Course Curriculum and Detailed Syllabi

For

B. Tech. Computer Science & Engineering

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B. Tech. Information Technology

Effective for

Students admitted in the

Academic Session 2019-20

Department of Computer Science & Engineering

School of Engineering

Harcourt Butler Technical University, Kanpur

Kanpur-208002

1. About the Department

The Department of Computer Science & Engineering was established in 1984 with a 4-year B. Tech. program in Computer Science & Engineering having an intake of 30 students. A 3-year Post Graduate Program, Master of Computer Application (MCA), with an intake of 60 students was introduced in 1987. Under IT task force recommendations, B. Tech. Information Technology Program with an intake of 60 students was introduced in the year 2000. Currently, the department is running B. Tech. Computer Science & Engineering, B. Tech. Information Technology and MCA with students' intake of 60, 30 and 60 respectively. One of the youngest, but among the most efficient departments, it is reputed for producing the best quality software engineers who serve in leading companies in India and abroad. The students have an in-depth exposure to computing environment consisting of state-of-the-art machines in different laboratories. In order to identify Industrial projects for the students and to expose them to the industrial environment, the department has continuous interaction with the Industries.

2. Vision

To excel in Computer Science & Engineering education, research, innovation and global employability.

3. Mission

1. Achieve academic excellence in Computer Science & Engineering through an innovative teaching-learning process.
2. Inculcate technical competence and collective discipline in students to excel for global employability, higher education and societal needs.
3. Establish focus research groups in leading areas of Computer Science & Engineering.
4. Sustain quality in Computer Science & Engineering education & research through continuous & rigorous assessment.

4. Program Educational Objectives (PEOs)

1. Graduates will be able to take up technical/ professional positions for design, development, and problem solving in software industries and R&D organizations.
2. Graduates will be technical, ethical, responsible solution providers and entrepreneurs in various areas of Computer Science & Engineering.
3. Graduates will be capable and competent to pursue higher studies in Institutions of International / National repute.
4. Technical ability to analyze, develop and innovate systems and technologies in the leading/ever-evolving areas of Computer Science & Engineering.

5. Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

6. Program Specific Outcomes (PSOs)

By the completion of B. Tech. Computer Science & Engineering program, the students will achieve the following program specific outcomes:-

1. The ability to understand, analyse and develop applications in the field of algorithms, system software, databases, web design, networking and artificial intelligence.
2. The ability to apply standard practices and strategies in software project development using suitable programming environment to deliver a quality product.
3. The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies.
4. The ability to use research based knowledge to do literature survey, formulate problem, design & carry-out experimentation, analyse & interpret experimental results for complex research problems.

7. Consistency/Mapping of PEOs with Mission of the Department

PEO	M1	M2	M3	M4
PEO1	2	3	2	3
PEO2	3	3	1	2
PEO3	2	3	3	2
PEO4	3	3	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) "-": No correlation

8. Components of the Curriculum

(*Program curriculum grouping based on course components)*

Sr. No.	Curriculum Content			
	Course Component	**% of total number of credits of the Program**	**Total number of contact hours**	**Total number of Credits**
1.	Basic Sciences (BSC)	13.95	26	24
2.	Engineering Sciences (ESC)	16.86	38	29
3.	Humanities and Social Sciences (HMSC)	6.39	12	11
4.	Program Core (PCC)	36.63	71	63
5.	Program Electives (PEC)	8.14	14	14
6.	Open Electives (OEC)	7.56	13	13
7.	Project(s) (PRC)	8.14	28	14
8.	Industrial Training/Internships (ISC)	1.16	04	02
9.	Seminar	1.16	04	02
9.	Any Other (Please Specify) (MC)	0.00	06	00
10.	**Total Credits**	**100**	**216**	**172**

Department of Computer Science & Engineering

Course Structure (Semester wise)

B. Tech. Computer Science & Engineering

(Applicable w.e.f. the Session 2019-20)

Semester-I

Sr. No.	Course Type	Course Code	Course Name	Credits	Details of Sessional Marks				ESM	Total Marks
					CT	TA	Lab	Total		
1	BSC	BPH-101 / BPH-102	Physics	4 (3-0-2)	15	20	15	50	50	100
2	BSC	BMA-101	Mathematics-I	4 (3-1-0)	30	20	-	50	50	100
3	ESC	EEE-101 / EEE-102	Electrical Engineering	4 (3-0-2)	15	20	15	50	50	100
4	ESC	EME-101 / EME-102	Engineering Mechanics	3 (3-0-0)	30	20	-	50	50	100
5	HSMC	HHS-103 / HHS-104	Professional Communication	3 (2-0-2)	15	20	15	50	50	100
6	HSMC	HHS-101 / HHS-102	English Language & Composition	2 (2-0-0)	30	20	-	50	50	100
Total Credits				**20**						600

Semester-II

Sr. No.	Course Type	Course Code	Course Name	Credits	Details of Sessional Marks				ESM	Total
					CT	TA	Lab	Total		
1	BSC	BCY-101 / BCY-102	Engineering Chemistry	4 (3-0-2)	15	20	15	50	50	100
2	BSC	BMA-102	Mathematics-II	4 (3-1-0)	30	20	-	50	50	100
3	ESC	EET-101 /EET-102	Electronics & Instrumentation Engineering	3 (3-0-0)	30	20	-	50	50	100
4	ESC	ECE-101 / ECE-102	Engineering Graphics	3 (0-0-6)	30	20	-	50	50	100
5	ESC	ECS-101 / ECS-102	Computer Concepts & 'C' Programming	4 (3-0-2)	15	20	15	50	50	100
6	ESC	EWS-101 /EWS-102	Workshop Practice	2 (0-0-4)		20	30	50	50	100
7	MC	ECE-103 / ECE-104	Environment & Ecology	0 (2-0-0)	30	20	-	50	50	100*
	Total Credits			**20**						600

*Non-Credit course

Semester-III

Sr. No.	Course Type	Course Code	Course Name	Credits	Details of Sessional Marks				ESM	Total Marks
*Non-Credit course					CT	TA	Lab	Total		
1	BSC	BMA-253	Computer Oriented Numerical & Statistical Techniques	4 (3-1-0)	30	20	-	50	50	100
2	ESC	EET-	Digital Electronics	5 (3-1-2)	15	20	15	50	50	100
3	PCC	ECS-	Data Structure using C	4 (3-0-2)	15	20	15	50	50	100
4	PCC	ECS-	Pythan Programming	4 (2-1-2)	15	20	15	50	50	100
5	PCC	ECS-	Computer Organization & Architecture	2 (2-0-0)	30	20	-	50	50	100
6	HSMC	HHS-	Engineering Economics & Management	3 (3-0-0)	30	20	-	50	50	100
7	MC	HHS-	Indian Constitution	0 (2-0-0)	30	20	-	50	50	100*
Total Credits				**22**						600

*Non-Credit course

Semester-IV

Sr. No.	Course Type	Course Code	Course Name	Credits	Details of Sessional Marks				ESM	Total Marks
					CT	TA	Lab	Total		
1	BSC	BMA-254	Discrete Mathematical Structures	4 (3-1-0)	30	20	-	50	50	100
2	ESC	EIT-252	Software Engineering	5 (3-1-2)	15	20	15	50	50	100
3	PCC	ECS-	Principles of Programmin Languages	3 (2-1-0)	15	20	15	50	50	100
4	PCC	ECS-	Web Technology	4 (2-1-2)	15	20	15	50	50	100
5	PCC	ECS-	Operating Systems	3 (2-1-0)	15	20	15	50	50	100
6	HSMC	HHS-	Organisational Behaviour	3 (3-0-0)	30	20	-	50	50	100
7	MC	ECS-	Cyber Security	0 (2-0-0)	30	20	-	50	50	100*
	Total Credits			**22**						600

*Non-Credit course

Semester-V

Sr. No.	Course Type	Course Code	Course Name	Credits	Details of Sessional Marks				ESM	Total Marks
					CT	TA	Lab	Total		
1	PCC	ECS-351	Computer Networks	4 (2-1-2)	15	20	15	50	50	100
2	PCC	ECS-353	Database Management Systems	4 (2-1-2)	15	20	15	50	50	100
3	PCC	ECS-355	Design & Analysis of Algorithms	5 (3-1-2)	15	20	15	50	50	100
4	PCC	ECS-357	Theory of Automata & Formal Languages	3 (2-1-0)	30	20	-	50	50	100
5	PCC	ECS-359	Data Science	3 (2-1-0)	30	20	-	50	50	100
6	OEC (Maths)	BMA-351	Operation Research	3 (3-0-0)	30	20	-	50	50	100
Total Credits				**22**						600

Semester-VI

Sr. No.	Course Type	Course Code	Course Name	Credits	Details of Sessional Marks				ESM	Total Marks
					CT	TA	Lab	Total		
1	PCC	ECS-352	Compiler Design	4 (3-1-0)	30	20	-	50	50	100
2	PCC	ECS-354	Object Oriented Systems	3 (2-0-2)	15	20	15	50	50	100
3	PCC	ECS-356	Computer Graphics	3 (2-1-0)	30	20	-	50	50	100
4	PCC	ECS-358	Soft Computing	3 (2-1-0)	30	20	-	50	50	100
5	PCC	ECS-360	Internet of Things	3 (2-1-0)	30	20	-	50	50	100
6	PCC	ECS-362	Network Security	3 (3-0-0)	30	20	-	50	50	100
7	OEC (HSS)	HHS-352	Entrepreneurship Development	3 (3-0-0)	30	20	-	50	50	100
Total Credits				**22**						700

Semester-VII

Sr. No.	Course Type	Course Code	Course Name	Credits	Details of Sessional Marks				ESM	Total Marks
					CT	TA	Lab	Total		
1	PCC	ECS-451	Mobile Application Development	2 (2-0-0)	30	20	-	50	50	100
2	PCC	ECS-452	Artificial Intelligence	3 (2-0-2)	15	20	15	50	50	100
3	PEC	ECS-	Programme Elective-I#	3 (3-0-0)	30	20	-	50	50	100
4	PEC	ECS-	Programme Elective-II#	3 (3-0-0)	30	20	-	50	50	100
5	OEC	OEC-	Open Elective-I#	3 (3-0-0)	30	20	-	50	50	100
6	ISC	ECS-493	Industrial Training	2 (0-0-4)	-	50	-	50	50	100
7	ISC	ECS-495	Seminar	2 (0-0-4)	-	50	-	50	50	100
8	PRC	ECS-497*	Project	4 (0-0-8)	-	50	-	50	50	100
	Total Credits			**22**						800

Semester-VIII

Sr. No.	Course Type	Course Code	Course Name	Credits	Details of Sessional Marks				ESM	Total Marks
					CT	TA	Lab	Total		
1	PEC	ECS-	Programme Elective-III#	4 (3-1-0)	30	20	-	50	50	100
2	PEC	ECS-	Programme Elective-IV#	4 (3-1-0)	30	20	-	50	50	100
3	OEC	OEC-	Open Elective-II#	4 (3-1-0)	30	20	-	50	50	100
4	PRC	ECS-498*	Project	10 (0-0-20)	-	50	-	50	50	100
	Total Credits			**22**						400
					Total Programme Credits: 172					

*ECS-497 will have Internal Whereas ECS-498 will have External Evaluation

In addition to the Elective Courses listed below, students may also do these or equivalent/relevant course through MOOCs.

Programme Elective-I

1. Digital Image Processing (ECS-461)
2. Data Warehousing & Data Mining (EIT-463)
3. Advance Computer Architecture (ECS-465)
4. Human Computer Interaction (EIT-467)
5. Information Storage & Retrieval (EIT-469)
6. Advance Database Management Systems (ECS-471)

Programme Elective-II

1. Cloud Computing (ECS-481)
2. Real Time Systems (ECS-483)
3. Big Data Analytics (EIT-485)
4. Multimedia Systems (EIT-487)
5. Robotics (EIT-489)
6. Software Testing (ECS-491)

Programme Elective-III

1. Mobile Computing (EIT-462)
2. Embedded Systems (ECS-464)
3. Distributed Systems (ECS-466)
4. Agile Software Development (ECS-468)
5. Software Project Management (EIT-470)
6. ERP Systems (EIT-472)

Programme Elective-IV

1. Machine Learning (ECS-482)
2. Pattern Recognition (EIT-484)
3. Software Quality Engineering (ECS-486)
4. Computer Vision (EIT-488)
5. Natural Language Processing (ECS-490)
6. Virtual Reality (EIT-492)

Open Elective-II: (Can be opted by the students of other than CSE Branch)

1. Machine Learning (ECS-482)

Detailed Syllabus

Ist Year

PHYSICS (BPH-101/102)

Type	L	T	P	Credits
BSC	3	0	2	4

Prerequisite: Basic knowledge of Maths (12^{th} level) and preliminary idea of Vector calculus

Course Content:

Unit-1: Introductory Mechanics & Theory of Relativity: (Lectures: 08)

Potential energy function $F = -\text{grad}\,(V)$, equipotential surfaces, meaning of gradient, divergence, curl and their physical significance, Conservative and Non-Conservative forces, Curl of a force, Central forces, Examples of Central forces, Conservation of Angular Momentum, Inertial and Non- Inertial Frames of reference, Galilean transformation, Michelson Morley Experiment, Lorentz Transformation, Length contraction, Time dilation and Evidences for time dilation, Relativistic velocity addition formula, Relativistic variation of mass with velocity, Evidence of mass variation with velocity, Einstein's Mass energy equivalence, Examples from nuclear physics, Relativistic energy momentum relation.

Unit-2: Quantum Mechanics-Schrodinger Equation and its Applications: (Lectures: 08)

Dual Nature of matter & Radiation, Heisenberg's uncertainty Principle and their applications, wave group concept, Davisson Germer experiment, Postulates of quantum mechanics, Significance of wave function, Derivation of Schrodinger equation for time independent and time dependent cases, Application of Schrodinger wave equation for a free particle, Particle in a box (one dimensional and three dimensional), Simple harmonic oscillator (one dimensional).

Unit-3: Electromagnetic Theory: (Lectures: 08)

Ampere's law and Faraday's law of electromagnetic induction, Maxwell's equations, Correction of Ampere's law by Maxwell (concept of displacement current), transformation from integral to differential form, Physical significance of each equation, Poynting theorem, Maxwell's equations in free space, velocity of electromagnetic wave, Transverse character of the wave and orthogonality of **E**, **H** and **V** vectors, Maxwell's equation in dielectric medium and velocity of e.m. wave, Comparison with free space, Maxwell's equations in conducting media, Solution of differential equation in this case, penetration depth, its significance.

Unit-4: Materials of Technological Importance: (Lectures: 09)

Dielectric Materials: Electric field in presence of dielectric medium, concept of electric polarization, different types of polarizations, dielectric in A. C. field, concept of dielectric loss and loss energy.

Semiconducting Materials: Concept of energy bands in solids, carrier concentration and conductivity in intrinsic semiconductors and their temperature dependence, carrier concentration and conductivity in extrinsic semiconductors and their temperature dependence, Hall effect in semiconductors, compound semiconductors.

Nano Materials: Basic principles of nano science and technology, preparation, structure and properties of fullerene and carbon nanotubes, applications of nanotechnology.

Unit-5: Statistical Mechanics & Lasers: (Lectures: 09)

Phase space, the probability of distribution, most probable distribution, Maxwell-Boltzmann Statistics, Applications of Maxwell-Boltzmann Statistics, derivation of average velocity, RMS velocity and most probable velocity in the above case, Bose-Einstein Statistics, application to black body radiation, distribution law of energy, Planck's radiation formula and Stefan's law, Fermi – Dirac statics, application in case of free electrons in metals, energy distribution, Fermi energy.

Lasers: Spontaneous and stimulated emission of radiations, Einstein's theory of matter-radiation interaction, Einstein's coefficients and relation between them, Population inversion, components of a laser, different kinds of lasers, Ruby laser, He-Ne laser, properties of laser beams, mono-chromaticity, coherence, directionality, and brightness, applications of lasers.

Text and Reference Books:

1. Physics, Marcelo Alonso, J. Finn Edwards, Addison Wesley
2. Perspectives of Modern Physics, Arthur Beiser, McGraw Hill
3. Engineering Physics, R. K. Shukla, Pearson Education
4. Electrical Engineering Materials, R.K. Shukla, McGraw Hill
5. Introduction to Electrodynamics, David Griffiths, Cambridge University Press
6. Principles of Engineering Physics, R.K. Shukla, Ira Books
7. Introduction to Solid State Physics, Charles Kittel, Wille**y**

Lab Work:

Any ten (10) experiments from the following

1. To determine the energy of band gap of a N-type Ge-semiconductor using four probe method
2. Verification of Stefan's fourth power law for black body radiation, determination of the exponent of the temperature
3. Study of thermoelectricity: Determination of thermo-power of Copper-constantan thermo-couple
4. To study the variation of magnetic field with distance along the axis of current carrying coil and then to estimate the radius of the coil
5. Study of Carrey Foster's bridge: determination of resistance per unit length of the bridge wire and of a given unknown resistance
6. Determination of specific charge (charge to mass ratio; e/m) for electron
7. Study of tangent galvanometer: determination of reduction factor and horizontal component of earth's magnetic field
8. Determination of the wavelength of sodium light using Newton Rings' method
9. To determine the concentration of sugar solution using half shade polarimeter
10. Determination of wavelength of spectral lines of mercury (for violet, green, yellow-1 and yellow-2) using plane transmission grating
11. Determination of charge sensitivity and ballistic constant of a ballistic galvanometer

12. To determine the wavelength of spectral lines of hydrogen & hence to determine the value of Rydberg Constant
13. Draw the V-I characteristic of Light Emitting Diode (LED) and determine the value of Planck's constant

Course Outcomes

1. Understand and apply principle of conservation of momentum, theory of relativity.
2. Understand the basics of quantum mechanics and apply its principles to learn the phenomena that occur at subatomic dimensions.
3. Understand Maxwell's equations of electromagnetic theory with aim to apply in communication systems.
4. Apply the fundamentals of material science especially dielectric materials, semiconducting materials and nano-material, to apply these in different areas.
5. Understand the statistical behavior of the constituent particles and apply the principles of statistical mechanics and basics of Laser.

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	1	2	0	0	0	0	0	1
CO2	3	3	1	2	1	2	0	0	0	0	0	1
CO3	3	3	1	2	1	2	0	0	0	0	0	1
CO4	3	3	1	2	1	2	0	0	0	0	0	1
CO5	3	3	1	2	1	2	0	0	0	0	0	1

MATHEMATICS (BMA-101)

Type	L	T	P	Credits
BSC	**3**	**1**	**0**	**4**

Prerequisite:

Course Content:

Unit-1: Functions of One Real Variable

Successive differentiation, Leibnitz theorem, Mean value theorems, sequences and series, Expansion of functions, Improper integrals and their convergence.

Unit-2: Functions of Several Real Variables

Limit, Continuity, Partial differentiation, Total differential and approximations, Jacobian, Euler's theorem Expansion of functions, Beta and Gamma Functions, Multiple integral, Change of order, Change of variables, Applications to area, volume, mass, surface area etc. Dirichlet's Integral & applications.

Unit-3: Vector Calculus

Point functions, differentiation, Gradient, Directional derivative, Divergence and Curl of a vector and their physical interpretations, Solenoidal & irrotational fields, Integration, Line, Surface and Volume integrals Green's. Stoke's and Gauss Divergence theorems (without proof) and applications.

Unit-4: Matrices and Linear Algebra

Vector space and subspace, linear dependence, dimensions and basis, Linear transformation and its matrix representation, Elementary transformations, Echelon form, rank & nullity, Consistency of linear system of equations and their solutions, characteristic equation, Cayley Hamilton theorem, Real and complex eigenvalues and eigenvectors, diagonalisation, quadratic forms, complex, orthogonal, and unitary matrices, Application to Cryptography, discrete, Compartmental models and system stability.

Unit-5: Optimization

Engineering applications of optimization, statement and classification of optimization problems, Optimization techniques, single variable optimization, multi variable optimization with no constraint, with equality and inequality constraints, Linear Programming Problems, Graphical method and Simplex method.

Text and Reference Books:

1. R. K. Jain & S. R. K. lyengar; Advanced Engineering Mathematics, Narosa Publishing House 2002.
2. Erwin Kreyszig: Advanced Engineering Mathematics. John Wiley & Sons 8th Edition.
6. Dennis G. Zill & Michael R Cullen; Advanced Engineering Mathematics, Jones & Bartlett Publishers, 2nd Edition.
3. S. S. Rao; Optimization: Theory & application Wiley Eastern Limited.
4. T. M. Apostol, calculus, Vol. I, 2nd ed., Wiley 1967.
5. T. M. Apostol, Calculus, Vol. II, 2nd ed**.,** Wiley 1969.
6. Gilbert Strang, Linear Algebra & its applications, Nelson Engineering 2007.
7. Calculus & Analytic Geometry, Thomas and Finny.

Course Outcomes:

1. Find nth derivative, determine the expansion of functions and to find convergence of series and improper integral.
2. Find partial differentiation and evaluate area and volume using multiple integrals.
3. Convert line integrals to surface integrals and volume integrals. Determine Potential function for irrotational force fields.
4. Solve linear system of equations and determine the eigen value and eigen vectors of the matrix.

5. Learn concept of optimization and optimization techniques.

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	0	0	1	0	1	0	3
CO2	3	3	2	1	2	0	0	1	0	1	0	3
CO3	3	3	2	1	2	0	0	1	0	1	0	3
CO4	3	3	2	1	2	0	0	1	0	1	0	3
CO5	3	3	2	1	2	0	0	1	0	1	0	3

ELECTRICAL ENGINEERING (EEE-101/102)

Type	L	T	P	Credits
BSC	3	0	2	4

Prerequisite:

Course Content:

Unit-1: DC Circuit Analysis and Network Theorems: Circuit Concepts: Concepts of Network, Active and Passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements. R L and C as linear elements. Source Transformation. Kirchhoff's Law; loop and nodal methods of analysis; star – delta transformation; Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem. (Simple Numerical Problems)

Unit-2: Steady State Analysis of Single Phase AC Circuits: AC Fundamentals: Sinusoidal, Square and Triangular waveforms – average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel, and series – parallel RLC Circuits: Apparent, Active & Reactive Powers, Power factor, causes and problems of low power factor, power factor improvement. Resonance in Series and Parallel Circuits, Bandwidth and Quality Factor. (Simple Numerical Problems)

Unit-3: Three Phase AC Circuits: Three Phase System – its necessity and advantages, meaning of phase sequence and star and delta connections, balanced supply and balanced load, line and phase voltage / current relations, three phase power and its measurement. (Simple Numerical Problems)

Measuring Instruments: Types of instruments: Construction and Working Principles of PMMC and Moving Iron type Voltmeter & Ammeters, Single Phase Dynamometer Wattmeter and Induction Type Energy Meter, use of Shunts and Multipliers. (Simple Numerical Problems on Energy Meter, Shunts and Multipliers)

Unit-4: Introduction To Power System: General layout of Electrical Power system and functions of its elements, standard transmission and distribution voltages, concept of grid. Magnetic Circuit: Magnetic circuit concepts, analogy between Electric & Magnetic circuits, Magnetic circuits with DC and AC excitations, Magnetic leakage. B-H curve, Hysteresis and Eddy Current Losses, Magnetic circuit calculations mutual Coupling. Single Phase Transformer: Principle of Operation, Construction, e.m.f. equation, equivalent circuit, Power losses, efficiency, introduction to auto transformer. (Simple Numerical Problems)

Unit-5: Electrical Machines: Principles of electro mechanical energy conversion.

DC Machines: Types of DC machines, e.m.f. equation of generator and torque equation of motor, characteristics and applications of dc motors. (Simple Numerical Problems). Three Phase Induction Motor: Types, Principle of Operation, Slip – torque Characteristics, applications. (Simple Numerical Problems). Single Phase Induction Motor: Principle of Operation and introduction to methods of starting, applications. Three Phase Synchronous Machines: Principle of Operation of alternator and synchronous motor and their applications.

Lab Work:

A minimum ten experiments out of the following list.

1. Verification of Kirchhoff's laws.
2. Verification of (1) Superposition Theorem (2) Thevenin's Theorem (3) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a 1 – Ø ac series inductive circuit and study improvement of power factor using capacitor.
4. Study of phenomenon of resonance in RLC series circuit and obtain the resonant frequency.
5. Measurement of power in 3 – Ø circuit by Two Wattmeter method and determination of its power factor.
6. Determination of parameter of ac 1 – Ø series RLC Circuit.
7. Determination of (1) Voltage Ratio (2) Polarity and (3) Efficiency by load test of a 1 – Ø Transformer.
8. To Study speed control of dc shunt motor using (1) Armature Voltage Control (2) Field Flux Control.
9. Determination of Efficiency of a dc shunt motor by load test.
10. To study running and speed reversal of a 3 – Ø induction motor and record its speed in both direction.
11. To measure energy by a 1 – Ø energy meter and determine error.
12. Department may add any three experiments in the above list.

Text and Reference Books:

1. V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International
2. I. J. Nagarath, "Basic Electrical Engineering" Tata Mc - Graw Hill

3. D. E. Fitzgerald & A. Grabel Higginbotham, “Basic Electrical Engineering” Mc - Graw Hill
4. Edward Hughes, “Electrical Technology” Longman
5. T. K. Nagsarkar & M. S. Sukhija, “Basic Electrical Engineering” Oxford University Press
6. H. Cotton, “Advanced Electrical Technology” Wheeler Publishing
7. W. H. Hayt & J. E. Kennely, “Engineering Circuit Analysis” Mc - Graw Hill

Course Outcomes:

1. Understand the common electrical elements and their behavior with insight applications.
2. Analyze the ac circuit and calculate the various parameters.
3. Understand the 3-phase connections of source and load, various electrical measuring instruments and measurement of 3-phase power.
4. Understand the structure of Power system and Grid, magnetic circuit with working & applications and 1-phase transformer. Calculate the various parameters of magnetic circuits and transformer efficiency.
5. Understand the electromechanical energy conversion, 1-phase & 3-phase Induction motor and Synchronous machines with characteristics & applications.

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	1	2	1	0	1	1	0	2
CO2	3	3	1	2	1	2	1	0	1	1	0	2
CO3	3	3	1	2	1	2	1	0	1	1	0	2
CO4	3	3	1	2	1	2	1	0	1	1	0	2
CO5	3	3	1	2	1	2	1	0	1	1	0	2

ENGINEERING MECHANICS (EME-101/102)

Type	L	T	P	Credits
ESC	3	0	0	3

Prerequisite: Class XII Mathematics & Physics

Course Content:

Unit-1:

Two Dimensional Force Systems: Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position, Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Distributed force system, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications.

Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction, Applications.

Unit-2:

Beam: Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beams.

Trusses: Introduction, Simple Truss and Solution of Simple truss, Method of Joints and Method of Sections.

Unit-3:

Centroid and Moment of Inertia: Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry.

Unit-4:

Simple Stress and Strain: Introduction, Normal and Shear stresses, Stress- Strain Diagrams for ductile and brittle material, Elastic Constants, One Dimensional Loading of members of varying cross-sections, Strain energy.

Compound stress and strains: Introduction, state of plane stress, Principal stress and strain, Mohr's stress circle, Theories of Failure.

Unit-5:

Pure Bending of Beams: Introduction, Simple Bending Theory, Stress in beams of different cross sections.

Torsion: Introduction to Torsion of circular shaft, combined bending & torsion of solid & hollow shafts.

Text and Reference Books:

1. Engineering Mechanics by R.K.Bansal
2. Strength of Materials by R.K. Rajput
3. Engineering Mechanics by Irving H. Shames, Prentice-Hall
4. Mechanics of Materials by E. P. Popov, PHI
5. Strength of Materials by Ryder
6. Mechanics of Material by Gere & Timoshenko
7. Engineering Mechanics by A. Nelson
8. Engineering Mechanics by U.C. Jindal
9. Engineering Mechanics Statics by J. L. Meriam & L.G.Kraige

Course Outcomes:

1. Apply basic principal of mechanics and its application in engineering problems.
2. Determine resultants and apply conditions of static equilibrium to plane force systems
3. Identify and quantify all forces associated with a static framework
4. Generate and sketch shear force and bending moment diagrams
5. Derive and apply stress and strain relationships in single and compound members subject to axial force, bending moment and torsion.
6. Stress analysis for two dimensional stress systems.

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	0	0	0	0	0	0	0	0	1
CO2	3	3	3	0	0	0	0	0	0	0	0	1
CO3	3	3	3	0	0	0	0	0	0	0	0	1
CO4	0	3	2	2	0	0	0	0	0	0	0	1
CO5	0	3	2	2	0	0	0	0	0	0	0	1
CO6	0	3	2	3	0	0	0	0	0	0	0	1

PROFESSIONAL COMMUNICATION (HHS-103/104)

Type	L	T	P	Credits
HSMC	2	0	2	3

Prerequisite: NIL

Course Content:

Unit-1: Fundamentals of Technical Communication:

Process of communication, language as a tool of communication, levels of communication, flow of communication, barriers to communication, communication across cultures; Technical Communication: meaning, significance, characteristics, difference between technical and general communication.

Unit-2: Elements of Written Communication:

Words and phrases, word formation, synonyms and antonyms, homophones, one word substitution, sentence construction, paragraph construction,

Unit-3: Forms of Technical Communication:

(A) Business letters, job application letter and resume, business letters: sales & credit letters, letters of enquiry, letters of quotation, order, claim and adjustment letters, official letters: D.O. letters, government letters, letters to authorities, etc.

(B) Technical Reports: general format of a report, formal and informal reports, memo report, progress report, status report, survey report, trip report, complaint report, , Joining Report ,laboratory report, research papers, dissertations and theses. E-mail writing, Technical Proposals: purpose, characteristics, types, structure.

Unit-4: Presentation Strategies:

Defining the subject, Scope and purpose, analysing audience & locale, collecting materials, preparing outlines, organising the contents, visual aids, nuances of delivery, extemporaneous, manuscripts, impromptu, non- verbal strategies.

Unit-5: Value-based Text Reading:

(A) Study of the following essays from the text book with emphasis on writing skills:

1. Man and Nature by J. Bronowski
2. The Language of Literature and Science by Aldous Huxley
3. The Aims of Science & the Humanities by Moody E Prior
4. Gods in this Godless Universe by Bertrand Russell
5. Science and Survival by Barry Commoner

(B) Readings of selected short stories:

1. The Renunciation by Rabindranath Tagore

2. The Lament by Anton P. Chekhov

3. The Barber's Trade Union by Mulk Raj Anand

4. The Eyes Are Not Here by Ruskin Bond

Lab Work:

Interactive practical sessions with emphasis on oral presentations/ spoken communication:

1. Group Discussions: selected topical issues to be discussed in groups.
2. Mock interviews
3. Communication skills for seminars/conferences/workshops with emphasis on non-verbal skills.
4. Presentation skills for technical papers/project reports/professional reports.
5. Theme presentation/ key note presentation based on correct argumentation methodologies.
6. Argumentative skills
7. Role play
8. Comprehension skills based on reading and listening practice, asking questions.
9. Introduction to International Phonetics Alphabets
10. Audio Visual demonstration of effective communicative strategies & TED Talks

Text and Reference Books:

1. 'Improve Your Writing', V N Arora and Laxmi Chandra, Oxford University Press, New Delhi
2. 'An Anthology of English Short Stories', edited by R P Singh, Oxford University Press.
3. 'Technical Communication- Principles and Practices',Meenakshi Raman & Sangeeta Sharma, Oxford University Press, New Delhi.
4. Effective Technical Communication, by Barun K Mitra, Oxford University Press.
5. Business Correspondence & Report Writing by R.C. Sharma & Krishna Mohan, Tata McGraw Hill, N.D.
6. Developing Communication Skills by Krishna Mohan & Meera Banerjee, Macmillan India.
7. 'Technical Communication- Principles and Practices' by M R S Sharma, Oxford University Press, New Delhi.
8. Sethi and Dhamija, 'A Course in Phonetics and Spoken English', Prentice Hall of India, New Delhi.
9. Joans Daniel, 'English Pronouncing Dictionary', Cambridge University Press.
10. R. K. Bansal & J.B. Harrison, Spoken English for India, Orient Longman.
11. Excellence in Business Communication, Boeuve & Thill and Courtland.

Course Outcomes:

At the end of this course students should be able to:

1. Effectively communicate their ideas in the contemporary global competitive environment.
2. Convey their messages through constructive writing.
3. Draft potent E-Mails, letters, proposals and reports.
4. Present their presentations along with using all nuances of delivery with clarity and thoroughness.
5. Solve problems based on real time situations and articulate them eventually.

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	0	0	0	0	0	0	0	0	2	3	0	1
CO2	0	0	0	0	0	0	0	0	2	3	0	1
CO3	0	0	0	0	0	0	0	0	2	3	0	1
CO4	0	0	0	0	0	0	0	0	2	3	0	1
CO5	0	0	0	0	0	0	0	0	2	3	0	1

ENGLISH LANGUAGE AND COMPOSITION (HHS-101/102)

Type	L	T	P	Credits
HSMC	2	0	0	2

Prerequisite:

Course Content:

Unit-1: Basic Applied Grammar and Usage (Sentence Structure-1)

Constituent of a sentence- noun, verb, adjective, preposition, etc.; use of articles, adjectival forms, prepositions, adverbs; verb forms; finite and non-finite verbs, gerund and participles, auxiliary verbs. Tense and mood, Subject- verb concord, pronoun concord

Unit-2: Sentence Structure-2

(i) adverb clause, adjective clause, noun-clause; (ii) negation and interrogation; (iii) passive; (iv) exclamatory; (v) transformations; (vi) tense forms; (vii) varieties of sentences; (viii) placement of modifiers

Unit-3: Paragraph Writing

Structure of Paragraph, Topic Sentence, Construction of Paragraph, Technique of Paragraph writing, Unity, Coherence, Emphasis

Unit-4: Comprehension and Précis Writing

Reading and listening comprehension, improving comprehension skills, précis writing

Unit-5: Short Essay Writing

Dimension of essay writing- literary, Scientific, Comparison and Contrast, Narrative, Descriptive, Reflective, Expository, Argumentative and Imaginative

Text and References Books:

1. Das, B K and A David, 'A Remedial Course in English for Colleges', (Book -1, 2, 3) Oxford University Press, New Delhi.
2. Sinha, R P, 'Current English Grammar and Usage with Composition', Oxford University Press, New Delhi.
3. Wren, P C & Martin, 'English Grammar and Composition', S Chand & Co Ltd. New Delhi.
4. A. S. Horne, Guide to Pattern and usage in English, Oxford University Press, N.D.
5. M. L. Tickoo & A. E. Subramanian, Intermediate Grammar, usage & composition, Orient Longman

Course Outcomes:

1. Understand the various techniques of writing effectively and write professional statements & organizational communications. (Apply)
2. Develop writing skills by applying different strategies on organization system. (Apply)
3. Will write articles, reports, projects and different organizational proposals differently and efficiently. (Apply,Create)
4. Write in concise with brevity and coherency all the messages of the organization. (Analyze, Create)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	0	0	0	0	0	0	0	0	2	3	0	1
CO2	0	0	0	0	0	0	0	0	2	3	0	1
CO3	0	0	0	0	0	0	0	0	2	3	0	1
CO4	0	0	0	0	0	0	0	0	2	3	0	1

ENGINEERING CHEMISTRY (BCY-101/102)

Type	L	T	P	Credits
BSC	3	0	2	4

Prerequisite: Basic knowledge of Maths (12^{th} Level)

Course Content:

Unit-1:

***Bonding*:** CFT, Electronic Spectra and Ligands (strong and weak field), Phosphorescence and Fluorescence, Jablonski diagram, hydrogen bonding and their effect on physical properties, Metallic bonds, Classification and Applications of Liquid crystals, Band Theory of Solids and superconductors. (Lectures: 7-8)

Spectroscopy: Basic Principles, Instrumentation and Applications of UV-VIS and IR Spectroscopy. (Lectures: 5-6)

Unit-2:

Chemical Kinetics: Second order reactions. Determination of order, Fast and slow reaction, steady state approximation, Temperature effect, Concept of Activated Complex/Transition State: Energy of activation, Potential energy surface, Theories of reaction rate: Collision and Transition State theories in terms of enzyme catalysis. (Lectures: 4-5)

Unit-3:

Electrochemistry: Dry and fuel cells, electrochemical cell, Solar cells, Disensitized cell, Photovoltaic cell. (Lectures: 3-4)

***Environmental Chemistry*:** Air and Water Pollution, analysis of gaseous effluents oxides of Nitrogen, oxides of Sulphur and H_2S, chemical analysis of effluents liquid streams, BOD, COD, control of pollution, Depletion of ozone layer. (Lectures: 5-6)

Unit-4:

***Stereochemistry*:** Stereoisomerism of organic compounds containing one & two chiral centers. Enantiomers & Diastereomers, E-Z nomenclature, R-S configuration, Atropisomerism, and Optical isomerism in Allenes, biphenyl and Spiranes, Circular Dichroism. (Lectures: 5-6)

Reaction Mechanism: Inductive, Electromeric and Mesomeric effects. Study of reaction intermediates (Carbanion, carbocation, carbene, nitrene and benzyne). Mechanism of nucleophilic and electrophilic substitution reactions. Mechanism and application of following reactions:

a) Suzuki-Miyaura Cross coupling reaction
b) Fries and Photo-Fries Rearrangement
c) Wagner- Meerweir Rearrangement
d) Umpolung Reactions
e) Reaction of vision **(**Lectures: 4-5)

Unit-5:

Polymers: Introduction and their classifications, types of polymerization, Free radical, anionic and cationic polymerization, Preparation, Rheological properties and uses of some common polymers. Synthetic Polymers (carbon framework, silicon framework, fluorinated polymer), Conducting and Biodegradable polymers. (Lectures: 4-5)

***Water Analysis*:** Introduction; Hardness of Water- cause, types, units, Disadvantages of using hard water for domestic and industrial purposes, Softening of hard water, Chemical analysis

of Water- estimation of free chlorine, total alkalinity, hardness, Numerical based on determination of hardness. (Lectures: 4-5)

Lab Work:

1. Determination of alkalinity in given water sample.
    a. Sodium Carbonate & Sodium Bicarbonate
    b. Sodium Carbonate & Sodium Hydroxide
2. Determination of temporary and permanent hardness in water sample using EDTA as standard solution.
3. Determination of Chloride content of water by Mohr's Method.
4. Determination of Chlorine content in Bleaching powder.
5. Determination of strength of supplied Ferrous Ammonium Sulphate (FAS) solution in using external, internal indicators.
6. Determination of viscosity of a given liquid by Ostwald's viscometer.
7. Determination of surface tension of a given liquid by Stalagmometer.
8. pH determination of given sample.
9. Determination of iron content of water by Mohr's Method.
10. Determination of Dissociation constant of weak acids by conductometric Titration.

Text and Reference Books:

1. Advance Organic Chemistry by Jerry March, Third Edition Wiley Eastern Limited, New Delhi.
2. Organic Chemistry by Morrision & Boyd, Allyn and Bacon, Inc. Boston.
3. Physical Chemistry by Puri, Sharma & Pathania, Peter Atkins & Julio de Paula, Arun Bahl, B.S. Bahl & G.D.Tuli.
4. Textbook of Physical Chemistry by S. Glasstone, Macmillan and Co. Ltd., London.
5. Chemical Kinetics and Reaction Dynamics by Puri, Sharma & Pathania.
6. Principles of Polymerization by George Odian.
7. Polymer Science by V. R. Gowarikar, N. V. Vishwanathan and J. Shridhar, Wiley Eastern Ltd., New Delhi.
8. Principles of Instrumental Analysis by Douglas and Skoog, Saunder College Publishing Co., New York.
9. Engineering Chemistry by Jain & Jain, Dhanpat Rai Publication Co., New Delhi.
10. Application of Absorption Spectroscopy of Organic Compounds by John R. Dyer, Prentice Hall of India Pvt. Ltd., New Delhi.
11. Spectroscopy of Organic Compounds by P.S. Kalsi, Y.R. Sharma.

Course Outcome:

1. Interpret UV-Visible and IR–Spectra.
2. Describe a reaction rate having various reaction orders.
3. Understand different aspects of corrosion (Chemical and Electrochemical corrosion, mechanism, factors affecting, protection and practical problems, prevention methods). Thermodynamic overview of electrochemical processes. Reversible and irreversible cells.
4. Gain hands-on experience in making different polymers, distinguish between different polymeric structures, classify polymers and analyze the polymerization mechanism. The uses of polymers in different walks of life.
5. Knowledge of conductivity polymers, bio-degradable polymers and fiber reinforced plastics. Acquire knowledge about water and treatment of municipal water.

Expected Experimental Learning Outcomes

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will be able to:

1. Design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. (Apply, Analyse)
2. Be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems. (Apply, Analyse)
3. Clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large. (Apply)
4. Explore new areas of research in both chemistry and allied fields of science and technology. (Analyse)
5. Appreciate the central role of chemistry in our society and use this as a basis for ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine. (Understand)
6. Design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. (Apply)
7. Communicate the results of scientific work. (Understand)
8. Measure molecular/system properties such as surface tension, viscosity, conductance of solution. (Apply)
9. Perform Chemical analysis of water-hardness, alkalinity, pH and chloride content.

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	3	2	0	2	0	0	0	0	3
CO2	3	3	1	3	2	0	2	0	0	0	0	3
CO3	3	3	1	3	2	0	2	0	0	0	0	3
CO4	3	3	1	3	2	0	2	0	0	0	0	3
CO5	3	3	1	3	2	0	2	0	0	0	0	3

MATHEMATICS-II (BMA-102)

Type	L	T	P	Credits
BSC	3	1	0	4

Prerequisite: NIL

Course Content:

Unit-1: Ordinary Differential Equations

First order ordinary differential equations, Existence and uniqueness of solutions of initial value problems, Solution of higher order linear differential equation with constant coefficients, Solution of second order differential equations by changing dependent and independent variables, Cauchy- Euler equations, Methods of diagonalization, undetermined coefficients and variation of parameters: Nonlinear equations, Linear and nonlinear models, Initial value and boundary value problems, Systems of equations. Application of differential

equations as mathematical models, Models from population dynamics, Newton's Law of cooling, electric circuit, Oscillation of spring.

Unit-2: Series Solutions of Ordinary Differential Equations & Special Functions

Ordinary and singular points of an equation, Power series solutions, Frobenius method, Bessel's and Legendre's equations and their series solutions, Properties of Legendre's polynomials and Bessel's functions, Generating functions, Fourier- Bessel series and Fourier-Legendre series expansions, sturm- Liouville Problem and related theorems.

Unit-3: Laplace Transform

Laplace transform, Existence conditions and ROC, Inverse Laplace transform, Operational properties, Convolution, Unit step function, Dirac-Delta function, Periodic functions, Applications to solve IVP and BVP: Linear ordinary differential equations, Transfer function and control system analysis.

Unit-4: Fourier Series and Partial Differential Equations

Orthogonal functions, Fourier series, existence conditions, Fourier series of even and odd functions, convergence of Fourier series, Fourier half range series, Harmonic analysis, Complex Fourier series and frequency spectrum.

Development of partial differential equations and Solutions, Solution of first order partial differential equations, Solutions of linear higher order partial differential equations with constant coefficients.

Unit-5: Boundary-Value Problems

Classification of second order partial differential equations, Derivation of heat and wave equations, solutions in rectangular coordinates by separation variable method, solution of Laplace equation, D'Alemberts solution of wave equation, Non-homogeneous equations and boundary conditions, Orthogonal series expansions, Fourier series in two dimensions, Boundary value problems in polar, cylindrical and spherical coordinate systems and their solutions.

Text and Reference Books:

1. E. A. Coddington, An Introduction to Ordinary Differential Equations, Practice Hall, 1995.
2. I. N. Sneddon, Elements of Partial Differential equations, McGraw-Hill 1957.
1. Dennis G, Zill & Michael R. Cullen; Advanced Engineering Mathematics, Jones & Bartlett Publishers. 2nd Edition.
3. R. K. Jain & S.R.K. Iyengar; Advanced Engineering Mathematics, Narosa Publishing House, 2002.
4. Erwin Kreyszig; Advaced Engineering Mathematics, John Wiley & Sons 8th Edition.

Course Outcomes:

1. Solve first and higher order ordinary differential equations.
2. Find series solution of ordinary differential equations and learn Bessel's and Legendre's function and its applications.
3. Solve IVP and BVP using Laplace Transforms.

4. Find Fourier series expansion of given function and solve Partial differential equations.
5. Solve Boundary value problems using variable separable methods.

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	-	-	1	-	1	-	3
CO2	3	3	2	1	2	-	-	1	-	1	-	3
CO3	3	3	2	1	2	-	-	1	-	1	-	3
CO4	3	3	2	1	2	-	-	1	-	1	-	3
CO5	3	3	2	1	2	-	-	1	-	1	-	3

ELECTRONICS & INSTRUMENTATION ENGINEERING (EET-101/102)

Type	L	T	P	Credits
ESC	3	0	0	3

Prerequisite: NIL

Course Content:

Unit-1:

P-N Junction Diode, V-I Characteristics, Diode Application as Rectifier (Half Wave & Full Wave), Zener Diode and its Applications.

Unit-2:

Introduction of Bipolar Junction Transistor, FET: Applications, demo, explanation, OPAMP and its Applications.

Unit-3:

Boolean Algebra, Logic Gates, Concept of Universal Gate. Basic Combinational Circuits: Adder, Subtractor, Sequential Circuits: Flip-Flops, Registers.

Unit-4:

Functional Elements of Instruments, Classification & Characteristics, Types of Errors, Active and Passive Transducers and their Characteristics, LVDT

Unit-5:

Display Devices: Seven Segment Display, Alphanumeric Display, LCD, Dot Matrix Displays, Electronic Ammeter and Voltmeter, Digital Multi-meter, Cathode Ray Oscilloscope.

Text and Reference Books:

1. Malvino, A.P. / "Electronics Principles" / Tata McGraw-Hill / 6th Ed.

2. Boylestad, Robert & Nashelsky, Louis / "Electronic Devices & Circuit Theory" / Prentice Hall of India / 8th Ed.
3. H.S. Kalsi / "Electronic Instrumentation" / Tata McGraw-Hill
4. Malvino & Leach / "Digital Principles & Applications" / Tata McGraw-Hill / 5th Edition.
5. Sedra, Adel S., Smith, Kenneth C. / "Microelectronic Circuits"/ Oxford University Press / 5th Edition.
6. Sawhney AK/ "Electrical and electronic Measurement and Instrumentation"/ Dhanpat Rai & sons.
7. Lectures of NPTEL

Course Outcomes:

1. To enhance the fundamental knowledge in electronics engineering and its application relevant to various streams of science and technology
2. To make student conversant with the basic knowledge of instrumentation devices.
3. To acquaint the students with basic knowledge of digital electronics.
4. To develop an understanding of the basic concepts of BJT, FET, CRO, ammeter & voltmeter.
5. To understand the functional elements of Instrumentation Engineering.

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	-	-	2	2	2
CO2	3	3	3	3	3	3	3	-	-	2	2	2
CO3	3	3	3	3	3	3	3	-	-	2	2	2
CO4	3	3	3	3	3	3	3	-	-	2	2	2
CO5	3	3	3	3	3	3	3	-	-	2	2	2

ENGINEERING GRAPHICS (ECE-101/102)

Type	L	T	P	Credits
ESC	0	0	6	3

Prerequisite: NIL

Course Content:

Unit-1: Lettering and Dimensioning

Introduction, lettering practice, Elements of dimensioning- system of dimensioning.

Geometric Construction: Free hand sketching, Conic section, Special curves.

Engineering scales.

Unit-2: Projection of points and Projection lines

Projection of Points: First and Third Angle projection; Projection of Points. Projection of Lines; Projection of straight lines (First angle projection only); Projection of lines inclined to one plane and both plane, true length and true inclinations.

Unit-3: Projection of Solids and section of solids

Projection of solids: Classification of solids, Projection of solids in simple position, Projection of solids inclined to one plane. Sections of solids: Right regular solids and auxiliary views for the true shape of the sections.

Unit-4: Development of surfaces

Development of surfaces for various regular solids.

Isometric Projection and Perspective projection

Isometric Projection: Isometric scales, Isometric projections of simple and combination of solids:

Perspective projection: Orthographic representation of perspective views – Plane figure and simple solids – Visual ray method.

Unit-5: Orthographic Projection

Conversion of pictorial views into orthographic projection.

Introduction to auto CAD

Text and Reference Book(s)

1. Venugopal K and Prabhu Raja V, " Engineering Graphics", New AGE International Publishers 2015.
2. N.D. Bhatt, Engineering Drawing, Charotar publishing House.
3. Natarajan , K.V., A Text book of Engineering Graphics, Dhanalakshmi Publishers, 2012.
4. K.L. Narayana , P. Kannaiah &K . Venkata Reddy New Age International Publishers.

Course Objectives:

1. To follow basic drawing standards and conventions.
2. To develop skills in three –dimensional visualization of engineering components.
3. To prepare sectional views of solids.
4. To draw the development of surfaces and estimate the sheet metal requirement.
5. To development an understanding of solid modeling using CAD software.

Course Outcomes:

1. Draw orthographic projections of Lines, Planes and Solids
2. Construct isomeric scale, Isometric projections and views
3. Draw sections of various solids including Cylinders, Cones, Prisms and pyramids.
4. Draw projections of lines, planes, solids, isometric projections and sections of solids including cylinders, cones, prisms and pyramids using Auto CAD.

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	0	2	0	0	0	0	0	1	0	0	0
CO2	3	0	0	0	2	0	0	0	1	0	0	0
CO3	1	0	0	0	0	0	0	0	1	0	0	0
CO4	3	0	2	0	3	0	0	0	1	0	0	2

COMPUTER CONCEPTS & 'C' PROGRAMMING (ECS-101/102)

Type	L	T	P	Credits
ESC	3	0	2	4

Prerequisite: NIL

Course Content:

Unit-1:

Introduction to Computers: Computer hardware Components, peripherals and their functions, Number Systems and conversion methods, Concept of an algorithm; termination and correctness. Algorithms to programs: specification, top-down development and stepwise refinement, Introduction to programming environment, use of high level programming language for the systematic development of programs. Introduction to the design and implementation of correct, efficient and maintainable programs, Structured Programming, Trace an algorithm to depict the logic.

Unit-2:

Basic operating System Concepts: Introduction of MS-DOS, WINDOWS, and LINUX Operating Systems, Functional Knowledge of these operating systems, Introduction of basic commands of LINUX and Editors, Managing Files and Directories in LINUX, Programming Environment in LINUX, Writing and executing programs in LINUX.

Unit-3:

Programming in C: History, Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programs, Debugging Techniques, Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolic constants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor.

Unit-4:

Operators: Unary operators, Arithmetic & logical operators, Bit wise operators, Assignment operators and expressions, Conditional expressions, Precedence and order of evaluation.

Control statements: if-else, switch, break, and continue, the comma operator, goto statement. Loops: for, while, do-while. Functions: built-in and user-defined, function declaration, definition and function call, and parameter passing: call by value, call by reference, recursive functions, Multi-file programs. Arrays: linear arrays, multidimensional arrays, passing arrays to functions, Arrays and strings.

Unit-5:

Structure and Union: definition and differences, self-referential structure. Pointers: value at (*) and address of (&) operator, pointer to pointer, Dynamic Memory Allocation, calloc and malloc functions, array of pointers, function of pointers, structures and pointers. File Handling in C: opening and closing a data file, creating a data file, read and write functions, unformatted data files.

Lab Work:

1. Write C program to find largest of three integers.
2. Write C program to check whether the given string is palindrome or not.
3. Write C program to find whether the given integer is

   (i). a prime number

   (ii). an Armstrong number.
4. Write C program for Pascal triangle.
5. Write C program to find sum and average of n integer using linear array.
6. Write C program to perform addition, multiplication, transpose on matrices.
7. Write C program to find Fibonacci series of iterative method using user-defined function.
8. Write C program to find factorial of n by recursion using user-defined functions.
9. Write C program to perform following operations by using user defined functions:

   (i) Concatenation

   (ii) Reverse

   (iii) String Matching
10. Write C program to find sum of n terms of series: n – n*2/2! + n*3/3! - n*4/4! + ...
11. Write C program to interchange two values using

    (i). Call by value.

(ii). Call by reference.

12. Write C program to sort the list of integers using dynamic memory allocation.

13. Write C program to display the mark sheet of a student using structure.

14. Write C program to perform following operations on data files:

    (i) Read from data file.

    (ii) Write to data file.

15. Write C program to copy the content of one file to another file using command line argument.

Text and References Books:

1. Kernighan, Ritchie, "The C Programming Language", PHI
2. V. Rajaraman, "Fundamentals of Computers", PHI
3. Peter Norton's, "Introduction to Computers", TMH
4. Gottfried, "Programming in C", Schaum's Series, Tata McGraw Hill
5. Yashwant Kanitkar, "Working with C", BPB
6. E. Balagurusamy, "Programming in ANSI C", TMH

Course Outcomes:

1. Identify the parts of the computer system and explain the functioning of its components alongwith the process of problem solving. (Remember)

2. Design an algorithmic solution for a given problem and translate it into a program. (Design)

3. Understand different operating systems, related concepts and their functions. (Understand)

4. Use the appropriate control statements to solve the given problem. (Apply)

5. Implement different Operations on arrays and use functions to solve the given problem. (Apply)

6. Understand pointers, structures and unions & Implement file Operations in C programming. (Apply)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	0	0	0	0	0	2	0	0	2
CO2	3	3	3	0	0	0	0	0	2	0	0	2
CO3	3	3	1	0	0	0	0	0	2	0	0	2
CO4	3	3	3	0	0	0	0	0	2	0	0	2
CO5	3	3	3	0	0	0	0	0	2	0	0	2
CO6	3	3	3	0	0	0	0	0	2	0	0	2

CO and PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1
CO2	3	2	1	1
CO3	3	2	1	1
CO4	3	2	1	1
CO5	2	1	-	-
CO6	2	1	1	1

WORKSHOP PRACTICE (EWS-101/102)

Type	L	T	P	Credits
ESC	0	0	4	2

Prerequisite:

Course Content:

1. Carpentry Shop:

Practice (I): To prepare half lap corner joint from given pieces of mango wood.

Practice (II): To prepare mortise and tenon joint from given pieces of mango wood.

Instructions: Description and demonstration of different tools, joints along with advanced Carpentry joints, classification and definition of timber, wood seasoning, demonstration of wood working lathe and advanced power tools used in carpentry work, safety precaution during actual working

2. Fitting and Bench working Shop:

Practice (I): To prepare male-female joint from given pieces of mild steel.

Practice (II): To prepare practice work piece involving marking, measuring, sawing, drilling and tapping operations.

Instruction: Classification and description of different tools used in fitting shop e.g. marking and measuring tools , holding and supporting tools, striking tools and cutting tools etc., safety precaution during actual working.

3. Black Smithy Shop:

Practice (I): To prepare 'L' shape job from given piece of mild steel rod by hand forging.

Practice (II): To prepare a 'Ring' from given piece of mild steel rod by hand forging.

Instructions: Description of various forging processes done in black-smithy work e.g. upsetting, drawing down, punching, bending, fullering etc, classification and description of different tools, equipments used in black smithy shop, safety precaution during actual working.

4. Welding Shop:

Practice (I): To prepare simple butt joint and lap joint by electric arc welding from given pieces of mild steel.

Practice (II): To prepare simple lap joint by oxy-acetylene gas welding and gas flame cutting practice.

Instructions: Concept of welding, classification and explanation of various types of welding with the help of flow chart, description of different tools. Equipment required for arc welding and gas welding, demonstration of various types of flames in Oxy-acetylene gas welding, setting of current and selection of electrodes along with different welding joints, safety precaution during actual working.

5. Sheet Metal Shop:

Practice (I): To prepare a funnel complete with soldering from given G.I. sheet.

Practice (II): To fabricate tray / tool box or electric panel box from given G.I. sheet.

Instructions: Classification and description of different types of tools, equipment used in sheet metal work, different types of metals used in sheet metal shop e.g. Galvanized iron, black iron, copper, aluminum etc, concept of development of surfaces along with different types of joints in sheet metal work, safety precaution during actual working.

6. Machine Shop:

Practice (I): To prepare a job by plain turning, facing, step turning and chamfering operation from given mild steel rod.

Practice (II): To prepare a job by taper turning, threading, knurling operations from given mild steel rod.

Instructions: Classification of lathe machines, different parts of lathe machine, tools and equipment used, explanation and demonstration of various operations on lathe machine, tool geometry of single point cutting tool, cutting speed, feed and depth of cut in turning, safety precaution during actual working.

7. Foundry Shop:

Practice (I): To prepare a mould of given pattern in Green Sand.

Practice (II): To prepare a mould with two step pulley with runner and riser.

Instructions: Description and use of various foundry tools, shovel, flat rammer, hand rammer, strike off bars, vent wire, trowels, hand riddle etc. Types of various molding sands, types of patterns, pattern materials, pattern allowances, safety precautions during actual working.

Course Outcomes:

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, black-smithy and welding work
3. Identify and apply suitable tools for manufacturing processes including plain turning, step turning, taper turning, facing, thread cutting operations
4. Understand and practice welding and forging operations
5. Select the appropriate tools required for specific operation

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	0	0	1	1	1	0	0	0	0	0	1
CO2	2	0	0	1	1	1	0	0	0	0	0	1
CO3	2	0	0	1	1	1	0	0	0	0	0	1
CO4	2	0	0	1	1	1	0	0	0	0	0	1
CO5	2	0	0	1	1	1	0	0	0	0	0	1

ENVIRONMENT AND ECOLOGY (ECE-103/104)

Type	L	T	P	Credits
MDC	2	0	0	0

Prerequisite: NIL

Course Content:

Unit-1:

Definition, Scope and importance, Need for Public awareness, Environment definition, Ecosystem, Concept of ecosystem, Structure and function of an ecosystem, Energy flow in ecosystem, Ecological succession, Balanced ecosystem, Human activities, Food shelter, Economic and Social Security.

Effects of Human Activities on Environment: Agriculture, Housing Industry, Mining and Transportation Activities, Basic of Environmental Impact Assessment, Sustainable Development.

Unit-2:

Natural Resources: Water Resources – Availability and Quality Aspects, Conservation of water, Water Borne Diseases, Water induced Diseases, Fluoride problems in Drinking water, Mineral Resources, Forest Wealth, Material Cycles- Carbon, Nitrogen and Sulphur Cycles.

Energy – Different Types of Energy, Electro-magnetic Radiation, Conventional and Non-Conventional Sources, Hydro Electric Fossil Fuel Based, Nuclear, Solar, Biomass, Bio-gas, Hydrogen as an Alternative Future Sources of energy.

Unit-3:

Environmental Pollution: Water Pollution, Land Pollution, Noise Pollution , Public health aspects, Air Pollution, Soil pollution, Marine Pollution, Thermal Pollution, Nuclear Hazards.

Solids Waste Management: Cause, effects and control measures of urban and industrial wastes, Role of an Individual in prevention of pollution, Pollution case studies, Disaster management: Floods, earthquake, cyclone and landslides.

Unit-4:

Current Environmental Issue of Importance, Population Growth, Variation among nations, Population explosion , family welfare Programme, Climate Change and Global Warming-Effects, Urbanization, Automobile pollution, Acid Rain, Ozone Layer Depletion.

Environmental Protection –Role of Government, Legal Aspects, Initiatives by Non-Government Organization (NGO), Environmental Education, Value Education, Human Rights, HIV/AIDS, Women and child welfare, Case Studies.

Course Objectives:

1. To make students understand and appreciate the unity of life in all its forms, the implication of the life style on the environmental.
2. To understand the various causes for environmental degradation.
3. To understand individual contribution in the environmental pollution.
4. To understand the impact of pollution at the global level and also in the local environment.
5. To understand the concept of sustainable development.

Course Outcomes:

1. Understand the need for eco-balance.
2. Acquire basic knowledge about global climate change with a particular reference to the Indian context.
3. Find ways to protect the environment and play pro-active roles.
4. Involve themselves in activities for environment protection.

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	0	2	0	1	3	3	2	1	0	1	2
CO2	1	0	0	0	2	3	3	2	1	0	2	1
CO3	1	0	0	0	0	3	3	2	1	0	1	2
CO4	1	0	2	0	1	3	3	2	1	0	2	2

Detailed Syllabus

II Year

COMPUTER ORIENTED NUMERICAL & STATISTICAL TECHNIQUES (BMA-253)

Type	L	T	P	Credits
BSC	3	1	0	4

Prerequisite:

Course Content:

UNIT I: Nonlinear Equations and Simultaneous Linear Equations:
Roots of nonlinear equation, Methods of solution, Order of convergence of iterative methods, Simple roots: Bisection, False position, Secant, Newton-Raphson, Chebyshev, Iteration and multi point iteration methods, Multiple roots: Newton-Raphson and Chebyshev, Complex roots: Newton-Raphson and Muller's method, a system of nonlinear equations: Newton-Raphson and iteration methods, Polynomial equations: Bairstow's method, convergence analysis of above methods.
Linear systems: Introduction, Direct methods, Operation count, Pivoting, III conditioned linear systems & condition number, Iteration methods: Jacobi, Gauss-Seidel, SOR methods, convergence conditions. Special system of equations: Thomas algorithm. Eigen value problems: Power methods.

UNIT II: Interpolation, Differentiation and Integration:
Curve fitting: Polynomial interpolation, error, Existence and Uniqueness, Truncation error bounds, difference operators, Newton forward and backward difference interpolations, Lagrange, Newton divided difference and Iterated interpolations, Stirling and Bessel's interpolations, Spline interpolation, Least squares and Chebyshev approximations. Numerical Differentiation: Methods based on interpolation, Error analysis.
Numerical Integration: Methods based on interpolations (Trapezoidal, Simpson's 1/3, Simpson's 3/8 rule), Gauss quadrature methods, Romberg integration, Error bounds and estimates.

UNIT-III: Numerical Solution of Ordinary Differential Equations:
Initial-value problems, Single step methods; Taylor's, Picard's, Modified Euler's method and Runge- Kutta method (fouth order), Error estimates, Multi-step methods: Adam's –Bashforth and Milne's methods, convergence and stability analysis, simultaneous and Higher equations: RK Fourth order method.

UNIT-IV: Curve- Fitting, Correlation, Regression and Probability:
Curve-fitting, method of least- squares, fitting of straight lines, polynomials, non-linear and exponential curves etc., correlation analysis, linear, non-linear and multi- regression analysis, probability, random variables and probability distributions, expectation, moments and transform methods, Binomial, Poisson and Normal distributions, overview of t-distribution, F-distribution and χ^2-distribution.

UNIT-V: Statistical Methods:
Sampling theory (small and large), parameter estimation, confidence intervals, tests of hypotheses and significance; z-, t-, F-, and χ^2 tests, goodness of fit test-χ^2 test, analysis of variance, non-parametric tests (Simple application), time series analysis, index numbers, quality control charts.

Text and Reference Books:

1. M.K. Jain, S.R.K. Iyengar & R.K. Jain, Numerical methods for Scientific and Engineering Computation, New age international Publication.
2. S.S. Sastry, Introductory Methods of Numerical Analysis, Eastern Economy Edition.
3. S. Rajasekaran, Numerical Method in Science and Engineering, Wheeler Publishing House.
4. B.S. Grewal, Numerical Method in Engineering & Science, Khanna Publishers.
5. D.L. Harnett, Statistical methods.
6. J.N. Kapur and H.C. Saxena, Mathematical, S. Chand, & Co., 2001.

Course Objectives:

Objectives of this course are to provide conceptual understanding of:

- Numerical methods for solving nonlinear equations and simultaneous equations.
- Numerical techniques for interpolation, differentiation, integration, and solving IVP_S .
- Curve fitting, correlation and regression, probability distributions and applied statistical methods.

Course Outcomes

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

CO1	Find roots of nonlinear equations and solve systems of algebraic equations.	Apply, Evaluate
CO2	Use Interpolations techniques and to find numerical differentiation/ integration of data, function.	Apply, Evaluate
CO3	Use numerical methods for finding solutions of ordinary differential equations, simultaneous and higher order equations.	Apply, Evaluate
CO4	Use statistical techniques like regression, correlation for finding relation between two or more variables. apply discrete and continuous probability distributions to various problems.	Apply, Evaluate
CO5	Use to various parametric and nonparametric tests parameter estimation, hypothesis testing and ANOVA.	Understand, Apply

CO and PO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	1	1	-	-	-	-	-	3
CO2	3	2	3	3	1	1	-	-	-	-	-	3
CO3	3	2	3	3	1	1	-	-	-	-	-	2
CO4	3	3	3	3	1	1	-	-	-	-	-	2
CO5	3	3	3	3	1	2	3	2	2	1	1	2
Average	3.00	2.40	3.00	3.00	1.00	1.20	0.60	0.40	0.40	0.20	0.20	2.40

DIGITAL ELECTRONICS (EET-253)

Type	L	T	P	Credits
ESC	3	1	2	5

Prerequisite:

Course Content:

Unit-1:

Logic Families: CMOS Logic, CMOS Dynamic Electrical Behaviour, Bipolar Logic: Diode Logic, Transistor Logic Inverter, TTL Logic, NMOS, CMOS / TTL Interface, ECL

Minimization Techniques & logic gates:

Minimization Techniques: Boolean postulates and laws – De-Morgan‟s Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don‟t care conditions – Quine - Mc Cluskey method of minimization. Number System: Representation of Negative Numbers & 1's Complement, 10's Complement, Arithmetic Using 2's Complement.

Unit-2:

Combinational Circuits: Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators – code converters - Magnitude Comparator

Unit-3

Sequential Circuits: Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

Unit-4:

VLSI Design flow: Design entry: Schematic, FSM & HDL, different modeling styles in VHDL, Data typesand objects, Dataflow, Behavioral and Structural Modeling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits

Unit-5:

Memory Devices: Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell – Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

Text and Reference Books:

1. Wakerly, John F. / "Digital Design Principles & Practices" / Pearson Education / 3rd Ed.
2. Bartee , Thomas C. / "Fundamentals of Digital Computers"/ Tata McGraw-Hill.
3. Gopalan, K. "Gopal" / "Introduction to Digital Microelectronic Circuits" / Tata McGraw-Hill.

4. Taub, Herbert & Schilling, Donald / "Digital Integrated Electronics"/ Tata McGraw-Hill.
5. Millman, Jocob & Taub, Herbert / "Pulse, Digital & Switching Waveforms" / Tata McGraw-Hill.
6. Mano, M. Morris / "Digital Design"/ Prentice Hall
7. Malvino, A.P. & Leach, Donald P. / "Digital Principles & Applications" / Tata McGraw-Hill.
8. Mano, M. Morris / "Digital Logic and Computer Design"/ Prentice Hall (India).
9. Tokheim, H. Roger L. /"Digital Electronics Principles & Application"/ Tata McGraw-Hill / 6th Ed.
10. John F. Wakerly, "Digital Design", Fourth Edition, Pearson/PHI, 2008.
11. John. M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
12. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
13. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011
14. Donald D. Givone, "Digital Principles and Design", TMH, 2003.
15. Lectures of NPTEL

Course Objectives:

1. To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
2. To introduce the methods for simplifying Boolean expressions
3. To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
4. To introduce the concept of memories and programmable logic devices.
5. To illustrate the concept of synchronous and asynchronous sequential circuits

Course Outcomes:

1. Analyse different methods used for simplification of Boolean expressions. (Analyse)
2. Design and implement Combinational circuits. (Apply, Analyse)
3. Design and implement synchronous and asynchronous sequential circuits. (Apply, Analyse)
4. Write simple HDL codes for the circuits. (Apply)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	3	3	-	2	2	1	1
CO2	3	3	3	3	2	3	3	-	2	2	-	1
CO3	2	3	3	3	3	3	3	-	2	2	1	-
CO4	2	3	3	3	3	3	3	-	2	2	1	1

DATA STRUCTURE USING C (ECS-251)

Type	L	T	P	Credits
PCC	3	0	2	4

Prerequisite: Computer Concepts & 'C' Programming (ECS-101/102)

Course Content:

Unit -1:

Introduction: Basic Terminology, Elementary Data Organization, Structure operations, Algorithm Complexity and Time-Space trade-off.

Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered List, Sparse Matrices and Vectors.

Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array and Linked Representation of Stack, Operations associated with Stacks, Applications of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack, Applications of recursion in problems like 'Tower of Hanoi'.

Unit-2:

Queues: Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, D-queues and Priority Queues**.**

Linked list: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

Unit-3:

Trees: Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm**.**

Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Unit-4:

Sorting: Insertion Sort, Bubble Sort, Quick Sort, Two Way Merge Sort, and Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting**.**

Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

Unit-5:

Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.

Text and Reference Books:

1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., New Delhi.
2. R. Kruse et. al, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002
3. A. M. Tenenbaum, "Data Structures using C & C++", PHI Pvt. Ltd., New Delhi.

4. K Loudon, “Mastering Algorithms with C”, Shroff Publisher & Distributors Pvt. Ltd.
5. Bruno R Preiss, “Data Structures and Algorithms with Object Oriented Design Pattern in C++”, Jhon Wiley & Sons, Inc.
6. Adam Drozdek, “Data Structures and Algorithms in C++”, Thomson Asia Pvt. Ltd.(Singapore)

Lab Work:

Write Program in C or C++ for the following

1. Array implementation of Stack, Queue, Circular Queue, List.
2. Implementation of Stack, Queue, Circular Queue, List using Dynamic memory Allocation.
3. Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.
4. Implementation of Searching and Sorting Algorithms.
5. Graph Implementation, BFS, DFS, Min. cost spanning tree, shortest path algorithm.

Course Outcomes:

1. Analyze the algorithms to determine the time and computation complexity and justify the correctness. (Analyze)
2. Implement Arrays, Stacks, Queues and linked list based problems and analyze the algorithm to determine the time complexity. (Apply, Analyze)
3. Implement search and traversal algorithms on Trees and Graphs and determine the time complexity. (Apply, Analyze)
4. Algorithms for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of space and time complexity. (Apply, Analyze, Evaluate)
5. Understand file structures and file handling. (Understand)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	-	-	-	-	-	-	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	2	-	-	-	-	-	-	-	-	-	-	-

CO and PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1
CO2	3	2	1	1
CO3	3	2	1	1
CO4	3	2	1	1
CO5	2	1	-	-

Python Programing (ECS-253)

Type	L	T	P	Credits
PCC	2	1	2	4

Prerequisite: Computer Concepts & 'C' Programming (ECS-101/102)

Course Content:

Unit 1: Introduction
The Programming Cycle for Python, Python IDE, Interacting with Python Programs, Elements of Python, Type Conversion. Basics: Expressions, Assignment Statement, Arithmetic Operators, Operator Precedence, Boolean Expression.

Unit 2: Conditionals and Loops
Conditional statement in Python: if-else statement, its working and execution, Nested-if statement and Elif statement in Python, Expression Evaluation & Float Representation, Loops: Purpose and working of loops, while loop including its working, For Loop, Nested Loops, Break and Continue.

Unit 3: Strings and Functions
Strings: Length of the string, Concatenation and Repeat operations, Indexing and Slicing of Strings. Python Data Structure: Tuples, Unpacking Sequences, Lists, Mutable Sequences, List Comprehension, Sets, Dictionaries, Functions: Parts of a Function, Execution of a Function, Keyword and Default Arguments, Scope Rules, Higher Order Functions: Treat functions as first class Objects, Lambda Expressions.

Unit 4: Classes and Files
Generate prime numbers with the help of Sieve of Eratosthenes algorithm, File I/O: File input and output operations in Python Programming Exceptions and Assertions Modules: Introduction, Importing Modules, Abstract Data Types: Abstract data types and ADT interface in Python Programming, Classes: Definition and operations in the classes, Special Methods (such as _init_, _str_, comparison methods and Arithmetic methods etc.), Class Example, Inheritance, Inheritance and OOP.

Unit 5: Iterators & Recursion
Recursive Fibonacci, Tower of Hanoi, Search: Simple Search, Binary Search, Estimating Search Time in Simple Search and Binary Search, Sorting & Merging: Selection Sort, Merge List, Merge Sort, Higher Order Sort.

Text and Reference Books:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016, (http://greenteapress.com/wp/thinkpython/)
2. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. John V Guttag, ―Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press, 2013.

4. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
5. Timothy A. Budd, Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd., 2015.
6. Kenneth A. Lambert, Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
7. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition, 2013.
8. Paul Gries, Jennifer Campbell and Jason Montojo, Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013. Mapped With: https://ict.iitk.ac.in/product/python-programming-a-practical

Lab Work:

1. To read and write simple Python programs.
2. To develop Python programs with conditionals and loops.
3. To define Python functions and to use Python data structures –- lists, tuples, dictionaries
4. To do input/output with files in Python
5. Write a Python Program to perform Linear Search
6. Write a Python Program to perform Binary Search
7. Write a Python Program to perform selection sort
8. Write a Python Program to perform insertion sort.

Course Objectives:

1. Understanding Fundamentals of Python Programming
2. Understand and implement Control Structures.
3. Learn and implement Strings and Functions in Python.
4. Understand and implement advance functions like iteration and recursion.
5. Implement Object Oriented Programming concepts in Python

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	0	0	0	0	0	2	0	0	2
CO2	3	3	3	0	0	0	0	0	2	0	0	2
CO3	3	3	1	0	0	0	0	0	2	0	0	2
CO4	3	3	3	0	0	0	0	0	2	0	0	2
CO5	3	3	3	0	0	0	0	0	2	0	0	2

CO and PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	1
CO2	3	2	1	1
CO3	3	2	1	1
CO4	3	2	1	1
CO5	2	1	-	-

COMPUTER ORGANIZATION & ARCHITECTURE (ECS-255)

Type	L	T	P	Credits
PCC	2	0	0	2

Prerequisite: Computer Concepts & 'C" Programming (ECS-101/102)

Course Content:

Unit-1: Introduction
Von Neumann Architecture, Number System, Character Codes (BCD, ASCII, EBCDIC), Logic gates. Arithmetic and Logical Unit (ALU), Micro-Operation, ALU Chip.

Unit-2: Basic Organization
Instruction Cycle, Organization of Central Processing Unit, Hardwired & micro programmed control unit, General Register Organization, Stack Organization, Addressing modes, Instruction formats.

Unit-3: Memory Organization
Memory Hierarchy, Main memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache memory, Virtual Memory, hit/miss ratio, magnetic disk and its performance, magnetic Tape etc.

Unit-4: I/O Organization
Peripheral devices, I/O interface, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input Output Processor and Serial Communication. Asynchronous data transfer, Strobe Control, Handshaking.

Unit-5: Processor Organization
Basic Concepts of a Microprocessor, Advanced Processors, Pipelining, Vector and Array Processors.

Text and References Books:

1. William Stalling, "Computer Organization & Architecture", Pearson education Asia
2. Mano Morris, "Computer System Architecture", PHI

3. Zaky & Hamacher, “Computer Organization”, McGraw Hill
4. B. Ram, “Computer Fundamental Architecture & Organization”,
5. New Age, A.S. Tannenbaum, “Structured Computer Organization”, PHI.

Course Outcomes:

1. Understand Number systems, Logic Gates, Boolean algebra, Design of Combinational and sequential circuits. (Understand)
2. Understand Von Neumann architecture, instruction cycle and the concept of Hardwired and Micro programmed control unit, addressing modes, register organization. (Understand)
3. Apply the concepts of memory organization in calculating hit-miss ratio and access time of magnetic disks. (Apply)
4. Understand the working of various I/O devices, buses, interrupt and interfaces etc. (Understand)
5. Understand the basics of pipelining and Multicore architecture. (Understand)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	-	-	-	-	-	-	-	-	-
CO2	2	2	1	1	-	-	-	-	-	-	-	-
CO3	2	1	1	1	-	-	-	-	-	-	-	-
CO4	2	1	1	-	-	-	-	-	-	-	-	-
CO5	1	1	1	-	-	-	-	-	-	-	-	-

CO and PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4
CO1	2	-	2	-
CO2	2	-	1	-
CO3	2	2	1	-
CO4	2	-	1	-
CO5	2	-	1	-

ENGINEERING ECONOMICS & MANAGEMENT (HHS-251)

Type	L	T	P	Credits
HSMC	3	0	0	3

Prerequisite:

Course Content:

Unit-1: Introduction to Economics
Overview: production possibility curve, choices-what, how and for whom, micro- and macro-economics, inflation, unemployment, GDP and business cycle; demand and supply, elasticity of demand, consumer surplus and its applications, utility theory.

Unit-2: Production and Cost
Factors of production, production function, law of variable proportion, isoquant analysis, return to scale, economies of scale; Types of costs: direct and indirect costs, explicit and implicit costs, opportunity cost, economic cost, fixed cost and variable costs, average and marginal costs, short-run and long-run costs, optimal combination of factor-inputs.

Unit-3: Market Structure
Perfectly Competitive Market, Imperfect market: Monopoly, Oligopoly, Monopolistic Market

Unit-4: Fundamentals of Management:
Development of Management Thoughts, Objectives, Functions of Management: Planning, Organising, Directing, Controlling and Coordination.

Unit-5: Business Enterprises
Business Ownership: Sole Proprietorship, Partnership, Company: Promotion, Formation & Development, Cooperative Firms.

Text and Reference Books:

1. Koutsoyiannis, A., 'Modern Microeconomics', English Language Book Society, Macmillan.
2. Joseph, L Massod, "Essential of Management", Prentice Hall, India.
3. Armstrong, Michel, "A Handbook of Management Techniques", Kogan Page Limited.
4. Babcock, D L and Lucy C Morse, "Managing Engineering and Technology", third edition, Pearson Education, 2006.
5. Pindyck, R S, Rubinfeld, D L & Mehta, 'Microeconomics', 6 th Edition, Pearson Education India.
6. Barthwal, R R , Microeconomic Analysis.
7. Samuelson, Paul A, 'Economics', 5th edition, McGraw Hill New York.
8. Henderson, J M and Quadnt, R E, 'Microeconomic Theory: A Mathematical Approach', Tata MacGraw Hill, New Delhi, 2003.
9. H. Varian, 'Intermediate Micro Economics'.
10. G. Mankiw,''Principles of Micro Economics.

Course Outcomes:

1. Understanding essential economic principle for solving economic problem with suitable policy alternatives and know how rational consumers can maximize their satisfaction with limited incomes and make best use of their resources. (Understand)

2. Understand production principles and cost analysis. (Understand)
3. Gain market knowledge and study the contemporary market situations, market strategy to manage the industries. (Understand, Apply)
4. Understand and gain basic knowledge of management technique. (Understand)
5. Develop Entrepreneurship skills towards formation of partnership, companies and their functions. (Apply)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	1	-	2	1	3	1	3	3	3
CO2	1	-	-	-	-	2	1	3	3	3	3	3
CO3	-	-	-	1	-	2	2	3	2	3	3	3
CO4	-	-	-	-	-	2	2	3	3	3	3	3
CO5	-	-	-	-	-	2	3	3	3	2	3	3

INDIAN CONSTITUTION (HHS-255)

Type	L	T	P	Credits
HSMC	2	0	0	0

Prerequisite:

Course Content:

Unit-1: Indian Constitution
Sources and Features, Preamble, Fundamental Rights, Fundamental Duties and Directive Principles of State Policy

Unit-2: Union Executive
President, Vice President, Prime Minister, Council of Ministers, State Executives- Governor, Chief Minister and Council of Ministers

Unit-3: Union Legislature
Parliament- Composition and Functions, Speaker of Lok Sabha, Amendment Process, State Legislature- Vidhaan Sabha, Panchaayati Raj, Institutions- History, Basic Features and 73rd Amendment

Unit-4: Judiciary
Supreme Court, High Courts, Judicial Review and Judicial Activism

Unit-5: Election Commission
Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the Welfare of SC/ST/OBC and Women.

Text and Reference Books:

1. Indian Constitution: D.D Basu.
2. Indian Administration: Avasthi and Avasti.
3. The Indian Constitution: Corner Stone of a Nation, G. Austin, Oxford University Press.
4. Indian Politics: Contemporary Issues and Concerns, M. P. Singh and Rekha Saxena, Prentice Hall of India, Delhi.

Course Outcomes:

1. Configure the preambles & fundamental rights.
2. Actuate the governance & functioning of constitutional functionaries.
3. Describe the functions of legislative bodies.
4. Decipher the judiciary system & its role in governance.
5. Develop a democratic process through electoral mechanism into system.

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	0	0	0	0	0	2	1	2	2	0	0	2
CO2	0	0	0	0	0	1	0	2	1	0	0	1
CO3	0	0	0	0	0	1	0	2	1	0	0	1
CO4	0	0	0	0	0	2	1	2	2	0	0	2
CO5	0	0	0	0	0	1	1	2	2	0	0	2

DISCRETE MATHEMATICAL STRUCTURES (BMA-254)

Type	L	T	P	Credits
ESC	3	1	0	4

Prerequisite:

Course Content:

Unit-1: Fundamentals of Logic

Propositional Logic: Propositions, Basic logic operations and truth tables, Tautologies, Contradictions, Contigency, Algebra of propositions, Logical equivalence: the laws of logic, Logical implication: Rules of inference, Logical analysis of argument, Some computing application (Normal forms), Functionally complete set of operations, Formal proofs.

First Order Predicate Logic: Predicates & quantifiers, Nested quantifiers, Use of quantifiers, Rules of inference, Validity of arguments and proof methods.

Unit-2: Set Theory, Relations and Functions

Set Theory: Sets & subsets, Venn diagrams, set operations and laws, countable set, Cartesian product, Cardinality, Principle of inclusion- exclusion.

Relations: Relation, Representation & properties, n-ray relations and applications, Composition of relations, Closures of relations, Equivalence relation & partitions, partial orders, compatibility relation.
Functions: Functions and its types, Inverse function, Composition of functions, Special functions, Recursively defined functions, Computational Complexity, Analysis of algorithms.
Theorem Proving Techniques: Mathematical induction (weak, strong, structural) and its applications, Proof by contradiction, Pigeonhole principle.

Unit-3: Algebraic Structures and Coding Theory
Algebraic Structures: Definition, Properties, Semi group, Monoid, Group, properties of groups, Subgroup, Cyclic group, Cosets and Lagrange's theorem, Permutation groups, Normal subgroup, Homomorphism and isomorphism of groups, Congruence relation, Rings and Fields. Example and standard results.
Coding Theory: Elements of coding theory, Hamming matric, Parity-check and generator matrices, Coding and error detection, Group codes: decoding with coset leaders and error correction, Hamming matrices.

Unit-4: Partially Ordered Structures
Posets: Definitions, ordered set, Hasse diagram, isomorphic ordered set, well ordered set, Minimal and Maximal elements, LUB &GLB etc.
Lattices: Definition & Properties, Product Lattices, Isomorphic Lattices, Applications, Types of Lattices.
Boolean Algebra: Definitions & Properties, SOP & POS forms, Logic gates and minimization of circuits, Karnaugh maps, Quine-McClusky method.
Trees: Definition & Examples and Properties, Rooted tree, Binary tree, Tree traversal, application in computer science and engineering.

Unit-5: Combinatorics and Graph Theory
Combinatorics: Discrete numeric functions and properties, Recurrence relations and their applications (modeling), various methods of solutions, system of recurrence relations, OGF & EGF, properties, applications: solution of recurrence relations and combinatorial problems.
Graphs: Graphs and graph models, terminology, matrices associated with graphs, Isomorphism, Special types of graphs, connectedness, Euler and Hamilton graphs with their applications, trees with properties, MST, planer graphs and applications, criteria of planarity, Graph coloring and coloring models, directed graphs.

Text and Reference Books:

1. Trembley, J.P. & R. Manohar, "Discrete Mathematical Structures with applications to Computer Science", McGraw Hill.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", McGraw Hill.
3. Ralph, P. Garimaldi, "Discrete& Combinatorial Mathematics" Pearson Publication, Asia.
4. Deo, narsingh, "Graph Theory with applications to Engineering & Computer Science", PHI.
5. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi.

Course Outcomes:

1. Understand concepts of Logic and various inference mechanisms using logic. (Understand)
2. Understand Set theory, functions, relations and the concepts of theorem proving. (Understand)
3. Explain algebraic structure and coding theory. (Understand)
4. Understand and apply concepts of partially ordered structures, Boolean algebra and trees in various application of computer science domain. (Apply)
5. Understand and apply graph theory and concepts of recurrence relation in system modeling. (Apply)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	2	3	1	2	-	3	3
CO2	3	3	3	3	3	2	3	1	2	-	3	3
CO3	3	3	3	3	3	2	3	1	3	-	3	3
CO4	3	3	3	3	3	2	3	1	3	-	3	3
CO5	3	3	3	3	3	2	3	-	3	-	3	3

SOFTWARE ENGINEERING (EIT-252)

Type	L	T	P	Credits
PCC	3	1	2	5

Prerequisite:

Course Content:

Unit-1:

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models, Selection of Software Development Models,

Unit-2:

Software Requirement Specifications (SRS) Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS, Estimation of various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Unit-3:

Software Design Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit-4:

Software Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Unit-5:

Software Maintenance: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering, Software Configuration Management Activities, Change Control Process, Software Version Control, Defect Detection and Removal: Defect Amplification Model, An Overview of CASE Tools.

Lab Work:

Lab exercises or a Mini Project (as per list given below) to be carried out using languages like C++, Java, C# and tools like Visio, ARGOUML, Rational Rose etc. Design and Implementation of an Object based application using any one of the above languages/tools is desirable.

- Hotel Automation System
- Book Shop Automation Software
- Word processing Software
- Software Component Cataloguing Software
- Payroll System
- Banking System
- Purchase Order System
- Library Management System
- Railway Reservation System
- Bill Tracking System
- University Admission System
- Estate Management System.

Text and References Books:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
3. Ian Sommerville, Software Engineering, Addison Wesley.
4. Pankaj Jalote, Software Engineering, Narosa Publication
5. Pfleeger, Software Engineering, Macmillan Publication.

Course Outcomes:

1. Understand and explain various concepts of software engineering and software life cycle development models. (Understand)
2. Prepare SRS and Compute cost and effort required to complete a given project, using various estimation techniques and models. (Apply)
3. Understand various concepts of Software design and Construct Data Flow Diagrams, Data Dictionaries and UML diagrams for a given software requirement specification. (Understand, Apply)
4. Understand various testing techniques and use these concepts to design optimal test cases. (Understand, Apply, Analyze)
5. Understand software configuration management, version control, reverse engineering, defect tracking etc. (Understand)
6. Build a project report as a team which contains the requirement specification, plan, schedule and design documents based on the knowledge of software development lifecycle. (Apply)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	-	-	-	-	-	1
CO2	2	2	1	1	1	-	-	-	-	-	3	1
CO3	2	2	3	1	3	1	1	1	3	3	3	1
CO4	2	2	1	-	1	-	-	-	-	-	3	1
CO5	2	2	1	-	1	-	-	-	-	-	3	1
CO6	3	3	3	3	3	1	1	1	3	3	3	-

CO and PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1
CO2	3	3	1	2
CO3	3	3	1	2
CO4	3	3	1	1
CO5	2	2	-	1
CO6	3	3	2	2

PRINCIPLES OF PROGRAMMING LANGUAGES (ECS-254)

Type	L	T	P	Credits
PCC	2	1	0	3

Prerequisite:

Course Content:

Unit-1:

Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, developments in programming methodologies, desirable features and design issues. Programming language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

Unit -2:

Elementary and Structured Data Types: Data object variables, constants, data types, elementary data types, declaration, assignment and initialization, enumeration, characters, strings. Structured data type and objects: Specification of data structured types, vectors and arrays, records, variable size data structure, pointers and programmer constructed data structure, Sets files. Sub Program and programmer defined data types: Evolution of data types, abstractions, encapsulations, information hiding, sub programs, abstract data types.

Unit -3:

Sequence Control; Implicit and Explicit sequence control, sequence control with within expression and statements, recursive sub programs, exception handling, co routines, Scheduled sub programs, concurrent execution. Data control referencing environments, static and dynamic scope, local data local data referencing environment, shared data: Explicit common environment dynamic scope parameter passing mechanism.

Unit-4:

Storage Management: Major run time requirements, storage management phases, static storage management, stack based, heap based storage management. Syntax and translation: General syntactic criteria, syntactic element of a language, stages in translation, formal syntax and semantics.

Unit-5:

Operating and Programming Environment: Batch Processing Environments, Embedded system requirements, Theoretical models, Introduction to Functional Programming, Lambda calculus, Data flow language and Object Oriented language, Comparison in various general and special purpose programming languages e.g. Fortran, C, Pascal, Lisp, etc.

Text and References Books:

1. Terrance W. Pratt, "Programming Languages: Design and Implementation" PHI
2. Sebesta, "Concept of Programming Language", Addison Wesley
3. E Horowitz, "Programming Languages", 2nd Edition, Addison Wesley

Course Outcomes:

1. Understand the evolution of programming languages alongwith the desirable features and design issues. (Understand)
2. Understand the requirement of elementary and structured data types in programming languages and analyze their features. (Analyze)

3. Understand and apply the concept of various program development constructs/mechanisms such as sequence control, recursion, scope rules, co-routines, parameter passing, exception handling etc. (Apply)
4. Understand the concept of storage management and language translation issues as applicable to a programming language. (Understand)
5. Understand and compare features of various types of general/specific purpose programming languages and their programming environment. (Analyze)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-
CO3	2	2	-	1	-	-	-	-	-	-	-	1
CO4	2	1	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	2	-	-	-	-	-	-	-	-

CO and PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4
CO1	2	1	-	-
CO2	2	2	2	-
CO3	2	2	2	-
CO4	2	1	-	-
CO5	2	2	1	2

WEB TECHNOLOGY (ECS-256)

Type	L	T	P	Credits
ESC	2	1	2	4

Prerequisite:

Course Content:

Unit-1:

History of the web, Protocols governing the web, Growth of the Web, Web 2.0 and its features. Introduction to Cyber Laws in India, Introduction to International Cyber laws, Web project, Web Team, Team dynamics, Communication Issues, the Client, Multi departmental & large scale Websites, Quality Assurance and testing, Technological advances and Impact on Web Teams.

Unit-2:

HTML: Formatting Tags, Links, List, Tables, Frames, forms, Comments in HTML, DHTML, and Introduction to HTML 5, JavaScript: Introduction, Documents, Documents, forms, Statements, functions, objects in JavaScript, Events and Event Handling, Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas, Introduction to j-Query.

Unit-3:

XML: Document type definition, XML Schemas, Document Object model, Presenting XML, Using XML Processors: DOM and SAX parsers, Java Beans: Introduction to Java Beans, Advantages of Java Beans, BDK, Introspection, Using Bound properties, Bean Info Interface, Constrained properties , Persistence, Customizes, Java Beans API, Introduction to EJBs.

Unit-4:

Web Servers and Servlets: Tomcat web server, Introduction to Servelets: Lifecycle of a Serverlet, JSDK, The Servelet API, The javax.servelet Package, Reading Servelet parameters, Reading Initialization parameters, The javax.servelet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, Security Issues. Introduction to JSP: The Anatomy of a JSP Page. JSP Application Design with MVC, JSP Application Development: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing Sharing Session and Application Data Memory Usage Considerations

Unit-5:

Database Access: Database Programming using JDBC, Studying Javax.sql.* package, Accessing a Database from a JSP Page, Application – Specific Database Actions, Deploying JAVA Beans in a JSP Page, Introduction to struts framework. Semantic Web: Introduction, growth and evolution, goals and vision, need, problems, Architecture, applications.

Lab Work:

1. Design a HTML page to display your CV.
2. Design a HTML form to reserve a railway ticket.
3. Write a Java Script program that finds the greatest common divisor of two numbers.
4. In the form mentioned in problem 2 to reserve a railway ticket add the following validations using java Script.
    - From city and to city are two different cities.
    - Age of passengers should not be greater than 150.
    - Name of the passenger should be a string of a maximum length
5. Write a program for illustrating client/server side scripting with help of ASP.
6. Write a piece of code in XML for creating DTD, which specifies set of rules.
7. Create style sheet in CSS/XSL and display the document in Internet Explorer.

Text and References Books:

1. Burdman, “Collaborative Web Development”, Addison Wesley.
2. Ivan Bayross, “Web Technologies Part II”, BPB Publications.
3. Deitel & Deitel, “Internet and World Wide Web – How to Program”, Goldberg, Pearson Education.
4. Eric Ladd, Jim O’ Donnel,Using HTML 4, XML and JAVA”, Prentice Hall of India
5. Hans Bergsten, Java Server Pages, SPD O’Reilly
6. Patrick Naughton and Herbert Schildt, The complete Reference Java 2 Fifth Edition by TMH

7. Michael C Daconta, Leo, Kelvin Smith, "The Semantic Web: A guide to the future of XML, Web services, and knowledge management", Wiley.

Course Outcomes:

1. Understand the basics of web and apply the web concepts for web application development. (Apply)
2. Understand, apply and analyze mark-up languages like HTML, DHTML, and XML for development of different web applications. (Apply, Analyze)
3. Develop interactive web applications using client-side scripting languages. (Apply)
4. Develop three-tier applications using PHP, JSP and servlets. (Apply)
5. Construct interoperable web applications using XML and related technologies. (Apply)
6. Develop and deploy web services to build the server side components in web applications. (Apply)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	-	-	-	-	-	-
CO2	2	2	2	-	2	-	-	-	-	-	-	-
CO3	2	1	3	1	2	-	-	-	-	-	-	-
CO4	2	1	3	1	2	-	-	-	-	-	-	-
CO5	2	1	3	1	2	-	-	-	-	-	-	-
CO6	2	1	3	1	2	-	-	-	-	-	-	-

CO and PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4
CO1	2	2	2	-
CO2	3	2	3	-
CO3	3	2	3	1
CO4	3	2	3	1
CO5	3	2	3	1
CO6	3	2	3	1

OPERATING SYSTEMS (ECS-258)

Type	L	T	P	Credits
PCC	2	1	0	3

Prerequisite:

Course Content:

Unit-1:
Introduction: Operating System and its functions, Evolution of Operating System, Batch, Interactive, Time Sharing and Real Time Operating System, System Protection. Operating System Structure: System Components, System Structure, Operating System Services.

Unit-2:

Process Management: Process Concept, Process State, Process Control Block, Threads. Concurrent Processes: Principle of Concurrency, Mutual Exclusion, Inter Processes Communication, Critical Section Problem, Semaphores, Classical Problems in Concurrency, Producer / Consumer Problem, Readers-Writers Problem, Dining Philosophers Problem.

Unit-3:
CPU Scheduling: Scheduling Concept, Scheduling Techniques, Performance Criteria for Scheduling Algorithm, Evolution, Multiprocessor Scheduling. Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery From Deadlock Combined Approach.

Unit-4:
Memory Management: Basic Machine, Resident Monitor, Multiprogramming with Fixed Partition, Multiprogramming With Variable Partition, Multiple Base Register, Paging, Segmentation, Paged Segmentation. Virtual Memory: Virtual Memory Concept, Demand Paging, Performance, Paged Replaced Algorithm, Allocation of Frames, Thrashing, Cache Memory Organization, Impact on Performance.

Unit-5:
I/O Management & Disk Scheduling: I/O Devices, Organization of I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, CSCAN). File Management: File Concept, File Organization, File Directories, File Sharing, Allocation Methods, Free Space Management, and Implementation Issues.

Text and References Books:

1. Milenekovik, "Operating System Concept", McGraw Hill.
2. Petersons, "Operating Systems", Addison Wesley.
3. Dietal, "An Introduction to Operating System", Addison Wesley.
4. Tannenbaum, "Operating System Design and Implementation", PHI.
5. Gary Nutt, "Operating System, A Modern Perspective", Addison Wesley.
6. Stalling, Williams, "Operating System", Maxwell Macmillan
7. Silveschatz, Peterson J., "Operating System Concepts", Willey.
8. Crowley, "Operating System", TMH.

Course Outcomes:

1. Understand types and structure of operating systems. (Understand)
2. Develop programs using system-calls related to process, memory and file management. (Apply)
3. Construct solutions for problems related to process scheduling, deadlocks and synchronization in a multi-programmed operating system. (Apply)

4. Develop appropriate solutions for memory management considering challenges due to multi-programming and virtual memory. (Apply)
5. Apply knowledge of various software and hardware synchronization tools for solving critical section problem in concurrent processes. (Apply)
6. Construct solutions for problems related to secondary storage management with an understanding of file systems and disk scheduling. (Apply)
7. Design various system protection and security mechanisms in order to design efficient software system. (Apply)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	3	-	-	-	-	-	-	-	-	-
CO3	2	2	3	-	-	-	-	-	-	-	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-
CO5	2	2	3	1	2	-	-	-	-	-	-	2
CO6	2	2	3	-	-	-	-	-	-	-	-	-
CO7	2	2	3	1	-	-	-	-	-	-	-	2

CO and PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4
CO1	2	-	-	-
CO2	3	3	2	-
CO3	3	3	2	-
CO4	3	3	2	-
CO5	3	3	3	1
CO6	3	2	2	-
CO7	3	2	2	1

ORGANISATIONAL BEHAVIOUR (HHS-254)

Type	L	T	P	Credits
HSMC	3	0	0	3

Prerequisite:

Course Content:

Unit 1: Introduction to organizations
What is an organization, components of organization, nature and variety of organizations (in terms of objectives, structure etc.), models of analyzing organizational phenomena, organizational and business variables, organizations in the Indian context, institutions and structures.

Unit 2: Dimensions of Individual Behavior
Individual Behavior, Dimensions of individual behavior: Perceptions, Learning, Motivation, Personality, Commitment, Attitudes, Values & Ethics, Stress Management

Unit 3: Dimensions of Interpersonal Behavior
Transactional Analysis, Interpersonal communication, Listening, Feedback, Counseling,

Unit 4: Group Behavior
Leadership, Communication, Group: Formal Vs Informal Groups, Group Decision making, Team: Team building, team problem solving.

Unit 5: Organizational Dimensions
Organizational Structure: Elements of Organizational Structure, Dimensions of Organizational Structure, Organizational change, Organizational Development, Power, Authority, Politics

Note:- *Integrating cases: Case method and lectures should be supplemented with a variety of other methodologies such as feedback on questionnaires and tests, role plays, and behavior simulation exercise.*

Text and Reference Books:

1. Luthans Fred., "Organizational Behavior", McGraw Hill, 1998
2. Pareek, Udai, "Understanding Organizational Behavior, Oxford university press.
3. Robbins (4th ed.), "Essentials of organizational behavior", Prentice Hall of India Pv1. Ltd., New Delhi, 1995.
4. Keith Davis, "Organisational Behaviour.
5. Hersey and Blanchard (6th ed.). "Management of organizational behavior L utilising human resources", Prentice Hall of India Pv1. Ltd., New Delhi, 1996.
6. Nancy J. Adler, ‘‘International Organisational Behaviour’, Cengage Learning.
7. Nelson Quick, ‘Organizational Behaviour Function Learning’, Fifth Edition

Course Outcomes:

1. Apply organizational objectives, components and models in Indian context for better results for attaining organizational goals. (Apply)
2. Demonstrate individual behavioural dimensions, learning theories, perceptual process, values & ethics with motivational techniques in stressed situations. (Apply)

3. Identify mechanism for conducive survival of individual in an organization with interpersonal understanding. (Remember)
4. Ascertain group, group behaviour, Team & Team building with its key role in organization. (Understand)
5. Demonstrate organisational structure, organisational change, organisational development for achieving higher productivity and accomplishing goals of organisation. (Apply)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	1	-	1	1	1	2	2	1	3
CO2	-	-	-	1	-	1	1	3	3	3	1	3
CO3	-	-	-	1	-	2	1	3	3	3	2	3
CO4	-	-	-	2	-	2	2	3	3	3	2	3
CO5	-	-	-	2	-	1	2	2	2	2	2	3

CYBER SECURITY (258)

Type	L	T	P	Credits
MC	2	0	0	0

Prerequisite:

Course Content:

Unit-1:
Introduction to information systems, Types of information systems, Development of Information systems, Introduction to information security, Need for Information security, Threats of Information Systems, Information Assurance, Cyber Security and Security Risk Analysis.

Unit-2
Application security (Database, E-mail and Internet), Data Security Considerations - Backups, Archival Storage and Disposal of Data, Security Technology - Firewall and VPNs, Intrusion Detection, Access Control, Security Threats - Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce – Electronic Payment System, e-Cash, Credit/Debit Cards, Digital Signature, public Key Cryptography.

Unit-3
Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design, Security Issues in Hardware, Data Storage & Downloadable devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.

Unit-4
Security Policies, why Policies should be developed, WWW Policies, Email Security Policies, Policy Review Process- Corporate policies- Sample Security Policies, Publishing and Notification requirement of the Policies. Information Security Standards- ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India: IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Pattern Law.

Text and Reference Books:

1. Charles, P., and Shari Lawrence Pfleeger, "*Analyzing Computer Security"*. Pearson Education India.
2. V.K. Pachghare, "*Cryptography and information security",* PHI Learning Pvt. Ltd., Delhi India.
3. Dr Surya Prakash Tripathi, Ritendra Goyal, and Praveen Kumar Shukla, "Introduction to Information Security and Cyber Law", Willey Dreamtech Press.
4. Schou, Shoemaker, "Information Assurance for the Enterprise", Tata McGraw Hill.
5. Chander Harish, "Cyber Laws and their Protection", PHI Learning Private Limited, Delhi, India.

Course Outcomes:

1. Understand information, information systems, information security, Cyber Security and Security Risk Analysis. (Understand)
2. Understand and apply application security, data security, security technology, security threats from malicious software. (Apply)
3. Understand the concepts of security threats to e-commerce applications such as electronic payment system, e-Cash, Credit/Debit Cards etc. (Understand)
4. Understand and apply Information Security Governance & Risk Management, Security of IT Assets and Intrusion Detection Systems. (Apply)
5. Understand various types of Security Policies, Cyber Ethics, IT Act, IPR and Cyber Laws in India. (Understand)

CO and PO Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	-	3	2	2	1	1	1	2
CO2	2	2	2	2	2	3	2	2	2	1	-	2
CO3	2	2	1	2	2	3	2	2	1	1	-	2
CO4	2	2	2	2	2	3	2	2	1	1	-	2
CO5	2	1	1		1	2	2	2	1	-	-	2

CO and PSO Mapping

CO/PSO	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	1
CO2	2	1	1	2
CO3	3	2	2	1
CO4	3	2	2	1
CO5	3	2	2	1