Order Quantity and Stores Ledger.
6. Understand the fundamental financial concept of time value of money and apply compounding and discounting techniques to single sums and mixed streams.
7. Apply various criteria to evaluate corporate projects.

Module-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.

Module-2

3. Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal & Effective Interest.
4. Cash Flow & Rate Of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate Of
Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost
Ratio Analysis, Sensitivity And Breakeven Analysis. Economic Analysis In The Public Sector - Quantifying And Valuing Benefits & drawbacks.

Module-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 Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of 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.

Module-4

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.

Readings

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

PCCEC591: ELECTROMAGNETIC WAVES LABORATORY

Module 1:

1. 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 load end.
2. Input Impedance of a terminated coaxial line using shift in minima technique.
3. Study of Smith chart on Matlab platform.
4. Simulation study of Smith chart - Single and double stub matching.

Module 2:

5. Radiation Pattern of dipole antenna.
6. Radiation Pattern of a folded-dipole antenna.
7. Radiation pattern of a 3-element Yagi-Uda Antenna.
8. Beam width, gain and radiation pattern of a 3-element, 5-element and 7-element. Yagi-Uda antenna - Comparative study.
9. Radiation pattern, Gain, Directivity of a Pyramidal Horn Antenna.
10. Study of Spectrum Analyzer.

PCCEC592: DIGITAL SIGNAL PROCESSING LABORATORY

Simulation Laboratory using standard Simulator:

1. Sampled sinusoidal signal, various sequences and different arithmetic operations.
2. Convolution of two sequences using graphical methods and using commands- verification of the properties of convolution.
3. Z-transform of various sequences – verification of the properties of Z-transform.
4. Twiddle factors – verification of the properties.
5. DFTs / IDFTs using matrix multiplication and also using commands.
6. Circular convolution of two sequences using graphical methods and using commands, differentiation between linear and circular convolutions.
7. Verifications of the different algorithms associated with filtering of long data sequences and Overlap –add and Overlap-save methods.
8. Butterworth filter design with different set of parameters.
9. FIR filter design using rectangular, Hamming and Blackman windows.

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus based on AICTE Model Curriculum for Undergraduate Courses

6th SEMESTER

PCCEC601: CONTROL SYSTEM

Course Outcomes (COs) –

1. Applying the mathematical and graphical methods to simplify complex control systems.
2. Evaluating the responses and performing error analysis of systems in time domain.
3. Interpreting the conditions for stability of a system in time domain through Routh-Hurwitz and root locus technique.
4. Analyzing performance characteristics of a system in frequency domain.
5. Analyzing the system with state variable approach.
6. Applying the compensation technique to design a compensator with desired specification.

Module-1

Concepts of Control Systems- Open Loop and closed loop control systems and their differences. Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems.

Module-2

TRANSFER FUNCTION REPRESENTATION

Transfer Function of linear systems, Block diagram representation of systems considering Electrical systems as examples -Block diagram algebra. Representation by Signal flow graph - Reduction using mason's gain formula.

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems. Transient response of second order systems - Time domain specification. Steady state response - Steady state errors and error constants

STABILITY ANALYSIS IN S-DOMAIN

The concept of stability – Routh's stability criterion – limitations of Routh's stability. Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

Module-3

FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams. Difference between time domain and Frequency domain. Determination of Frequency domain specifications and transfer function from the Bode Diagram Phase margin and Gain margin-Stability Analysis from Bode Plots.

STABILITY ANALYSIS IN FREQUENCY DOMAIN

Polar Plots, Nyquist Plots Stability Analysis.

Module-4

CLASSICAL CONTROL DESIGN TECHNIQUES

Compensation techniques: Lag, Lead, Lead-Lag Controllers design in frequency Domain PD, PI, PID Controllers design.

Module-5

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations. State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

Text Books:

1. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John Wiley and Son's.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, NewAge International (P) Limited, Publishers, 2nd edition.

Reference Books:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.
2. Control Systems Engg. by NISE 3rd Edition – John Wiley

PCCEC602: COMPUTER NETWORK

Course Outcomes (COs) –

1. Define Network and its components, understand and explore the basics of Computer Networks and Various Protocols.
2. Illustrate the functionality of OSI and TCP/IP reference models
3. Compare different network layer protocols
4. Evaluate Architecture for Application layer protocols
5. Choose appropriate protocol for desired communication service
6. Enables the students to examine the important aspects and functions of network layer, transport layer and application layer in internetworking
7. Understand easily the concepts of network security.

Module-1

Introduction – Uses – Network Hardware – LAN –MAN – WAN, Internetworks – Network Software – Protocol hierarchies – Design issues for the layers – Interface & Service – Service Primitives. Reference models – OSI – TCP

Module-2

Data Link layer Design Issues – Flow Control and ARQ techniques. Data link Protocols – HDLC. DLL in Internet. MAC Sub layer – IEEE 802 FOR LANs & MANs, IEEE 802.3, 802.4, 802.5. Bridges - Switches – High Speed LANs - Gigabit Ethernet. Wireless LANs - 802.11 a/b/g/n, 802.15.PPP

Module-3

Congestion control algorithms – QoS. Internetworking – Network layer in internet. IPv4 - IP Addressing – Classless and Classfull Addressing. Sub-netting.

Network layer – Routing – Shortest path routing, Flooding, Distance Vector Routing, Link State Routing, RIP, OSPF, Routing for mobile hosts.

Module-4

Internet Control Protocols – ICMP, ARP, RARP, BOOTP. Internet Multicasting – IGMP, Exterior Routing Protocols – BGP. IPv6 – Addressing – Issues, ICMPv6.

Transport Layer – TCP & UDP. Application layer –FTP, DNS, Electronic mail, MIME, SNMP. Introduction to World Wide Web

Module-5

Application Layer- Introduction, providing services, Applications layer paradigms: Client server model, HTTP,E-mail, WWW, TELNET,DNS; RSA algorithm.

Textbooks

1. Computer Networks-Andrew S Tanenbaum, 4th Edition, Pearson Education.
2. Data Communications and Networking- Behrouz A. Forouzan, Fifth Edition TMH,2013

Reference Books:

1. An Engineering Approach to Computer Networks -S.Keshav, 2nd Edition, Pearson Education.
2. Understanding communications and Networks, 3rd Edition, W.A.Shay, Cengage Learning.
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K.W. Ross, 3rd Edition, Pearson Education.

ECELEC603: ANTENNAS & PROPAGATION

Course Outcomes (COs) –

1. Understanding the performance parameters of antenna and applying them to calculate performance of antenna.
2. Analyzing the radiated fields of antennas and applying the methods to calculate the results.
3. Analyzing the requirements, principles, and structures of different antennas.
4. Understanding the concept of antenna designing for practical applications.
5. Implementing mode classification for propagation of waves.
6. Illustrating the effect of atmosphere on the radio wave propagation.

Module-1

Fundamental Concepts- Physical concept of radiation, Radiation pattern, near-andfar-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions.

Radiation from Wires and Loops- Infinitesimal dipole, finite-length dipole, linear elements near conductors, dipoles for mobile communication, small circular loop.

Module-2

Aperture and Reflector Antennas- Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic reflector and cassegrain antennas.

Broadband Antennas- Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas.

Microstrip Antennas- Basic characteristics of micro strip antennas, feedingmethods, methods of analysis, design of rectangular and circular patch antennas.

Module-3

Antenna Arrays- Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes, extension to planar arrays, and synthesis of antenna arrays using Schelkunoff polynomial method, Woodward-Lawson method.

Basic Concepts of Smart Antennas- Concept and benefits of smart antennas, fixed weight beam forming basics, Adaptive beam forming.

Module-4

Different modes of Radio Wave propagation used in current practice.

Text Book

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

Reference Book

1. Elements of Electromagnetics; Mathew N.O. Sadiku, Oxford University Press, 5th Edition (2010)
2. Electromagnetic Waves & Radiating Systems, EC Jordan & K.G. Balmain; Pearson Education, 2nd Edition (2009)
3. Microstrip Antenna Design Handbook- Ramesh Garg; Artech House (2001)

OECEC604: DATA ANALYTICS / MACHINE LEARNING

DATA ANALYTICS

Course Outcomes (COs) –

1. Describe the life cycle phases of Data Analytics through discovery, planning and building; Gain the principle concepts and foundational understanding of data analytics.
2. Learn various Data Analysis Techniques.
3. Implement various Data streams and Demonstrate the business analytical techniques used in decision-making.

4. Understand item sets, Classification, Clustering, frame works & Visualizations.
5. Employ tools and technologies to analyze data and Apply R tool for developing real time applications

MODULE – 1

Introduction: Concept of Data Analytics, Comparison of Dara Science and Data Analytics, Data Life cycle, Data Acquisition, Data Preparation & Cleaning, Data Exploration.

Data Mining: Data Mining, Data Mining vs. Data Science, KDD Process, Data Mining Techniques.

MODULE – 2

Statistics: Statistics in Data Analytics, Applications, Basic terminologies, Types of Data Analysis, Descriptive Statistics vs Inferential Statistics, Standard Deviation, Entropy & Information Gain, Covarience, Correlation, Regression Analysis, simple Linear Regression.

Probability: Probability, Types of events, Types of probability, Conditional Probability, Bayes' Theorem, Point Estimation, Interval Estimation, Margin of error, Level of confidence, Hypothesis Testing

.

MODULE – 3

Machine Learning: Introduction to Machine Learning, Artificial Intelligence vs. Machine Learning, Machine Learning vs. Traditional Programming, Applications, Supervised Learning, Unsupervised Learning, Classification, Regression, Clustering, Data Pre-processing: Level Encoding, Feature Scaling. Regression Analysis: Linear Regression, Polynomial Regression. Model estimator, Classification: Decision Tree, Random Forest, Overfitting vs Underfitting, Bias and Variance, Cross validation, KNN, K-means Clustering.

MODULE –4

Artificial Intelligence: Introduction and applications of AI, Types of AI, Agents: Types and structures, PEAS representation, Environment of AI, Uninformed Search vs. Informed Search, Expert System, Proposition Logic in AI.

Big Data Analysis: Introduction to Big Data, Sources of Big Data, 5 V's of Big data, Benefits & Applications of Big Data, Hadoop, HDFS: HDFS components, features and goals, Introduction to MapReduce, YARN, HBase.

Text books:

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley Publication.
2. Lillian Pierson, Jake Porway, "Data Science for Dummies".
3. Gareth M. James, Daniela Witten, Trevor Hastie, R J Tibshirani, "An Introduction to Statistical Learning: With Applications in R."
4. Andreas C. Müller, Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists".

HSMC601: ESSENTIAL STUDIES FOR PROFESSIONALS - VI

Module-1

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.

Module-2

Electromagnetics

Electrostatics; Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Pointing 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, S parameters, 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.

Reference Books

1. G.K publishers GATE Electronics & Communications
2. Mcgraw hill GATE 2017 Electronics & Communications
3. Wiley GATE 2017 Electronics & Communications

HSMC602: PRINCIPLES OF MANAGEMENT

Course Outcomes (COs) –

1. Knowledge about the concepts, need, importance and applications of management.
2. Understand the concepts related to Business.
3. Demonstrate the roles, skills and functions of management.
4. Analyze effective application of PPM knowledge to diagnose and solve organizational problems and develop optimal managerial decisions.
5. Understand the complexities associated with management of human resources in the organizations and integrate the learning in handling these complexities.

Module-1

Basic concepts of management: Definition – Essence, Functions, Roles, Level.

Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by objectives; Organization Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organizational Effectiveness.

Module-2

Management and Society – Concept, External Environment, CSR, Corporate Governance, Ethical Standards.
People Management – Overview, Job design, Recruitment & Selection, Training & Development, Stress Management. Managerial Competencies – Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship.

Module-3
Leadership: Concept, Nature, Styles. Decision making: Concept, Nature, Process, Tools & techniques.
Economic, Financial & Quantitative Analysis – Production, Markets, National Income Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control
.

Module-4
Customer Management – Market Planning & Research, Marketing Mix, Advertising & Brand Management.
Operations & Technology Management – Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six
Sigma, MIS.

Readings:

1. Management: Principles, Processes & Practices – Bhat, A& Kumar, A(OUP).
2. Essentials for Management – Koontz, Revised edition, Tata McGraw Hill (TMH)
3. Management – Stoner, James A. F. (Pearson).
4. Management - Ghuman, Tata McGraw Hill(TMH)

PCCEC691: CONTROL SYSTEMS LABORATORY

1. Familiarization with MATLAB Control System tool Box, MATLAB- SIMULINK tool box & pSPICE.
2. Determination of step response for 1st order & 2nd order system with amity feedback on CRO & calculation of control system specifications for variations of system design.
3. Simulation of step response & impulse response for Type-I & Type-II system with unity feedback using MATLAB & pSPICE.
4. 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.
5. Determination of PI, PD, and PID controller action on 1st order simulated process
6. Determination of approximate transfer function experimentally using Bode Plot.
7. 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.
8. Study of position control system using servomotor.
9. Design and hardware implementation of a temperature controller using microprocessor/microcontroller.

PCCEC692: COMPUTER NETWORK LABORATORY

1. IPC (Message queue)
2. NIC Installation & Configuration (Windows/Linux)
3. Familiarization with Networking cables (CAT5, UTP) and Connectors (RJ45, T-connector) Hubs, Switches
4. TCP/UDP Socket Programming
5. Multicast & Broadcast Sockets
6. Implementation of a Prototype Multithreaded Server
7. Implementation of Data Link Layer Flow Control Mechanism (Stop & Wait, Sliding Window)
8. Data Link Layer Error Detection Mechanism (Cyclic Redundancy Check)
9. Data Link Layer Error Control Mechanism (Selective Repeat, Go Back N)

PCCEC693: DATA ANALYTICS LABORATORY

1. Assignment on basic data types & mathematical operators in Python.
2. Assignment on conditional statement & control flow.
3. Assignment on Objects & Functions in Python
4. Assignment on Strings & related library functions.
5. Assignments on Collections (Tuple, Lists, Dictionary, Set)
6. Assignment using library functions on List.
7. Assignment using scikit-learn library.
8. Assignment on Supervised Learning
9. Assignment on Unsupervised Learning.
10. Use R as a calculator to compute the following values. After you do so, cut and paste your input and output from R to Word. Add numbering in Word to identify each part of each problem. (Do this for every problem from now on.)
    (a) 27(38-17)
    (b) ln(14^2)
    (c) (436/12)^1/2
11. Read the two data sets into the R environment (phenotypes.txt, genotypes.txt)
12. Create a boxplot showing the trait distributions (from phenotypes.txt)
13. Create the following vectors in R.
14. a = (5, 10, 15, 20, ..., 160)
15. b = (87, 86, 85, ..., 56)
16. Use vector arithmetic to multiply these vectors and call the result d. Select subsets of d to identify the following.
    (a) What are the 19th, 20th, and 21st elements of d?
    (b) What are all of the elements of d which are less than 2000?
    (c) How many elements of d are greater than 6000?
17. The dataset RADIOLOGY may be found on the web page. This dataset (from problem 3.5 in your book), contains hospital information for 31 months: visits to radiology, patient-days, ER visits, and clinic visits. Save this file and use read. table to import it into R.
18. What are the means and standard deviations of the four data variables (excluding month)?

19. From the radiology data, examine the histograms and boxplots of clinic visits and radiology visits.

PCCEC694: ELECTRONIC MEASUREMENT LABORATORY

1. Study of Static Characteristics of a Measuring Instrument
2. Study of Dynamic Characteristics of a Measuring Instrument
3. Acquaintance with basic structure of DMM and measurement of different electrical parameters
4. Realization of Data Acquisition system
5. Wave and spectrum analysis using Q meter
6. Realization of a V-to-I & I-to-V converter.
7. Statistical analysis of errors in measurement.
8. Study of VCO (Voltage controlled oscillator) & PLL (Phase Locked Loop).

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus based on AICTE Model Curriculum for Undergraduate Courses

7th SEMESTER

ECELEC701: MICROWAVE THEORY & TECHNIQUES

Course Outcomes (COs) –

1. Develop understanding of the basic properties and application areas of microwaves, transmission losses, and analyze various modes in microstrip lines and waveguides.
2. Develop the ability to apply analysis methods to determine circuit properties of microwave networks, realize the scattering parameters.
3. Analyze the microwave semiconductor devices and for their properties, and determine the performance characteristics of microwave passive circuits, reciprocal/non-reciprocal systems
4. Develop the ability to design and analyze microwave filters, amplifiers, oscillators, impedance matching and noise, interference analysis in such devices and measurement of various device parameters
5. Acquire knowledge about microwave antennas for various applications, interference, the microwave technologies used for civil and medical applications and their effect on human health.

Module-1

Introduction to Microwaves-History of Microwaves, Microwave Frequency bands; Applications of Microwaves: Civil and Military, Medical, EMI/ EMC.

Mathematical Model of Microwave Transmission-Concept of Mode, Features of TEM, TE and TM Modes, Losses associated with microwave transmission, Concept of Impedance in Microwave transmission.

Module-2

Analysis of RF and Microwave Transmission Lines- Coaxial line, Rectangular wave guide, Circular waveguide, Strip line, Micro strip line.

Microwave Network Analysis- Equivalent voltages and currents for non-TEMlines, Network parameters for microwave circuits, Scattering Parameters.

Module-3

Passive and Active Microwave Devices- Microwave passive components: Directional Coupler, Power Divider, Magic Tee, Attenuator, Resonator. Microwave active components: Diodes, Transistors, Oscillators, Mixers. Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes. Microwave Tubes: Klystron, TWT, Magnetron. Microwave Design Principles- Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power Amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design. Microwave Antennas- Antenna parameters, Antenna for ground based systems, Antennas for airborne and satellite borne systems, Planar Antennas.

Module-4

Microwave Measurements- Power, Frequency and impedance measurement atmicro wave 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.

Module-5

Microwave Systems- Radar, Terrestrial and Satellite Communication, Radio Aidsto Navigation, RFID, GPS. Modern Trends in Microwaves Engineering- Effect of Microwaves on human body, Medical and Civil applications of microwaves, Electromagnetic interference and Electromagnetic Compatibility (EMI & EMC), Monolithic Microwave ICs, RF-MEMS for microwave components, Microwave Imaging.

Text/Reference Books:

1. R.E. Collins, Microwave Circuits, McGraw Hill
2. K.C. Gupta and I.J. Bahl, Microwave Circuits, Artech house

ECELEC702: EMBEDDED SYSTEM

Course Outcomes (COs) –

1. Understand and implement the concept of embedded System Design
2. Design of microcontroller based embedded system.
3. Understand the concept of real time operating systems and implement different types of scheduling strategies based on embedded system design requirements.
4. Design interfacing of the systems with other data handling / processing system
5. Analysis of engineering constraints like energy dissipation, data exchange speeds etc.
6. Develop design approach using advanced controllers to real-life situations.

Module-1

Introduction to Embedded System: Embedded system Vs General computing systems, History of Embedded systems, Purpose of Embedded systems, Microprocessor and Microcontroller, Hardware architecture of the real time systems.

Module-2

Devices and Communication Buses: I/o types, serial and parallel communication devices, wireless communication devices, timer and counting devices, watchdog timer, real time clock, serial bus communication protocols, parallel communication network using ISA, PCI, PCT-X, Intrnet embedded system network protocols, USB, Bluetooth.

Module-3

Program Modelling Concepts : Fundamental issues in Hardware software co-design, Unified Modelling Language(UML), Hardware Software trade-offs DFG model, state machine programming model, model for multiprocessor system.

Module-4

Real Time Operating Systems : Operating system basics, Tasks, Process and Threads, Multiprocessing and multitasking, task communication, task synchronization, qualities of good RTOS. Examples of Embedded System : Mobile phones, RFID, WISENET, Robotics, Biomedical Applications, Brain machine interface etc. Popular microcontrollers used in embedded systems, sensors, actuators. Programming concepts and embedded programming in C, C++, JAVA.

Reference Books:

1. Introduction to Embedded Systems : Shibu K. V. (TMH)
2. Embedded System Design – A unified hardware and software introduction: F. Vahid (John Wiley)
   3. Embedded Systems : Rajkamal (TMH)
3. Embedded Systems : L. B. Das (Pearson)
4. Embedded System design : S. Heath (Elsevier)
5. Embedded microcontroller and processor design: G. Osborn (Pearson)

ECELEC703: SATELLITE COMMUNICATION

Course Outcomes (COs) –

1. Develop the understanding about the dynamics of the satellite services, fundamental laws governing satellite stabilization.
2. Gain knowledge about launching mechanism of satellites, orbit tracking, stabilization and controlling methods.
3. Able to realize the design of various satellite sub-systems, satellite antennas for wireless communication applications.
4. Develop understanding of the application of analog and digital technologies, multiple access techniques for satellite communication network.
5. Acquire knowledge of the design of satellite links including both uplink and downlink with budget analysis and effect of various sources of noise on link
6. Analyze the design of Earth stations, antennas used and various applications of satellites in specific areas

Module 1

Fundamentals of Satellite Communication

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.

Orbital Mechanics: Orbital equations, Kepler's laws, Apogee and Perigee, evaluation of velocity, orbital period, concepts of Solar day and Sidereal day, satellite launching mechanism

Module 2

Satellite Sub-systems and Various Phenomena in Satellite Communication

Typical Phenomena in Satellite Communication: Solar Eclipse on satellite, Sun Transit Outage and its effects, Doppler frequency shift and its expression, effects of rain on satellite communication

Satellite sub-systems: Architecture and Roles of various sub-systems of a satellite such as Telemetry, tracking, command and monitoring (TTC & M), Attitude and orbit control system (AOCS), Communication sub-system, Satellite antennas, power sub-systems etc.

Module 3

Satellite Link-budget analysis and Receivers

Satellite link budget: Calculation of flux density and received signal power, system noise temperature for satellite receiver, noise power calculation, Drafting of satellite link budget and C/N ratio calculations for the uplink, downlink with and without noise and interference

Earth station receiver in satellite communication- various types of receivers and their building blocks

Module 4

Satellite Modulation and Multiple Access Schemes

Various modulation schemes used in satellite communication- analog and digital modulation techniques, Multiple access schemes based on time, frequency, and code sharing namely TDMA, FDMA and CDMA.

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

OECEC704: INTERNET OF THINGS

Course Outcomes (COs) –

1. Understand the concepts of Internet of Things.
2. Analyze basic protocols in wireless sensor network.
3. Design IOT applications in different domain and be able to analyze their performance.
4. Implement basic IOT applications.

Module-1

Introduction to IoT

Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT.

Module-2

Elements of IoT

Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols - MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

Module-3

IoT Application Development

Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

Module-4

IoT Case Studies

IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.

References:

1. Vijay Madisetti, Arshdeep Bahga, Ïnternet of Things, "A Hands on Approach", University Press
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
4. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi
5. Adrian McEwen, "Designing the Internet of Things", Wiley
6. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill
7. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media

HSMC702: ORGANIZATIONAL BEHAVIOUR

Course Outcomes (COs) –

1. Students are able to understand structural intricacies of organization and its departmentalization process.
2. Students are able to observe how people behave under different conditions and understand why people behave as they do.
3. Students are able to apply the knowledge of principles of management to suggest ways to motivate employees and design organizational incentives.
4. Students are able to analyse related information and evaluate options for the most logical and optimal solution such that they would be able to predict and control human behaviour and improve results.

Module-1

Organizational Behaviour: Definition, Importance, Historical Background, Fundamental Concepts of OB, Challenges and Opportunities for OB.

Personality and Attitudes: Meaning of personality, Personality Determinants and Traits, Development of Personality, Types of Attitudes, Job Satisfaction.

Perception: Definition, Nature and Importance, Factors influencing Perception, Perceptual Selectivity, Link between Perception and 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.

Module-2

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.

Module-3

Leadership: Definition, Importance, Theories of Leadership Styles.

Organizational Politics: Definition, Factors contributing to Political Behaviour.

Conflict Management: Traditional vis-a-vis Modern View of Conflict, Functional and Dysfunctional Conflict, Conflict Process, Negotiation – Bargaining Strategies, Negotiation Process.

Module-4

Organizational Design: Various Organizational Structures and their Effects on Human Behaviour, Concepts of Organizational Climate and Organizational Culture.

References:

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, 10thEdn.

HSMC701: ESSENTIAL STUDIES FOR PROFESSIONALS - VII

Module-1

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.

Module-2

Communications

Random processes: autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems; 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 frequency synchronization, inter-symbol interference and its mitigation; Basics of TDMA, FDMA and CDMA.

Reference Books

1. G.K publishers GATE Electronics & Communications
2. Mcgraw hill GATE 2017 Electronics & Communications
3. Wiley GATE 2017 Electronics & Communications

PCCEC791: MICROWAVE LABORATORY

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. Experimental/Simulation Study of filter (LPF, HPF,BPF) response.
8. Measuring of dielectric constant of a material using waveguide test bench at X-band.

PCCEC792: EMBEDDED SYSTEM LABORATORY

1. Write a Program to Glow the Traffic Lightsusing 8051 Assembly Language
2. Interfacing UART: Serial Communication – Transmission & Receiver using 8051 Assembly language.
3. Interfacing the seven-segment display 8051 Assembly Language
4. Interfacing the matrix keypad 8051 Assembly Language
5. Interfacing LED display8051 Assembly Language
6. Design and Simulation of Encoders and Decoders.
7. Design and Simulation of Multiplexers and Demultiplexers.
8. Design and Simulation of Arithmetic Logic Unit

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus based on AICTE Model Curriculum for Undergraduate Courses

8th SEMESTER

ECELC801: FIBRE OPTIC COMMUNICATION

Course Outcomes (COs) –

1. Understand the structure of fiber with various modes of propagation and illustrate the concept of light traveling in the fiber
2. Classify the various splices and connectors and analyze its effect while joining the fibers
3. Analyze the concept of various losses associated with fibers and the methods by which the losses can be reduced
4. Understand the concept of optical sources with its characteristics
5. Interpret the working of optical detectors and sensors
6. Illustrate the various components needed in optical networks and explain the different couplers in fiber communication system

Module-1

Introduction to vector nature of light, propagation of light, propagation of light in a cylindrical dielectric rod, Ray model, wave model. Different types of optical fibers, Modal analysis of a step index fiber. Signal degradation on optical fiber due to dispersion and attenuation. Fabrication of fibers and measurement techniques like OTDR.

Module-2

Optical sources - LEDs and Lasers, Photo-detectors - pin-diodes, APDs, detector responsivity, noise, optical receivers. Optical link design - BER calculation, quantum limit, power penalties.

Module-3

Optical switches - coupled mode analysis of directional couplers, electro-optic switches.
Optical amplifiers - EDFA, Raman amplifier.WDM and DWDM systems. Principles of WDM networks.

Module-4

Nonlinear effects in fiber optic links. Concept of self-phase modulation, group velocity dispersion and solution based communication.

Text/Reference Books

1. J. Keiser, Fibre Optic communication, McGraw-Hill, 5th Ed. 2013 (Indian Edition).
2. T. Tamir, Integrated optics, (Topics in Applied Physics Vol.7), Springer-Verlag, 1975.
3. J. Gowar, Optical communication systems, Prentice Hall India, 1987.
4. S.E. Miller and A.G. Chynoweth, eds., Optical fibres telecommunications, Academic Press, 1979.
5. G. Agrawal, Nonlinear fibre optics, Academic Press, 2nd Ed. 1994.
6. G. Agrawal, Fiber optic Communication Systems, John Wiley and sons, New York, 1997
7. F.C. Allard, Fiber Optics Handbook for engineers and scientists, McGraw Hill, New York (1990).

ECELC802: MOBILE COMMUNICATION AND NETWORKS

Course Outcomes (COs) –

1. Understand mobile radio communication principles and to study the recent trends adopted in cellular systems and wireless standards.
2. Understanding the typical infrastructure for mobile networks through a popular GSM architecture.
3. Understanding GPRS, UMTS, 4G and 5G technologies.
4. Understanding problems and solutions for different layers of mobile networks, namely MAC layers, network layers and transport layers.
5. Outline various wireless standards and study the architecture and channel types.
6. Analyze the mobility of users and manage it through location tracing.

Module-1

Cellular concepts- Cell structure, frequency reuse, cell splitting, channel assignment, handoff, interference, capacity, power control; Wireless Standards: Overview of 2G and 3G cellular standards.

Module-2

Signal propagation-Propagation mechanism- reflection, refraction, diffraction and scattering, large scale signal propagation and lognormal shadowing. Fading channels-Multipath and small scale fading- Doppler shift, statistical multipath channel models, narrowband and wideband fading models, power delay profile, average and rms delay spread, coherence bandwidth and coherence time, flat and frequency selective fading, slow and fast fading, average fade duration and level crossing rate.

Module-3

Capacity of flat and frequency selective channels. Antennas- Antennas for mobile terminal monopole antennas, PIFA, base station antennas and arrays.

Module-4

Multiple access schemes-FDMA, TDMA, CDMA and SDMA. Modulation schemes- BPSK, QPSK and variants, QAM, MSK and GMSK, multicarrier modulation, OFDM.

Receiver structure- Diversity receivers- selection and MRC receivers, RAKE receiver, equalization: linear-ZFE and adaptive, DFE. Transmit diversity-Altamonte scheme.

Module-5

MIMO and space time signal processing, spatial multiplexing, diversity/multiplexing tradeoff. Performance measures- Outage, average snr, average symbol/bit error rate. System examples- GSM, EDGE, GPRS, IS-95, CDMA 2000 and WCDMA.

Text/Reference Books:

1. WCY Lee, Mobile Cellular Telecommunications Systems, McGraw Hill, 1990.
2. WCY Lee, Mobile Communications Design Fundamentals, Prentice Hall, 1993.
3. Raymond Steele, Mobile Radio Communications, IEEE Press, New York, 1992.
4. AJ Viterbi, CDMA: Principles of Spread Spectrum Communications, Addison Wesley, 1995.
5. VK Garg &JE Wilkes, Wireless & Personal Communication Systems, Prentice Hall, 1996.

OECEC803: NEURAL NETWORK AND APPLICATION/ARTIFICIAL INTELLIGENCE

NEURAL NETWORK AND APPLICATION

Course Outcomes (COs) –

1. Understanding the basics, characteristics, applications of neural network
2. Explain the theoretical and practical aspects of Hopfield, Feed Forward Back Propagation & Counter Propagation Neural Network
3. Model McCllouch-Pitts & Perceptron neural network and Linear Separability
4. Demonstrate theoretical and practical aspects of Optical Neural Networks, Bidirectional Associative & Adaptive Resonance Theory Neural Network
5. Apply the knowledge of Neural Networks, Fuzzy Logic & genetic Algorithm for solving a problem in the different application fields
6. Analyse basic concept of Genetic Algorithm and neocognitron

Module-1

Introduction to neural networks: Human brain and models of a neuron, artificial neurons and activation functions; Learning processes: Introduction to Supervised, Unsupervised and Reinforcement Learning, Memory-based learning, Hebbian learning, competitive learning, Boltzman learning, Adaptive Linear Neuron (Adeline);

Module-2

Single-layer perceptrons: Unconstrained optimization, LMS algorithm, learning curves, perceptrons, convergence theorem, limitations of single-layer perceptrons; Multi-layer perceptrons: Back-propagation algorithm, XOR problem, feature detection, accelerated convergence of back-propagation algorithm, limitations;

Module-3

Radial Basis function networks: Theorems on separability of patterns, interpolation problem, regularization theory and regularization networks, generalized RBF, approximation properties of RBF, Wavelet Neural Network, comparison of RBF and back-propagation;

Module-4

Associative Memory Networks: Training Algorithm for Pattern Association-Hebb Rule, Bidirectional Associative Memory, Hopfield Networks- Continuous and Discrete, Hamming Network;
Self- Organizing maps: Feature mapping models, SOM algorithm, learning vector quantization, adaptive vector quantization; Stochastic machines: Statistical mechanics, Markov chains, Simulated annealing, Gibbs sampling, Boltzman machine, Sigmoid belief networks;

Module-5

Applications: Applications on Digital Image Processing and other related areas, Image Restoration based on Associative Memory, Data Visualization with self organizing feature MAP, Support Vector machines (SVM), SVM based learning. Introduction to MATLAB Programming.

Text Books:

1. S. N. Sivanandam, S.N. Deepa: Principles of Soft Computing (Wiley India)
2. Satish Kumar: Neural Networks – A Classroom Approach (Mc Graw Hill Ed.)
3. Mohamad H. Hassoun: Fundamentals of Artificial Neural Networks(PHI)
4. James A. Freeman, David M. Skapura: Neural Networks (Pearson)
5. Simon Heykin : Neural Networks – A Comprehensive Foundation (PHI)
6. M. Ananda Rao, J. Srinibas: Neural Networks Algorithms and Applications (Narosa Publ. House)
7. S. Rajsekaran, G.A. Vijaylakshmi Pai: Neural Networks, Fuzzy Logic and Genetic Algorithm

Reference Books:

1. Amit Konar: Artificial Intelligence and Soft Computing (CRC Press, Indian Edition Available)
2. Cloete, Zarunda: Knowledge based Neurocomputing (University Press)
3. Duda, Hart, Stork: Pattern Classification (Wiley)
4. J.S. Jang, C.T. Sun, E. Mizutani: Neuro-Fuzzy and Soft Computing (PHI)
5. Bart Kosko: Neural Network and Fuzzy Systems (PHI)
6. N. K. Bose, P. Liang : Neural Network Fundamentals with Graphs, Algorithms and Applications (TMG)
7. Dan W Patterson, PHI : Introduction to Artificial Intelligence and Expert Systems (PHI)

ARTIFICIAL INTELLIGENCE

Course Outcomes (COs) –

1. Develop understanding of various AI techniques, including uninformed and informed search methods and algorithms, knowledge representation, planning and constraint management and categorize various problem domains.
2. Realize the present view of AI as the study of agents receiving percepts from the environment and develop ability to perform actions.
3. Develop awareness of AI facing primary challenges and the complexity of typical problems in the field along with possible solutions.
4. Develop knowledge about the models and techniques including Bayesian networks and Hidden Markov Models and apply them to real world problems.
5. Develop self-learning and research skills to interpret the architecture for intelligent agents and implement an intelligent agent.

Module-1

Introduction Overview of Artificial intelligence- Problems of AI, AI technique, Tic - Tac - Toe problem.

Intelligent Agent

Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.

Problem Solving

Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.

Module-2

Search techniques

Solving problems by searching: problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies.

Heuristic search strategies

Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, local beam search, genetic algorithms; constraint satisfaction problems, local search for constraint satisfaction problems.

Module-3

Adversarial search

Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning, additional refinements, iterative deepening.

Module-4

Knowledge & reasoning

Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation.

Using predicate logic Representing simple fact in logic, representing instant & ISA relationship, computable functions & predicates, resolution, natural deduction.

Representing knowledge using rules

Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.

Module-5

Probabilistic reasoning

Representing knowledge in an uncertain domain, the semantics of Bayesian networks, Dempster-Shafer theory, Fuzzy sets & fuzzy logics.

Planning

Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques.

Natural Language processing

Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing.

Learning

Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning.

Expert Systems

Representing and using domain knowledge, expert system shells, knowledge acquisition.

Basic knowledge of programming language like Prolog & Lisp.

Books:

1. Artificial Intelligence, Ritch & Knight, TMH
2. Artificial Intelligence A Modern Approach, Stuart Russel Peter Norvig Pearson
3. Introduction to Artificial Intelligence & Expert Systems, Patterson, PHI
4. Poole, Computational Intelligence, OUP
5. Logic & Prolog Programming, Saroj Kaushik, New Age International

6. Expert Systems, Giarranto, VIKAS

OECEC804: CLOUD COMPUTING

Course Outcomes (COs) –

1. Explaining various paradigm of cloud computing and computing techniques.
2. Articulating the concepts, key technologies, strength and limitation of cloud computing and possible applications.
3. Understanding architecture and infrastructure of cloud computing including SaaS, PaaS, Iaas, public cloud, private cloud and hybrid cloud.
4. Interpreting various data, scalability and cloud services to acquire efficient database for cloud storage.
5. Describing the appropriate cloud computing solutions and recommendations according to application used.
6. Explain the core issues of cloud computing such as security, privacy and interoperability and deal with controlling mechanism for accessing sage cloud service.

Module-1
Introductory Concepts & overview:

Distributed Systems - Parallel Computing Architectures: Vector Processing, Symmetric Multi Processing and Massively parallel processing systems - Grid Computing - Service Oriented Architecture Overview - Virtualization.

Module-2
Overview of Cloud Computing:

Meaning of the terms Cloud and cloud computing - cloud based service offerings - Grid Computing Vs Cloud Computing - Benefits of Cloud Model - limitations - legal issues - key characteristics of cloud computing - challenges for the cloud - the evolution of cloud computing.

Module-3
Web services delivered from the cloud: Infrastructure as a service - platform as a service - software as a service. Building Cloud networks: Evolution from the MSP model to cloud computing and software as a service - the cloud data center - SOA as step toward cloud computing - basic approach to a data center based SOA.

Module-4
Federation Presence, Identity & Privacy in the Cloud:
Federation in the cloud - presence in the cloud - privacy in the cloud - Privacy and its relation to cloud based information system. Security in the cloud: cloud security challenges - software as a service security.

Module-5
Common Standards in cloud computing: the open cloud consortium - the distributed management task force - standards for application developers -standards for messaging - standards for security.

Module-6

Mobile internet devices and the cloud: smartphone - mobile operating systems for smartphones - mobile platform virtualization - Collaboration Applications for mobile platforms - future trends. Casestudies:MapReduce,HDFS.

Text Books:

1. Cloud Computing Implementation, Management and Security by John W. Rittinghouse, James F. Ransome, CRC Press, Taylor & Francis group, 2010.
2. Cloud Computing a practical approach by Anthony T. Velte, Toby J. velte Robert Elsenpeter, Tata McGrawHill edition, 2010.

References:

1. Cloud Application Architectures by George Reese, Oreilly publishers.
2. Cloud Computing and SOA convergence in your enterprise, David S. Linthicum, Addison- Wesley.
3. George Coulouris, JeanDollimore and Tim Kindberg. Distributed Systems:Concepts and Design (Edition 3).Addison-Wesley2001