UNIVERSITY OF MYSORE

(Re-accredited by NAAC with 'A' Grade)

(NIRF-2022: Ranked 33rd in University Category and 54th in Overall Category)

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

SCHEME AND SYLLABUS OF

B.E IN COMPUTER SCIENCE & DESIGN

Outcome Based Education (OBE)

and

Choice Based Credit System (CBCS)

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DIRECTOR
Mysore University
School of Engineering
Manasagangotri, Mysuru - 06

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Scheme of Teaching and Examination 2021-2022 (As per NEP-2020)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021–2022)

I-SEMESTER BE (Physics Cycle)

Sl No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theory lectures	Tutorial	Practical/ Drawing	Examination in Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	BSC	21MAT11	Engineering Mathematic-I	MAT	MAT	3	2	-	03	50	50	100	4
2	BSC	21PHY12	Engineering Physics	PHY	PHY	3	-	-	03	50	50	100	3
3	ESC	21ELN13	Basic Electronics Engineering	BM & RE	BM & RE	3	-	-	03	50	50	100	3
4	ESC	21CIV14	Elements of Civil Engineering	CEE	CEE	3	-	-	03	50	50	100	3
5	BSC	21BIE15	Biology for Engineers	CHE	CHE	3	-	-	03	50	50	100	3
6	BSC	21PHYL16	Engineering Physics Laboratory	PHY	PHY	-	-	2	03	50	50	100	1
7	ESC	21EEL17	Basic Electrical & Electronics Laboratory	BM & RE	BM & RE	-	-	2	03	50	50	100	1
8	ESC	21IDT18	Innovation & Design Thinking	Respective Dept.	Respective Dept.	-	2	-	-	50	-	50	1
9	HSMC	21EGH19	Technical English	HSMC	HSMC	-	-	2	-	50	-	50	1
Total						**15**	**04**	**06**	**21**	**450**	**350**	**800**	**20**

Note: BSC: Basic Science Courses, ESC: Engineering Science Courses, MAT: Mathematics, PHY: Physics, BM & RE: Bio-medical and Robotics Engineering, CEE: Civil Environmental Engineering, CHE: Chemistry, HSMC: Humanity, Social Science and Management Courses.

Credit Definition:

- 1-hour lecture**(L)** per week per semester = **1 Credit**
- 2-hour tutorial **(T)** per week per semester = **1 Credit**
- 2-hour Practical/Drawing **(P)** per week per semester = **1 Credit**

- **Four-credit** courses are to be designed for **50** hours of Teaching-Learning process.
- **Three credit** courses are to be designed for **40** hours of Teaching-Learning process.
- **Two credit** courses are to be designed for **25** hours of Teaching-Learning process.
- **One credit** courses is to be designed for **15** hours of Teaching-Learning process

AICTE Activity Points to be earned by students admitted to BE/B.Tech., day college programme (For more details refer to Chapter 6, AICTE Activity Point Programme, Model Internship Guidelines):

Over and above the academic grades, every Day College regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to UoM. The Activity Points earned shall be reflected on the student's eighth semester Grade Card.

The activities can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression.

In case students fail to earn the prescribed activity Points, an Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Scheme of Teaching and Examination 2021-2022(As per NEP-2020)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021–2022)

II-SEMESTER BE (Chemistry Cycle)

Sl No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theory lectures	Tutorial	Practical/ Drawing	Examination in Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	BSC	21MAT21	Engineering Mathematic-II	MAT	MAT	3	2	-	03	50	50	100	4
2	BSC	21CHE22	Engineering Chemistry	CHE	CHE	3	-	-	03	50	50	100	3
3	ESC	21ELE23	Basic Electrical Engineering	BM & RE	BM & RE	3	-	-	03	50	50	100	3
4	ESC	21CPS24	C Programming for Problem Solving	CS & E	CS & E	3	-	-	03	50	50	100	3
5	BSC	21EME25	Elements of Mechanical Engineering	BM & RE	BM & RE	3	-	-	03	50	50	100	3
6	BSC	21CHEL26	Engineering Chemistry Laboratory	CHE	CHE	-	-	2	03	50	50	100	1
7	ESC	21CPL27	C Programming Laboratory	CS & E	CS & E	-	-	2	03	50	50	100	1
8	ESC	21AEC28	Ability Enhancement Course	Respective Dept.	Respective Dept..	-	2	-	-	50	-	50	1
9	HSMC	21KAN29	Technical Kannada	HSMC	HSMC	-	2	-	-	50	-	50	1
Total						**15**	**06**	**04**	**21**	**450**	**350**	**800**	**20**

Note: BSC: Basic Science Courses, ESC: Engineering Science Courses, MAT: Mathematics, CHE: Chemistry, BM & RE: Bio-medical and Robotics Engineering, CS & E: Computer Science and Engineering, HSMC: Humanity, Social Science and Management Courses

Credit Definition:

- 1-hour lecture **(L)** per week per semester = **1 Credit**
- 2-hour tutorial **(T)** per week per semester = **1 Credit**
- 2-hour Practical/Drawing **(P)** per week per semester = **1 Credit**

- **Four-credit** courses are to be designed for **50** hours of Teaching-Learning process.
- **Three credit** courses are to be designed for **40** hours of Teaching-Learning process.
- **Two credit** courses are to be designed for **25** hours of Teaching-Learning process.
- **One credit** course are to be designed for **15** hours of Teaching-Learning process

AICTE Activity Points to be earned by students admitted to BE/B.Tech., day college programme (For more details refer to Chapter 6, AICTE Activity Point Programme, Model Internship Guidelines):

Over and above the academic grades, every Day College regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to UoM. The Activity Points earned shall be reflected on the student's eighth semester Grade Card.

The activities can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression.

In case students fail to earn the prescribed activity Points, an Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

Physics Cycle

Engineering Mathematics-I (21MAT11)

Semester I (Common for both Physics and Chemistry Cycle)			
No. of Teaching hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T :P	3:2:0	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Differential Calculus:** **Partial Differentiation**: Basics; Euler's theorem of first kind (only problems); Total derivatives; Jacobian; Maclaurin's series of one and two variable; Differentiation under Integral sign. **Applications:** Problems on evaluation of non-elementary integrals using Maclaurin's series	**10 Hours**
Module 2	**Ordinary Differential Equations** **Linear Equations**: Bernoulli's equation; Exact Equations; Reducible to Exact (If of the form); Orthogonal Trajectory (Cartesian only); and Newton's law of cooling. **Non- Linear Equations:** Solve for p, Clairaut's form(singular, general solution). **Applications:** Problems on LR circuits leading to linear differential equations.	**10 Hours**
Module 3	**Integral Calculus:** **Multiple Integrals:** Double integrals, changing the order of integration, changing Cartesian form to polar form. Special Functions- Beta and Gamma Functions, relation between beta and gamma function, properties, and its problems (related to reduction formula of definite integral). **Applications:** Problems on centre of gravity and moment of inertia which involve evaluation of multiple integrals.	**10 Hours**
Module 4	**Numerical methods and Infinite Series** **Numerical methods:** Types of errors in numerical methods, Solution of Algebraic and Transcendental Equation: Newton-Raphson. Finite Differences: Forward and Backward, Interpolation, Lagrange's Interpolation. Numerical Integration- Simpson's $1/3^{rd}$rule. **Infinite Series: C**onvergence of infinite series: D-Alembert's Ratio Test, Raabe's Test, Leibniz test, absolute and conditional convergent. **Applications:** Problems on application of Newton-Raphson method to some physical contexts	**10 Hours**

Module 5	**Linear Algebra** Vectors, linearly dependent and independent vectors, Solution to systems of Linear Equation: Rank, Consistency, Gauss Elimination, LU decomposition. Eigen values- Eigen vectors, Diagonalization, Gauss–Seidel Method, Rayleigh Power method. **Applications:** Problems on Kirchhoff's law leading to solving system of linear equations. Problems on computation of inverse matrix using LU decomposition.	**10 Hours**

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

- Explain the basic concepts of calculus for a single and multivariable function, ordinary.
  differential equations, infinite series, numerical methods and linear algebra.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyze the solutions of engineering problems using these concepts.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration) and then it is reduced to 50. Based on this grading will be awarded.

Continuous Internal Evaluation (CIE): The CIE marks for theory part of I year courses shall be 50.

1. Thirty (30) marks shall be considered to evaluate students in tests. There shall bethree tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30marks.
2. Ten (10) marks shall be prescribed for assignments /written quizzes (one scheduled quiz and one surprize quiz). There shall be at least two assignments and two quizzes. The marks earned in these events shall be averaged to reduce to 10 marks.
3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

Question Paper Pattern (SEE):

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks. Each fullquestion carries 20 marks.

- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Text and Reference Books:

1. S C Chapra and R P Canale, *Numerical Methods for Engineering,* 15th Edition, Tata McGraw Hill
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
3. B.S. Grewal, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
4. Gilbert Strang, Linear Algebra and its Applications, Wellesley Publishers.
5. Peter V. O'Neil, *Engineering Mathematics*, CENGAGE Learning India Pvt Ltd.
6. B.V. Ramana, *Higher Engineering Mathematics*, Latest edition, Tata McGraw Hill.
7. Thomas and Finney, *Calculus and Analytic Geometry,* 9th Edition, Pearson Education.

Engineering Physics (21PHY12/22)

Semester I/II			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	3:0:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Electrostatics, Magnetostatics and Elastic properties of materials:** **Electrostatics:** Electrostatic field and potential of a dipole, dielectric constant, Bound charges due to electric polarization, electric displacement, dielectric slab in uniform electric field, relation between dielectric susceptibility (χ), dielectric constant and polarization density (P). Numerical problems. **Magnetostatics:** Biot Savart's law, divergence and curl of static magnetic field, Gauss divergence theorem sand stokes' theorem, Faraday's law in terms of EMF produced by changing magnetic flux. **Elastic properties of materials:** concept of elasticity, stress, strain, tensile stress, shear stress, compressive stress. Hooke's law, different elastic moduli: Poisson's ratio, Expression for Young's modulus (Y), Bulk modulus and Rigidity modulus (n) in terms of α and β. Relation between Y, n and K. Derivation of expression for bending moment of a beam with circular and rectangular cross section. Numerical problems.	**08 Hours**
Module 2	**Crystal physics:** Space lattice, Basis vectors, Unit cell, lattice parameters. Bravais lattice and crystal systems, Estimation of directions and planes in a crystal lattice, Miller indices and expression for interplanar spacing in terms of Miller indices. Expression for lattice constant for a cubic lattice, Co-ordination number, Atomic packing factor-Atomic packing factor for sc, bcc and fcc structures. Crystal structures of NaCl and diamond, Diffraction of X-rays –derivation of Bragg's law, X-ray spectrometer, –problems on Bragg's law.	**08 Hours**
Module 3	**Introduction to solids**: Review of classical free electron theory, Quantum free electron theory, Fermi energy and Fermi factor in metals, Variation of Fermi factor with energy and temperature, Fermi-Dirac statistics, Derivation of density of states, Band theory of solids (qualitative approach) Intrinsic semiconductors, concept of effective mass (qualitative) Intrinsic carrier density, Fermi level in intrinsic semiconductors, Extrinsic semiconductors- types, variation of carrier concentration with temperature, variation of Fermi	**08 Hours**

	level with temperature, numerical problems.	
Module 4	**Modern Physics** **Dual nature of matter**: Wave particle dualism, de-Broglie hypothesis, Davisson and Germer experiment, Matter waves and their characteristic properties. Phase velocity and group velocity, Relation between phase velocity and group velocity. Relation between group velocity and particle velocity. Problems on de-Broglie's wavelength. **Wave mechanics**; Heisenberg's uncertainty principle, significance and its applications: non-existence of electron inside the nucleus. Properties of wave function and physical significance. Probability density and Normalization of wave function, Schrodinger time independent wave equation in one-dimension, Eigen values and Eigen functions. Particle in one dimensional infinite potential well. Numerical problems.	**08 Hours**
Module 5	**Lasers, optical fibers and nanomaterials**: **Lasers:** Laser Characteristics, Spatial and Temporal Coherence, Einstein Coefficient and its significance, Population inversion, Two, three and four level systems, Pumping schemes, Threshold gain coefficient, Components of laser, Nd-YAG, He-Ne, and Dye laser and their engineering applications. Numerical problems. **Optical fibers**- Construction and light propagation mechanism in optical fibers (total internal reflection and its importance), Propagation mechanism in optical fibers. Angle of acceptance. Numerical aperture. Types of optical fibers and modes of propagation. Attenuation, Pulse dispersion (qualitative only). **Nanomaterials**- Effect of nano-scale dimension, Classification of nano materials, Properties and applications of nano systems, Carbon nanotubes (CNTs).	**08 Hours**

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

- Recall and relate the knowledge of quantum physics to the properties of advanced materials such as conductors, semiconductors, dielectrics, lasers, optical fibers and nanomaterials.
- Interpret the physical laws to study the materials properties.
- Apply the problem-solving ability to identify and construct the applications of the advanced materials in new technologies.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration) and then it is reduced to 50. Based on this grading will be awarded.

Continuous Internal Evaluation: The CIE marks for theory part of I year courses shall be 50.

1. Thirty (30) marks shall be considered to evaluate students in tests. There shall bethree tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30marks.
2. Ten (10) marks shall be prescribed for assignments /written quizzes (one scheduled quiz and one surprize quiz). There shall be at least two assignments and two quizzes. The marks earned in these events shall be averaged to reduce to 10 marks.
3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

Question Paper Pattern (SEE):

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks. Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module. The students will have to answer five full questions, selecting one full question from each module.

Text and Reference books:

1. Fundamentals of Physics - Halliday and Resnick, 10th Edition, 2012, Wiley, UK
2. Introduction to Mechanics - MK Verma, 2008, CRC Press, Taylor and Francis.
3. Quantum Mechanics - D.J Griffiths, 2013, Pearson Pentice Hall, New Jercy.
4. Lasers and Nonlinear Optics - B.B Laud, 2011, New Age International, New Delhi.
5. Solid State Electronics Devices - B.G. Streetman, 7th Edition, 2014, Pearson Pentice Hall, New Jersy.
6. Concept of Modern Physics - Arthur Beiser, 2009, MacGraw Hill, New Delhi.

Basic Electronics Engineering (21ELN13/23)

Semester I/II			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	3:0:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Semiconductor Diode and its Applications**: Construction, working, and characteristics of PN-junction Diode, Diode approximations, Shockley's Equation, Half-wave, Full-wave, and Bridge Rectifiers, Mention of expression for average, RMS, and Peak Inverse Voltage, and Ripple Factor to each configuration, Zener Diode and its Characteristics, **Transistor:** Construction and working of Bipolar Junction Transistor, Transistor voltages and currents, mention of CB, CE and CC configurations, Input and Output characteristics of CE configuration, Circuit diagram and working of Transistor as Switch and Amplifier. **Amplifiers:** Need for transistor biasing, Voltage-Divider Bias Circuit, Classification of amplifiers.	**08 Hours**
Module 2	**Field Effect Transistors:** Construction and working of JFET, Common Drain and Transfer Characteristics of JFET. **MOSFET:** Construction, working and Characteristics of Depletion and Enhancement mode MOSFETs. **CMOS:** Construction, Working and Characteristics of CMOS transistors.	**08 Hours**
Module 3	**Basics of Digital Electronics:** Analog verses Digital Signals, Decimal, Binary, Octal and Hexadecimal Numbers and interconversion among them, 2's complement Arithmetic, Addition and Subtraction of Binary Numbers, Basic and Universal Gates. **Combinational Logic Circuits:** Boolean Algebra and Theorems, Simplification of Logic Circuits, SoP and PoS forms, 2 and 3 variable K-Maps. **Sequential Logic Circuits:** Basics of Flip-flops, SR and JK Flip-flops.	**08 Hours**
Module 4	**Operational Amplifiers and its Applications:** Basics of Differential Ampler, Block diagram of Op-amp and its modes, Ideal verses Practical Op-amps, Open and Closed Loop Op-amp configurations. **Op-amp Parameters**: Definition and expression for Voltage gain, CMRR, Input Offset Voltage and Current, Input Bias Current, Virtual Ground, Input and Output impedance, Slew	**08 Hours**

	Rate.	
Module 5	**Basics of Electronic Communication:** Definition of Modulation and Demodulation, Need for Modulation, Electromagnetic Frequency Spectrum. **Analog Communication:** Block Diagram of Analog Communication System, Principles of AM and FMModulation Schemes and their Comparison. **Digital Communication:** Block Diagram of Digital Modulation System, Advantages of Digital Communication over Analog Communication.	**08 Hours**

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

- Analyze the characteristics of Basic Electronic Devices
- Realize the importance of Electronic Devices in everyday life
- Apply the principles of working of Electronic Devices to design the Electronic circuits
- Analyze the importance of Electronic Communication System
- Gain the fundamental knowledge on the operation of Mobile Telephones

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration) and then it is reduced to 50. Based on this grading will be awarded.

Continuous Internal Evaluation: The CIE marks for theory part of I year courses shall be 50.

1. Thirty (30) marks shall be considered to evaluate students in tests. There shall bethree tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30marks.
2. Ten (10) marks shall be prescribed for assignments /written quizzes (one scheduled quiz and one surprize quiz). There shall be at least two assignments and two quizzes. The marks earned in these events shall be averaged to reduce to 10 marks.
3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

Question Paper Pattern (SEE):

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks. Each fullquestion carries 20 marks.

- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Text Books:

1. David A. Bell, "Electronic Devices and Circuits," 5th Edition, Oxford University Press, 2015.
2. Ramakanth A Gayakwad, "Op-Amps and Linear ICs," Pearson Education, 4th Edition, 2015.
3. D. P. Leach, A.P. Malvino, Goutham S, "Digital Principles and Applications," 8th Edition, MGH, 2014.
4. Wayne Tomasi, "Electronic Communications Systems," 5th Edition, Pearson Education, 2009.

Reference Books:

1. Robert L Boylestad and Louis Nashelsky, "Electronic Devices & Circuit Theory," 11th Edition, Pearson Education India, 2018.
2. David A. Bell, "Operational Amplifiers and Linear ICs," 3rd Edition, Oxford University Press, 2011.
3. Morris Mano, "Digital Logic and Computer Design," Pearson Education, 2004
4. Kennedy and Davis, "Electronic Communication System," 5th Edition, MGH, 2011.
5. R. S. Sedha, "A Text book of Applied Electronics," 7th Edition, S. Chand and Company Ltd., 2011.

E-Resources:

1. https://www.elsevier.com/books/basic-electronics/holbrook/978-0-08-006865-7
2. http://nptel.ac.in/courses/117103063/
3. https://nptel.ac.in/courses/117/105/117105143/
4. https://swayam.gov.in/
5. https://www.mooc-list.com/course/introduction-electronics-coursera

Elements of Civil Engineering (21CIV14/24)

Semester I/II			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	3:0:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Definition of Civil Engineering, Scope of different fields of Civil Engineering; Building Materials, Surveying, Geotechnical Engineering, Structural Engineering, Construction Technology, Hydraulics, Water Resources & Irrigation Engineering, Transportation Engineering and Environmental Engineering. Role of Civil Engineers in the Infrastructural development, effect of infrastructural facilities on social- economic development of a country. Bridges: Types of Bridges and Culverts, RCC, Steel and Composite Bridges Dams: Different types of Dams based on Material, Structural behaviour and functionality with simple sketches.	**08 Hours**
Module 2	Virtual Work and Energy Method-Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.	**08 Hours**
Module 3	Review of particle dynamics-Rectilinear motion; Plane curvilinear motion(rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular).	**08 Hours**
Module 4	Introduction to Kinetics of Rigid Bodies covering, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in planemotion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation.	**08 Hours**
Module 5	Mechanical Vibrations covering, Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple,	**08 Hours**

	compound and torsion pendulums.	

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

- Mention the application of the various fields of civil Engineering.
- Determining the basic knowledge of mathematics and physics to solve real-world problem.
- Use scalar and vector analytical techniques for analysing forces in statically determinate structures
- Understand basic kinematics concepts – displacement, velocity and acceleration.
- Understand basic dynamics concepts – force, momentum, work and energy.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration) and then it is reduced to 50. Based on this grading will be awarded.

Continuous Internal Evaluation: The CIE marks for theory part of I year courses shall be 50.

1. Thirty (30) marks shall be considered to evaluate students in tests. There shall be three tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30 marks.
2. Ten (10) marks shall be prescribed for assignments /written quizzes (one scheduled quiz and one surprize quiz). There shall be at least two assignments and two quizzes. The marks earned in these events shall be averaged to reduce to 10 marks.
3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

Question Paper Pattern (SEE):

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks. Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Text/Reference Books:

1. Reddy Vijaykumar K. and K. Suresh Kumar Singer's "Engineering Mechanics", 2010.
2. Tayal A.K.," Engineering Mechanics", Umesh Publications, 2010.
3. F. P. Beer and E. R. Johnston, "Vector Mechanics for Engineers", Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill,2011.
4. Andy Ruina and Rudra Pratap, "Introduction to Statics and Dynamics", Oxford University Press,2011.

Biology for Engineers (21BIE15/25)

Semester I/II			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	3:0:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	Need to study Biology: – Life Science Studies Significance - Bio Inspired Inventions - Role of Biology in Next Generation Technology Development – Cell Structure – Cell Potential - Action Potential – ECG and other common signals – Sodium	**08 Hours**
Module 2	Potassium channels – Neuron function – Central Nervous Systems – Discussion Topics: Evolution of Artificial Neural Networks, Machine Learning techniques.	**08 Hours**
Module 3	Genetics: Basic Principles of Mendel, molecular genetics, Structure and function of genes and chromosomes, Transcription and Translation, Gene expression and regulation	**08 Hours**
Module 4	Sensing Techniques: - Understanding of Sense organs working – Sensing mechanisms - Sensor Development issues – Discussion Topics: Digital Camera – Eye Comparison, electronic nose, electronic tongue, electronic skin.	**08 Hours**
Module 5	Physiological Assist Device: Artificial Organ Development: Kidney, Liver, Pancreas, heart valves – Design Challenges and Technological Developments	**08 Hours**

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

- Understand the biological concepts from an engineering perspective.
- Understand the concepts of biological sensing and its challenges.
- explain the fundamentals of genetic and transfer of genetic information.
- Understand development of artificial systems mimicking human action.
- Integrate biological principles for developing next generation technologies.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration) and then it is reduced to 50. Based on this grading will be awarded.

Continuous Internal Evaluation: The CIE marks for theory part of I year courses shall be 50.

1. Thirty (30) marks shall be considered to evaluate students in tests. There shall be three tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30 marks.
2. Ten (10) marks shall be prescribed for assignments /written quizzes (one scheduled quiz and one surprize quiz). There shall be at least two assignments and two quizzes. The marks earned in these events shall be averaged to reduce to 10 marks.
3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

Question Paper Pattern (SEE):

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks. Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Text Books:

1. "Biology for Engineers: As per Latest AICTE Curriculum" Wiley Editorial ISBN:9788126576340.
2. Biology for Engineers (ISBN: 9781121439931), TMH
3. Leslie Cromwell, Biomedical Instrumentation, Prentice Hall 2011.
4. Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Biology for Engineers, Tata McGraw-Hill, New Delhi, 2012.
5. Medicine Dentistry Electronic Nose
6. Electronic Tongue

Reference Books:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
2. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons
3. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

Engineering Physics Laboratory (21PHYL16/26)

Semester I/II			
No. of Lecture hour/Week	-	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	50
Total No. of Lecture hours	-	**Exam Hours**	03
L: T:P	0:0:2	**Credits**	01

Sl No.	List of experiments
1	**Resonance in LCR circuits-** Study frequency response of series and parallel resonance circuits
2	**Dielectric constant**- Determination of dielectric constant of the given dielectric material by charging and discharging
3	**Zener diode-** I-V characteristics of Zener diode
4	**B-H curve**- Determination of energy loss, remnant flux density and coercive field of the given ferromagnetic material
5	**Planck's constant**- Determination of the Planck's constant using light emitting diodes
6	**Stefan's law**- Verification of Stefan's law
7	**Fermi Energy-** Determination of Fermi energy of given material
8	**Band gap**- Determination of energy gap of a given semiconductor
9	**Laser diffraction-** Determination of wavelength of given laser
10	**Torsional Pendulum-** Determination of moment of inertia of the given irregular body

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

- Understand the Measuring Techniques
- Understand the characteristics of devices and materials.
- Use different techniques of measuring instruments

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain minimum of 40% marks individually both in CIE and SEE to pass. Practical Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration). Based on this grading will be awarded.

Continuous Internal Evaluation (CIE): The 75% (35 marks) CIE marks awarded in case of Practical shall be based on the weekly evaluation of laboratory journals/ reports after the

conduction of every experiment and 25% (15 marks) marks for one practical test. The total CIE marks shall be the sum of marks secured by students in the above events.

Semester End Evaluation (SEE): The practical examinations to be conducted as per the time table of University in a batch wise with strength of students not more than 10-12 per batch.

1. All laboratory experiments are to be included for practical examination.
2. The instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Break up of marks are 15% marks for procedure, 70% marks for conduction and calculation and 15% of marks for viva voce.
4. Students can pick one experiment from the questions lot prepared by the examiners.
5. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

Basic Electrical and Electronics Laboratory (21EEL17/27)

Semester I/II			
No. of Lecture hour/Week	-	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	50
Total No. of Lecture hours	-	**Exam Hours**	03
L: T:P	0:0:2	**Credits**	01

Sl No.	List of experiments
1	Verification of KVL and KCL for DC circuits
2	Measurement of resistance and inductance of a choke coil using three voltmeter method
3	Two-Way and Three-Way control of lamp.
4	Measurement of Current, Power and Power Factor of Incandescent Lamp, Fluorescent Lamp and LED Lamp.
5	Determination of Electrical Characteristic of Photovoltaic cells.
6	Obtain the V-I Characteristics of a Diode.
7	Zener diode as a Voltage Regulator with variable load.
8	Design and Verify the truth table of logic gates
9	Calculate the efficiency of Half Wave and Full Wave diode rectifier.
10	Obtain the characteristic of MOSFET.

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

- To conduct experiment to verify KVL and KCL.
- To conduct experiment to measure impedance of a choke coil & power factor of different lamps.
- To understand the working of two-way and three-way control of lamp.
- To obtain the characteristic of Diode, Zener diode, MOSFET & PV Cell.
- To verify the truth table of Logic gates
- To compute the efficiency of half wave and full wave diode rectifier

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain minimum of 40% marks individually both in CIE

and SEE to pass. Practical Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration). Based on this grading will be awarded.

Continuous Internal Evaluation (CIE): The 75% (35 marks) CIE marks awarded in case of Practical shall be based on the weekly evaluation of laboratory journals/ reports after the conduction of every experiment and 25% (15 marks) marks for one practical test. The total CIE marks shall be the sum of marks secured by students in the above events.

Semester End Evaluation (SEE): The practical examinations to be conducted as per the time table of University in a batch wise with strength of students not more than 10-12 per batch.

1. All laboratory experiments are to be included for practical examination.
2. The instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Break up of marks are 15% marks for procedure, 70% marks for conduction and calculation and 15% of marks for viva voce.
4. Students can pick one experiment from the questions lot prepared by the examiners.
5. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

Innovation and Design Thinking (21IDT18/28)

Semester I/II			
No. of Lecture hour/Week	-	**CIE Marks**	50
No. of Tutorial hours/week	02	**SEE Marks**	-
Total No. of Lecture hours	-	**Exam Hours**	-
L: T:P	0:2:0	**Credits**	01

Module 1	
PROCESS OF DESIGN: Understanding Design thinking Shared model in team-based design – Theory and practice in Design thinking – Exploring work of Designers across globe – MVP or Prototyping.	
Pedagogy	*Introduction about the design thinking: Chalk and Talk method* *Theory and practice through presentation* *MVP and Prototyping through live examples and videos.*
Module 2	
Tools for Design Thinking Real-Time design interaction capture and analysis – Enabling efficient collaboration in digital space – Empathy for design – Collaboration in distributed Design.	
Pedagogy	*Case studies on design thinking for real-time interaction and analysis,* *Simulation exercises for collaborated enabled design thinking,* *Live examples on the success of collaborated design thinking.*
Module 3	
Design Thinking in IT Design Thinking to Business Process modeling – Agile in Virtual collaboration environment – Scenario based Prototyping.	
Pedagogy	*Case studies on design thinking and business acceptance of the design,* *Simulation on the role of virtual eco-system for collaborated prototyping.*
Module 4	
DT For strategic innovations Growth – Story telling - Predictability – Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization - Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design.	
Pedagogy	*Business model examples of successful designs* *Presentation by the students on the success of design* *Live project on design thinking in a group of 4 students.*
Module 5	
Design thinking workshop Design Thinking Work shop Empathize, Design, Ideate, Prototype and Test.	
Pedagogy	*8 hours design thinking workshop from the expect and then presentation by the students on the learning from the workshop.*

Course Outcome:

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

- Explain various design process.

- Generate and develop ideas through different techniques.
- Identify the significance of reverse engineering
- Draw technical drawings for design ideas.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50%. The student has to obtain minimum of 40% marks in CIE to pass.

Continuous Internal Evaluation:

1. Methods suggested: Test, Open Book test, Written Quiz, Seminar, report writing micro project etc.
2. The class teacher has to decide the topic for closed book test, open book test, Written Quiz and Seminar. In the beginning only teacher has to announce the methods of CIE for the subject.

Text Books:

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International edition) Second Edition, 2013.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011.
4. Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.

Reference Books:

1. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.
2. Book - Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author).

Technical English (21EGH19)

Semester I (Common for both Physics and Chemistry Cycle)			
No. of Lecture hour/Week	-	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	-
Total No. of Lecture hours	-	**Exam Hours**	-
L: T:P	0:0:2	**Credits**	01

Modules	Course Content	Teaching Hours
Module 1	1.1 Word Formation 1.2 Etymology, origin of foreign words and their use in English Language 1.3 Familiarizing with prefixes and suffixes from foreign languages in English to form derivatives. 1.4 Synonyms, Antonyms and Standard Abbreviations. Basic Writing Skills	**05 Hours**
Module 2	2.1 Structure of Sentences 2.2 Use of Idioms and phrases in sentences 2.3 Punctuation of Sentences 2.4 Syntax and Creating coherence 2.5 Organizing principles of paragraphs in documents	**05 Hours**
Module 3	Identifying Common Errors in Writing 3.1 Subject-verb agreement 3.2 Noun-pronoun agreement 3.3 Misplaced modifiers 3.4 Articles 3.5 Prepositions 3.6 Redundancies 3.7 Clichés	**05 Hours**
Module 4	Nature and Style of Proper Writing 4.1 Defining 4.2 Describing and Classifying 4.3 Illustrations with suitable examples 4.4 Formulating Introduction and Conclusion Honing Writing Skills	**05 Hours**
Module 5	5.1 Report Writing/Comprehension 5.2 Précis Writing 5.3 Essay Writing 5.4 Critical analysis of unknown Prose Pieces/Poems Oral Communication (This unit involves interactive practice sessions in Language Lab) Listening Comprehension- Active Listening, Feedback and Response, Pronunciation, Intonation and Accent, Common	**05 Hours**

	Everyday Situations: Conversations and Dialogues, Communication at Workplace, Interviews, Formal and PPT Presentations	

Course Outcomes:
At the end of the course the Student will be able to:

- Comprehend and Perceive things/issues to be Creative and Innovative.
- To voice the opinions with precision.
- Communicate and Converse with exuberance with the Global Audience.

Assessment Details (CIE)

The weightage of Continuous Internal Evaluation (CIE) is 50%. The student has to obtain a minimum of 40% marks in CIE to pass.

Continuous Internal Evaluation: The CIE marks for theory part of I year courses shall be 50.

1. Thirty (30) marks shall be considered to evaluate students in tests. There shall bethree tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30marks.
2. Ten (10) marks shall be prescribed for assignments /written quizzes (one scheduled quiz and one surprize quiz). There shall be at least two assignments and two quizzes. The marks earned in these events shall be averaged to reduce to 10 marks.
3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

Text Books

1. Balasubramanian, P. Phonetics for Indian Students. (Second Edition) Macmillan, Mumbai, 2013
2. CIEFL, Hyderabad , Exercises in Spoken English. Parts. I-III. Oxford University Press.
3. Liz Hamp-Lyons and Ben Heasly Study Writing. Cambridge University Press. 2006.
4. Raman, M & Sharma. S. Technical Communication: Principles and Practice. OUP, New
5. Delhi, 2014
6. Sanjay Kumar and PushpLata Communication Skills. Oxford University Press. 2011.
7. Swan, Michael. Practical English Usage. (Fourth Edition) OUP. 2017.
8. Wood. F.T. Remedial English Grammar. Macmillan.2007
9. Zinsser William. On Writing Well. Harper Resource Book. 2001

Chemistry Cycle

Engineering Mathematics-I (21MAT11)

Semester I (Common for both Physics and Chemistry Cycle)			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:2:0	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Differential Calculus:** **Partial Differentiation**: Basics; Euler's theorem of first kind (only problems); Total derivatives; Jacobian; Maclaurin's series of one and two variable; Differentiation under Integral sign. **Applications:** Problems on evaluation of non-elementary integrals using Maclaurin's series.	**10 Hours**
Module 2	**Ordinary Differential Equations** **Linear Equations**: Bernoulli's equation; Exact Equations; Reducible to Exact (If of the form); Orthogonal Trajectory (Cartesian only); and Newton's law of cooling. **Non- Linear Equations:** Solve for p, Clairaut's form(singular, general solution). **Applications:** Problems on LR circuits leading to linear differential equations.	**10 Hours**
Module 3	**Integral Calculus:** **Multiple Integrals:** Double integrals, changing the order of integration, changing Cartesian form to polar form. Special Functions- Beta and Gamma Functions, relation between beta and gamma function, properties, and its problems (related to reduction formula of definite integral). **Applications:** Problems on centre of gravity and moment of inertia which involve evaluation of multiple integrals.	**10 Hours**
Module 4	**Numerical methods and Infinite Series** **Numerical methods:** Types of errors in numerical methods, Solution of Algebraic and Transcendental Equation: Newton-Raphson. Finite Differences: Forward and Backward, Interpolation, Lagrange's Interpolation. Numerical Integration- Simpson's $1/3^{rd}$rule. **Infinite Series: C**onvergence of infinite series: D-Alembert's Ratio Test, Raabe's Test, Leibniz test, absolute and conditional convergent. **Applications:** Problems on application of Newton-Raphson method to some physical contexts	**10 Hours**

Module 5	**Linear Algebra** Vectors, linearly dependent and independent vectors, Solution to systems of Linear Equation: Rank, Consistency, Gauss Elimination, LU decomposition. Eigen values- Eigen vectors, Diagonalization, Gauss–Seidel Method, Rayleigh Power method. **Applications:** Problems on Kirchhoff's law leading to solving system of linear equations. Problems on computation of inverse matrix using LU decomposition.	**10 Hours**

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

- Explain the basic concepts of calculus for a single and multivariable function, ordinary differential equations, infinite series, numerical methods and linear algebra.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyze the solutions of engineering problems using these concepts.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration) and then it is reduced to 50. Based on this grading will be awarded.

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1. Thirty (30) marks shall be considered to evaluate students in tests. There shall be three tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30 marks.
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3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

Question Paper Pattern (SEE):

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks. Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

- The students will have to answer five full questions, selecting one full question from each module.

Text and Reference Books

1. S C Chapra and R P Canale, *Numerical Methods for Engineering*, 15th Edition, Tata McGraw Hill
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
3. B.S. Grewal, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
4. Gilbert Strang, Linear Algebra and its Applications, Wellesley Publishers.
5. Peter V. O'Neil, *Engineering Mathematics*, CENGAGE Learning India Pvt Ltd.
6. B.V. Ramana, *Higher Engineering Mathematics*, Latest edition, Tata McGraw Hill.
7. Thomas and Finney, *Calculus and Analytic Geometry*, 9th Edition, Pearson Education.

Engineering Mathematics-II (21MAT21)

Semester II (Common for both Physics and Chemistry Cycle)			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:2:0	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Higher Order Differential Equations** Inverse Differential Operator: Particular integral of the form e^{ax}, Sinax, polynomials and $e^{ax}V(x)$ (up to third order) and Variation of Parameters. Differential Equation with variable coefficient: Cauchy's and Legendre differential equations. **Applications:** Problems on LRC circuit leading to higher order differential equation. Problems on forced oscillation leading to homogeneous linear ODE	**10 Hours**
Module 2	**Power Series Solutions:** Frobenius method of Power Series (only second order), Bessel's Differential Equation leading to $J_n(x)$, $J_{1/2}(x)$, $J_{-1/2}(x)$, Legendre's Differential Equations, Rodrigues formula (without proof)-Legendre's Polynomial.	**10 Hours**
Module 3	**Vector Calculus**: VPDO- Gradient of a scalar field (angle between two surfaces & Directional Derivatives), Divergence and Curl of Vector field and its properties (Solenoidal and Irrotational). Line integrals, Green's theorem, Stroke's theorem, and Gauss Divergence theorem. **Applications:** Problems on calculating work done using line integrals. Problems on finding the outward flux of a filedusing Green's theorem	**10 Hours**
Module 4	**Laplace Transform** Definition and Laplace transforms of elementary functions (statements only). Laplace transforms of Periodic functions and unit-step function (problems only). Inverse Laplace Transform: Inverse Laplace transforms by method of partial fractions, Convolution theorem to find the inverse Laplace transforms. Solution of linear differential equations using Laplace transforms. **Applications:** Problems on Laplace transforms related to electric circuits.	**10 Hours**
Module 5	**Advanced Linear Algebra:** Vector Space, basis and span, subspace, linear Transformation (LT), Matrix representation of LT, Change of basis, Rank nullity theorem, inverse LT.	**10 Hours**

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

- Explain the basic concepts of vector calculus, higher order differential equations,
- Laplace transforms and advanced linear algebra.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyze the solutions of engineering problems using these concepts.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration) and then it is reduced to 50. Based on this grading will be awarded.

Continuous Internal Evaluation: The CIE marks for theory part of I year courses shall be 50.

1. Thirty (30) marks shall be considered to evaluate students in tests. There shall be three tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30 marks.
2. Ten (10) marks shall be prescribed for assignments /written quizzes (one scheduled quiz and one surprize quiz). There shall be at least two assignments and two quizzes. The marks earned in these events shall be averaged to reduce to 10 marks.
3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

Question Paper Pattern (SEE):

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks. Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Text and Reference Books:

1. S C Chapra and R P Canale, *Numerical Methods for Engineering,* 15th Edition, Tata McGraw Hill
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
3. B.S. Grewal, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
4. Gilbert Strang, Linear Algebra and its Applications, Wellesley Publishers.

5. Peter V. O'Neil, *Engineering Mathematics*, CENGAGE Learning India Pvt Ltd.
6. B.V. Ramana, *Higher Engineering Mathematics*, Latest edition, Tata McGraw Hill.
7. Thomas and Finney, *Calculus and Analytic Geometry,* 9th Edition, Pearson Education.

Engineering Chemistry (21CHE12/22)

Semester I/II			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	3:0:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Thermodynamics and Energy Balance** Introduction, Terminology of thermodynamics, Zeroth law; First law of thermodynamics- Heat and work, Enthalpy, Standard Enthalpies, Bond Enthalpy; The Second Law of Thermodynamics- Entropy the Carnot Cycle; The Third Law of Thermodynamics- Entropy and Temperature-Gibbs Free Energy, Standard Gibbs Free Energies and Chemical Equilibrium. **Electrochemical Energy Systems** Introduction, Single Electrode Potential-origin and terminology; Derivation of Nernst Equation and its applications; Standard Electrode Potential; Measurement of Single Electrode Potential and its applications- Definition, construction of a galvanic cell; Classification of galvanic cells-primary, secondary and concentration cells; EMF of a cell-Definition, notation and conventions; Types of electrodes; Reference electrodes- calomel electrode and Ag / AgCl electrode. **Battery Technology: A New Era Emerging:** **Batteries**-Basic concepts, battery characteristics, Classification of batteries-primary, secondary and reserve batteries; Classical batteries-construction, working and applications of Nickel-metal hydride, lithium-MnO_2 and Li-ion batteries.	**08 Hours**
	Self-Study Components: Concentration Cells- construction and working; Determination of pH using Glass Electrode; Ion Selective Electrode-Principle, construction and applications.	
Module 2	**Science of Corrosion and Electrolysis** **Corrosion**: Introduction, electrochemical theory of corrosion, galvanic series. **Factors affecting the rate of corrosion**: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of medium – pH, conductivity, and temperature. **Types of corrosion**- Differential metal, differential aeration	**08 Hours**

	(Pitting and water line) and stress. **Corrosion control**: Inorganic coatings- Anodizing of Al and phosphating; Metal Coatings-Galvanization and Tinning. Cathodic protection (sacrificial anodic and impressed current methods). **Metal Finishing:** Introduction, Technological importance. **Electroplating:** Introduction, principles governing- Polarization, decomposition potential and overvoltage. Factors influencing the nature of electro deposit-current density, concentration of metal ion and electrolyte; pH, temperature and throwing power of plating bath; additives- brighteners, levellers, structure modifiers and wetting agents. Electroplating of Nickel (Watt's Bath) and Chromium (decorative and hard).	
	<u>Self-Study Components</u>: **Electroless plating:** Introduction, distinction between electroplating and electro less plating, electro less plating of copper and manufacture of double-sided Printed Circuit Board with copper.	
Module 3	**<u>Energy Sources</u>** **Chemical Fuels**: Introduction, classification, calorific value-gross and net calorific values, determination of calorific value of fuel using bomb calorimeter, numerical problems. **Cracking**: Introduction, fluidized catalytic cracking, synthesis of petrol by Fishcher-Tropsch process, reformation of petrol, octane and cetane numbers. Gasoline and diesel knocking and their mechanism, anti-knocking agents, power alcohol and biodiesel. **Solar Energy:** Introduction, utilization and conversion, photovoltaic cells (PV)- construction and working. **Design of PV cells**: modules, panels and arrays. Advantages and disadvantages of PV cells.	**08 Hours**
	<u>Self-Study Components</u>: **Production of solar grade silicon**: Union carbide process, purification of silicon (zone refining), doping of silicon-diffusion technique (n- and p-types). Construction and working of energy storage supercapacitors.	
Module 4	**Water Technology** Introduction**,** Boilers and Boiler Troubles, Determination of hardness, DO, BOD and COD, Determination of acidity, chlorides and alkalinity. **Sewage treatment**: Primary, secondary (activated sludge method) and tertiary methods. Softening of water by ion- exchange process. Desalination of sea water by reverse osmosis and electro dialysis (ion selective) **Silicate Technology** Introduction, Cement nomenclature, manufacture of Portland cement, setting of cement, Analysis of Cement, Plaster of Paris/Gypsum Plaster. **Refractories**: Characteristics of Good Refractory Materials,	**08 Hours**

	Classification of refractories, Properties of Refractories, Manufacture of High-Alumina Bricks, Magnesite Bricks and Zirconia Bricks.	
	Self-Study Components: Public Health Significance of heavy metal ions, fluoride, nitrate and detergents	
Module 5	**Functional Materials for Engineers** **Polymers:** Introduction, Classification of Polymers, Functionality, Mechanism of Polymerisation, Polymerisation Techniques, Molecular Weight of Polymers. Plastics, Individual Polymers, Rubbers (Elastomers), Fibres, Speciality Polymers, Properties of Polymers, Degradation of Polymer and Polymer Composites. **Nanomaterials** Introduction, Nanotechnology in the Twenty-First Century, Classification of Nanomaterials, Synthesis of Nanomaterials by Top-down and Bottom-up approaches, Properties of nanomaterials (Surface area, Magnetic, Optical, Electrical, catalytic and thermal).	**08 Hours**
	Self-Study Components: Carbon nanotubes and Graphene and their applications.	

Course Outcome:

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

- Explain the basic concept of thermodynamics, batteries and their applications.
- Develop the knowledge in corrosion science and also to control corrosion problems.
- Understand different energy sources and storage devisors
- Determine the contaminants in the water samples by suitable analytical procedures.
- Explain the properties and applications of functional materials in the different fields.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration) and then it is reduced to 50. Based on this grading will be awarded.

Continuous Internal Evaluation: The CIE marks for theory part of I year courses shall be 50.

1. Thirty (30) marks shall be considered to evaluate students in tests. There shall bethree tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30marks.

2. Ten (10) marks shall be prescribed for assignments /written quizzes (one scheduled quiz and one surprize quiz). There shall be at least two assignments and two quizzes. The marks earned in these events shall be averaged to reduce to 10 marks.
3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

Question Paper Pattern (SEE):

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks. Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Text Books:

1. Essentials of Engineering Chemistry, S. K. Bhasin and Vijay Sharma, Himalaya Publishing House (2010).
2. Engineering Chemistry: Fundamentals and Applications, Shikha Agarwal, Cambridge University Press (2015).
3. Engineering Chemistry, R. Mukhopadhyay and Sriparna Datta, New Age International Ltd (2007).
4. Engineering Chemistry, V. Srinivasan, S. Rekha and K. Sudhakar, Pearson Ltd (2017).
5. Engineering Chemistry, K N Jayaveera, G V Subba Reddy and C Ramachandraiah, McGraw Hill Education (India) Private Limited (2016).
6. Engineering Chemistry, K. SeshaMaheswaramma and MridulaChugh, Pearson India Education Services Pvt. Ltd (2017).
7. Nanomaterials and Nanocomposites: Synthesis, Properties, Characterization Techniques and Applications, Rajendra Kumar Goyal, CRC Press, Taylor and Francis (2018).

Reference Books

1. Fundamentals of Corrosion: Mechanisms, Causes and Preventive Methods, Philip A. Schweitzer, CRC Press (2010).
2. Applied Chemistry- A Textbook for Engineers and Technologists, 2nd Edition, O.V. Roussak and H.D. Gesser, Springer (2013).
3. Introduction to Polymer Chemistry, 3rd Edition, Charles E. Carraher, Jr. CRC Press (2013).
4. Fundamentals of Electrochemistry, Second Edition, V. S. Bagotsky, Wiley Inter science (2006).
5. Introduction to Corrosion Science, E. McCafferty, Springer (2010).

Basic Electrical Engineering (21ELE13/23)

Semester I/II			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	3:0:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**DC Circuits:** Ohm's Law and Kirchhoff's Laws, analysis of series, parallel and series-parallel circuits excited by independent voltage sources. Power and Energy. **AC Fundamentals:** Generation of sinusoidal voltage, frequency of generated voltage, definition and numerical values of average value, root mean square value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities.	**08 Hours**
Module 2	**Single Phase Circuits:** Analysis of circuits with R, L, C, R-L, RC, R-L-C for series and parallel configurations with phasor diagram, Real power, reactive power, apparent power and power factor. **Three Phase circuits:** Advantages of 3-phase power, Generation of 3-phase power, voltage and current relations in star and delta connections.	**08 Hours**
Module 3	**Electrical Machines:** Constructional features, Operation and applications: Single and three phase induction motors, universal motor, stepper motor, Single-phase transformers: Principle and emf equation.	**08 Hours**
Module 4	**Renewable and Non-Renewable Energy Resources:**Sources of energy-Power generation: thermal, hydel, nuclear, Advantages of renewable energy sources, power generation Solar, Wind, Tidal, biomass, geothermal, Electrical characteristic of PV Cell.	**08 Hours**
Module 5	**Tariff**: Tariff Schemes, Study of Electricity Bill, Calculation of electricity bill **Protection Devices:** Need of earthing, types of Earthing: Plate and Pipe Earthing, Fuse, MCB, Electrical Safety Issues, Two-way and Three-Way control of lamp. **Battery:** Types of Batteries: lead acid, Nickel-iron and lithium-ion, important characteristic of batteries: Voltage, Capacity and efficiency.	**08 Hours**

Course Outcome:

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

- To explain the fundamental laws of electric circuits and behaviour of single-phase circuit with circuit elements.
- To explain the generation and operation of three-phase power
- To understand the construction and operation of Electrical Machines.
- To Describe the working principle of both renewable and non-renewable power generating plant.
- To explain the tariff, electricity billing, protection devices and batteries.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration) and then it is reduced to 50. Based on this grading will be awarded.

Continuous Internal Evaluation: The CIE marks for theory part of I year courses shall be 50.

1. Thirty (30) marks shall be considered to evaluate students in tests. There shall be three tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30 marks.
2. Ten (10) marks shall be prescribed for assignments /written quizzes (one scheduled quiz and one surprize quiz). There shall be at least two assignments and two quizzes. The marks earned in these events shall be averaged to reduce to 10 marks.
3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

Question Paper Pattern (SEE):

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks. Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Text Books:

1. D.C. Kulshreshtha “Basic Electrical Engineering” Tata McGraw Hill Education, Revised first edition, 2019.
2. Edward Hughes “Electrical and Electronic Technology” Pearson, 12th edition, 2016.
3. Mittle V.N. and A. Mittal, “Basic Electrical Engineering” Tata McGraw Hill, 2nd Edition, 2005
4. Kothari D.P., L.J. Nagrath “Basic Electrical Engineering”, Tata McGraw Hill, 2009

C Programming for Problem Solving (21CPS14/24)

Semester I/II			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	3:0:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction to computer Hardware and Software:** Computer Generations, Von Neumann Architecture, ports & its functions, Port Vs. Connector, Input and Output Devices, Types of Computer Network, basic concepts of software. **Overview of C:** Basic structure of C program, C program execution. Keywords, Constant & Variable, data types, Operators and expressions.	**08 Hours**
Module 2	**Managing Input and output operations in C:** Reading and writing a character, C-formatted I/O Functions, Control statements in C with Programming examples.	**08 Hours**
Module 3	**C Array:** 1-D & 2-D Arrays, return an Array in C, Passing Arrays to a function, Basic Searching & Sorting Algorithms: (Linear search, Binary search, Bubble sort and Selection sort). C Strings: string basics, String Functions.	**08 Hours**
Module 4	**C Functions:** What is function- Advantages, Function aspects, Types of functions, Different aspects of Function call,call by value and call by reference, Programming Examples. Introduction to Recursive function. C Pointers: Pointer basics, Simple programming examples. Dynamic Memory allocation in C.	**08 Hours**
Module 5	**Structure**: What is Structure? declaring structure variable, Accessing Members of the Structure, Programming examples. **File Handling in C:** Functions for file handling, Simple Programming examples.	**08 Hours**

Course Outcomes:

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

- Analyse the given problem and develop an algorithm to solve the problem.
- Optimize the solution given for an existing problem.
- Use ‘C’ language constructs in the right way.
- Develop and test programs written in ‘C’.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE

and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration) and then it is reduced to 50. Based on this grading will be awarded.

Continuous Internal Evaluation: The CIE marks for theory part of I year courses shall be 50.

1. Thirty (30) marks shall be considered to evaluate students in tests. There shall be three tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30marks.
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3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

Question Paper Pattern (SEE):

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks. Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Text Books:

1. E. Balaguruswamy, Programming in ANSI C, 7th Edition, Tata McGraw• Hill
2. Brian W. Kernighan and Dennis M. Ritchie, The 'C' Programming Language, PrenticeHall of lndia.

Reference Books:

1. Sumitabha Das, Computer Fundamentals & C Programming, Mc Graw Hill Education.
2. Gary JBronson, ANSI C Programming, 4th Edition, Ceneage Leam in g.
3. Dey and Ghosh, Programming in C, 3rd Edition, Oxford University Press.
4. Vikas Gupta: Computer Concepts and C Programming, Dreamtech Press 2013.
5. RS Bichkar, Programming with C, University Press, 2012.
6. V Rajaraman: Computer Programming in C, PHI, 2013.
7. Basavaraj S. Anami, Shanrnukhappa A Angadi, Sunilkumar S. Manvi, Computer Concepts and C Programming: A Holistic Approach to Leaming C, Seond edition, PHI India, 2010.

Elements of Mechanical Engineering (21EME15/25)

Semester I/II			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	3:0:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Energy Sources:** Sources and Classification of Energy Resources. Non-renewable and renewable energy resources, Brief Description and Utilization of Solar Energy, Wind Energy, Ocean Thermal Energy Conversion (OTEC), Geothermal Energy, Tidal Energy and Nuclear Energy. Steam: Steam Formation, Steam Properties, Boilers-Classification, Lancashire boiler, Simple numerical.	**08 Hours**
Module 2	**Steam turbines** – Classification, Principle of Operation and Working of Impulse and Reaction. Type Steam Turbines. **Gas turbines** – Classification, Working Principles and Operations of Open Cycle and Closed Cycle Gas Turbines. **Water turbines** –Classification, Principles and Working of Pelton wheel and Francis turbine **Internal Combustion Engines:** Classification, Two and Four Stroke Petrol and Diesel Engines. P-V Diagramsof Otto and Diesel Cycles. Comparison of Petrol and Diesel Engines. Comparison of two and Four Stroke Engines.	**08 Hours**
Module 3	**Refrigeration Air conditioning:** Refrigeration - Definitions - Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, relative COP, Unit of Refrigeration. Refrigerants, Properties of refrigerants, List of commonly used refrigerants. Domestic refrigerator. Principles and applications of air conditioners. **Power Transmission:** Belt Drives – Open and Cross Belt drives, Definition-slip, creep, velocity ratio, Derivation of length of the belt in open and crossed belt drive, ratio of tension in belt drives. Gear Drives – Types of gears, velocity ratio, advantages and disadvantages over belt drives. Simple numerical problems.	**08 Hours**
Module 4	**Machine Tools:** Lathe: Working Principle of engine lathe, Main parts of lathe, Operations on lathe: Turning, facing, knurling, thread cutting, taper turning and drilling. **Drilling Machine:** Working Principle, Operations of drilling machines, Drilling, grinding machine: working principle of cylindrical and surface grinding machines.	**08 Hours**

	Metal Joining Processes: Definitions and methods of Soldering, Brazing and Welding	
Module 5	**Automation and Robotics:** Automation: CNC- Introduction, components of CNC, Advantages and disadvantages of CNC. Robotics: Introduction, Robot anatomy, Robots configuration- Polar, cylindrical, Cartesian coordinate and spherical. Applications, Advantages, and disadvantages. **Engineering Materials:** Properties, Composition and Industrial Applications of engineering materials Metals – Ferrous: cast iron, tool steels and stainless steels and Non-ferrous: aluminium, brass, bronze. **Polymers** - Thermoplastics and thermosetting polymers. **Ceramics** - Glass, optical fiber, glass, cermet's.**Composites** - Fiber reinforced composites, Metal Matrix Composites	**08 Hours**

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

- Identify different sources of energy and their conversion process
- Explain the working principle of hydraulic turbines, pumps, IC engines and refrigeration.
- Understand the properties of common engineering materials and their applications in engineering industry.
- Recognize power transmission elements.
- Discuss the working of conventional machine tools, machining processes, tools and accessories.
- Describe the advanced manufacturing systems.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain a minimum of 40% marks individually both in CIE and SEE to pass. Theory Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration) and then it is reduced to 50. Based on this grading will be awarded.

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1. Thirty (30) marks shall be considered to evaluate students in tests. There shall bethree tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30marks.

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Question Paper Pattern (SEE):

- The SEE question paper will be set for 100 marks and the marks scored will be proportionately reduced to 50.
- The question paper will have ten full questions carrying equal marks. Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Text Books

1. Elements of Mechanical Engineering by K.P. Roy, S K Hajra Choudhury, A K Hajra Choudhury, Media Promoters, 2012
2. Elements of Mechanical Engineering b K R Gopalakrishna, Subhash Publishers, Bangalore
3. Elements of Mechanical Engineering - Kestoor Praveen, Ramesh M R: Interline Publishing House

Reference Books

1. Workshop Technology, Vol I & II, - by SK Hajra Choudhury, A K Hajra Choudhury, Nirjhar Roy, 11th edition 2001, Media Promotors and Publishers, Mumbai.
2. Elements of Mechanical Engineering by Sadhu Singh S. Chand Publication
3. S.Trymbaka Murthy, "A Text Book of Elements of Mechanical Engineering", 4th Edition2006, Universities Press (India) Pvt Ltd, Hyderabad.

Engineering Chemistry Laboratory (21CHEL16/26)

Semester I/II			
No. of Lecture hour/Week	-	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	50
Total No. of Lecture hours	-	**Exam Hours**	03
L: T:P	0:0:2	**Credits**	01

Sl No.	List of experiments
	Part-A
1	Determination of total hardness in water by complexometric titration.
2	Determination of total alkalinity of soda ash.
3	Analysis of chromate-dichromate mixture by acid-base titration.
4	Determination of manganese dioxide in pyrolusite by permanganate method.
5	Determination of Iron in the Haematite ore by dichromate method.
6	Determination of Chemical Oxygen Demand (COD) of the given industrial waste water sample.
7	Determination of Calcium Oxide (CaO) in the given sample of cement by Rapid EDTA method.
	Part-B
9	Determination of Iron (II) by Potentiometric titration.
10	Conductometric titration of a mixture of HCl and CH_3COOH against NaOH.
11	Determination of dissociation constant of a weak acid using pH meter.
12	Colorimetric method for the determination of Iron (III) using thiocyanate.
13	Determination of chromium in industrial waste by colorimetric method using diphenyl carbazide reagent.
14	Electro gravimetric method for the determination of copper.

(Note: Any ten experiments may be conducted)

Course Outcome:

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

- Carryout quantitative determination of analytes accurately and handling of some minor equipment's.
- Validation of the data and interpret the experimental results.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain minimum of 40% marks individually both in CIE and SEE to pass. Practical Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration). Based on this grading will be awarded.

Continuous Internal Evaluation (CIE): The 75% (35 marks) CIE marks awarded in case of Practical shall be based on the weekly evaluation of laboratory journals/ reports after the conduction of every experiment and 25% (15 marks) marks for one practical test. The total CIE marks shall be the sum of marks secured by students in the above events.

Semester End Evaluation (SEE): The practical examinations to be conducted as per the time table of University in a batch wise with strength of students not more than 10-12 per batch.

1. All laboratory experiments are to be included for practical examination.
2. The instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Break up of marks are 15% marks for procedure, 70% marks for conduction and calculation and 15% of marks for viva voce.
4. Students can pick one experiment from the questions lot prepared by the examiners.
5. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

Reference Books

1. Vogels textbook of quantitative chemical analysis, 5th edition revised by G.H.Jeffery, J.Bassett, J. Mendham and R.C.Denny, Longman Scientific Technical (2005).
2. Analytical Chemistry, 6th Edition, G.D.Christian, John Wiley & Sons (2004).
3. Quantitative Chemical Analysis, 8th Edition, Daniel C. Harris, W. H. Freeman and Company (2010).

C Programming Laboratory (21CPL17/27)

Semester I/II			
No. of Lecture hour/Week	-	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	50
Total No. of Lecture hours	-	**Exam Hours**	03
L: T:P	0:0:2	**Credits**	01

Sl No.	Title of the experiment
	Part-A
1	Develop a C program to compute the roots of a quadratic equation by accepting the coefficients. Print appropriate messages.
2	Write a C program to perform arithmetic operations using switch statement.
3	Develop a program to find the reverse of a positive integer and check for palindrome or not using while- loop and display appropriate messages wherever necessary.
4	Develop a C program to generate the first ‘n’ terms of the Fibonacci sequence using for- loop.
5	Develop a C Program to Sort the Array elements in an Ascending Order i. Bubble sort ii. Selection Sort
6	Develop a C Program to search for an element in an array using i. Linear Search ii. Binary Search Display appropriate messages for successful and unsuccessful attempts.
7	Implement a C program using function to check whether the given number is prime or not.
	Part-B
9	Develop a program to introduce 2D Array manipulation and implement Matrix multiplication and ensure the rules of multiplication are checked.
10	Develop a C program to find the square root of a given number N and execute for all possible inputs with appropriate messages. Note: Don’t use library function sqrt(n).
11	Develop a C Program using structure i. To read student information such as (Sname, RollNo, Marks in 3 subjects) ii. Compute average- marks and appropriate grades. (S:98% to 100%, A+: 95 to 97%, A: 94 to 90%, B- 85 to 89%, C- 84% to 80%, D- 79% to 65%, E- >35% to 64%, F: <35%) iii. Print student details along with computed grade for a class of ‘N‘students.
12	Develop a program using pointers to compute the sum, mean and standard deviation of all elements stored in an array of n real numbers.
13	Implement Recursive functions for Binary to Decimal Conversion.
14	Write a C program to copy the contents of one file (t1.txt) to another file (t2.txt).

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

- Analyses of a given problem and implement an algorithm to solve the problem.
- Improve upon a solution to a problem.
- Implement the 'C' language constructs in the right way.
- Develop and test programs written in 'C'.

Assessment Details (both CIE and SEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The student has to obtain minimum of 40% marks individually both in CIE and SEE to pass. Practical Semester End Exam (SEE) is conducted for 100 marks (3 Hours duration). Based on this grading will be awarded.

Continuous Internal Evaluation (CIE): The 75% (35 marks) CIE marks awarded in case of Practical shall be based on the weekly evaluation of laboratory journals/ reports after the conduction of every experiment and 25% (15 marks) marks for one practical test. The total CIE marks shall be the sum of marks secured by students in the above events.

Semester End Evaluation (SEE): The practical examinations to be conducted as per the time table of University in a batch wise with strength of students not more than 10-12 per batch.

1. All laboratory experiments are to be included for practical examination.
2. The instructions printed on the cover page of answer script to be strictly adhered by the examiners.
3. Break up of marks are 15% marks for procedure, 70% marks for conduction and calculation and 15% of marks for viva voce.
4. Students can pick one experiment from the questions lot prepared by the examiners.
5. Change of experiment is allowed only once and 15% Marks allotted to the procedure part to be made zero.

Ability Enhancement Course-I (21AEC18/28)

Personality Development and Soft Skills			
Semester I/II			
No. of Lecture hour/Week	-	**CIE Marks**	50
No. of Tutorial hours/week	02	**SEE Marks**	-
Total No. of Lecture hours	-	**Exam Hours**	-
L: T:P	0:2:0	**Credits**	01

Modules	Course Content	Teaching Hours
Module 1	**Personal Skills** Self-Assessment; Identifying Strength & Limitations; Habits, Will-Power and Drives; Developing Self-Esteem and Building Self-Confidence, Significance of Self-Discipline, Understanding Perceptions, Attitudes, and Personality Types Mind-Set: Growth and Fixed; Values and Beliefs, Motivation and Achieving Excellence; Self-Actualisation Need, Goal Setting, Life and Career Planning; Constructive Thinking	**05 Hours**
Module 2	**Professional Skills** Communicating Clearly: Understanding and Overcoming barriers; Cross gender/Cross Cultural communication, Strategic Communication. Active Listening, Persuasive Speaking, Conducting Meetings, Writing Minutes, Sending Memos and Notices, Netiquette: Effective E-mail Communication; Telephone Etiquette, Body Language in Group Discussion and Interview	**05 Hours**
Module 3	**Presentation Skills:** Overcoming fear, Presentation Skills: Becoming a professional, Presentation Skills: the role of body language, Presentation Skills: using visuals, Reading skills: Effective Reading.	**05 Hours**
Module 4	**Interpersonal Skills** Enhancing Empathy, Showing Sympathy and Dealing with Antipathy; Gaining Trust and Developing Emotional Bonding Ethics and Etiquettes (Social and Official Settings); Respecting Privacy; Civic Sense and Care for theEnvironment, Negotiating, Decision-Making, Conflict- Resolution, Five Styles, Emotional Literacy; Assertiveness versus Aggressiveness; Learning to Say "No."; Learning to Appreciate and Give Praise; Presenting Bad News, Humour, Jokes and Anecdotes in Effective Communication	**05 Hours**
Module 5	**Management Skills** Managing Time and Beating Procrastination Managing People: Leading and Working with Team (Co-	**05 Hours**

	ordination and Co-operation); Developing Accountability, Commitment and Responsibility; Behaving Conscientiously Managing Stress and Maintaining Positive Outlook, Managing Health, Boosting Memory, Enhancing Study Skills, Managing Money and Love; Balancing Personal and Professional Life	

Course Outcome:

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

- Understand the role of soft skills in professional and interpersonal communication.
- Develop an all-round development of personality.

Assessment Details (CIE)

The weightage of Continuous Internal Evaluation (CIE) is 50%. The student has to obtain a minimum of 40% marks in CIE to pass.

Continuous Internal Evaluation: The CIE marks for theory part of I year courses shall be 50.

1. Thirty (30) marks shall be considered to evaluate students in tests. There shall bethree tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30marks.
2. Ten (10) marks shall be prescribed for assignments /written quizzes (one scheduled quiz and one surprize quiz). There shall be at least two assignments and two quizzes. The marks earned in these events shall be averaged to reduce to 10 marks.
3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

Text and Reference Books:

1. Dorch, Patricia, "What Are Sift Skills?" New York: Execu Dress Publisher, 2013.
2. Kamin, Maxine, "Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams and Leaders", Washington, DC: Pfeiffer & Company, 2013.
3. Klaus, Peggy, Jane Rohman & Molly Hamaker," The Hard truth about Soft Skills", London: HarperCollins E- books, 2007.
4. Petes S. J., Francis, "Soft Skills and Professional Communication", New Delhi: Tata McGraw-Hill Education, 2011
5. Stein, Steven J. & Howard E. Book, "The EQ Edge: Emotional Intelligence and Your Success", Canada: Wiley & Sons, 2006.

Technical Kannada (21KAN29)

Semester II (Common for both Physics and Chemistry Cycle)			
No. of Lecture hour/Week	-	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	-
Total No. of Lecture hours	-	**Exam Hours**	-
L: T:P	0:2:0	**Credits**	01

Modules	Contents	Teaching Hours
Module 1	1) ಶ್ರಾವಣ (ಕವನ) ದ.ರಾ.ಬೇಂದ್ರೆ 2) ಡಾ. ವಿಶ್ವೇಶ್ವರಯ್ಯ ವ್ಯಕ್ತಿ ಮತ್ತು ಐತಿಹ್ಯ (ವ್ಯಕ್ತಿಚಿತ್ರ) ಎ.ಎನ್. ಮೂರ್ತಿರಾವ್ 3) ದೋಣಿ ಹರಿಗೋಲುಗಳಲ್ಲಿ (ಪ್ರವಾಸ ಕಥನ) ಶಿವರಾಮ ಕಾರಂತ	**06 Hours**
Module 2	4) ಅಣ್ಣಪ್ಪನ ರೇಷ್ಮೆ ಕಾಯಿಲೆ (ಪ್ರಬಂಧ) ಕುವೆಂಪು 5) ನಮ್ಮ ಎಮ್ಮೆಗೆ ಮಾತು ತಿಳಿಯುವುದೇ (ವಿನೋದ) ಗೋರೂರು ರಾಮಸ್ವಾಮಿ ಅಯ್ಯಂಗಾರ್ 6) ಆನೆಹಳ್ಳದಲ್ಲಿ ಹುಡುಗಿಯರು(ವಿಜ್ಞಾನ ಲೇಖನ) ಬಿ.ಜಿ.ಎಲ್ ಸ್ವಾಮಿ	**06 Hours**
Module 3	7) ಬೆಡ್ ನಂ. ಏಳು (ಕತೆ) ತ್ರಿವೇಣಿ 8) ರೊಟ್ಟಿ ಮತ್ತು ಕೋವಿ (ಕವನ) ಸು.ರಂ.ಎಕ್ಕುಂಡಿ 9) ಗುಬ್ಬಚ್ಚಿ ಗೂಡು (ಅಂಕಂ ಬರಹ) ಲಂಕೇಶ್	**06 Hours**
Module 4	10) ಚೀಂಕ್ರ ಮೇಸ್ತ್ರಿ ಮತ್ತು ಹಾವು ಗಿಮೀನು (ಪರಿಸರ ಲೇಖನ) ಕೆ.ಪೂರ್ಣಚಂದ್ರ ತೇಜಸ್ವಿ 11) ಗಾಂಧಿ (ಕತೆ) ಬೆಸಗರಹಳ್ಳಿ ರಾವುಣ್ಣ 12) ಬೆಲ್ಚಿಯ ಹಾಡು (ಕವನ) ಸಿದ್ಧಲಿಂಗಯ್ಯ 13) ಎಲ್ಲ ಹುಡುಗಿಯರ ಕನಸು (ಕವನ) ಸವಿತಾ ನಾಗಭೂಷಣ	**06 Hours**
Module 5	14) ನೀರು (ಕತೆ) ಬಸವರಾಜ ಕುಕ್ಕರಹಳ್ಳಿ 15) ಕರ್ನಾಟಕ ಸಂಸ್ಕೃತಿ ಸ್ವರೂಪ (ಪರಿಚಯ ಲೇಖನ) ರಹಮತ ತರೀಕೆರೆ 16) ತಂತ್ರಜ್ಞಾನ ಕಲಿಕೆಯಲ್ಲಿ ಭಾಷೆ (ತಂತ್ರಜ್ಞಾನ ಬರಹ) ಎಸ್.ಸುಂದರ್ 17) ಕೊಣವೇಗೌಡ (ಕಾವ್ಯ) ಜಾನಪದ	**06 Hours**

Assessment Details (CIE)

The weightage of Continuous Internal Evaluation (CIE) is 50%. The student has to obtain a minimum of 40% marks in CIE to pass.

Continuous Internal Evaluation: The CIE marks for theory part of I year courses shall be 50.

1. Thirty (30) marks shall be considered to evaluate students in tests. There shall bethree tests generally conducted at the end of fifth, tenth and fifteenth week of each semester. Each test shall be conducted for a maximum of 50 marks and the final test marks shall be the average of three tests, proportionately reduced to a maximum of 30marks.
2. Ten (10) marks shall be prescribed for assignments /written quizzes (one scheduled quiz and one surprize quiz). There shall be at least two assignments and two quizzes. The marks earned in these events shall be averaged to reduce to 10 marks.

3. Ten (10) marks shall be prescribed for open book tests, for self-study or to test problem solving skills. There shall be at least two events. The marks earned in these events shall be averaged to reduce to 10 marks.

ABILITY ENHANCEMENT COURSE II (21AEC48)

Semester IV (Common to all branches)			
No. of Lecture hour/Week	1	CIE Marks	50
No. of Tutorial hours/week	0	SEE Marks	00
Total No. of Lecture hours	16	Exam Hours	00
L: T:P	1:0:0	Credits	01

Modules	Course Content	Teaching Hours
Module 1	**Technical Report Writing:** Introduction to Technical writing process, Understanding of writing process, Introduction to various Technical Report writing.	03 Hours
Module 2	**Art of condensation and Paragraph Writing:** Introduction and importance, Types and principles of condensation. Importance of paragraph writing, Features and its construction styles.	03 Hours
Module 3	**Business Report Writing:** Introduction, Definition and Salient features of Business reports. Significance and types of report writing. (Formal and Informal). Resume building and Types of resumes. (Samples of resumes)	03 Hours
Module 4	**Technical Articles and Proposals:** Nature and significance, Types of technical Articles Journal articles and conference papers. Elements of technical articles. Introduction to technical proposal writing, Purpose, importance, structure and types of technical proposals.	04 Hours
Module 5	**Social media posts and Blog Writing:** Ethics and practices of social media posts, Principles and fundamentals, Guiding principles for composition of articles, some common pitfalls. Maintaining common etiquette. Blogs and Blog writings strategies.	03 Hours

Course Outcomes:

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

- Effectively communicate in technical matters.
- Practice preparation of gist, abstract and notes from a technical article.
- Prepare a business proposals and reports.
- Write and respond in social media and write blogs.

Reference Books:

1. Sanjay Kumar and Pushpalata, „Communication Skills", Oxford University Press. 2018.
2. M. Ashraf Rizvi, „Effective Technical Communication", McGraw Hill, 2018.
3. Gajendra Singh Chauhan and et.al. „Technical Communication", Cengage Publication, 2018.
4. Meenakshi Raman and Sangeeta Sharma, Technical Communication Principles and Practice, Oxford University Press, 2018.

DIRECTOR
Mysore University
School of Engineering
Manasagangotri, Mysuru - 06

UNIVERSITYOF MYSORE
(Re-accredited by NAAC with 'A' Grade)
(NIRF-2022: Ranked 33rd in University Category and 54th in Overall Category)

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Manasagangotri Campus, Mysuru

Prof. Suresha
Chairman, Computer Science & Design
Mobile No. 9449810894
Email: sureshasuvi@gmail.com

No. MUSE/236(N)2022-23

Dated 13.09.2022

To
The Registrar,
University of Mysore
Crawford Hall
Mysuru.

Sir,

Sub: **Proceedings of the meeting of the members of the BoS in Computer Science & Design -reg**

Ref: No.UA2 /134/2021-22 dated 08.09.2022.

With reference to the above subject, I am herewith enclosing the **Proceedings of the meeting of the members of the Board of Studies in Computer Science & Design (CS&D)** held on **13.09.2022** at 10.00 AM along with (1) **Scheme, Syllabus and Regulations, (2) Panel of Examiners for 2022-23** both **hard and soft copies.**

Yours faithfully,

13/9/22

(Prof. Suresha)
Chairman
BoS in Computer Science & Design

CHAIRPERSON
BOS IN C S & D
M U S E
M G M 06

Copy to:
The Dy. Registrar (Academic), University of Mysore, Mysuru.

Proceeding of the meeting of the members of the Board of Studies in Computer Science & Design (CS&D) of Mysore University School of Engineering held on 13th Sept. 2022 at 10.00 AM at Vijnana Bhavan, Manasagangotri, Mysuru – 570 006.

Members Present

1	Prof. Suresha	Chairman
2	Prof. Ananthapadmanabha T	Member
3	Prof. Thippeswamy	Member
4	Prof. Natesh M	Member
5	Dr. Manjunath Aaradhya	Member
6	Prof. Anil Kumar K M	Member

Members Virtually Present

7	Prof. Deepu R	Member
8	Prof. Ranjit K N	Member
9	Dr. Nagesh Poojary	Member

The Chairman welcomed the members present in the meeting. The following agenda were taken up for discussion.

Agenda 1: Scheme of III and IV Semesters for B.E. in Computer Science & Design.

The Chairman explained that the Scheme has been framed on the lines of guidelines of AICTE/VTU and within the framework of NEP – 2020 of III and IV semester. The Scheme to include the Basic Science Courses (BSC), Engineering Science Courses (ESC), Professional Core Courses (PCC), Professional Elective Courses (PEC), Open Elective Courses (OEC), Integrated Professional Core Courses (IPCC), Project Work, Internship (INT), Non-Credit Mandatory Courses (NCMC), Ability Enhancement Course (AEC), Universal Human Value Courses (UHV) and Languages. The Members of the Board examined and approved the Scheme for B.E. Computer Science & Design of III Semester and IVSemester within the ambit of 160 credits for the entire B.E. program. The Scheme is enclosed in the **Annexure I.**

Agenda 2: Syllabus for III and IV semesters B.E. Computer Science & Design

The Members of the Board has examined, discussed and approved the Syllabus for III and IV semester B.E. Computer Science & Design Courses. The Syllabus is enclosed in the **Annexure II.**

13/9/22

Agenda 3: Panel of Examiners for 2022-23

The Board has prepared and approved Panel of Examiners for the year 2022-23 **(Annexure III)**.

The meeting ended with vote of thanks.

13/9/2022

(Prof. Suresha)
Chairman
BoS in Computer Science & Design

Sl No	Name	Chairman/Member	Signature
1	Prof. Suresha S	Chairman	
2	Prof. Ananthapadmanabha T	Member	
3	Prof. Thippeswamy	Member	13/9/22
4	Prof. Natesh M	Member	13/09/22
5	Dr. Manjunath Aaradhya	Member	13/9/22
6	Prof. Deepu R	Member	virtually
7	Prof. Anil Kumar K M	Member	13/9/22
8	Prof. Ranjit K N	Member	virtually
9	Dr. Nagesh Poojary	Member	virtually

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Scheme of Teaching and Examination 2021-2022 (As per NEP-2020)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021–2022)

Computer Science & Design (CS&D)

III SEMESTER

Sl. No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theory lecures	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	BSC	21MAT31	Engineering Mathematic-III	Basic Science	Basic Science	2	2	0	03	50	50	100	3
2	IPCC	21CD32	Data Structures and Applications	CS&D	CS&D	3	0	2	03	50	50	100	4
3	IPCC	21CD33	Analog and Digital Electronics	CS&D/ BM&RE	CS&D/ BM&RE	3	0	2	03	50	50	100	4
4	PCC	21CD34	Computer Organization	CS&D	CS&D	2	2	0	03	50	50	100	3
5	PCC	21CD35	Software Engineering	CS & D	CS&D	2	2	0	03	50	50	100	3
6	PCC	21CD36	Discrete Mathematical Structures	CS&D	CS&D	2	2	0	03	50	50	100	3
7	CEE	21CIV37	Environmental Studies	CEE	CEE	1	0	0	NA	50	-	50	1
8	UHV	21UHV38	Universal Human Values and Professional Ethics	Basic Science	Basic Science	1	0	0	NA	50	-	50	1
Total						**16**	**08**	**04**	**18**	**400**	**300**	**700**	**22**

Note: BSC: Basic Science Courses, PCC: Professional Core Courses, IPCC: Professional Lab Courses, CEE: Civil Environmental Engineering, UHV: Universal Human Values, BM&RE: Biomedical and Robotics Engineering, NCMC: Non-credit mandatory course, INT: Internship, IESC: Integrated Engineering Science Course.

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

9	NCMC	21MATDIP31	Additional Mathematics-1	Basic Science	Basic Science	2	2	0	03	50	50	100	0
10	NCMC	21KANDIP32	Technical Kannada	Basic Science	Basic Science	0	2	0	-	50	-	50	0

(a) The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the student has to fulfil the requirements during subsequent semester/s to appear for SEE.
(b) These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree

Credit Definition:
1-hour lecture**(L)** per week per semester = **1 Credit**
2-hour tutorial **(T)** per week per semester = **1 Credit**
2-hour Practical/Drawing **(P)** per week per semester = **1 Credit**

Four-credit courses are to be designed for **50** hours of Teaching-Learning process.
Three credit courses are to be designed for **40** hours of Teaching-Learning process.
Two credit courses are to be designed for **25** hours of Teaching-Learning process.
One credit course is to be designed for **15** hours of Teaching-Learning process.

AICTE Activity Points to be earned by students admitted to BE/B.Tech., day college programme (For more details refer to Chapter 6, AICTE Activity Point Programme, Model Internship Guidelines): Over and above the academic grades, every Day Collegeregular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry,shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to UoM. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, an Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

DIRECTOR
Mysore University
School of Engineering
Manasagangotri, Mysuru - 06

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Scheme of Teaching and Examination 2021-2022 (As per NEP-2020)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021–2022)

Computer Science & Design (CS&D)

IV SEMESTER

Sl. No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theory lectures	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	BSC	21MAT41	Engineering Mathematics-IV	Basic Science	Basic Science	2	2	0	03	50	50	100	3
2	IPCC	21CD42	Design and Analysis of Algorithms	CS&D	CS&D	3	0	2	03	50	50	100	4
3	IPCC	21CD43	Operating Systems	CS&D	CS&D	2	2	2	03	50	50	100	4
4	PCC	21CD44	Data Communication	CS&D	CS&D	3	0	0	03	50	50	100	3
5	IPCC	21CD45	Programming in C++	CS&D	CS&D	2	0	2	03	50	50	100	3
6	IPCC	21CD46	Graph Algorithms	CS&D	CS&D	2	0	2	03	50	50	100	3
7	HSMC	21CPH47	Constitution of India, Professional Ethics and Cyber Law	Basic Science	Basic Science	1	0	0	NA	50	-	50	1
8	HSMC	21AEC48	Ability Enhance Course-II	CS&D	CS&D	1	0	0	NA	50	-	50	1
9	INT	21INT49	Summer Internship-II	(To be carried out during the intervening vacations of IV and V semesters)					-	-	-	-	-
Total						**16**	**04**	**08**	**18**	**400**	**300**	**700**	**22**

Note: BSC: Basic Science Courses, PCC: Professional Core Courses, IPCC: Professional Lab Courses, HSMC: Humanity, Social Science and Management Courses. NCMC: Non-credit mandatory course, AEC: Ability Enhancement Course, INT: Internship, IESC: Integrated Engineering Science Course.

Summer Internship-I (21INT58): shall be carried out at industrial (State and Central Government /Non-government organizations (NGOs)/Micro, Small and Medium Enterprise (MSME)/Innovation centres/ Incubation centres. The internship can also be Rural internship. All the students admitted shall have to undergo a mandatory internship of 04 weeks during the intervening vacation of IV and V semesters. A University Viva-Voce examination (Presentation followed by Question & Answer session) shall be conducted during V semester and the prescribed credit shall be included in the V semester. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/complete the internship shallbe declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements. (The faculty coordinator or mentor has to monitor the students' internship progress and interact to guide them for the successful completion of the internship.)
Summer Internship-I: SEE shall be through seminar and viva-voce.

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

10	NCMC	21MATDIP41	Additional Mathematics-II	Basic Science	Basic Science	02	02	-	03	50	50	100	0
11	NCMC	21ENGDIP42	Technical English	Basic Science	Basic Science	-	2	-	-	50	-	50	0

(a) The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the student has to fulfil the requirements during subsequent semester/s to appear for SEE.
(b) These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree

Credit Definition:
1-hour lecture**(L)** per week per semester = **1 Credit**
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2-hour Practical/Drawing **(P)** per week per semester = **1 Credit**

Four-credit courses are to be designed for **50** hours of Teaching-Learning process.
Three credit courses are to be designed for **40** hours of Teaching-Learning process.
Two credit courses are to be designed for **25** hours of Teaching-Learning process.
One credit course is to be designed for **15** hours of Teaching-Learning process.

AICTE Activity Points: In case students fail to earn the prescribed activity Points, an Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

Engineering Mathematics-III (21MAT31)

Semester III			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L:T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Fourier Series:** Periodic functions, Dirichlet‟s condition. Fourier series of periodic functions period 2π and arbitrary period. Half range Fourier series. Application of Practical harmonic analysis.	**08 Hours**
Module 2	**Fourier Transforms:** Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. Problems.	**08 Hours**
Module 3	**Difference Equations and Z-Transforms:** Difference equations, basic definition, z-transform-definition, Standard z-transforms, Damping and shifting rules, initial value and final value theorems (without proof) and problems, Inverse z-transform and applications to solve difference equations.	**08 Hours**
Module 4	**Partial Differential Equations (PDE's):** Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one-dimensional heat equation and wave equation. Solution of one-dimensional heat equation and wave equation by the method of separation of variables.	**08 Hours**
Module 5	**Statistical Methods:** Correlation and regression-Karl Pearson‟s coefficient of correlation and rank correlation-problems. Regression analysis- lines of regression –problems. **Curve Fitting:** Curve fitting by the method of least squares-fitting the curves of the form- $y = ax + b, y = ax^b and$ $y = ax^2 + bx + c.$	**08 Hours**

Course outcomes:

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

- Explain the basic concepts of Fourier Series, Fourier Transforms, Z-Transforms,Partial Differential Equations, Some concepts of statistical analysis and curve fitting.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyse the solutions of engineering problems using these concepts.

Reference Books:

1. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed. (Reprint), 2017.
2. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2017.
3. Srimanta Pal & Subobh C Bhunia: “Engineering Mathematics”, Oxford University Press, 3rd Reprint, 2016.
4. C.Ray Wylie, Louis C.Barrett : “Advanced Engineering Mathematics", 6th Edition, 2. McGrawHill Book Co., New York, 1995.
5. S.S.Sastry: “Introductory Methods of Numerical Analysis”, 11th Edition, Tata McGraw-Hill, 2010.
6. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
7. N.P.Bali and Manish Goyal, “A Text Book of Engineering Mathematics”, Laxmi Publications. Latest edition, 2014.
8. Chandrika Prasad and Reena Garg “Advanced Engineering Mathematics”, Latest edition, Khanna Publishing, 2018.

Additional Mathematics-I (21MATDIP31)

Semester III			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	00

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Complex V a r i a b l e s :** Definitions and properties. Modulus and amplitude of a complex number, Argand‟s diagram, De-Moivre‟s theorem (without proof). **Vector Algebra:** Scalar and vectors. Addition and subtraction and multiplication of vectors- Dot and Cross products, problems.	**08 Hours**
Module 2	**Differential Calculus**: Review of successive differentiation-illustrative examples. Maclaurin‟s series expansions-Illustrative examples. Partial Differentiation: Euler‟s theorem-problems on first order derivatives only. Total derivatives-differentiation of composite functions. Jacobians of order two-Problems.	**08 Hours**
Module 3	**Vector Differentiation**: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl-simple problems. Solenoidal and irrotational vector fields-Problems.	**08 Hours**
Module 4	**Numerical Methods:** Finite differences. Interpolation/extrapolation using Newton‟s forward and backward difference formulae (Statements only)-problems. Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods (only formulae)-Illustrative examples. Numerical integration: Simpson‟s one third rule and Weddle‟s rule (without proof) Problems.	**08 Hours**
Module 5	**Ordinary differential equations (ODE's)**. Introduction-solutions of first order and first-degree differential equations: exact, linear differential equations. Equations reducible to exact and Bernoulli‟s equation.	**08 Hours**

Course outcomes:

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

- Explain the basic concepts of complex trigonometry, differential calculus and vector differentiation, Numerical methods, Ordinary Differential Equations of first order.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyse the solutions of engineering problems using these concepts.

Reference Books:

1. S C Chapra and R P Canale, *Numerical Methods for Engineering,* 15th Edition, Tata McGraw Hill
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
3. B.S. Grewal, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
4. B.V. Ramana, *Higher Engineering Mathematics*, Latest edition, Tata McGraw Hill.
5. Srimanta Pal & Subodh C. Bhunia: *"Engineering Mathematics"* Oxford University Press, 3rd Reprint, 2016.
6. N.P Bali and Manish Goyal: *"A textbook of Engineering Mathematics"* Laxmi Publications, Latest edition.
7. H.K.Dass and Er. Rajnish Verma: *"Higher Engineering Mathematics"* S.Chand Publication (2014).

Data Structures and Applications (21CD32)

Semester III			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:0:1	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, dynamically allocated arrays. **Array Operations:** Traversing, inserting, deleting, searching, and sorting. Multidimensional Arrays, Polynomials and Sparse Matrices. **Strings:** Basic Terminology, Storing, Operations and Pattern Matching algorithms. Programming Examples.	**10 Hours**
Module 2	**Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Recursion:** Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Ackerman's function. **Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues, A Mazing Problem. Multiple Stacks and Queues. Programming Examples.	**10 Hours**
Module 3	**Linked Lists**: Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linkedlists. Linked Stacks and Queues. Applications of Linked lists – Polynomials, Sparse matrix representation. Programming Examples	**10 Hours**
Module 4	**Trees:** Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples	**10 Hours**
Module 5	**Graphs:** Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search. **Sorting and Searching:** Insertion Sort, Radix sort, Address Calculation Sort. **Hashing:** Hash Table organizations, Hashing Functions, Static and Dynamic Hashing. **Files and Their Organization:** Data Hierarchy, File Attributes, Text Files and Binary Files, Basic File Operations, File Organizations and Indexing.	**10 Hours**

Sl. No.	List of experiments
1	Design, Develop and Implement a menu driven Program in C for the following array operations. a. Creating an array of N Integer Elements b. Display of array Elements with Suitable Headings c. Inserting an Element (ELEM) at a given valid Position (POS) d. Deleting an Element at a given valid Position (POS) e. Exit. Support the program with functions for each of the above operations.
2	Design, Develop and Implement a Program in C for the following operations on Strings. a. Read a main String (STR), a Pattern String (PAT) and a Replace String (REP) b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built-in functions.
3	Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations
4	Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %(Remainder), ^(Power) and alphanumeric operands.
5	Design, Develop and Implement a Program in C for the following Stack Applications a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ b. Solving Tower of Hanoi problem with n disks
6	Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations
7	Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, Sem, PhNo a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it c. Perform Insertion / Deletion at End of SLL d. Perform Insertion / Deletion at Front of SLL(Demonstration of stack) e. Exit

8	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit
9	Design, Develop and Implement a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes a. Represent and Evaluate a Polynomial P(x,y,z) = 6x2y2z-4yz5+3x3yz+2xy5z-2xyz3 b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z) Support the program with appropriate functions for each of the above operations
10	Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers. a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message d. Exit
11	Design, Develop and Implement a Program in C for the following operations on Graph(G) of Cities a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method
12	Given a File of N employee records with a set K of Keys(4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table (HT) of m memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers. Design and develop a Program in C that uses Hash mod m (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.

Course outcomes:

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

- Use stack, Queue, Lists, Trees and Graphs in solving real world problems.
- Implement all data structures in a high-level language for problem solving.
- Analyse and compare various linear and non-linear data structures
- Code, debug and demonstrate the working nature of different types of data structures and their applications
- Implement, analyse and evaluate the searching and sorting algorithms.

Reference Books:

1. Ellis Horowitz and SartajSahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2. 2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.
3. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014.
4. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
5. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013
6. A M Tenenbaum, Data Structures using C, PHI, 1989.
7. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

Analog and Digital Electronics (21CD33)

Semester III			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:0:1	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**BJT Biasing:** Introduction, operating point, Fixed-bias configuration, Emitter-bias configuration, Voltage-divider biasing, Collector feedback bias, Emitter follower configuration. Current mirror circuits, Bias stabilization, Application of BJT as Rely Driver, Switch and constant current source.	**10 Hours**
Module 2	**FET Biasing:** Introduction, Fixed-bias configuration, Self-bias configuration, Voltage-divider biasing. **FET Amplifiers:** Introduction, JFET Small signal model, JFET AC equivalent circuit, Fixed- bias configuration, Self-bias configuration with by passed source resistance, Voltage-divider configuration, Source follower configuration.	**10 Hours**
Module 3	**Principles & Design of Combinational Logic:** Theoremsand Properties of Boolean algebra, Boolean Functions,Definition of combinational logic, Canonical forms, Generation of switching equations from Truth Tables, Relevant Problems.	**10 Hours**
Module 4	**Karnaugh maps:** Minimum forms of switching functions,two and three variable Karnaugh maps, four variable karnaugh maps, determination of minimum expressions using essential prime implicants, Quine-McClusky Method: determination of prime implicants. Related Problems. **Logic Circuit Design:** Arithmetic Operation Combinational Circuit, Binary Adder, Binary Subtractor, Binary Parallel Adder, The Look-Ahead-Carry Binary Adders, Binary Multipliers, Binary Dividers, Comparator.	**10 Hours**
Module 5	**Power Amplifiers:** Introduction, Series Fed Class A Amplifier, Transformer-Coupled Class A Amplifier, Class B Amplifier operation. **Class B amplifier circuits:** Transformer-Coupled Push-Pull and Complementary– Symmetry circuits, Amplifier Distortion. **Latches and Flip-Flops:** Set Reset Latch, Gated Latches, Edge-Triggered D Flip Flop 3, SR Flip Flop, J K Flip Flop, T Flip Flop, Flip Flop with additional inputs, Relevant Problems.	**10 Hours**

Sl. No.	List of experiments
1	Study and plot the input and output characterises of CE transistor
2	Study and plot the drain and transfer characteristics of FET
3	Find the Efficiency and ripple factor of full-wave bridge rectifier
4	Study the frequency response of CE amplifier with and without bypass capacitor
5	Simplification, realization of Boolean expressions using logic gates and Universal gates.
6	Operational verification of Flip–Flops: (i) T type (ii) D type and iii) J–K Master slave.
7	Realization of half and full adders, half and full subtractor using logic gates.
8	(a) Realization of parallel adder and parallel subtractor using 7483 chip (b) Demonstration of BCD to Excess–3 code conversion and vice versa.
9	Realization of half and full adders, half and full subtractor using logic gates.

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

- Design and implement a biasing circuit for BJT and FET
- Model the FET amplifier for ac analysis.
- Ability to apply the knowledge of mathematics and science to understand the operation of logic circuits and performance parameters.
- Ability to apply the simplification techniques/methods to optimize and implement the digital functions/circuits.
- Acquire the knowledge of classifications of Power amplifier, operation, and design power amplifier.
- Ability to analyse the given logic circuit based on the knowledge of digital elements.

Reference books:

1. Robert L Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 10th Edition, Pearson Prentice Hall, 2009
2. Charles H. Roth. Jr, Larry L. Kenny, “Fundamentals of Logic Design”, 7th edition, Cengage Learning, ISBN: 978-1133628477.
3. Morris Mano, Digital Logic and Computer Design, Pearson, 2016, ISBN: 9789332542525.
4. Charles H Roth and Larry L Kinney and Raghunandan., G H Analog and Digital Electronics, Cengage Learning,2019.

Computer Organization (21CD34)

Semester III			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Basic Structure of Computers:** Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. **Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions	**08 Hours**
Module 2	**Input/Output Organization:** Accessing I/O Devices, Interrupts – Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB.	**08 Hours**
Module 3	**Memory System:** Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations.	**08 Hours**
Module 4	**Arithmetic:** Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division.	**08 Hours**
Module 5	**Basic Processing Unit:** Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control, Micro programmed Control. Pipelining: Basic concepts of pipelining.	**08 Hours**

Course Outcome:

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

- Explain the basic organization of a computer system.
- Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.
- Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems.
- Design and analyse simple arithmetic and logical units.

Reference Books:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th Edition, Tata McGraw Hill, 2002.
2. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2015.R. S. Sedha, “A Text book of Applied Electronics,” 7th Edition, S. Chand and Company Ltd., 2011.

Software Engineering (21CD35)

Semester III			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Software Crisis, Need for SoftwareEngineering. Professional Software Development, Software Engineering Ethics. Case Studies. Software Processes: Models: Waterfall Model, Incremental Model and Spiral Model. Process activities. **Requirements Engineering:** Requirements Engineering Processes, Requirements Elicitation and Analysis. Functional and non-functional requirements. The software Requirements Document. Requirements Specification. Requirements validation. Requirements Management.	**08 Hours**
Module 2	What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. **Introduction, Modelling Concepts and Class Modelling:** What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. Class Modelling: Object and Class Concept; Link and associations concepts; Generalization and Inheritance; A sample class model; Navigation of class models;	**08 Hours**
Module 3	**System Models:** Context models. Interaction models. Structural models. Behavioral models, Model-driven engineering. **Design and Implementation:** Introduction to RUP, Design Principles. Object-oriented design using the UML. Design patterns. Implementation issues. Open-source development.	**08 Hours**
Module 4	**Software Testing:** Development testing, Test-driven development, Release testing, User testing. Test Automation. **Software Evolution:** Evolution processes. Program evolution dynamics. Software maintenance. Legacy system management.	**08 Hours**
Module 5	**Project Planning:** Software pricing. Plan-driven development. Project scheduling: Estimation techniques. **Quality management:** Software quality. Reviews and inspections. Software measurement and metrics. Software standards	**08 Hours**

Course outcomes:

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

- Design a software system, component, or process to meet desired needs within realistic constraints.
- Assess professional and ethical responsibility
- Function on multi-disciplinary teams
- Use the techniques, skills, and modern engineering tools necessary for engineering practice
- Analyse, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems.

Reference Books:

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.
2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005.
3. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.
4. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.

Discrete Mathematical Structures (21CD36)

Semester III			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Sets:** Set basics, Venn diagrams, Union, intersection, set difference, complement, Cartesian product, Power sets, Cardinality of finite sets. **Relation:** Reflexivity, symmetry, antisymmetry, transitivity, Equivalence relations, partial orders. **Function:** Domain, target, and range/image of a function, surjection, injections, bijections, inverses, composition.	**08 Hours**
Module 2	**Basic Logic:** Propositional logic, Logical connectives, Truth tables, Disjunctive normal form, Validity of a well-formed formula, Propositional inference rules, Universal and existential quantifiers and their negations. **Proof Techniques:** Proof by Induction.	**08 Hours**
Module 3	**Counting:** The basics of counting, the pigeonhole principle, permutations and combinations, recurrence relations, solving recurrence relations, generating functions, inclusion-exclusion principle and application of inclusion-exclusion, Basic modular arithmetic.	**08 Hours**
Module 4	**Discrete Probability:** Finite probability space, events, Properties of events, Conditional probability, Bayes‟ theorem, Independence. **Statistical Distribution:** Discrete Distribution, Binomial distribution, Gamma distribution, Beta distribution, Chi-square distribution, Univariate normal distribution.	**08 Hours**
Module 5	**Group theory**: Groups, subgroups, generators and evaluationof powers, cosets and Lagrange's theorem, permutation groups and Burnside's theorem, isomorphism, automorphisms, homomorphism, monoids, concepts of rings, fields. Introduction to vector space.	**08 Hours**

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

- Perform the operations associated with sets, functions, and relations.
- Convert logical statements from informal language to propositional (and quantified) logic expressions.
- Use the rules of inference to construct proofs in propositional logic.
- Identify the proof technique used in a given proof.
- Apply each of the proof techniques correctly in the construction of a sound argument.

- Make a probabilistic inference in a real-world problem using Bayes‟ theorem to determine the probability of a hypothesis given evidence.
- Model a variety of real-world problems in computer science using appropriate forms of graphs and trees, such as representing a network topology or the organization of a hierarchical file system.

Reference Books:

1. Edgar Goodaire and Michael Parmenter, Discrete Mathematics with Graph Theory, Third Edition, PHI, ISBN-13-9750131679955.
2. S. Lipschutz, Discreate Mathematics, TMH, ISBN 0-07-066932-0
3. Bernard Kolman C,Busby and Sharon Ross, Discrete Mathematical Structures, 2007, ISBN - 81-203-2082-4, Publication PHI.
4. Rosen, K.H., Discrete Mathematics and its Applications, 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.

Environmental Studies (21CIV37)

Semester III (Common to all branches)			
No. of Lecture hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	00
Total No. of Lecture hours	16	**Exam Hours**	00
L: T:P	1:0:0	**Credits**	01

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Environment - Components of Environment **Ecosystem:** Types & Structure of Ecosystem, Balanced ecosystem Human Activities – Food, Shelter, And Economic & Social Security. **Impacts:** Impacts of Agriculture & Housing Impacts of Industry, Mining & Transportation Environmental Impact Assessment, Sustainable Development.	**03 Hours**
Module 2	**Natural Resources, Water resources** – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water Mineral resources, Forest Wealth Material Cycles – Carbon Cycle, Nitrogen Cycle & Sulphur Cycle. **Energy** – Different types of energy, Conventional sources & non-conventional sources of energy Solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy.	**04 Hours**
Module 3	**Environmental Pollution** – Water Pollution, Noise pollution, Land Pollution, Public Health Aspects. **Global Environmental Issues:** Population Growth, Urbanization, Land Management, Water & Waste Water Management	**03 Hours**
Module 4	**Air Pollution & Automobile Pollution:** Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, controlling measures. **Solid Waste Management,** E –Source, Segregation, Transportation, and Waste Treatment and Management &Biomedical Waste Management - Sources, Characteristics & Disposal methods.	**03 Hours**
Module 5	Applications of GIS & Remote Sensing and Smart Technologies in Environmental Engineering Practices. **Environmental Legislations**: Acts, Rules& Regulations,Role of government, Legal aspects, Role of Nongovernmental Organizations (NGOs), Environmental Education & Women Education.	**03 Hours**

Course outcomes:

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

- Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
- Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment,

- Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components
- Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.
- Build inquisitiveness to protect environment through societal interventions.

Reference Books:

1. Benny Joseph (2005), "Environmental Studies", Tata McGraw – Hill Publishing Company Limited.
2. R.J.Ranjit Daniels and Jagadish Krishnaswamy, (2009), "Environmental Studies", Wiley India Private Ltd., New Delhi.
3. R Rajagopalan, "Environmental Studies – From Crisis to Cure", Oxford University Press, 2005,
4. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd. 2012.
5. Raman Sivakumar, "Principals of Environmental Science and Engineering", Second Edition, Cengage learning Singapore, 2005
6. P. Meenakshi, "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi, 2006
7. S.M. Prakash, "Environmental Studies", Elite Publishers Mangalore, 2007
8. Erach Bharucha, "Text Book of Environmental Studies", for UGC, University press, 2005
9. G.Tyler Miller Jr., "Environmental Science – working with the Earth", Tenth Edition, Thomson Brooks /Cole, 2004
10. G.Tyler Miller Jr., "Environmental Science – working with the Earth", Eleventh Edition, Thomson Brooks /Cole, 2006
11. Dr.Pratiba Sing, Dr.AnoopSingh and Dr.Piyush Malaviya, "Text Book of Environmental and Ecology", Acme Learning Pvt. Ltd. New Delhi.

UNIVERSAL HUMAN VALUE & PROFESSIONAL ETHICS (21UHV38)

Semester III (Common to all branches)			
No. of Lecture hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	00
Total No. of Lecture hours	16	**Exam Hours**	00
L: T:P	1:0:0	**Credits**	01

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Value Education:** Right Understanding, Relationship and Physical Facility (Holistic Development andthe Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations	**03 Hours**
Module 2	**Harmony in the Human Being:** Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health	**03 Hours**
Module 3	**Harmony in the Family and Society:** Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order	**03 Hours**
Module 4	**Harmony in the Nature/Existence:** Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence	**03 Hours**
Module 5	**Implications of the Holistic Understanding – a Look at Professional Ethics:** Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession	**04 Hours**

Course outcomes:

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

- Holistic vision of life.
- Socially responsible behaviour and environmentally responsible work.
- Ethical human conduct.
- Having Competence and Capabilities for Maintaining Health and Hygiene.

- Appreciation and aspiration for excellence (merit) and gratitude for all.

Reference Books:

1. R R Gaur, R Asthana, G P Bagaria, The Textbook “A Foundation Course in Human Values and Professional Ethics”, 2ndRevised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 447-1 b.
2. R R Gaur, R Asthana , The Teacher‟s Manual for “A Foundation Course in Human Values and Professional Ethics”.

Engineering Mathematics-IV (21MAT41)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Calculus of complex functions:** Review of function of a complex variables, limits, continuity, and differentiability. Analytic functions: Cauchy-Riemann equations in Cartesian and polar forms and consequences. **Construction of analytic functions:** Milne-Thomson method- Problems.	**08 Hours**
Module 2	**Conformal transformations:** Introduction. Discussion of transformations: $w = z^2$, $w = e^z$, $w = z + \frac{1}{z}(z \neq 0)$. Bilinear transformations- Problems. **Complex integration:** Line integral of a complex function- Cauchy"s theorem and Cauchy"s integral formula and problems.	**08 Hours**
Module 3	**Numerical Solutions of Ordinary Differential Equations (ODE's):** Numerical solution of ODE"s of first order and first degree- Taylor"s series method, Modified Euler"s method. Runge -Kutta method of fourth order, Milne"s predictor and corrector method (No derivations of formulae)-Problems. Numerical Solution of Second Order ODE"s - Runge-Kutta method and Milne"s predictor and corrector method. (No derivations of formulae).	**08 Hours**
Module 4	**Probability Distributions:** Review of basic probabilitytheory. Random variables (discrete and continuous), probability mass/density functions. Binomial, Poisson, exponential and normal distributions- problems (No derivation for mean and standard deviation)-Illustrative examples.	**08 Hours**
Module 5	**Joint probability distribution:** Joint Probability distribution for two discrete random variables, expectation and covariance. **Sampling Theory:** Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student"s t-distribution, Chi-square distribution as a test of goodness of fit.	**08 Hours**

Course outcomes:

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

- Explain the concepts of integral calculus, Higher order differential equations, Laplace transforms, Probability and Linear Algebra.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyse the solutions of engineering problems using these concepts.

Reference Books

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2016
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017
3. Srimanta Pal et al , Engineering Mathematics, Oxford University Press, 3rd Edition, 2016.
4. C.Ray Wylie, Louis C.Barrett , Advanced Engineering Mathematics, McGraw-Hill Book Co, 6th Edition, 1995
5. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India, 4th Edition 2010
6. B.V.Ramana, Higher Engineering Mathematics, McGraw-Hill, 11th Edition,2010
7. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, 6th Edition, 2014.

Additional Mathematics-II (21MATDIP41)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	00

Modules	Course Content	Teaching Hours
Module 1	**Integral Calculus**: Review of elementary integralcalculus. Reduction formulae for $sin^n x$, $cos^n x$ (with proof) and $sin^m x cos^n x$ (without proof) and evaluation of these with standard limits-Examples. Double integrals- Simple examples. Beta and Gamma functions- Simple problems	**08 Hours**
Module 2	**Higher order ODE's:** Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators. [Particular Integral restricted to$R(x) = e^{ax}$, $\sin ax$ / $\cos ax$for$f(D)y = R(x)$].	**08 Hours**
Module 3	**Laplace Transform:** Definition and Laplace transforms of elementary functions (statements only)-problems. Inverse Laplace Transform: Inverse Laplace transforms by method of partial fractions, Convolution theorem to find the inverse Laplace transforms. Solution of linear differential equations using Laplace transforms.	**08 Hours**
Module 4	**Introduction to Probability:** Introduction. Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability, Bayes"s theorem, problems.	**08 Hours**
Module 5	**Linear Algebra:** Introduction - rank of matrix by elementary row operations - Echelon form. Consistency of system of linear equations - Gauss elimination method. Eigen values and Eigen vectors of a square matrix. Problems.	**08 Hours**

Course outcomes:

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

- Explain the concepts of integral calculus, Higher order differential equations, Laplace transforms, Probability and Linear Algebra.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyse the solutions of engineering problems using these concepts.

Reference Books:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
2. B.S. Grewal, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
3. B.V. Ramana, *Higher Engineering Mathematics*, Latest edition, Tata McGraw Hill.
4. Srimanta Pal & Subodh C. Bhunia: *"Engineering Mathematics"* Oxford University Press, 3rd Reprint, 2016.
5. N.P Bali and Manish Goyal: *"A textbook of Engineering Mathematics"* Laxmi Publications, Latest edition.
6. H.K.Dass and Er. Rajnish Verma: *"Higher Engineering Mathematics"* S.Chand Publication (2014).

Design and Analysis of Algorithms (21CD42)

Semester IV			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:0:1	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Introduction to** Algorithm, Algorithm Specification, Analysis Framework, Performance Analysis: Space complexity, Time complexity. Asymptotic Notations: Mathematical analysis of non-recursive and recursive Algorithms with Examples. Important Problem Types: Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. **Fundamental Data Structures:** Stacks, Queues, Graphs, Trees, Sets and Dictionaries.	**10 Hours**
Module 2	**Divide and Conquer:** General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum, Merge sort, Quick sort, Strassen‟s matrix multiplication, Advantages and Disadvantages ofdivide and conquer. Decrease and Conquer Approach: Topological Sort.	**10 Hours**
Module 3	**Greedy Method:** General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines. Minimum cost spanning trees: Prim‟s Algorithm, Kruskal‟s Algorithm. Single source shortest paths: Dijkstra's Algorithm. Optimal Tree problem: Huffman Trees and Codes. Transform and Conquer Approach: Heaps and Heap Sort.	**10 Hours**
Module 4	**Dynamic Programming:** General method with Examples, Multistage Graphs. Transitive Closure: Warshall‟s Algorithm, All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem, Bellman-Ford Algorithm, Travelling Sales Person problem, Reliability design.	**10 Hours**
Module 5	**Backtracking:** General method, N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles. Branch and Bound: Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem: LC Branch and Bound solution, FIFO Branch and Bound solution. NP- Complete and NP-Hard problems: Basic concepts, nondeterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.	**10 Hours**

Sl. No.	List of experiments
1	a. Create a Java class called ***Student*** with the following details as variables within it. (i) USN (ii) Name (iii) Branch (iv) Phone Write a Java program to create *n Student* objects and print the USN, Name, Branch, and Phone of these objects with suitable headings. b. Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.
2	***a.***Design a superclass called ***Staff*** with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely ***Teaching*** (domain, publications), ***Technical*** (skills), and ***Contract*** (period). Write a Java program to read and display at least 3 *staff* objects of all three categories. b. Write a Java class called ***Customer*** to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display as <name, dd, mm, yyyy> using StringTokenizer class considering the delimiter character as "/".
3	a. Write a Java program to read two integers *a*and*b*. Compute *a*/*b* and print, when *b* is not zero. Raise an exception when *b* is equal to zero. b. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square ofthe number and prints; third thread will print the value of cube of the number.
4	Sort a given set of ***n*** integer elements using **Quick Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000 and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
5	Sort a given set of ***n*** integer elements using **Merge Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000, and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case,average case and best case.
6	Implement in Java, the **0/1 Knapsack** problem using (a) Dynamic Programming method (b) Greedy method.
7	From a given vertex in a weighted connected graph, find shortest paths to other vertices using **Dijkstra's algorithm**. Write the program in Java.
8	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Kruskal'salgorithm.** Use Union-Find algorithms in your program
9	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Prim's algorithm**..
10	Write Java programs to (a) Implement All-Pairs Shortest Paths problem using **Floyd's algorithm**. (b) Implement **Travelling Sales Person problem** using Dynamic programming.

11	Design and implement in Java to find a **subset** of a given set **S** = {Sl, S2,.... ,Sn} of ***n*** positive integers whose SUM is equal to a given positive integer ***d***. For example, if S ={1, 2,5, 6, 8} and ***d***= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.
12	Design and implement in Java to find all **Hamiltonian Cycles** in a connected undirected Graph G of *n* vertices using backtracking principle.

Course Outcome:

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

- Describe computational solution to well-known problems like searching, sorting etc.
- Estimate the computational complexity of different algorithms.
- Devise an algorithm using appropriate design techniques (brute-force, greedy, dynamic programming, backtracking) for problem solving.
- Implement a variety of algorithms such as sorting, graph related, combinatorial, etc., in a high-level language to solve real-world problems.
- Analyse and compare the performance of algorithms using language features.

Reference Books:

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 2rd Edition, 2009. Pearson.
2. Ellis Horowitz, Satraj Sahni and Rajasekaran, Computer Algorithms/C++, 2nd Edition, 2014, Universities Press.
3. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, Introduction to Algorithms, 3rd Edition, PHI.
4. S. Sridhar, Design and Analysis of Algorithms, Oxford (Higher Education).

Operating System (21CD43)

Semester IV			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:0:1	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Introduction to operating systems, System structures:** What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot. **Process Management:** Process concept, Process scheduling; Operations on processes; Inter process communication	**10 Hours**
Module 2	**Multi-threaded Programming:** Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling. Process Synchronization: Synchronization: The critical section problem; Peterson‟s solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.	**10 Hours**
Module 3	**Deadlocks:** Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.	**10 Hours**
Module 4	**Virtual Memory Management:** Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. File System, Implementation of File System: File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.	**10 Hours**
Module 5	**Secondary Storage Structures, Protection:** Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability- Based systems. Case Study: The Linux Operating System: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.	**10 Hours**

Sl.	List of Experiments

No	
1	Simulate the following CPU scheduling algorithms: a) FCFS b) SJF c)Round Robin d)Priority
2	Simulate the following Memory management Techniques a) Multi Programming with Fixed Number of Tasks (MFT) b) Multi Programming with Variable Number of Tasks (MVT)
3	Write a C program to stimulate the following contiguous memory allocation techniques a) Worst-fit b) Best fit c) First fit
4	Simulate Paging Technique of memory management
5	Simulate following page replacement Algorithms a) FIFO b) LRU c) LFU
6	Simulate Producer-Consumer Problem Using Semaphores
7	Write a C program to simulate the concept of Dining-Philosophers problem.
8	Write a C program to stimulate the disk scheduling algorithms. a) FCFS b) SCAN c) C-SCAN
9	Simulate Bankers Algorithm for Deadlock Avoidance
10	Simulate the file allocation strategies: a) Sequential b) Indexed c) Linked
11	Simulate all File Organization techniques a) Single level directory b) Two level c) Hierarchical

Course Outcome:

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

- Demonstrate need for OS and different types of OS
- Apply suitable techniques for management of different resources
- Realize the different concepts of OS in platform of usage through case studies
- Design and solve synchronization problems.
- Simulate and implement operating system concepts such as scheduling, deadlock management, file management, and memory management.

Reference Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7th edition, Wiley-India, 2006.
2. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
3. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw-Hill, 2013.
4. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014.
5. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

Data Communication (21CD44)

Semester IV			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	3:0:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Data Communications, Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Introduction to Physical Layer-1: Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance. SLE: Internet History, Standards and Administration	**08 Hours**
Module 2	**Digital Transmission:** Digital to digital conversion: Line coding- Polar, Bipolar, Manchester coding, AMI, Pseudo ternary, Physical Layer-2: Analog to digital conversion, Pulse Code Modulation, Delta Modulation, Transmission Modes, Analog Transmission: Digital to analog conversion. SLE: Bandwidth Utilization: Multiplexing	**08 Hours**
Module 3	**Transmission Media:** Introduction, Guided Media: Twisted Pair Cable, Coaxial Cable, Fiber Optics Cable, switching: Introduction, Circuit Switched Networks and Packet switching, Data Link Layer: Error Detection and Correction: Introduction, Block Coding, Cyclic Code. SLE: Checksum	**08 Hours**
Module 4	**Data link control:** DLC Services: Framing, Flow Control, Error Control, Connectionless and Connection Oriented, Data link layer protocols, High Level Data Link Control (HDLC), Media Access control: Random Access, Controlled Access. SLE: Channelization	**08 Hours**
Module 5	**Introduction to Network Layer:** Network Layer Services, Packet Switching, Network Layer Performance, IPv4 Addresses. SLE: IPv6	**08 Hours**

Course Outcome:

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

- Explain the fundamentals of data communication.
- Illustrate the techniques for digital transmission and bandwidth utilization using various transmission media.
- Analyse the principles of protocol layering in modern communication systems.
- Demonstrate the working of physical, data link and network layer services using simulation tools such as Cisco packet tracer, Wireshark and so on (Additional CO).

Reference Books:

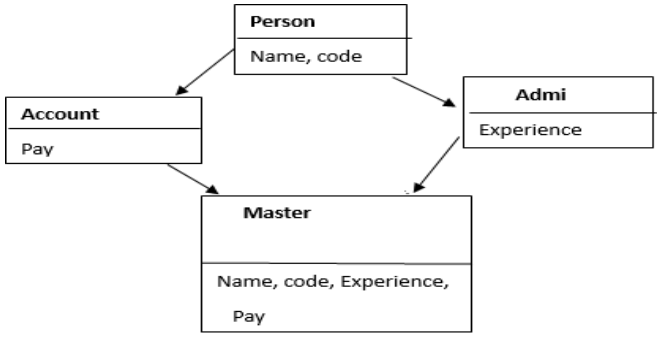
1. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2019
2. Nader F. Mir: Computer and Communication Networks, 2nd Edition, Pearson Education, 2015
3. William Stallings, Data and Computer Communication 10th Edition, Pearson Education, Inc., 2014

Programming in C++ (21CD45)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:0:1	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction to C++:** Introduction to Procedure-oriented programming vs. object-oriented programming, concepts of object-oriented programming. Overview of C++, Sample C++ program, Different data types, operators, expressions, and statements, arrays and strings, pointers & user-defined types Function Components,argument passing, inline functions, function overloading, recursive functions.	**08 Hours**
Module 2	**Classes, Objects and Polymorphism:** Class Specification, Class Objects, Scope resolution operator, Access members, Defining member functions, Data hiding, Constructors, Destructors, Static data members and functions. Constant data members and functions, mutable data members. Friend functions, Passing objects as arguments, Returning objects, Arrays of objects, Dynamic objects, Pointers to objects, Generic functions and classes, Operator overloading and their applications such as +, - , pre-increment, post-increment, [ ] etc.	**08 Hours**
Module 3	**Inheritance:** Introduction to Inheritance, Different types of Inheritances, Inheritance and protected members, protected base class inheritance, Constructors and Destructors in Inheritance, Granting access, Virtual base classes.	**08 Hours**
Module 4	**Run-time polymorphism and Exception handling:** Virtual functions and Polymorphism: Introduction to Virtualfunctions, calling a Virtual function through a base class reference, Inheritance of virtual attributes, Hierarchy of virtualfunctions, Pure virtual functions and Abstract classes, Early and late binding. **Exception Handling:** Exception handling fundamentals, Catching Class Types, Using Multiple catch Statements, Handling Derived-Class Exceptions, Exception handling options: Catching All Exceptions, Restricting Exceptions & Re-throwing an Exception, user defined exceptions, Applying Exception Handling.	**08 Hours**
Module 5	**I/O System Basics and Standard template library:** I/O System Basics: The C++ I/O system basics: C++ stream classes, Formatted I/O, I/O manipulators; C++ file I/O: fstream and the File classes, File operations. STL: An overview, the container classes, general theory of operations, vectors, lists, maps.	**08 Hours**

Sl.	Experiments

No.	
1	Write a function using reference variables as arguments to swap the values of pair of integers.
2	Write a program to perform the addition of two complex numbers using friend function (use constructor function to initialize data members of complex class).
3	Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.
4	Write a C++ program to display names, roll no and grades of 3 students appeared in the examination. Declare the class containing the name, roll no and grade.
5	Define a class string and overload == to compare two strings and + operator for concatenation two strings.
6	Write a program to perform matrix addition using operator overloading concept.
7	Write a program to compute square root of a number. The input value must be tested for validity. If it is negative, the user defined function my_sqrt() should raise an exception.
8	Consider the class network diagram of Figure 1. Define all the four classes and write a program to create, update and display the information contained in Master objects.  Figure 1
9	Create a class called STACK which represents one dimensional numeric array. Implement operations on the stack using integer and double data types. Use exception handling mechanism to handle overflow and underflow exceptions.
10	Write a C++ program to perform the following operations a) Read from the File b) Write into a File c) Copy contents from one file to another

Course Outcomes:

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

- Understand the features of C++ supporting object-oriented programming.
- Understand the relative merits of C++ as an object-oriented programming language.
- Understand how to apply the major object-oriented concepts to implement object-oriented programs in C++, encapsulation, inheritance and polymorphism.
- Understand advanced features of C++ specifically stream I/O, templates and operator overloading.
- Develop applications for a range of problems using object-oriented programming techniques using C++.

Reference Books:

1. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.
2. Stanley B.Lippmann, JoseeLajore: C++ Primer, 4th Edition, Pearson Education, 2005.
3. E Balagurusamy: Object Oriented Programming with C++, 7th Edition, Tata Mcgraw Hill Education, 2017
4. Paul J Deitel, Harvey M Deitel: C++ for Programmers, Pearson Education, 2009.
5. K R Venugopal, RajkumarBuyya, T Ravi Shankar: Mastering C++, Tata McGraw Hill, 2017
6. Yashavant P. Kanetkar: Let Us C++, 2nd Edition, BPB Publications.

Graph Algorithms (21CD46)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:0:1	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Graph Theory:** Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits.	**08 Hours**
Module 2	**Introduction to Graph Theory contd.:** Planar Graphs, Hamilton Paths and Cycles, Graph Colouring, and Chromatic Polynomials	**08 Hours**
Module 3	**Trees:** Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes	**08 Hours**
Module 4	**Optimization and Matching:** Dijkstra‟s Shortest Path Algorithm, Minimal Spanning Trees - The algorithms of Kruskal and Prim, Transport Networks - Max-flow, Min-cut Theorem, Matching Theory	**08 Hours**
Module 5	**The Principle of Inclusion and Exclusion:** The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements - Nothing is in its Right Place, Rook Polynomials.	**08 Hours**

Sl. No.	List of Experiments
1	Obtain the Topological ordering of vertices in a given digraph.
2	Compute the transitive closure of a given directed graph using Warshall's algorithm.
3	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra‟s algorithm
4	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm
5	Print all the nodes reachable from a given starting node in a digraph using BFS method.
6	Check whether a given graph is connected or not using DFS method.
7	Find Minimum Cost Spanning Tree of a given undirected graph using Prim‟s algorithm
8	Find a subset of a given set S = {sl, s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1,2,6} and {1,8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.
9	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using OpenMP and determine the speed-up achieved.

Course Outcomes:

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

- Explain what a graph is and how it is used.
- Learn how to use algorithms to explore graphs, compute shortest distance, min spanning tree, and connected components.
- Implement a variety of algorithms such as topological sorting, prims, kruskals and Dijkstra's etc., in a high-level language to solve real-world problems.
- Implement the transitive closure of a directed graph using Warshall's algorithm.
- Analyse and differentiate DFS and BFS, prims and kruskals through high level programming languages.
- Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.

Reference Books:

1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education, 2004.
2. D.S. Chandrasekharaiah: Graph Theory and Combinatorics, Prism, 2020.
3. Chartrand Zhang: Introduction to Graph Theory, TMH, 2006.
4. Richard A. Brualdi: Introductory Combinatorics, 6th Edition, Pearson Education, 2018.
5. Geir Agnarsson & Raymond Geenlaw: Graph Theory, Pearson Education, 2018.

CONSTITUTION OF INDIA, PROFESSIONAL ETHICS & CYBER LAW (21CPH47)

Semester IV (Common to all branches)			
No. of Lecture hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	00
Total No. of Lecture hours	16	**Exam Hours**	00
L: T:P	1:0:0	**Credits**	01

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Indian Constitution:** Definition ofConstitution, Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the ConstituentAssembly. Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.	03 Hours
Module 2	**Fundamental Rights (FR's), Directive Principles of State Policy (DPSP's) and Fundamental Duties (FD's):**Fundamental Rights and its Restriction and limitations in different Complex Situations. DPSP"s and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation building.	03 Hours
Module 3	**Union Executive:** Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.	03 Hours
Module 4	**State Executive & Elections, Amendments and Emergency Provisions:** State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (Why and How) and Important Constitutional Amendments till today. Emergency Provisions.	03 Hours
Module 5	**Professional Ethics:** Definition of Ethics & Values. Professional & Engineering Ethics. Positive and Negative aspects of Engineering Ethics. **Cyber Laws:** Salient features of the IT Act, 2000, various authorities under IT Act and their powers. ; Penalties & Offences, amendments. **Computer & Cyber Security:** (a) Types of Attacks, (b) Network Security (c) Overview of Security threats, (d) Hacking Techniques, (e) Password cracking (f) Insecure Network connections, (g) Malicious code (h) Concept of Fire wall Security	04 Hours

Course Outcomes:

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

- Have constitutional knowledge and legal literacy.

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- Understand Engineering and Professional ethics and responsibilities of Engineers.
- Understand cyber threats & cyber laws, acts and their powers.

Reference Books:

1. Shubham Singla, „Constitution of India, Professional Ethics & Human Rights", CENGAGE Publications 2018.
2. Cyber Law & Cyber Crimes by Advocate Prashant Mali; Snow White publications, Mumbai.
3. Cyber Law in India by Farooq Ahmad; Pioneer Books.

ABILITY ENHANCEMENT COURSE II (21AEC48)

Semester IV (Common to all branches)			
No. of Lecture hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	00
Total No. of Lecture hours	16	**Exam Hours**	00
L: T:P	1:0:0	**Credits**	01

Modules	Course Content	Teaching Hours
Module 1	**Technical Report Writing:** Introduction to Technical writing process, Understanding of writing process, Introduction to various Technical Report writing.	**03 Hours**
Module 2	**Art of condensation and Paragraph Writing:** Introduction and importance, Types and principles of condensation. Importance of paragraph writing, Features and its construction styles.	**03 Hours**
Module 3	**Business Report Writing:** Introduction, Definition and Salient features of Business reports. Significance and types of report writing. (Formal and Informal). Resume building and Types of resumes. (Samples of resumes)	**03 Hours**
Module 4	**Technical Articles and Proposals:** Nature and significance, Types of technical Articles Journal articles and conference papers. Elements of technical articles. Introduction to technical proposal writing, Purpose, importance, structure and types of technical proposals.	**04 Hours**
Module 5	**Social media posts and Blog Writing:** Ethics and practices of social media posts, Principles and fundamentals, Guiding principles for composition of articles, some common pitfalls. Maintaining common etiquette. Blogs and Blog writings strategies.	**03 Hours**

Course Outcomes:

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

- Effectively communicate in technical matters.
- Practice preparation of gist, abstract and notes from a technical article.
- Prepare a business proposals and reports.
- Write and respond in social media and write blogs.

Reference Books:

1. Sanjay Kumar and Pushpalata, „Communication Skills", Oxford University Press. 2018.
2. M. Ashraf Rizvi, „Effective Technical Communication", McGraw Hill, 2018.
3. Gajendra Singh Chauhan and et.al. „Technical Communication", Cengage Publication, 2018.
4. Meenakshi Raman and Sangeeta Sharma, Technical Communication Principles and Practice, Oxford University Press, 2018.

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UNIVERSITYOF MYSORE
(Re-accredited by NAAC with 'A' Grade)
(NIRF-2022: Ranked 33rd in University Category and 54th in Overall Category)

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Manasagangotri Campus, Mysuru

Prof. Suresha
Chairman, Computer Science & Design
Mobile No. 9449810894
Email: sureshasuvi@gmail.com

No. MUSE/236(N)2022-23

Dated 13.09.2022

To
The Registrar,
University of Mysore
Crawford Hall
Mysuru.

Sir,

Sub: **Proceedings of the meeting of the members of the BoS in Computer Science & Design -reg**

Ref: No.UA2 /134/2021-22 dated 08.09.2022.

With reference to the above subject, I am herewith enclosing the **Proceedings of the meeting of the members of the Board of Studies in Computer Science & Design (CS&D)** held on **13.09.2022** at 10.00 AM along with (1) **Scheme, Syllabus and Regulations, (2) Panel of Examiners for 2022-23** both **hard and soft copies.**

Yours faithfully,

13/9/22

(Prof. Suresha)
Chairman
BoS in Computer Science & Design

CHAIRPERSON
BOS IN C S & D
M U S E
M G M 06

Copy to:
The Dy. Registrar (Academic), University of Mysore, Mysuru.

Proceeding of the meeting of the members of the Board of Studies in Computer Science & Design (CS&D) of Mysore University School of Engineering held on 13th Sept. 2022 at 10.00 AM at Vijnana Bhavan, Manasagangotri, Mysuru – 570 006.

Members Present

1	Prof. Suresha	Chairman
2	Prof. Ananthapadmanabha T	Member
3	Prof. Thippeswamy	Member
4	Prof. Natesh M	Member
5	Dr. Manjunath Aaradhya	Member
6	Prof. Anil Kumar K M	Member

Members Virtually Present

7	Prof. Deepu R	Member
8	Prof. Ranjit K N	Member
9	Dr. Nagesh Poojary	Member

The Chairman welcomed the members present in the meeting. The following agenda were taken up for discussion.

Agenda 1: Scheme of III and IV Semesters for B.E. in Computer Science & Design.

The Chairman explained that the Scheme has been framed on the lines of guidelines of AICTE/VTU and within the framework of NEP – 2020 of III and IV semester. The Scheme to include the Basic Science Courses (BSC), Engineering Science Courses (ESC), Professional Core Courses (PCC), Professional Elective Courses (PEC), Open Elective Courses (OEC), Integrated Professional Core Courses (IPCC), Project Work, Internship (INT), Non-Credit Mandatory Courses (NCMC), Ability Enhancement Course (AEC), Universal Human Value Courses (UHV) and Languages. The Members of the Board examined and approved the Scheme for B.E. Computer Science & Design of III Semester and IVSemester within the ambit of 160 credits for the entire B.E. program. The Scheme is enclosed in the **Annexure I.**

Agenda 2: Syllabus for III and IV semesters B.E. Computer Science & Design

The Members of the Board has examined, discussed and approved the Syllabus for III and IV semester B.E. Computer Science & Design Courses. The Syllabus is enclosed in the **Annexure II.**

13/9/22

Agenda 3: Panel of Examiners for 2022-23

The Board has prepared and approved Panel of Examiners for the year 2022-23 **(Annexure III)**.

The meeting ended with vote of thanks.

13/9/2022

(Prof. Suresha)
Chairman
BoS in Computer Science & Design

Sl No	Name	Chairman/Member	Signature
1	Prof. Suresha S	Chairman	
2	Prof. Ananthapadmanabha T	Member	
3	Prof. Thippeswamy	Member	13/9/22
4	Prof. Natesh M	Member	13/09/22
5	Dr. Manjunath Aaradhya	Member	13/9/22
6	Prof. Deepu R	Member	virtually
7	Prof. Anil Kumar K M	Member	13/9/22
8	Prof. Ranjit K N	Member	virtually
9	Dr. Nagesh Poojary	Member	virtually

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Scheme of Teaching and Examination 2021-2022 (As per NEP-2020)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021–2022)

Computer Science & Design (CS&D)

III SEMESTER

Sl. No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theory lecures	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	BSC	21MAT31	Engineering Mathematic-III	Basic Science	Basic Science	2	2	0	03	50	50	100	3
2	IPCC	21CD32	Data Structures and Applications	CS&D	CS&D	3	0	2	03	50	50	100	4
3	IPCC	21CD33	Analog and Digital Electronics	CS&D/ BM&RE	CS&D/ BM&RE	3	0	2	03	50	50	100	4
4	PCC	21CD34	Computer Organization	CS&D	CS&D	2	2	0	03	50	50	100	3
5	PCC	21CD35	Software Engineering	CS & D	CS&D	2	2	0	03	50	50	100	3
6	PCC	21CD36	Discrete Mathematical Structures	CS&D	CS&D	2	2	0	03	50	50	100	3
7	CEE	21CIV37	Environmental Studies	CEE	CEE	1	0	0	NA	50	-	50	1
8	UHV	21UHV38	Universal Human Values and Professional Ethics	Basic Science	Basic Science	1	0	0	NA	50	-	50	1
Total						**16**	**08**	**04**	**18**	**400**	**300**	**700**	**22**

Note: BSC: Basic Science Courses, PCC: Professional Core Courses, IPCC: Professional Lab Courses, CEE: Civil Environmental Engineering, UHV: Universal Human Values, BM&RE: Biomedical and Robotics Engineering, NCMC: Non-credit mandatory course, INT: Internship, IESC: Integrated Engineering Science Course.

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

9	NCMC	21MATDIP31	Additional Mathematics-1	Basic Science	Basic Science	2	2	0	03	50	50	100	0
10	NCMC	21KANDIP32	Technical Kannada	Basic Science	Basic Science	0	2	0	-	50	-	50	0

(a) The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the student has to fulfil the requirements during subsequent semester/s to appear for SEE.
(b) These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree

Credit Definition:
1-hour lecture**(L)** per week per semester = **1 Credit**
2-hour tutorial **(T)** per week per semester = **1 Credit**
2-hour Practical/Drawing **(P)** per week per semester = **1 Credit**

Four-credit courses are to be designed for **50** hours of Teaching-Learning process.
Three credit courses are to be designed for **40** hours of Teaching-Learning process.
Two credit courses are to be designed for **25** hours of Teaching-Learning process.
One credit course is to be designed for **15** hours of Teaching-Learning process.

AICTE Activity Points to be earned by students admitted to BE/B.Tech., day college programme (For more details refer to Chapter 6, AICTE Activity Point Programme, Model Internship Guidelines): Over and above the academic grades, every Day Collegeregular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry,shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme. Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to UoM. The Activity Points earned shall be reflected on the student's eighth semester Grade Card. The activities can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, the minimum hours' requirement should be fulfilled. Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression. In case students fail to earn the prescribed activity Points, an Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

DIRECTOR
Mysore University
School of Engineering
Manasagangotri, Mysuru - 06

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Scheme of Teaching and Examination 2021-2022 (As per NEP-2020)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021–2022)

Computer Science & Design (CS&D)

IV SEMESTER

Sl. No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theory lectures	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	BSC	21MAT41	Engineering Mathematics-IV	Basic Science	Basic Science	2	2	0	03	50	50	100	3
2	IPCC	21CD42	Design and Analysis of Algorithms	CS&D	CS&D	3	0	2	03	50	50	100	4
3	IPCC	21CD43	Operating Systems	CS&D	CS&D	2	2	2	03	50	50	100	4
4	PCC	21CD44	Data Communication	CS&D	CS&D	3	0	0	03	50	50	100	3
5	IPCC	21CD45	Programming in C++	CS&D	CS&D	2	0	2	03	50	50	100	3
6	IPCC	21CD46	Graph Algorithms	CS&D	CS&D	2	0	2	03	50	50	100	3
7	HSMC	21CPH47	Constitution of India, Professional Ethics and Cyber Law	Basic Science	Basic Science	1	0	0	NA	50	-	50	1
8	HSMC	21AEC48	Ability Enhance Course-II	CS&D	CS&D	1	0	0	NA	50	-	50	1
9	INT	21INT49	Summer Internship-II	(To be carried out during the intervening vacations of IV and V semesters)					-	-	-	-	-
Total						**16**	**04**	**08**	**18**	**400**	**300**	**700**	**22**

Note: BSC: Basic Science Courses, PCC: Professional Core Courses, IPCC: Professional Lab Courses, HSMC: Humanity, Social Science and Management Courses. NCMC: Non-credit mandatory course, AEC: Ability Enhancement Course, INT: Internship, IESC: Integrated Engineering Science Course.

Summer Internship-I (21INT58): shall be carried out at industrial (State and Central Government /Non-government organizations (NGOs)/Micro, Small and Medium Enterprise (MSME)/Innovation centres/ Incubation centres. The internship can also be Rural internship. All the students admitted shall have to undergo a mandatory internship of 04 weeks during the intervening vacation of IV and V semesters. A University Viva-Voce examination (Presentation followed by Question & Answer session) shall be conducted during V semester and the prescribed credit shall be included in the V semester. The internship shall be considered as a head of passing and shall be considered for the award of degree. Those, who do not take up/complete the internship shallbe declared fail and shall have to complete during subsequent University examination after satisfying the internship requirements. (The faculty coordinator or mentor has to monitor the students' internship progress and interact to guide them for the successful completion of the internship.)
Summer Internship-I: SEE shall be through seminar and viva-voce.

Course prescribed to lateral entry Diploma holders admitted to III semester of Engineering programs

10	NCMC	21MATDIP41	Additional Mathematics-II	Basic Science	Basic Science	02	02	-	03	50	50	100	0
11	NCMC	21ENGDIP42	Technical English	Basic Science	Basic Science	-	2	-	-	50	-	50	0

(a) The mandatory non – credit courses Additional Mathematics I and II prescribed for III and IV semesters respectively, to the lateral entry Diploma holders admitted to III semester of BE programs, shall attend the classes during the respective semesters to complete all the formalities of the course and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40 % of the prescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the student has to fulfil the requirements during subsequent semester/s to appear for SEE.
(b) These Courses shall not be considered for vertical progression, but completion of the courses shall be mandatory for the award of degree

Credit Definition:
1-hour lecture**(L)** per week per semester = **1 Credit**
2-hour tutorial **(T)** per week per semester = **1 Credit**
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Four-credit courses are to be designed for **50** hours of Teaching-Learning process.
Three credit courses are to be designed for **40** hours of Teaching-Learning process.
Two credit courses are to be designed for **25** hours of Teaching-Learning process.
One credit course is to be designed for **15** hours of Teaching-Learning process.

AICTE Activity Points: In case students fail to earn the prescribed activity Points, an Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

Engineering Mathematics-III (21MAT31)

Semester III			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L:T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Fourier Series:** Periodic functions, Dirichlet‟s condition. Fourier series of periodic functions period 2π and arbitrary period. Half range Fourier series. Application of Practical harmonic analysis.	**08 Hours**
Module 2	**Fourier Transforms:** Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. Problems.	**08 Hours**
Module 3	**Difference Equations and Z-Transforms:** Difference equations, basic definition, z-transform-definition, Standard z-transforms, Damping and shifting rules, initial value and final value theorems (without proof) and problems, Inverse z-transform and applications to solve difference equations.	**08 Hours**
Module 4	**Partial Differential Equations (PDE's):** Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Solution of Lagrange's linear PDE. Derivation of one-dimensional heat equation and wave equation. Solution of one-dimensional heat equation and wave equation by the method of separation of variables.	**08 Hours**
Module 5	**Statistical Methods:** Correlation and regression-Karl Pearson‟s coefficient of correlation and rank correlation-problems. Regression analysis- lines of regression –problems. **Curve Fitting:** Curve fitting by the method of least squares-fitting the curves of the form- $y = ax + b, y = ax^b and$ $y = ax^2 + bx + c.$	**08 Hours**

Course outcomes:

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

- Explain the basic concepts of Fourier Series, Fourier Transforms, Z-Transforms,Partial Differential Equations, Some concepts of statistical analysis and curve fitting.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyse the solutions of engineering problems using these concepts.

Reference Books:

1. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed. (Reprint), 2017.
2. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2017.
3. Srimanta Pal & Subobh C Bhunia: “Engineering Mathematics”, Oxford University Press, 3rd Reprint, 2016.
4. C.Ray Wylie, Louis C.Barrett : “Advanced Engineering Mathematics", 6th Edition, 2. McGrawHill Book Co., New York, 1995.
5. S.S.Sastry: “Introductory Methods of Numerical Analysis”, 11th Edition, Tata McGraw-Hill, 2010.
6. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
7. N.P.Bali and Manish Goyal, “A Text Book of Engineering Mathematics”, Laxmi Publications. Latest edition, 2014.
8. Chandrika Prasad and Reena Garg “Advanced Engineering Mathematics”, Latest edition, Khanna Publishing, 2018.

Additional Mathematics-I (21MATDIP31)

Semester III			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	00

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Complex V a r i a b l e s :** Definitions and properties. Modulus and amplitude of a complex number, Argand‟s diagram, De-Moivre‟s theorem (without proof). **Vector Algebra:** Scalar and vectors. Addition and subtraction and multiplication of vectors- Dot and Cross products, problems.	**08 Hours**
Module 2	**Differential Calculus**: Review of successive differentiation-illustrative examples. Maclaurin‟s series expansions-Illustrative examples. Partial Differentiation: Euler‟s theorem-problems on first order derivatives only. Total derivatives-differentiation of composite functions. Jacobians of order two-Problems.	**08 Hours**
Module 3	**Vector Differentiation**: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl-simple problems. Solenoidal and irrotational vector fields-Problems.	**08 Hours**
Module 4	**Numerical Methods:** Finite differences. Interpolation/extrapolation using Newton‟s forward and backward difference formulae (Statements only)-problems. Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods (only formulae)-Illustrative examples. Numerical integration: Simpson‟s one third rule and Weddle‟s rule (without proof) Problems.	**08 Hours**
Module 5	**Ordinary differential equations (ODE's)**. Introduction-solutions of first order and first-degree differential equations: exact, linear differential equations. Equations reducible to exact and Bernoulli‟s equation.	**08 Hours**

Course outcomes:

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

- Explain the basic concepts of complex trigonometry, differential calculus and vector differentiation, Numerical methods, Ordinary Differential Equations of first order.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyse the solutions of engineering problems using these concepts.

Reference Books:

1. S C Chapra and R P Canale, *Numerical Methods for Engineering,* 15th Edition, Tata McGraw Hill
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
3. B.S. Grewal, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
4. B.V. Ramana, *Higher Engineering Mathematics*, Latest edition, Tata McGraw Hill.
5. Srimanta Pal & Subodh C. Bhunia: *"Engineering Mathematics"* Oxford University Press, 3rd Reprint, 2016.
6. N.P Bali and Manish Goyal: *"A textbook of Engineering Mathematics"* Laxmi Publications, Latest edition.
7. H.K.Dass and Er. Rajnish Verma: *"Higher Engineering Mathematics"* S.Chand Publication (2014).

Data Structures and Applications (21CD32)

Semester III			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:0:1	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations, Review of Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, dynamically allocated arrays. **Array Operations:** Traversing, inserting, deleting, searching, and sorting. Multidimensional Arrays, Polynomials and Sparse Matrices. **Strings:** Basic Terminology, Storing, Operations and Pattern Matching algorithms. Programming Examples.	**10 Hours**
Module 2	**Stacks:** Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. **Recursion:** Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Ackerman's function. **Queues:** Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Priority Queues, A Mazing Problem. Multiple Stacks and Queues. Programming Examples.	**10 Hours**
Module 3	**Linked Lists**: Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linkedlists. Linked Stacks and Queues. Applications of Linked lists – Polynomials, Sparse matrix representation. Programming Examples	**10 Hours**
Module 4	**Trees:** Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples	**10 Hours**
Module 5	**Graphs:** Definitions, Terminologies, Matrix and Adjacency List Representation of Graphs, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search. **Sorting and Searching:** Insertion Sort, Radix sort, Address Calculation Sort. **Hashing:** Hash Table organizations, Hashing Functions, Static and Dynamic Hashing. **Files and Their Organization:** Data Hierarchy, File Attributes, Text Files and Binary Files, Basic File Operations, File Organizations and Indexing.	**10 Hours**

Sl. No.	List of experiments
1	Design, Develop and Implement a menu driven Program in C for the following array operations. a. Creating an array of N Integer Elements b. Display of array Elements with Suitable Headings c. Inserting an Element (ELEM) at a given valid Position (POS) d. Deleting an Element at a given valid Position (POS) e. Exit. Support the program with functions for each of the above operations.
2	Design, Develop and Implement a Program in C for the following operations on Strings. a. Read a main String (STR), a Pattern String (PAT) and a Replace String (REP) b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR Support the program with functions for each of the above operations. Don't use Built-in functions.
3	Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate how Stack can be used to check Palindrome d. Demonstrate Overflow and Underflow situations on Stack e. Display the status of Stack f. Exit Support the program with appropriate functions for each of the above operations
4	Design, Develop and Implement a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %(Remainder), ^(Power) and alphanumeric operands.
5	Design, Develop and Implement a Program in C for the following Stack Applications a. Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^ b. Solving Tower of Hanoi problem with n disks
6	Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations
7	Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: USN, Name, Branch, Sem, PhNo a. Create a SLL of N Students Data by using front insertion. b. Display the status of SLL and count the number of nodes in it c. Perform Insertion / Deletion at End of SLL d. Perform Insertion / Deletion at Front of SLL(Demonstration of stack) e. Exit

8	Design, Develop and Implement a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo a. Create a DLL of N Employees Data by using end insertion. b. Display the status of DLL and count the number of nodes in it c. Perform Insertion and Deletion at End of DLL d. Perform Insertion and Deletion at Front of DLL e. Demonstrate how this DLL can be used as Double Ended Queue. f. Exit
9	Design, Develop and Implement a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes a. Represent and Evaluate a Polynomial P(x,y,z) = 6x2y2z-4yz5+3x3yz+2xy5z-2xyz3 b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z) Support the program with appropriate functions for each of the above operations
10	Design, Develop and Implement a menu driven Program in C for the following operations on Binary Search Tree (BST) of Integers. a. Create a BST of N Integers: 6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2 b. Traverse the BST in Inorder, Preorder and Post Order c. Search the BST for a given element (KEY) and report the appropriate message d. Exit
11	Design, Develop and Implement a Program in C for the following operations on Graph(G) of Cities a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using DFS/BFS method
12	Given a File of N employee records with a set K of Keys(4-digit) which uniquely determine the records in file F. Assume that file F is maintained in memory by a Hash Table (HT) of m memory locations with L as the set of memory addresses (2-digit) of locations in HT. Let the keys in K and addresses in L are Integers. Design and develop a Program in C that uses Hash mod m (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.

Course outcomes:

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

- Use stack, Queue, Lists, Trees and Graphs in solving real world problems.
- Implement all data structures in a high-level language for problem solving.
- Analyse and compare various linear and non-linear data structures
- Code, debug and demonstrate the working nature of different types of data structures and their applications
- Implement, analyse and evaluate the searching and sorting algorithms.

Reference Books:

1. Ellis Horowitz and SartajSahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2. 2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.
3. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014.
4. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
5. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013
6. A M Tenenbaum, Data Structures using C, PHI, 1989.
7. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

Analog and Digital Electronics (21CD33)

Semester III			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:0:1	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**BJT Biasing:** Introduction, operating point, Fixed-bias configuration, Emitter-bias configuration, Voltage-divider biasing, Collector feedback bias, Emitter follower configuration. Current mirror circuits, Bias stabilization, Application of BJT as Rely Driver, Switch and constant current source.	**10 Hours**
Module 2	**FET Biasing:** Introduction, Fixed-bias configuration, Self-bias configuration, Voltage-divider biasing. **FET Amplifiers:** Introduction, JFET Small signal model, JFET AC equivalent circuit, Fixed- bias configuration, Self-bias configuration with by passed source resistance, Voltage-divider configuration, Source follower configuration.	**10 Hours**
Module 3	**Principles & Design of Combinational Logic:** Theoremsand Properties of Boolean algebra, Boolean Functions,Definition of combinational logic, Canonical forms, Generation of switching equations from Truth Tables, Relevant Problems.	**10 Hours**
Module 4	**Karnaugh maps:** Minimum forms of switching functions,two and three variable Karnaugh maps, four variable karnaugh maps, determination of minimum expressions using essential prime implicants, Quine-McClusky Method: determination of prime implicants. Related Problems. **Logic Circuit Design:** Arithmetic Operation Combinational Circuit, Binary Adder, Binary Subtractor, Binary Parallel Adder, The Look-Ahead-Carry Binary Adders, Binary Multipliers, Binary Dividers, Comparator.	**10 Hours**
Module 5	**Power Amplifiers:** Introduction, Series Fed Class A Amplifier, Transformer-Coupled Class A Amplifier, Class B Amplifier operation. **Class B amplifier circuits:** Transformer-Coupled Push-Pull and Complementary– Symmetry circuits, Amplifier Distortion. **Latches and Flip-Flops:** Set Reset Latch, Gated Latches, Edge-Triggered D Flip Flop 3, SR Flip Flop, J K Flip Flop, T Flip Flop, Flip Flop with additional inputs, Relevant Problems.	**10 Hours**

Sl. No.	List of experiments
1	Study and plot the input and output characterises of CE transistor
2	Study and plot the drain and transfer characteristics of FET
3	Find the Efficiency and ripple factor of full-wave bridge rectifier
4	Study the frequency response of CE amplifier with and without bypass capacitor
5	Simplification, realization of Boolean expressions using logic gates and Universal gates.
6	Operational verification of Flip–Flops: (i) T type (ii) D type and iii) J–K Master slave.
7	Realization of half and full adders, half and full subtractor using logic gates.
8	(a) Realization of parallel adder and parallel subtractor using 7483 chip (b) Demonstration of BCD to Excess–3 code conversion and vice versa.
9	Realization of half and full adders, half and full subtractor using logic gates.

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

- Design and implement a biasing circuit for BJT and FET
- Model the FET amplifier for ac analysis.
- Ability to apply the knowledge of mathematics and science to understand the operation of logic circuits and performance parameters.
- Ability to apply the simplification techniques/methods to optimize and implement the digital functions/circuits.
- Acquire the knowledge of classifications of Power amplifier, operation, and design power amplifier.
- Ability to analyse the given logic circuit based on the knowledge of digital elements.

Reference books:

1. Robert L Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 10th Edition, Pearson Prentice Hall, 2009
2. Charles H. Roth. Jr, Larry L. Kenny, “Fundamentals of Logic Design”, 7th edition, Cengage Learning, ISBN: 978-1133628477.
3. Morris Mano, Digital Logic and Computer Design, Pearson, 2016, ISBN: 9789332542525.
4. Charles H Roth and Larry L Kinney and Raghunandan., G H Analog and Digital Electronics, Cengage Learning,2019.

Computer Organization (21CD34)

Semester III			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Basic Structure of Computers:** Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement. **Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions	**08 Hours**
Module 2	**Input/Output Organization:** Accessing I/O Devices, Interrupts – Interrupt Hardware, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB.	**08 Hours**
Module 3	**Memory System:** Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations.	**08 Hours**
Module 4	**Arithmetic:** Numbers, Arithmetic Operations and Characters, Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division.	**08 Hours**
Module 5	**Basic Processing Unit:** Some Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control, Micro programmed Control. Pipelining: Basic concepts of pipelining.	**08 Hours**

Course Outcome:

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

- Explain the basic organization of a computer system.
- Demonstrate functioning of different sub systems, such as processor, Input/output, and memory.
- Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems.
- Design and analyse simple arithmetic and logical units.

Reference Books:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, 5th Edition, Tata McGraw Hill, 2002.
2. William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2015.R. S. Sedha, “A Text book of Applied Electronics,” 7th Edition, S. Chand and Company Ltd., 2011.

Software Engineering (21CD35)

Semester III			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Software Crisis, Need for SoftwareEngineering. Professional Software Development, Software Engineering Ethics. Case Studies. Software Processes: Models: Waterfall Model, Incremental Model and Spiral Model. Process activities. **Requirements Engineering:** Requirements Engineering Processes, Requirements Elicitation and Analysis. Functional and non-functional requirements. The software Requirements Document. Requirements Specification. Requirements validation. Requirements Management.	**08 Hours**
Module 2	What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. **Introduction, Modelling Concepts and Class Modelling:** What is Object orientation? What is OO development? OO Themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design technique: Modelling; abstraction; The Three models. Class Modelling: Object and Class Concept; Link and associations concepts; Generalization and Inheritance; A sample class model; Navigation of class models;	**08 Hours**
Module 3	**System Models:** Context models. Interaction models. Structural models. Behavioral models, Model-driven engineering. **Design and Implementation:** Introduction to RUP, Design Principles. Object-oriented design using the UML. Design patterns. Implementation issues. Open-source development.	**08 Hours**
Module 4	**Software Testing:** Development testing, Test-driven development, Release testing, User testing. Test Automation. **Software Evolution:** Evolution processes. Program evolution dynamics. Software maintenance. Legacy system management.	**08 Hours**
Module 5	**Project Planning:** Software pricing. Plan-driven development. Project scheduling: Estimation techniques. **Quality management:** Software quality. Reviews and inspections. Software measurement and metrics. Software standards	**08 Hours**

Course outcomes:

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

- Design a software system, component, or process to meet desired needs within realistic constraints.
- Assess professional and ethical responsibility
- Function on multi-disciplinary teams
- Use the techniques, skills, and modern engineering tools necessary for engineering practice
- Analyse, design, implement, verify, validate, implement, apply, and maintain software systems or parts of software systems.

Reference Books:

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education, 2012.
2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML,2nd Edition, Pearson Education,2005.
3. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.
4. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.

Discrete Mathematical Structures (21CD36)

Semester III			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Sets:** Set basics, Venn diagrams, Union, intersection, set difference, complement, Cartesian product, Power sets, Cardinality of finite sets. **Relation:** Reflexivity, symmetry, antisymmetry, transitivity, Equivalence relations, partial orders. **Function:** Domain, target, and range/image of a function, surjection, injections, bijections, inverses, composition.	**08 Hours**
Module 2	**Basic Logic:** Propositional logic, Logical connectives, Truth tables, Disjunctive normal form, Validity of a well-formed formula, Propositional inference rules, Universal and existential quantifiers and their negations. **Proof Techniques:** Proof by Induction.	**08 Hours**
Module 3	**Counting:** The basics of counting, the pigeonhole principle, permutations and combinations, recurrence relations, solving recurrence relations, generating functions, inclusion-exclusion principle and application of inclusion-exclusion, Basic modular arithmetic.	**08 Hours**
Module 4	**Discrete Probability:** Finite probability space, events, Properties of events, Conditional probability, Bayes‟ theorem, Independence. **Statistical Distribution:** Discrete Distribution, Binomial distribution, Gamma distribution, Beta distribution, Chi-square distribution, Univariate normal distribution.	**08 Hours**
Module 5	**Group theory**: Groups, subgroups, generators and evaluationof powers, cosets and Lagrange's theorem, permutation groups and Burnside's theorem, isomorphism, automorphisms, homomorphism, monoids, concepts of rings, fields. Introduction to vector space.	**08 Hours**

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

- Perform the operations associated with sets, functions, and relations.
- Convert logical statements from informal language to propositional (and quantified) logic expressions.
- Use the rules of inference to construct proofs in propositional logic.
- Identify the proof technique used in a given proof.
- Apply each of the proof techniques correctly in the construction of a sound argument.

- Make a probabilistic inference in a real-world problem using Bayes‟ theorem to determine the probability of a hypothesis given evidence.
- Model a variety of real-world problems in computer science using appropriate forms of graphs and trees, such as representing a network topology or the organization of a hierarchical file system.

Reference Books:

1. Edgar Goodaire and Michael Parmenter, Discrete Mathematics with Graph Theory, Third Edition, PHI, ISBN-13-9750131679955.
2. S. Lipschutz, Discreate Mathematics, TMH, ISBN 0-07-066932-0
3. Bernard Kolman C,Busby and Sharon Ross, Discrete Mathematical Structures, 2007, ISBN - 81-203-2082-4, Publication PHI.
4. Rosen, K.H., Discrete Mathematics and its Applications, 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.

Environmental Studies (21CIV37)

Semester III (Common to all branches)			
No. of Lecture hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	00
Total No. of Lecture hours	16	**Exam Hours**	00
L: T:P	1:0:0	**Credits**	01

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Environment - Components of Environment **Ecosystem:** Types & Structure of Ecosystem, Balanced ecosystem Human Activities – Food, Shelter, And Economic & Social Security. **Impacts:** Impacts of Agriculture & Housing Impacts of Industry, Mining & Transportation Environmental Impact Assessment, Sustainable Development.	**03 Hours**
Module 2	**Natural Resources, Water resources** – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water Mineral resources, Forest Wealth Material Cycles – Carbon Cycle, Nitrogen Cycle & Sulphur Cycle. **Energy** – Different types of energy, Conventional sources & non-conventional sources of energy Solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy.	**04 Hours**
Module 3	**Environmental Pollution** – Water Pollution, Noise pollution, Land Pollution, Public Health Aspects. **Global Environmental Issues:** Population Growth, Urbanization, Land Management, Water & Waste Water Management	**03 Hours**
Module 4	**Air Pollution & Automobile Pollution:** Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, controlling measures. **Solid Waste Management,** E –Source, Segregation, Transportation, and Waste Treatment and Management &Biomedical Waste Management - Sources, Characteristics & Disposal methods.	**03 Hours**
Module 5	Applications of GIS & Remote Sensing and Smart Technologies in Environmental Engineering Practices. **Environmental Legislations**: Acts, Rules& Regulations,Role of government, Legal aspects, Role of Nongovernmental Organizations (NGOs), Environmental Education & Women Education.	**03 Hours**

Course outcomes:

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

- Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale,
- Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment,

- Demonstrate ecology knowledge of a complex relationship between biotic and abiotic components
- Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.
- Build inquisitiveness to protect environment through societal interventions.

Reference Books:

1. Benny Joseph (2005), "Environmental Studies", Tata McGraw – Hill Publishing Company Limited.
2. R.J.Ranjit Daniels and Jagadish Krishnaswamy, (2009), "Environmental Studies", Wiley India Private Ltd., New Delhi.
3. R Rajagopalan, "Environmental Studies – From Crisis to Cure", Oxford University Press, 2005,
4. Aloka Debi, "Environmental Science and Engineering", Universities Press (India) Pvt. Ltd. 2012.
5. Raman Sivakumar, "Principals of Environmental Science and Engineering", Second Edition, Cengage learning Singapore, 2005
6. P. Meenakshi, "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi, 2006
7. S.M. Prakash, "Environmental Studies", Elite Publishers Mangalore, 2007
8. Erach Bharucha, "Text Book of Environmental Studies", for UGC, University press, 2005
9. G.Tyler Miller Jr., "Environmental Science – working with the Earth", Tenth Edition, Thomson Brooks /Cole, 2004
10. G.Tyler Miller Jr., "Environmental Science – working with the Earth", Eleventh Edition, Thomson Brooks /Cole, 2006
11. Dr.Pratiba Sing, Dr.AnoopSingh and Dr.Piyush Malaviya, "Text Book of Environmental and Ecology", Acme Learning Pvt. Ltd. New Delhi.

UNIVERSAL HUMAN VALUE & PROFESSIONAL ETHICS (21UHV38)

Semester III (Common to all branches)			
No. of Lecture hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	00
Total No. of Lecture hours	16	**Exam Hours**	00
L: T:P	1:0:0	**Credits**	01

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Value Education:** Right Understanding, Relationship and Physical Facility (Holistic Development andthe Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations	**03 Hours**
Module 2	**Harmony in the Human Being:** Understanding Human being as the Co-existence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health	**03 Hours**
Module 3	**Harmony in the Family and Society:** Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order	**03 Hours**
Module 4	**Harmony in the Nature/Existence:** Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence	**03 Hours**
Module 5	**Implications of the Holistic Understanding – a Look at Professional Ethics:** Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession	**04 Hours**

Course outcomes:

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

- Holistic vision of life.
- Socially responsible behaviour and environmentally responsible work.
- Ethical human conduct.
- Having Competence and Capabilities for Maintaining Health and Hygiene.

- Appreciation and aspiration for excellence (merit) and gratitude for all.

Reference Books:

1. R R Gaur, R Asthana, G P Bagaria, The Textbook “A Foundation Course in Human Values and Professional Ethics”, 2ndRevised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 447-1 b.
2. R R Gaur, R Asthana , The Teacher‟s Manual for “A Foundation Course in Human Values and Professional Ethics”.

Engineering Mathematics-IV (21MAT41)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Calculus of complex functions:** Review of function of a complex variables, limits, continuity, and differentiability. Analytic functions: Cauchy-Riemann equations in Cartesian and polar forms and consequences. **Construction of analytic functions:** Milne-Thomson method- Problems.	**08 Hours**
Module 2	**Conformal transformations:** Introduction. Discussion of transformations: $w = z^2$, $w = e^z$, $w = z + \frac{1}{z}(z \neq 0)$. Bilinear transformations- Problems. **Complex integration:** Line integral of a complex function- Cauchy"s theorem and Cauchy"s integral formula and problems.	**08 Hours**
Module 3	**Numerical Solutions of Ordinary Differential Equations (ODE's):** Numerical solution of ODE"s of first order and first degree- Taylor"s series method, Modified Euler"s method. Runge -Kutta method of fourth order, Milne"s predictor and corrector method (No derivations of formulae)-Problems. Numerical Solution of Second Order ODE"s - Runge-Kutta method and Milne"s predictor and corrector method. (No derivations of formulae).	**08 Hours**
Module 4	**Probability Distributions:** Review of basic probabilitytheory. Random variables (discrete and continuous), probability mass/density functions. Binomial, Poisson, exponential and normal distributions- problems (No derivation for mean and standard deviation)-Illustrative examples.	**08 Hours**
Module 5	**Joint probability distribution:** Joint Probability distribution for two discrete random variables, expectation and covariance. **Sampling Theory:** Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for means, student"s t-distribution, Chi-square distribution as a test of goodness of fit.	**08 Hours**

Course outcomes:

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

- Explain the concepts of integral calculus, Higher order differential equations, Laplace transforms, Probability and Linear Algebra.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyse the solutions of engineering problems using these concepts.

Reference Books

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2016
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017
3. Srimanta Pal et al , Engineering Mathematics, Oxford University Press, 3rd Edition, 2016.
4. C.Ray Wylie, Louis C.Barrett , Advanced Engineering Mathematics, McGraw-Hill Book Co, 6th Edition, 1995
5. S.S.Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India, 4th Edition 2010
6. B.V.Ramana, Higher Engineering Mathematics, McGraw-Hill, 11th Edition,2010
7. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, 6th Edition, 2014.

Additional Mathematics-II (21MATDIP41)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:1:0	**Credits**	00

Modules	Course Content	Teaching Hours
Module 1	**Integral Calculus**: Review of elementary integralcalculus. Reduction formulae for $sin^n x$, $cos^n x$ (with proof) and $sin^m x cos^n x$ (without proof) and evaluation of these with standard limits-Examples. Double integrals- Simple examples. Beta and Gamma functions- Simple problems	**08 Hours**
Module 2	**Higher order ODE's:** Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators. [Particular Integral restricted to$R(x) = e^{ax}$, $\sin ax$ / $\cos ax$for$f(D)y = R(x)$].	**08 Hours**
Module 3	**Laplace Transform:** Definition and Laplace transforms of elementary functions (statements only)-problems. Inverse Laplace Transform: Inverse Laplace transforms by method of partial fractions, Convolution theorem to find the inverse Laplace transforms. Solution of linear differential equations using Laplace transforms.	**08 Hours**
Module 4	**Introduction to Probability:** Introduction. Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability, Bayes"s theorem, problems.	**08 Hours**
Module 5	**Linear Algebra:** Introduction - rank of matrix by elementary row operations - Echelon form. Consistency of system of linear equations - Gauss elimination method. Eigen values and Eigen vectors of a square matrix. Problems.	**08 Hours**

Course outcomes:

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

- Explain the concepts of integral calculus, Higher order differential equations, Laplace transforms, Probability and Linear Algebra.
- Apply the above concepts of the syllabus in their respective branches of engineering.
- Analyse the solutions of engineering problems using these concepts.

Reference Books:

1. Erwin Kreyszig, *Advanced Engineering Mathematics*, Latest edition, Wiley Publications.
2. B.S. Grewal, *Higher Engineering Mathematics*, Latest edition, Khanna Publishers.
3. B.V. Ramana, *Higher Engineering Mathematics*, Latest edition, Tata McGraw Hill.
4. Srimanta Pal & Subodh C. Bhunia: *"Engineering Mathematics"* Oxford University Press, 3rd Reprint, 2016.
5. N.P Bali and Manish Goyal: *"A textbook of Engineering Mathematics"* Laxmi Publications, Latest edition.
6. H.K.Dass and Er. Rajnish Verma: *"Higher Engineering Mathematics"* S.Chand Publication (2014).

Design and Analysis of Algorithms (21CD42)

Semester IV			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:0:1	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Introduction to** Algorithm, Algorithm Specification, Analysis Framework, Performance Analysis: Space complexity, Time complexity. Asymptotic Notations: Mathematical analysis of non-recursive and recursive Algorithms with Examples. Important Problem Types: Sorting, Searching, String processing, Graph Problems, Combinatorial Problems. **Fundamental Data Structures:** Stacks, Queues, Graphs, Trees, Sets and Dictionaries.	**10 Hours**
Module 2	**Divide and Conquer:** General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum, Merge sort, Quick sort, Strassen‟s matrix multiplication, Advantages and Disadvantages ofdivide and conquer. Decrease and Conquer Approach: Topological Sort.	**10 Hours**
Module 3	**Greedy Method:** General method, Coin Change Problem, Knapsack Problem, Job sequencing with deadlines. Minimum cost spanning trees: Prim‟s Algorithm, Kruskal‟s Algorithm. Single source shortest paths: Dijkstra's Algorithm. Optimal Tree problem: Huffman Trees and Codes. Transform and Conquer Approach: Heaps and Heap Sort.	**10 Hours**
Module 4	**Dynamic Programming:** General method with Examples, Multistage Graphs. Transitive Closure: Warshall‟s Algorithm, All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem, Bellman-Ford Algorithm, Travelling Sales Person problem, Reliability design.	**10 Hours**
Module 5	**Backtracking:** General method, N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles. Branch and Bound: Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem: LC Branch and Bound solution, FIFO Branch and Bound solution. NP- Complete and NP-Hard problems: Basic concepts, nondeterministic algorithms, P, NP, NP-Complete, and NP-Hard classes.	**10 Hours**

Sl. No.	List of experiments
1	a. Create a Java class called ***Student*** with the following details as variables within it. (i) USN (ii) Name (iii) Branch (iv) Phone Write a Java program to create *n Student* objects and print the USN, Name, Branch, and Phone of these objects with suitable headings. b. Write a Java program to implement the Stack using arrays. Write Push(), Pop(), and Display() methods to demonstrate its working.
2	***a.***Design a superclass called ***Staff*** with details as StaffId, Name, Phone, Salary. Extend this class by writing three subclasses namely ***Teaching*** (domain, publications), ***Technical*** (skills), and ***Contract*** (period). Write a Java program to read and display at least 3 *staff* objects of all three categories. b. Write a Java class called ***Customer*** to store their name and date_of_birth. The date_of_birth format should be dd/mm/yyyy. Write methods to read customer data as <name, dd/mm/yyyy> and display as <name, dd, mm, yyyy> using StringTokenizer class considering the delimiter character as "/".
3	a. Write a Java program to read two integers *a*and*b*. Compute *a*/*b* and print, when *b* is not zero. Raise an exception when *b* is equal to zero. b. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square ofthe number and prints; third thread will print the value of cube of the number.
4	Sort a given set of ***n*** integer elements using **Quick Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000 and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
5	Sort a given set of ***n*** integer elements using **Merge Sort** method and compute its time complexity. Run the program for varied values of *n*> 5000, and record the time taken to sort. Plot a graph of the time taken versus ***n***on graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using Java how the divide-and-conquer method works along with its time complexity analysis: worst case,average case and best case.
6	Implement in Java, the **0/1 Knapsack** problem using (a) Dynamic Programming method (b) Greedy method.
7	From a given vertex in a weighted connected graph, find shortest paths to other vertices using **Dijkstra's algorithm**. Write the program in Java.
8	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Kruskal'salgorithm.** Use Union-Find algorithms in your program
9	Find Minimum Cost Spanning Tree of a given connected undirected graph using **Prim's algorithm**..
10	Write Java programs to (a) Implement All-Pairs Shortest Paths problem using **Floyd's algorithm**. (b) Implement **Travelling Sales Person problem** using Dynamic programming.

11	Design and implement in Java to find a **subset** of a given set **S** = {Sl, S2,.... ,Sn} of ***n*** positive integers whose SUM is equal to a given positive integer ***d***. For example, if S ={1, 2,5, 6, 8} and ***d***= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.
12	Design and implement in Java to find all **Hamiltonian Cycles** in a connected undirected Graph G of *n* vertices using backtracking principle.

Course Outcome:

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

- Describe computational solution to well-known problems like searching, sorting etc.
- Estimate the computational complexity of different algorithms.
- Devise an algorithm using appropriate design techniques (brute-force, greedy, dynamic programming, backtracking) for problem solving.
- Implement a variety of algorithms such as sorting, graph related, combinatorial, etc., in a high-level language to solve real-world problems.
- Analyse and compare the performance of algorithms using language features.

Reference Books:

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 2rd Edition, 2009. Pearson.
2. Ellis Horowitz, Satraj Sahni and Rajasekaran, Computer Algorithms/C++, 2nd Edition, 2014, Universities Press.
3. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, Introduction to Algorithms, 3rd Edition, PHI.
4. S. Sridhar, Design and Analysis of Algorithms, Oxford (Higher Education).

Operating System (21CD43)

Semester IV			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T:P	3:0:1	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Introduction to operating systems, System structures:** What operating systems do; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and Security; Distributed system; Special-purpose systems; Computing environments. Operating System Services; User - Operating System interface; System calls; Types of system calls; System programs; Operating system design and implementation; Operating System structure; Virtual machines; Operating System generation; System boot. **Process Management:** Process concept, Process scheduling; Operations on processes; Inter process communication	**10 Hours**
Module 2	**Multi-threaded Programming:** Overview; Multithreading models; Thread Libraries; Threading issues. Process Scheduling: Basic concepts; Scheduling Criteria; Scheduling Algorithms; Multiple-processor scheduling; Thread scheduling. Process Synchronization: Synchronization: The critical section problem; Peterson‟s solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.	**10 Hours**
Module 3	**Deadlocks:** Deadlocks; System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.Memory Management: Memory management strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation.	**10 Hours**
Module 4	**Virtual Memory Management:** Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. File System, Implementation of File System: File system: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection: Implementing File system: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management.	**10 Hours**
Module 5	**Secondary Storage Structures, Protection:** Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability- Based systems. Case Study: The Linux Operating System: Linux history; Design principles; Kernel modules; Process management; Scheduling; Memory Management; File systems, Input and output; Inter-process communication.	**10 Hours**

Sl.	List of Experiments

No	
1	Simulate the following CPU scheduling algorithms: a) FCFS b) SJF c)Round Robin d)Priority
2	Simulate the following Memory management Techniques a) Multi Programming with Fixed Number of Tasks (MFT) b) Multi Programming with Variable Number of Tasks (MVT)
3	Write a C program to stimulate the following contiguous memory allocation techniques a) Worst-fit b) Best fit c) First fit
4	Simulate Paging Technique of memory management
5	Simulate following page replacement Algorithms a) FIFO b) LRU c) LFU
6	Simulate Producer-Consumer Problem Using Semaphores
7	Write a C program to simulate the concept of Dining-Philosophers problem.
8	Write a C program to stimulate the disk scheduling algorithms. a) FCFS b) SCAN c) C-SCAN
9	Simulate Bankers Algorithm for Deadlock Avoidance
10	Simulate the file allocation strategies: a) Sequential b) Indexed c) Linked
11	Simulate all File Organization techniques a) Single level directory b) Two level c) Hierarchical

Course Outcome:

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

- Demonstrate need for OS and different types of OS
- Apply suitable techniques for management of different resources
- Realize the different concepts of OS in platform of usage through case studies
- Design and solve synchronization problems.
- Simulate and implement operating system concepts such as scheduling, deadlock management, file management, and memory management.

Reference Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles 7th edition, Wiley-India, 2006.
2. Ann McHoes Ida M Fylnn, Understanding Operating System, Cengage Learning, 6th Edition
3. D.M Dhamdhere, Operating Systems: A Concept Based Approach 3rd Ed, McGraw-Hill, 2013.
4. P.C.P. Bhatt, An Introduction to Operating Systems: Concepts and Practice 4th Edition, PHI(EEE), 2014.
5. William Stallings Operating Systems: Internals and Design Principles, 6th Edition, Pearson.

Data Communication (21CD44)

Semester IV			
No. of Lecture hour/Week	3	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	3:0:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Data Communications, Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Introduction to Physical Layer-1: Data and Signals, Digital Signals, Transmission Impairment, Data Rate limits, Performance. SLE: Internet History, Standards and Administration	**08 Hours**
Module 2	**Digital Transmission:** Digital to digital conversion: Line coding- Polar, Bipolar, Manchester coding, AMI, Pseudo ternary, Physical Layer-2: Analog to digital conversion, Pulse Code Modulation, Delta Modulation, Transmission Modes, Analog Transmission: Digital to analog conversion. SLE: Bandwidth Utilization: Multiplexing	**08 Hours**
Module 3	**Transmission Media:** Introduction, Guided Media: Twisted Pair Cable, Coaxial Cable, Fiber Optics Cable, switching: Introduction, Circuit Switched Networks and Packet switching, Data Link Layer: Error Detection and Correction: Introduction, Block Coding, Cyclic Code. SLE: Checksum	**08 Hours**
Module 4	**Data link control:** DLC Services: Framing, Flow Control, Error Control, Connectionless and Connection Oriented, Data link layer protocols, High Level Data Link Control (HDLC), Media Access control: Random Access, Controlled Access. SLE: Channelization	**08 Hours**
Module 5	**Introduction to Network Layer:** Network Layer Services, Packet Switching, Network Layer Performance, IPv4 Addresses. SLE: IPv6	**08 Hours**

Course Outcome:

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

- Explain the fundamentals of data communication.
- Illustrate the techniques for digital transmission and bandwidth utilization using various transmission media.
- Analyse the principles of protocol layering in modern communication systems.
- Demonstrate the working of physical, data link and network layer services using simulation tools such as Cisco packet tracer, Wireshark and so on (Additional CO).

Reference Books:

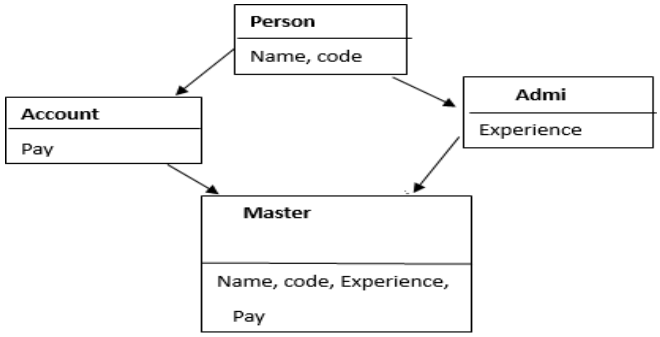
1. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2019
2. Nader F. Mir: Computer and Communication Networks, 2nd Edition, Pearson Education, 2015
3. William Stallings, Data and Computer Communication 10th Edition, Pearson Education, Inc., 2014

Programming in C++ (21CD45)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:0:1	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction to C++:** Introduction to Procedure-oriented programming vs. object-oriented programming, concepts of object-oriented programming. Overview of C++, Sample C++ program, Different data types, operators, expressions, and statements, arrays and strings, pointers & user-defined types Function Components,argument passing, inline functions, function overloading, recursive functions.	**08 Hours**
Module 2	**Classes, Objects and Polymorphism:** Class Specification, Class Objects, Scope resolution operator, Access members, Defining member functions, Data hiding, Constructors, Destructors, Static data members and functions. Constant data members and functions, mutable data members. Friend functions, Passing objects as arguments, Returning objects, Arrays of objects, Dynamic objects, Pointers to objects, Generic functions and classes, Operator overloading and their applications such as +, - , pre-increment, post-increment, [ ] etc.	**08 Hours**
Module 3	**Inheritance:** Introduction to Inheritance, Different types of Inheritances, Inheritance and protected members, protected base class inheritance, Constructors and Destructors in Inheritance, Granting access, Virtual base classes.	**08 Hours**
Module 4	**Run-time polymorphism and Exception handling:** Virtual functions and Polymorphism: Introduction to Virtualfunctions, calling a Virtual function through a base class reference, Inheritance of virtual attributes, Hierarchy of virtualfunctions, Pure virtual functions and Abstract classes, Early and late binding. **Exception Handling:** Exception handling fundamentals, Catching Class Types, Using Multiple catch Statements, Handling Derived-Class Exceptions, Exception handling options: Catching All Exceptions, Restricting Exceptions & Re-throwing an Exception, user defined exceptions, Applying Exception Handling.	**08 Hours**
Module 5	**I/O System Basics and Standard template library:** I/O System Basics: The C++ I/O system basics: C++ stream classes, Formatted I/O, I/O manipulators; C++ file I/O: fstream and the File classes, File operations. STL: An overview, the container classes, general theory of operations, vectors, lists, maps.	**08 Hours**

Sl.	Experiments

No.	
1	Write a function using reference variables as arguments to swap the values of pair of integers.
2	Write a program to perform the addition of two complex numbers using friend function (use constructor function to initialize data members of complex class).
3	Given that an EMPLOYEE class contains following members: data members: Employee number, Employee name, Basic, DA, IT, Net Salary and print data members.
4	Write a C++ program to display names, roll no and grades of 3 students appeared in the examination. Declare the class containing the name, roll no and grade.
5	Define a class string and overload == to compare two strings and + operator for concatenation two strings.
6	Write a program to perform matrix addition using operator overloading concept.
7	Write a program to compute square root of a number. The input value must be tested for validity. If it is negative, the user defined function my_sqrt() should raise an exception.
8	Consider the class network diagram of Figure 1. Define all the four classes and write a program to create, update and display the information contained in Master objects.  Figure 1
9	Create a class called STACK which represents one dimensional numeric array. Implement operations on the stack using integer and double data types. Use exception handling mechanism to handle overflow and underflow exceptions.
10	Write a C++ program to perform the following operations a) Read from the File b) Write into a File c) Copy contents from one file to another

Course Outcomes:

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

- Understand the features of C++ supporting object-oriented programming.
- Understand the relative merits of C++ as an object-oriented programming language.
- Understand how to apply the major object-oriented concepts to implement object-oriented programs in C++, encapsulation, inheritance and polymorphism.
- Understand advanced features of C++ specifically stream I/O, templates and operator overloading.
- Develop applications for a range of problems using object-oriented programming techniques using C++.

Reference Books:

1. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.
2. Stanley B.Lippmann, JoseeLajore: C++ Primer, 4th Edition, Pearson Education, 2005.
3. E Balagurusamy: Object Oriented Programming with C++, 7th Edition, Tata Mcgraw Hill Education, 2017
4. Paul J Deitel, Harvey M Deitel: C++ for Programmers, Pearson Education, 2009.
5. K R Venugopal, RajkumarBuyya, T Ravi Shankar: Mastering C++, Tata McGraw Hill, 2017
6. Yashavant P. Kanetkar: Let Us C++, 2nd Edition, BPB Publications.

Graph Algorithms (21CD46)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:0:1	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Graph Theory:** Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits.	**08 Hours**
Module 2	**Introduction to Graph Theory contd.:** Planar Graphs, Hamilton Paths and Cycles, Graph Colouring, and Chromatic Polynomials	**08 Hours**
Module 3	**Trees:** Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes	**08 Hours**
Module 4	**Optimization and Matching:** Dijkstra‟s Shortest Path Algorithm, Minimal Spanning Trees - The algorithms of Kruskal and Prim, Transport Networks - Max-flow, Min-cut Theorem, Matching Theory	**08 Hours**
Module 5	**The Principle of Inclusion and Exclusion:** The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements - Nothing is in its Right Place, Rook Polynomials.	**08 Hours**

Sl. No.	List of Experiments
1	Obtain the Topological ordering of vertices in a given digraph.
2	Compute the transitive closure of a given directed graph using Warshall's algorithm.
3	From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra‟s algorithm
4	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm
5	Print all the nodes reachable from a given starting node in a digraph using BFS method.
6	Check whether a given graph is connected or not using DFS method.
7	Find Minimum Cost Spanning Tree of a given undirected graph using Prim‟s algorithm
8	Find a subset of a given set S = {sl, s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1,2,6} and {1,8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.
9	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using OpenMP and determine the speed-up achieved.

Course Outcomes:

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

- Explain what a graph is and how it is used.
- Learn how to use algorithms to explore graphs, compute shortest distance, min spanning tree, and connected components.
- Implement a variety of algorithms such as topological sorting, prims, kruskals and Dijkstra's etc., in a high-level language to solve real-world problems.
- Implement the transitive closure of a directed graph using Warshall's algorithm.
- Analyse and differentiate DFS and BFS, prims and kruskals through high level programming languages.
- Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.

Reference Books:

1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Edition, Pearson Education, 2004.
2. D.S. Chandrasekharaiah: Graph Theory and Combinatorics, Prism, 2020.
3. Chartrand Zhang: Introduction to Graph Theory, TMH, 2006.
4. Richard A. Brualdi: Introductory Combinatorics, 6th Edition, Pearson Education, 2018.
5. Geir Agnarsson & Raymond Geenlaw: Graph Theory, Pearson Education, 2018.

CONSTITUTION OF INDIA, PROFESSIONAL ETHICS & CYBER LAW (21CPH47)

Semester IV (Common to all branches)			
No. of Lecture hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	00
Total No. of Lecture hours	16	**Exam Hours**	00
L: T:P	1:0:0	**Credits**	01

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Indian Constitution:** Definition ofConstitution, Necessity of the Constitution, Societies before and after the Constitution adoption. Introduction to the Indian constitution, Making of the Constitution, Role of the ConstituentAssembly. Preamble of Indian Constitution & Key concepts of the Preamble. Salient features of India Constitution.	03 Hours
Module 2	**Fundamental Rights (FR's), Directive Principles of State Policy (DPSP's) and Fundamental Duties (FD's):**Fundamental Rights and its Restriction and limitations in different Complex Situations. DPSP"s and its present relevance in Indian society. Fundamental Duties and its Scope and significance in Nation building.	03 Hours
Module 3	**Union Executive:** Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.	03 Hours
Module 4	**State Executive & Elections, Amendments and Emergency Provisions:** State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (Why and How) and Important Constitutional Amendments till today. Emergency Provisions.	03 Hours
Module 5	**Professional Ethics:** Definition of Ethics & Values. Professional & Engineering Ethics. Positive and Negative aspects of Engineering Ethics. **Cyber Laws:** Salient features of the IT Act, 2000, various authorities under IT Act and their powers. ; Penalties & Offences, amendments. **Computer & Cyber Security:** (a) Types of Attacks, (b) Network Security (c) Overview of Security threats, (d) Hacking Techniques, (e) Password cracking (f) Insecure Network connections, (g) Malicious code (h) Concept of Fire wall Security	04 Hours

Course Outcomes:

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

- Have constitutional knowledge and legal literacy.

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- Understand Engineering and Professional ethics and responsibilities of Engineers.
- Understand cyber threats & cyber laws, acts and their powers.

Reference Books:

1. Shubham Singla, „Constitution of India, Professional Ethics & Human Rights", CENGAGE Publications 2018.
2. Cyber Law & Cyber Crimes by Advocate Prashant Mali; Snow White publications, Mumbai.
3. Cyber Law in India by Farooq Ahmad; Pioneer Books.

ABILITY ENHANCEMENT COURSE II (21AEC48)

Semester IV (Common to all branches)			
No. of Lecture hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	0	**SEE Marks**	00
Total No. of Lecture hours	16	**Exam Hours**	00
L: T:P	1:0:0	**Credits**	01

Modules	Course Content	Teaching Hours
Module 1	**Technical Report Writing:** Introduction to Technical writing process, Understanding of writing process, Introduction to various Technical Report writing.	**03 Hours**
Module 2	**Art of condensation and Paragraph Writing:** Introduction and importance, Types and principles of condensation. Importance of paragraph writing, Features and its construction styles.	**03 Hours**
Module 3	**Business Report Writing:** Introduction, Definition and Salient features of Business reports. Significance and types of report writing. (Formal and Informal). Resume building and Types of resumes. (Samples of resumes)	**03 Hours**
Module 4	**Technical Articles and Proposals:** Nature and significance, Types of technical Articles Journal articles and conference papers. Elements of technical articles. Introduction to technical proposal writing, Purpose, importance, structure and types of technical proposals.	**04 Hours**
Module 5	**Social media posts and Blog Writing:** Ethics and practices of social media posts, Principles and fundamentals, Guiding principles for composition of articles, some common pitfalls. Maintaining common etiquette. Blogs and Blog writings strategies.	**03 Hours**

Course Outcomes:

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

- Effectively communicate in technical matters.
- Practice preparation of gist, abstract and notes from a technical article.
- Prepare a business proposals and reports.
- Write and respond in social media and write blogs.

Reference Books:

1. Sanjay Kumar and Pushpalata, „Communication Skills", Oxford University Press. 2018.
2. M. Ashraf Rizvi, „Effective Technical Communication", McGraw Hill, 2018.
3. Gajendra Singh Chauhan and et.al. „Technical Communication", Cengage Publication, 2018.
4. Meenakshi Raman and Sangeeta Sharma, Technical Communication Principles and Practice, Oxford University Press, 2018.

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