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 CIVIL ENVIRONMENTAL ENGINEERING

Outcome Based Education (OBE)

and

Choice Based Credit System (CBCS)

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and

Choice Based Credit System (CBCS)

DIRECTOR
Mysore University
School of Engineering
Manasagangotri, Mysuru

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

Mysore University School of Engineering
ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
ಎಂಜಿನಿಯರಿಂಗ್ ಶಾಲೆ

University of Mysore
Mysore University School of Engineering
Manasagangotri, Mysuru – 570 006
Mob:9845155757; email: doddi43@gmail.com

Prof. B. Shankar
Chairman, BoS in Civil Environmental Engineering

No. MUSE/ /2022-23 /2301 Dated 13 Sept. 2022

To
The Registrar,
(Syndicate Section)
University of Mysore
Crawford Hall
Mysuru

Sir,

Sub: **Proceeding** of **BoS in Civil Environmental Engineering-reg**
Ref: No UA2 /134/2021-22 dated 08-09-2022

With reference to the above subject, I am herewith enclosing the **Proceeding of Board of Studies in BoS in Civil Environmental Engineering** 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,

(Prof. B. Shankar)
Chairman
BoS in Civil Environmental Engineering
MYSORE UNIVERSITY
SCHOOL OF ENGINEERING
MANASAGANGOTRI
MYSURU-06

CC to: The Dy. Registrar, Academic, University of Mysore, Mysore

CHAIRPERSON
BOS IN C E E
M U S E
M G M - 06

Proceeding of the Board of Studies in Civil Environmental Engineering 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. B. Shankar,	Chairman
2.	Prof. Ananthapadmanabha T	Member
3.	Prof. Nagaraj M K	Member
4.	Prof. Naveen G M	Member
5.	Dr. Punith B. Kotagi	Member
6.	Prof. Manoj Kumar B	Member
7.	Prof. Sadhashiva Murthy B M	Member
8.	Prof. Anjaneyappa	Member

Members Absent

1.	Dr. Asha G	Member

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

Agenda 1: Scheme from III to VIII Semesters for B.E. in Civil Environmental Engineering.

The Chairman explained that the Scheme has been framed on the lines of guidelines of AICTE/VTU and within the framework of NEP – 2020 from III to VIII. 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.Civil Environmental Engineering from III Semester to VIII Semester within the ambit of 160 credits for the entire B.E. course. The Scheme is enclosed in the **Annexure I**.

Agenda 2: Syllabus for III and IV semesters B.E. Civil Environmental Engineering

The Members of the Board has examined, discussed and approved the Syllabus for III and IV semester B.E. Civil Environmental Engineering Course. The Syllabus is enclosed in the **Annexure II.**

Agenda 3: Regulations Governing the B.E Courses of Mysore University School of Engineering.

The Board has examined and discussed the draft Regulations Governing the B.E Courses of Mysore University School of Engineering(MUSE). The members of the Board taken note of VTU's implementation of NEP 2020. The Board also examined AICTE's letter dated 06.07.2022 for implementation of Credit Framework for the Movement from Professional/Vocational Education to Engineering and Technology and approve to incorporate the credit framework. The Board approved Regulations which governs B.E. courses of MUSE, UoM and enclosed in the **Annexure III.**

13/9/22

CHAIRPERSON
BOS IN C E E
M U S E
M G M - 06

Agenda 4: Panel of Examiners for 2022-23

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

Agenda 5: Any Other subject with the permission of Chair: Nil

The meeting ended with a word of thanks.

13/9/22

(Prof. B. Shankar)
Chairman
BoS in Civil Environmental Engineering

CHAIRPERSON
BOS IN C E E
M U S E
M G M - 06

Sl No	Name	Chairman/ Member	Signature
1	Prof. Shankar B	Chairman	13/9/22
2	Prof. Ananthapadmanabha T	Member	
3	Prof. Naveen G M	Member	
4	Dr. Punith B Kotagi	Member	
5	Prof. M. K. Nagaraj	Member	
6	Prof. Anjaneyappa	Member	
7	Prof. B. Manoj Kumar	Member	13/09/2022
8	Prof. B. M. Sadashiva Murthy	Member	13/9/22

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Scheme of Teaching and Examination2021-2022 (As per NEP-2020)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year2021–2022)

B.E in CIVIL ENVIRONMENTAL ENGINEERING [CEE]

III SEMESTER

Sl No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theorylectures	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	BSC	21MAT31	Engineering Mathematics-III	Basic Science	Basic Science	2	2	0	03	50	50	100	3
2	IPCC	21CV32	Surveying and Geomatics	CEE	CEE	3	0	2	03	50	50	100	4
3	IPCC	21CV33	Earth Resources Engineering	CEE	CEE	3	0	2	03	50	50	100	4
4	PCC	21CV34	Building Materials& Construction	CEE	CEE	3	0	0	03	50	50	100	3
5	IPCC	21CV35	Strength of Materials	CEE	CEE	3	0	2	03	50	50	100	4
6	PCC	21CVL36	Computer Aided Building Drawing	CEE	CEE	2	0	2	04	50	50	100	2
7	BSC	21CIV37	Environmental Studies	CEE	CEE	1	0	0	0	50	-	50	1
8	UHV	21UHV38	Universal Human Values and Professional Ethics	Basic Science	Basic Science	1	0	0	NA	50	-	50	1
Total						**18**	**02**	**08**	**19**	**400**	**300**	**700**	**22**

Note: BSC: Basic Science Courses, ESC: Engineering Science Courses, PCC: Professional Core Courses, IPCC: Integrated Professional Core CoursesUHV: Universal Human Values, HSMC: Humanity, Social Science and Management Courses. NCMC: Non-credit mandatory course, INT: Internship, Pro

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 Diplomaholders admitted to III semester of BE programs, shall attend the classes during the respective semesters to complete all the formalities of thecourse and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40 % of theprescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the student has to fulfil the requirements duringsubsequentsemester/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** 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.

DIRECTOR
Mysore University
School of Engineering
Manasagangotri, Mysuru - 09

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 year2021–2022)

B.E in CIVIL ENVIRONMENTAL ENGINEERING [CEE]

IV SEMESTER

Sl No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theorylectures	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	21CV42	Fluid Mechanics & Hydraulics	CEE	CEE	3	0	2	03	50	50	100	4
3	IPCC	21CV43	Environmental Engineering I	CEE	CEE	3	0	2	03	50	50	100	4
4	PCC	21CV44	Analysis of Structures	CEE	CEE	3	0	0	03	50	50	100	3
5	IPCC	21CV45	Transportation Engineering	CEE	CEE	3	0	2	03	50	50	100	4
6	PCC	21CV46	Geographic Information System	CEE	CEE	2	0	2	03	50	50	100	2
7	HSMC	21CPH47	Constitution of India, Professional Ethics and Cyber Law	Basic Science	Basic Science	1	0	0	NA	50	-	50	1
8	AEC	21AEC48	Ability Enhance Course-II	CEE	CEE	1	0	0	NA	50	-	50	1
9	INT	21INT49	Summer Internship-I	(To be carried out during the intervening vacations of IV and V semesters)					-	-	-	-	-
Total						**18**	**02**	**08**	**18**	**400**	**300**	**700**	**22**

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

Summer Internship-I (21INT59): shall be carried out at industrial (State and Central Government /Non-government organizations (NGOs)/Micro, Small and Medium Enterprise (MSME)/Innovation centers/ Incubation centers. The internship can also be Rural internship.All the students admitted shall have toundergo 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 Vsemesterandtheprescribedcreditshallbeincludedin the Vsemester.The internshipshallbeconsideredasaheadofpassingandshallbeconsideredforthe award of degree. Those, who do not take up/complete the internship shall be declared fail and shall have to complete during subsequent Universityexaminationafter satisfyingthe internshiprequirements. (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 Diplomaholders admitted to III semester of BE programs, shall attend the classes during the respective semesters to complete all the formalities of thecourse and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40 % of theprescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the student has to fulfil the requirements duringsubsequentsemester/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** courses 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.

Text and 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 Variables:** Definitions and properties. Modulus and amplitude of a complex number, Argand's diagram, De-Moivre's theorem (withoutproof). **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 vectorfields-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:

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

Text and Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2015
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2016

3. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, 6thEdition, 2014
4. RohitKhurana , Engineering Mathematics Vol.I, Cengage Learning, 1st Edition, 2015.

SURVEYING AND GEOMATICS (21CV32)

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

Modules	Course Content	Teaching Hours
Module 1	**Module 1:** ***Introduction to Surveying*** *Fundamentals of Maps:* Maps - types; scales-types; measuring distance; finding direction and use of symbols. Map projection - Latitude, Longitude and time, Topographical survey – Toposheets and Principles of topo sheet numbering, Analysis of landforms using maps. *History of Surveying:* Definition of Surveying, Uses of Surveying, Basic principles of surveying, Classification of Surveys. Introduction to Chain surveying, Compass surveying, Plane table surveying and Theodolite surveying. **Levelling:** Principles of levelling- booking and reducing levels; Types of levelling- differential, reciprocal levelling, profile levelling and cross sectioning. Numerical problems. **Contouring:**Contours and their characteristics, Uses of contours.Introduction to areas and volumes	**6 hours**
Module 2	**Curve Surveying:**Elements of simple and compound curves – Method of setting out of simple and compound curves, Elements of Reverse and Transition curve.	**8 hours**
Module 3	***Modern Field Survey Systems*** *(8 Hours)*: Principle of Electronic DistanceMeasurement, Modulation, Types of EDM instruments,Total Station – Parts of a Total Station – Accessories –Advantages and Applications, **Global Positioning Systems-** Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations. Introduction to DGPS, Dronesurveying and LiDAR	**8 hours**
Module 4	***Photogrammetry Surveying***: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.	**6 hours**
Module 5	***Remote Sensing and GIS***: Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation. Introduction to GIS, Digital Elevation Model (DEM),	**10 hours**

LABORATORY EXPERIMENTS

I. Chain Surveying

1. Measure distance between two points using direct ranging and setting out perpendiculars.
2. Marking central line of a building using grid plan using chain and its accessories.

II. Levelling

3. Determine difference in elevation between two points using differential levelling technique, using height of the instrument method and rise and fall methods.
4. Perform profile levelling and to draw the longitudinal section and cross section to determine thedepth of cut and height of filling for a given formation level.

III Total station

5. Contour surveying using total station.
6. Determine the elevation, Distance and gradient between two inaccessible points using totalstation.
7. Traversing using total station.

IV Curves

8. Set out simple curves using linear methods-perpendicular offsets from long chord and offsetsfrom chord produced methods.
9. Set out simple curve using Rankine's deflection angles method.
10. Set out compound curve by angular method.

V. GIS

11. Generate thematic map using GIS Software

Course outcomes:

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

1. Apply fundamental concepts of Surveying, Levelling, Total station, Remote Sensing and GIS to engineering and surveying activities
2. Evaluate principles and components of all types of surveying
3. Interpret the concepts of measurements in engineering problems
4. Demonstrate the application of Surveying in , Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing, and
5. Adopt GIS & remote sensing techniques for field measurements and other applications in Civil Engineering.

Text/Reference Books:

1. Surveying Vol.I and Vol.II, Punmia B.C, 16th Edition, 2016, Laxmi Publications, (P) Ltd, New Delhi ISBN-10: 9788170088530 ISBN-10: 8170088836
2. Fundamentals of Remote Sensing, George Joseph, 3rd Edition, 2018, Universities press, ISBN10: 9386235463, ISBN-13: 978-9386235466.
3. Surveying Vol.I&II,, Duggal S.K, 8th Edition, 2017, Tata Mc Graw Hill Publishing Co., ISBN10: 9781259028991 ISBN-10: 978125902899
4. Remote sensing and Geographical information system, Anji Reddy, M, B.S. Publications, 2001.
5. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
6. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011

EARTH RESOURCES ENGINEERING (21CV33)

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

Modules	Course Content	Teaching Hours
Module 1	**Introduction, scope of earth science in Engineering** Geohazards and disasters, Mitigation and management Earths internal dynamics ,Plate tectonics, Earth quakes types, causes iso-seismal line, seismic zonation map, seismic proof structures, volcanic eruption, landslides, tsunamis, cyclones – Causes & management.	**10 Hours**
Module 2	**Earth Resources** Minerals -Industrial, rock forming and ore minerals. Physical properties, composition and uses Rocks as a construction materials- physical properties, texture, composition, applications for aggregate, decorative (facing/polishing), railway ballast, rocks for masonry work, monumental/architecture, rocks as aquifers, water bearing properties igneous, sedimentary.	**10 Hours**
Module 3	**Surface investigation for Civil Engineering projects** Weathering, type, causes, soil in-situ, drifted soil, soil profile, soil mineralogy , structure, types of soil, Black cotton soil v/s Lateritic soil; effects of weathering on monumental rocks, River morphology and basin investigation for engineering Projects like earthen dam, gravity dam, arch dam, features of river erosion, deposition and their influences on river valley projects, morphometric analysis of river basin, selection of site for artificial recharge,, interlinking of river basins, coastal process and landforms, sedimentation /siltation, erosion.	**10 Hours**
Module 4	**Subsurface investigation for deep foundation** Borehole data(and problems), Dip and strike, and outcrop problems(numerical problem geometrical/ simple trigonometry based), Electrical Resistivity meter, depth of water table, (numerical problems) seismic studies, faults, folds, unconformity, joints types, recognition and their significance in Civil engineering projects like tunnel project, dam project, , Ground improvements like rock bolting, rock jointing, grouting.	**10 Hours**
Module 5	**Introduction to Mining and Its Impact** Mining – definition and economic importance; Mine – definition, different types and classification; Mine life cycle; Mineral deposit – different types and their classification; Mineral resources of India; Modes of entry to a mine – shaft, incline, decline, adit and box-cut. Overview of surface mining: Types of surface mines, unit operations, basic bench geometry, applicability & limitations and advantages & disadvantages. Granite mining and Mining Impacts	**10 Hours**

LABORATORY EXPERIMENTS

1. Evaluation of minerals based on physical properties for basic raw material for construction, industrial application (2 classes)
2. Investigation of rock based on physical, textural, and mineralogical properties for construction (2 classes)
3. Geologic maps studies (6 classes) Cross-section studies of Geological maps for suitability evaluation and subsurface investigation of geological conditions for Dams, tunnels water harvesting, aqua duct, bridges under conditions of Horizontal strata, inclined strata, Folded and Faulted beds, Unconformity, Intrusion relevant–; construction/ generation of Geological maps based on borehole data
4. Geospatial data analysis (3 classes)
    - Interpretation of topo sheets
    - Visual interpretation of FCCs (Geomorphology and Land use/land cover mapping) and TCCs,
5. Geophysical exploration – (2 classes)
    - Electrical resistivity methods for subsurface investigation – and its Interpretation, lateral and vertical sounding

Course outcomes:

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

- Comprehend the relations between minerals and rocks based on their physical properties
- Assess the suitability of materials used in building construction
- Differentiate geological investigations necessary for the construction of dams, bridges, and tunnels and mining
- Demonstrate the groundwater investigation using resistivity methods
- Appraise the applications of Geospatial technology in Civil and Environmental Engineering.

Text and Reference Books:

1. Engineering Geology, by Parthasarathy et al, Wiley publications
2. A textbook of Engineering Geology by ChennaKesavulu, Mac Millan India Ltd
3. Principle of Engineering Geology, by K.M. Bangar, Standard publishers
4. Physical and Engineering Geology, by S.K. Garg, Khanna publishers
5. Principles of Engineering Geology, by KVGK Gokhale, BS Publications
6. Introduction to Mining Engineering, Hartmann, 2nd edition.

BUILDING MATERIALS & CONSTRUCTION (21CV34)

SemesterIII			
No. of Teaching hour/Week	3	**CIE Marks**	50
No. of Practical 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 to Building materials** Aggregates, Bricks, concrete blocks, Cement, Mortar, Concrete, Timber, steel, Glass, MDF, Ply wood. **Painting**: Characteristics of an ideal paint, classification & types of paints, painting on different surfaces, defects in painting, varnishing, distempering, white washing &colour washing. **Green and Smart Materials***:* Passive Products & Materials include glazing, insulation, paints & coatings, adhesives & sealants, fly-ash blocks, cement, concrete, composite wood, filler slabs, certified new wood, housekeeping chemicals, false ceiling materials, flooring materials, furniture, gypsum-based products, high reflective materials & coatings, glass etc.	**08 Hours**
Module 2	**Foundations** Introduction, Depth of footings, Strip footing, Isolated footing, Eccentrically loaded footings, Grillage foundations, Combined footings, Strap footing, Raft foundation, Foundations for black cotton soils, stepped footings, Adjacent footings.	**08 Hours**
Module 3	**Masonry, Doors & Windows** Stone masonry: Definition of terms, Classification of stone masonry, dressing of stones, joints in stone masonry. Brick Masonry: Terminologies, types of bonds: stretcher bond, header bond, English bond, Flemish bond, brick laying, defects in brick masonry, Thickness of a brick wall, buttresses, thresholds, window sills, corbels, copings, jambs. Concrete masonry, Hollow clay block masonry. Doors& windows: Terminologies, Location of doors & windows, size of doors, door frames, types of doors & windows.	**08 Hours**
Module 4	**Formwork & scaffolding, Plastering & pointing** Formwork: requirements, IS standards on form work, Loads on form work, shuttering for:columns-beam & slab floor-stairs-walls. Shoring, under pinning, scaffolding. Plastering & pointing: plastering, terminologies, tools for plastering, number of coats of plaster, methods of plastering, types of plaster finishes, defects in plastering, pointing.	**08 Hours**
Module 5	**Green Building:** Concept of Green building, Principles of green buildings, Eco-friendly materials, Certification systems – Green Rating for Integrated Habitat Assessment (GRIHA) and Leadership in Energy and Environmental Design (LEED).	**08 Hours**

Course outcomes:

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

- Assess the suitability of building and construction materials and green materials used construction
- Differentiate types of footings used for buildings.
- Describe the erection of masonry work along with doors & windows.
- Appreciate the process involved in formwork & scaffolding work and plastering, painting, plumbing & sanitary works.
- Gain Knowledge on Green Buildings

Text and Reference Books:

1. Building Construction, by W B McKay, Pearson Publications, 2013.
2. Building Construction, by Dr. B C Punmia, Lakshmi Publications, 11 th edition, 2016.
3. Building Construction, by Rangwala, Charotar Publications, 2016.
4. Building Construction, by Sushil Kumar, Standard publications, 20th edition.
5. Building Construction& Material, byGurucharan Singh, Standard Book House, 2019.
6. IGBC and NBC Codes & Specifications.

STRENGTH OF MATERIALS (21CV35)

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

Modules	Course Content	Teaching Hours
Module 1	**Simple Stresses and Strains:** Introduction, Properties of Materials, Stress, Strain, Hook's law, Poisson's Ratio, Stress – Strain Diagram for structural steel, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections. Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants, Thermal stress and strains **Compound stresses:** Introduction, Stress components on inclined planes, General two-dimensional stress system, Principal planes and stresses, maximum shear stresses and their planes (shear planes). Compound stress using Mohr's circle method.	**10 Hours**
Module 2	**Bending moment and shear force diagrams in beams**: Definition of shear force and bending moment, Sign convention, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, development of Shear Force Diagram (SFD) and Bending Moment Diagram (BMD) with salient values for cantilever, simply supported and overhanging beams for point loads, UDL (Uniformly Distributed Load), UVL (Uniformly Varying Load) and Couple.	**10 Hours**
Module 3	**Bending stress in beams:** Introduction – Bending stress in beam, Pure bending, Assumptions in simple bending theory, derivation of Simple bending equation (Bernoulli's equation), modulus of rupture, section modulus, Flexural rigidity, Problems **Shear stress in beams:** Derivation of Shear stress intensity equations, Derivation of Expressions of the shear stress intensity for rectangular, triangular and circular cross sections of the beams. Problems on calculation of the shear stress intensities at various critical levels of T, I and Hollow rectangular cross sections of the beam.	**10 Hours**
Module 4	**Torsion:** Twisting moment in shafts, simple torque theory, derivation of torsion equation, tensional rigidity, polar modulus, shear stress variation across solid circular and hollow circular sections, Problems **Thin cylinders:** Introduction: Longitudinal, circumferential (hoop) stress in thin cylinders. Expressions for longitudinal and circumferential stresses. Efficiency of longitudinal and circumferential joints. Problems on estimation of change in length, diameter and volume when the thin cylinder subjected to internal fluid pressure. **Thick cylinders:** Concept of Thick cylinders Lame's equations applicable to thick cylinders with usual notations,	**10 Hours**

	calculation of longitudinal, circumferential and radial stresses – simple numerical examples. Sketching the variation of radial stress (pressure) and circumferential stress across the wall of thick cylinder.	
Module 5	**Elastic stability of columns:** Introduction – Short and long columns, Euler's theory on columns, Effective length, slenderness ratio, radii of gyration, buckling load, Assumptions, derivations of Euler's Buckling load for different boundary conditions, Limitations of Euler's theory, Rankine's formula and related problems. **Deflection of determinate Beams:** Introduction, Elastic curve –Derivation of differential equation of flexure, Sign convention, Slope and deflection using Macaulay's method for statically determinate beams subjected to various vertical loads, moment, couple and their combinations. Numerical problems.	**10 Hours**

LABORATORY EXPERIMENTS

1. Dimensionality of bricks, Water absorption, Initial rate of absorption
2. Specific gravity of coarse and fine aggregate
3. Fineness modulus of Fine and Coarse aggregate
4. Compressive strength tests on building blocks (brick, solid blocks and hollow blocks)
5. Tension test on Mild steel and HYSD bars
6. Compression test on HYSD, Cast iron
7. Bending Test on Wood under two-point loading.
8. Shear Test on Mild steel – single and double shear
9. Impact test on Mild Steel (Charpy& Izod)

Course outcomes:

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

- Evaluate the behaviour when a solid material is subjected to various types of forces (namely Compressive, Tensile, Thermal, Shear, flexure, Torque, internal fluid pressure) and estimate stresses and corresponding strain developed. (L3)
- Estimate the forces developed and draw schematic diagram for stresses, forces, moments for simple beams with different types of support and are subjected to various types of loads (L3).
- Evaluate the behaviour when a solid material is subjected to Torque and internal fluid pressure and estimate stresses and corresponding strain developed. (L3)
- Distinguish the behaviour of short and long column and calculate load at failure & explain the behaviour of spring to estimate deflection and stiffness (L3)
- Examine and evaluate the mechanical properties of various materials under different loading conditions.

Text and Reference Books:

1. Timoshenko and Young, "Elements of Strength of Materials",East West Press, 5t edition 2003
2. R. Subramanyam, "Strength of Materials", Oxford University Press, 3rd Edition -2016
3. B.C Punmia Ashok Jain, Arun Jain, "Strength of Materials", Laxmi Publications, 10th Edition-2018
4. S. Ramamrutham, "Strength of Materials", Dhanpath Rai Publications, 20th edition, 2020.
5. S. S Rattan, "Strength of Materials", Mc Graw Hill Publications, 3rd edition, 2017.

COMPUTER AIDED BUILDING DRAWINGS (21CVL36)

Semester III			
No. of Lecture hour/Week	02	**CIE Marks**	50
No. of Practical hours/week	02	**SEE Marks**	50
Total No. of Lecture hours	26	**Exam Hours**	03
L: T:P	2:0:2	**Credits**	02

Sl No.	Course Content	
Module 1	**Drawing Basics:** Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS: 962. **Simple Engineering Drawings with CAD** Drawing Tools**:** Lines Circle, Arc, Poly line, Multiline, Polygon, Rectangle, Spline, Ellipse. Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet. Using Text: Single line text, Multiline text, Spelling, Edit text. Special Features: View tools, Layers concept, Dimension tools, Hatching, Customizing Toolbars, Working with multiple drawings.	**8 hours**
Module 2	**Drawings of Different Building Elements:** Following drawings are to be prepared for the data given using CAD Software a) Cross section of Foundation, masonry wall, RCC columns with isolated & combined footings. b) Different types of staircases – Dog legged, Open well, c) Lintel and chajja. d) RCC Slabs and beams.	**8 hours**
Module 3	**Building Drawings :**Principles of planning, Planning regulations and building bye-laws, factors affecting site selection, Functional planning of residential and public buildings, design aspects for different public buildings. Recommendations of NBC. Drawing of plan, elevation and sectional elevation including electrical, plumbing and sanitary services using CAD software for 1. Single and double story residential building. 2. Hostel building. 3. Hospital building. 4. School building. Submission drawing (sanction drawing)of two storied residential building with access to terrace including all details and statements as per the local bye-laws Industry Applications : 3D Modelling and Rendering, 2D Animation, Construction site Simulation **Environmental Engineering Drawings** e) Septic Tank and sedimentation Tank. f) Layout plan of Rainwater recharging and harvesting system. g) Layout of Typical Water Supply System. f) Drawing of Hydraulic Profile for Water Treatment Unit. **Note:** Students shall sketch to dimension the above in a sketch book before doing the computer drawing and undertake one compulsory field visit/exercise. (Single line diagrams are given in the examination).	**10 hours**

Course Outcomes

At the end of the course the student will able to

1. Understand the basics of CAD Drawing and
2. Prepare, read and interpret the drawings in a professional set up.
3. Know the procedures of submission of drawings and Develop working and submission drawings for building.
4. Build the skills on elements of building Plan and design of residential or public building as per the given requirements including 2D and 3D Animation.
5. Prepare layout plans of environmental engineering using CAD

Text Books:

- MG Shah, CM Kale, SY Patki, "Building drawing with an integrated approach to Built Environment Drawing", Tata McGraw Hill Publishing co. Ltd, New Delhi.
- Gurucharan Singh, "Building Construction", Standard Publishers, & distributors, New Delhi.
- Malik RS and a Meo GS, "Civil Engineering Drawing", Asian Publishers/Computech Publication Pvt Ltd.
- Time Saver Standard by Dodge F.W, F.W Dodge Corp.
- IS: 962-1989 (Code of practice for architectural and building drawing).
- National Building Code, BIS, New Delhi.

ENVIRONMENTAL STUDIES [21CIV37]

Semester III			
No. of Teaching hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	-
Total No. of Lecture hours	16	**Exam Hours**	-
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:

After Studying this course, students will be able to

1. Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
3. Demonstrate Solid Waste Management.
4. Apply knowledge and technology in environmental practices
5. Build inquisitiveness to protect environment through societal interventions

Text 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.

UNIVERSAL HUMAN VALUE & PROFESSIONAL ETHICS [21UHV38]

Semester III			
No. of Teaching hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	-
Total No. of Lecture hours	16	**Exam Hours**	-
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 and the 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:

The course and further follow up is expected to positively impact common graduate attributes like:

- 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

Textbook/ Reference Books

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

ENGINEERING MATHEMATICS-IV [21MAT41]

Semester IV			
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	**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 3	**Probability Distributions:** Review of basic probability theory. 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.

Text and Reference Books:

Text 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.

Reference Books:

1. Srimanta Pal & Subodh C. Bhunia: *"Engineering Mathematics"* Oxford University Press, 3rd Reprint, 2016.
2. N.P Bali and Manish Goyal: *"A textbook of Engineering Mathematics"* Laxmi Publications, Latest edition.
3. H.K.Dass and Er. Rajnish Verma: *"Higher Engineering Mathematics"* S.Chand Publication (2014).

ADDITIONAL MATHEMATICS-II (21MATDIP41)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	1	**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 integral calculus. 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.

Text 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.

Reference Books:

1. N.P Bali and Manish Goyal: *"A textbook of Engineering Mathematics"* Laxmi Publications, Latest edition.
2. H.K.Dass and Er. Rajnish Verma: *"Higher Engineering Mathematics"* S.Chand Publication (2014).

FLUID MECHANICS & HYDRAULICS (21CV42)

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

Modules	Course Content	Teaching Hours
Module 1	Fluids and their properties, Fluid pressure measurements, Pascal's law, Measurement of pressure using manometer, Total pressure and centre of pressure on vertical and inclined plane surfaces.	**10 Hours**
Module 2	Kinematics- Types of fluid flow, continuity equation in Cartesian coordinates, flow nets, Dynamics- Euler's equation of motion, Bernoulli's equation, Application-Venturimeter, Orificemeter, Pitot tube	**10 Hours**
Module 3	Classification of orifice and mouth piece, Hydraulic coefficients, Discharge over Rectangular, Triangular and Cipoletti notch. Flow through pipes-Major and minor losses, pipes in series and parallel, concepts of water hammer and surge tanks	**10 Hours**
Module 4	Open Channel Hydraulics- Classification of Flow through channels, Most economical channel sections: Rectangular, Triangular and Circular. Uniform flow, Specific energy. Non-Uniform flow- Hydraulic jump, Analysis of GVF equation.	**10 Hours**
Module 5	Impact of jet on curved vanes,momentum equation, Impact of jet on stationary and moving curved vanes. Turbines- Pelton wheel and components, Velocity triangle Reaction turbine-Francis turbine,Working proportions. Centrifugal Pumps-Work done and efficiency, Multi stage pumps	**10 Hours**

LABORATORY EXPERIMENTS

1. Determination of Cd for Venturimeter or Orificemeter
2. Determination of Hydraulic coefficients of small vertical orifice
3. Calibration of Triangular notch
4. Determination of Major & Minor losses in pipes
5. Determination of Cd for ogee or broad crested weir
6. Determination of force exerted by a jet on flat and curved vanes
7. Determination of efficiency of centrifugal pump
8. Determination of efficiency of Kaplan or Francis turbine
9. Determination of efficiency of Pelton wheel turbine

Course outcomes:

After studying this course, students will able to:

1. Understand fundamental properties of fluids and solve problems on Hydrostatics.
2. Apply Principles of Mathematics to represent Kinematics and Bernoulli's principles.
3. Compute discharge through pipes, notches and weirs.
4. Design of open channels of various cross sections.

5. Design of turbines for the given data and understand their operation characteristics.

Text and Reference Books:

1. P.N.Modi and S.M.Seth-Hydraulics and Fluid Mechanics, including Hydraulic machines, standard Book House,New Delhi
2. K Subramanya- Fluid Mechanics and Hydraulic Machines, Tata McGrawhill, New Delhi
3. R.K. Bansal- A text book of Fluid Mechanics and Hydraulic Machines- Laxmi Publications, New Delhi
4. Victor L. Streeter, Benjamin Wyile E and Keith W. Bedford- Fluid Mechanics ,Tata McGraw Hill publishing Co Ltd,New Delhi

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ENVIRONMENTAL ENGINEERING – I (21CV43)

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

Modules	Course Content	Teaching Hours
Module 1	**Introduction**: Water: Need for protected water supply, Demand of Water: Types of water demands -domestic demand, industrial, institutional and commercial demand, public use and fire demand estimation, factors affecting per capita demand, Variations in demand of water, Peak factor. **Design period** and factors governing design period. Methods of population forecasting and numerical problems. Physico-chemical characteristics of water (Analysis to be conducted in laboratory session). Sampling.	**10 Hours**
Module 2	**Water Treatment:** Objectives, Unit flow diagrams – significance of each unit, Aeration process- Limitations and types **Sedimentation -** Theory, settling tanks, types and design, Coagulation and flocculation, types of coagulants,(Optimization of coagulant to be carried out in the laboratory), Clari-flocculator. **Filtration:** mechanism, theory of filtration, types offilters: slow sand, rapid sand andpressure filters. Operation and cleaning. Design of slow and rapid sand filter without under drainage system	**10 Hours**
Module 3	**Disinfection:** Methods of disinfection with merits and demerits. Breakpoint of chlorination (Analysis to be conducted in laboratory session) Softening: Lime soda and Zeolite process. **Wastewater:** **Introduction:** Need for sanitation, methods of sewage disposal, types of sewerage systems. **Treatment of municipal waste water:** Waste water characteristics (Analysis to be conducted in laboratory session): sampling, significance and techniques, physical, chemical and biological characteristics,Numericals on BOD.	**10 Hours**
Module 4	**Treatment Process:** flow diagram for municipal waste water Treatment unit operations andprocess,Screens: types, disposal. Grit chamber, oil and grease removal. Primary and secondary settling tanks, Suspended growth system - conventional activated sludge process and its modifications.	**10 Hours**
Module 5	Attached growth system – trickling filter, Trickling filters, bio-towers and rotating biological contactors. SBBR, SBR, MBR.	**10 Hours**

LIST OF DRAWINGS

1. Drawing of Distribution Systems for simple network.
2. Drawing of Flocculator and Sedimentation Units (Circular and Rectangular)
3. Plan and Sectional Elevation, Clariflocculator.
4. Drawing of Rapid Sand Filters (Plan and Section).
5. Layout showing hydrants, valves, bends and chlorination point in water treatment plant.

LABORATORY EXPERIMENTS

1. Determination of Acidity and Alkalinity
2. Determination of Calcium, Magnesium and Total Hardness.
3. Determination of Dissolved Oxygen / BOD / COD.
4. Determination of Chlorides.
5. Determination of percentage of available chlorine in bleaching powder sample,Determination of Residual Chlorine and chlorine demand.
6. Determination of Solids in Sewage: (i) Total Solids, (ii) Suspended Solids, (iii) Dissolved Solids, (iv)Volatile Solids, Fixed Solids (v) Settleable Solids.
7. Determination of optimum coagulant dosage using Jar test apparatus.
8. Determination Nitrates and Iron by spectrophotometer

Course outcomes:

- After studying this course, students will able to:
- Estimate average and peak water demand for a community.
- Evaluate water quality and environmental significance of various parameters and plan suitable treatment system.
- Design the different units of water treatment plant
- Understand and design the various units of wastewater treatment plant
- Acquire capability to conduct experiments and estimate the concentration of different parameters and compare the obtained results with the concerned guidelines and regulations.

Text and Reference Books:

1. Howard S. Peavy, Donald R. Rowe, George T, “Environmental Engineering” - Tata McGraw
2. Hill, New York, Indian Edition, 2013
3. S. K. Garg, Environmental Engineering vol-I, Water supply Engineering – M/s Khanna Publishers, New Delhi2010
4. B.C. Punmia and Ashok Jain, Environmental Engineering I-Water Supply Engineering,Laxmi Publications (P) Ltd., New Delhi2010.
5. B C Punmia, “Environmental Engineering vol-II”, Laxmi Publications 2nd, 2016

ANALYSIS OF STRUCTURES (21CV44)

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

Modules	Course Content	Teaching Hours
Module 1	**Deflection of Beams:** ***Moment area method***– Derivation, Mohr's theorems, Sign convention; Application of moment area method to determinate prismatic beams, beams of varying cross section; Use of moment diagram by parts; ***Conjugate beam method***– Real beam and conjugate beam, conjugate beam theorems; Application of conjugate beam method to determinate beams of varying cross sections.	**10 Hours**
Module 2	**Energy Principles and Energy Theorems:** ***Principle of virtual displacements***; *Principle of virtual forces*, Strain energy and complementary energy; Strain energy due to axial force, bending shear and torsion; Deflection of determinate beams and trusses using total strain energy; Deflection at the point of application of single point load; ***Castigliano's theorems***, application of Castigliano's theorems to calculate deflection of trusses, frames; Special application – Dummy unit load method.	**10 Hours**
Module 3	**Arches and Cables:** Three-hinged circular and parabolic arches with supports at the same and different levels; Determination of normal thrust, radial shear and bending moment; Analysisof cables under point loads and UDL; Length of cables with supports at the same and different levels; Stiffening trusses for suspension cables.	**10 Hours**
Module 4	**Slope Deflection Method:** Introduction, sign convention, development of slope deflection equation; Analysis of continuous beams including settlement of supports; Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy up to 3	**10 Hours**
Module 5	**Matrix Methods of Structural Analysis:** Definition of stiffness and flexibility methods, comparison to classical methods. **Stiffness Method:** Stiffness matrix, Analysis of continuous beams and plane trusses using system approach; Analysis of simple orthogonal plane frames using system approach with kinematic indeterminacy up to 3.	**10 Hours**

Course outcomes:

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

1. Evaluate slope and deflections in beams using geometrical methods.
2. Determine deflections in trusses and frames using energy principles.
3. Analyze arches and cables for stress resultants.

4. Apply slope defection method in analyzing indeterminate structures and construct bending moment diagram.
5. Analyze continuous beams, frames and trusses using stiffness matrix method of analysis.

Reference Books:

1. Reddy, C.S., “Basic Structural Analysis”, 3rd ed., Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2011.
2. Hibbeler, R.C., “Structural Analysis”, 9th edition, Pearson publications, New Delhi, 2012.
3. Thandavamoorthy, T.S., “Structural Analysis”, 6th edition., Oxford University press., New Delhi,2015.
4. Charles Head Norris, John Benson Wilbur and SenolUtku., “Elementary Structural Analysis”, 4th edition, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2003.
5. Hall, A. and Kabaila, A.P., “BasicConcepts of Structural Analysis”, Pitman Publishing, London, John Wiley & Sons, New York, 1977.
6. Wang, C.K., “Intermediate Structural Analysis”, McGraw-Hill International Book Co., 1985.

TRANSPORTATION ENGINEERING (21CV45)

Semester IV			
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	3:0:2	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Principles of Transportation Engineering**: Importance of transportation, Different modes of transportation. Characteristics of road transport, Importance of Roads in India, Current Road development Programmes in India. Highway Development and Planning: Highway Development in India, Highway Planning, Planning Surveys and Interpretation, Highway Planning in India. Highway Alignment and Project preparation: Highway Alignment, Engineering Surveys for Highway Alignment, Drawings and Reports, Highway Projects, Preparation of Detailed Project Report	**08 Hours**
Module 2	**Highway Geometric Design of horizontal alignment elements**: Cross sectional elements, Sight distance, Design of Horizontal alignment, Design of vertical alignment. Pavement Design: Pavement types, component parts of flexible and rigid pavements and their functions, ESWL and its determination (Graphical method only)-Examples.	**08 Hours**
Module 3	**Pavement Materials**: Sub grade soil-grade soil -desirable properties-HRB soil classificationdetermination of CBR and modulus of sub grade reaction with Problems. Aggregates- Desirable properties. Bituminous Binders & Mixes- Types, desirable properties. Pavement Quality concrete- Materials, Requirements. Pavement Construction: General features, Embankment and Subgrade, Construction of Flexible pavements, Construction of CC pavements	**08 Hours**
Module 4	**Highway Drainage:** Significance and requirements, Surface drainage system and Design-Examples, sub surface drainage system, design of filter materials, Types of cross drainage structures, their choice and location. Highway Economics: Highway user benefits, VOC using charts only-Examples, Economic analysis - annual Cost method-Benefit Cost Ratio method-NPV-IRR methods- Examples, Highway financing-BOT-BOOT concepts	**08 Hours**
Module 5	**Elements of Traffic Engineering** – Traffic characteristics, Traffic Engineering Studies and Analysis, Traffic Regulation and Control. Elements of Railways and Airport Engineering - Railways: Introduction, classification of routes; railway gauge, coning of wheels and canting of rails, train resistance and hauling power; track components: rails, sleepers, fastenings, ballast and formation. Airports: Introduction, Layout of an airport with component parts and functions of each, Aircraft Characteristics – Airport Classifications, - Site selection- regional Planning. Orientation of runway by using wind rose diagram with examples	**08 Hours**

Lab Experiments

1. Tests on Aggregates a. Aggregate Crushing value b. Los Angeles abrasion test c. Aggregate impact test d. Aggregate shape tests (combined index and angularity number)
2. Tests on Bituminous Materials a. Penetration test b. Ductility test c. Softening point test d. Specific gravity test

3. Tests on Soil a. Wet sieve analysis b. CBR test
4. Tests on Bituminous Mixes a. Marshall Method (Demo Experiment)

Course outcome

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

1. Acquire the capability of proposing a new alignment or re-alignment of existing roads, conduct necessary field investigation for generation of required data.
2. Evaluate the engineering properties of the materials and suggest the suitability of the same for pavement construction.
3. Design road geometrics, structural components of pavement and drainage.
4. Evaluate the highway economics by few select methods and also will have a basic knowledge of various highway financing concepts.

Text Books

1. S K Khanna and C E G Justo, “Highway Engineering”, Nem Chand Bros, Roorkee.
2. L R Kadiyali, “Highway Engineering”, Khanna Publishers, New Delhi.
3. R Srinivasa Kumar, “Highway Engineering”, University Press.
4. K. Subramaniam, “Transportation Engineering”, SciTech Publications, Chennai.
5. Saxena Subhash C and Satyapal Arora, “A Course in Railway Engineering”, Dhanpat Rai and Sons, Delhi.
6. Chandra S. and Agarwal M.M. “Railway Engineering”, Oxford University Press India.
7. Khanna S K, Arora M G and Jain S S, “Airport Planning and Design”, Nem Chand and Bros.
8. Khanna S.K. and Justo C.E.G. Highway Material Testing, Nem Chand & Bros

GEOGRAPHIC INFORMATION SYSTEM (21CV46)

Semester IV			
No. of Lecture hour/Week	02	**CIE Marks**	50
No. of Practical hours/week	02	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:0:2	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Geographic Information System-** Introduction, Functions and advantages, sources of data for GIS. Database – Types, advantages and disadvantages. Data Analysis.-overlay operations, network analysis, spatial analysis. Outputs and map generation. GPS- components and working principles.	**05 Hours**
Module 2	**Applications of GIS**, Remote Sensing and GPS: Water Resources engineering and management (prioritization of river basins, water perspective zones and its mapping), Highway and transportation (highway alignment, Optimization of routes, accident analysis), Environmental Engineering 2 (Geostatistical analysis of water quality, rainfall).	**05 Hours**
Module 3	**Applications of GIS, Remote Sensing and GPS:** Urban Planning & Management, urban sprawl, Change detection studies, forests and urban area, floods, drainage system agriculture, Disaster Management.	**05 Hours**
Module 4	**QGIS Introduction:** Definition of GIS and its use. Introduction to a free and open source desktop geographic information system software. Types of data (vector and raster formats), web services, useful commands and utilities for geo-processing, extending its capabilities to digital satellite image processing and analysis. **About QGIS** Characteristics of QGIS Start using QGIS. QGIS TOOLS QGIS Configuration, General tools, Working with projections QGIS Browser. WORKING WITH RASTER DATA Introduction, Display raster data, Raster calculator, Working with images, Practical exercises: Working with raster data and operations with images.	**10 Hours**
Module 5	**CREATE MAPS AND RELATED PRODUCTS**: Creation tools, Graphic elements, Atlases generation, and Graphic output creations. Practical exercises: Map creation with QGIS. Teaching-Learning Process Chalk and talk, PowerPoint Presentation & PBL **RELATIONAL DATABASE MANAGEMENT SYSTEMS AND SPATIAL DATA**. Database design, Database connections, Table joins Spatial joins, generate new statistics and new data using table and spatial data information. Practical exercises: Creation of thematic maps like population data of taluk, Watershed map with drainage and water bodies, Highway with other 2 road intersection details	**15 Hours**

Course Outcomes:

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

1. Understand principles Geographical Information Systems (GIS) data acquisition and its applications.
2. Apply GIS technologies in various fields of engineering and social needs for creating a feasible solution in the different fields of application of GIS
3. Use open source software for civil environmental engineering applications of various tools in QGIS software
4. Create thematic layers with attribute data and generate maps using QGIS for decision making

Reference Books:

1. Geographic Information System-An Introduction, Tor Bernharadsen, 2009, 3rd Edition, Wiley India Pvt. Ltd. New Delhi, ISBN - 9788126511389.
2. Principles of Remote sensing and Image Interpretation, Lillesand and Kiefer, 2011, 6th Edition, John Wiley Publishers, New Delhi, ISBN – 8126532238. Web links and Video Lectures (e-Resources):
3. https://docs.qgis.org/3.16/pdf/en/QGIS-3.16-DesktopUserGuide-en.pdf for QGIS manual
4. NPTEL Lectures

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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Mysore University School of Engineering
ಮೈಸೂರು ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
ಎಂಜಿನಿಯರಿಂಗ್ ಶಾಲೆ

University of Mysore
Mysore University School of Engineering
Manasagangotri, Mysuru – 570 006
Mob:9845155757; email: doddi43@gmail.com

Prof. B. Shankar
Chairman, BoS in Civil Environmental Engineering

No. MUSE/ /2022-23 /2301 Dated 13 Sept. 2022

To
The Registrar,
(Syndicate Section)
University of Mysore
Crawford Hall
Mysuru

Sir,

Sub: **Proceeding** of **BoS in Civil Environmental Engineering-reg**
Ref: No UA2 /134/2021-22 dated 08-09-2022

With reference to the above subject, I am herewith enclosing the **Proceeding of Board of Studies in BoS in Civil Environmental Engineering** 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,

(Prof. B. Shankar)
Chairman
BoS in Civil Environmental Engineering
MYSORE UNIVERSITY
SCHOOL OF ENGINEERING
MANASAGANGOTRI
MYSURU-06

CC to: The Dy. Registrar, Academic, University of Mysore, Mysore

CHAIRPERSON
BOS IN C E E
M U S E
M G M - 06

Proceeding of the Board of Studies in Civil Environmental Engineering 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. B. Shankar,	Chairman
2.	Prof. Ananthapadmanabha T	Member
3.	Prof. Nagaraj M K	Member
4.	Prof. Naveen G M	Member
5.	Dr. Punith B. Kotagi	Member
6.	Prof. Manoj Kumar B	Member
7.	Prof. Sadhashiva Murthy B M	Member
8.	Prof. Anjaneyappa	Member

Members Absent

1.	Dr. Asha G	Member

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

Agenda 1: Scheme from III to VIII Semesters for B.E. in Civil Environmental Engineering.

The Chairman explained that the Scheme has been framed on the lines of guidelines of AICTE/VTU and within the framework of NEP – 2020 from III to VIII. 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.Civil Environmental Engineering from III Semester to VIII Semester within the ambit of 160 credits for the entire B.E. course. The Scheme is enclosed in the **Annexure I**.

Agenda 2: Syllabus for III and IV semesters B.E. Civil Environmental Engineering

The Members of the Board has examined, discussed and approved the Syllabus for III and IV semester B.E. Civil Environmental Engineering Course. The Syllabus is enclosed in the **Annexure II.**

Agenda 3: Regulations Governing the B.E Courses of Mysore University School of Engineering.

The Board has examined and discussed the draft Regulations Governing the B.E Courses of Mysore University School of Engineering(MUSE). The members of the Board taken note of VTU's implementation of NEP 2020. The Board also examined AICTE's letter dated 06.07.2022 for implementation of Credit Framework for the Movement from Professional/Vocational Education to Engineering and Technology and approve to incorporate the credit framework. The Board approved Regulations which governs B.E. courses of MUSE, UoM and enclosed in the **Annexure III.**

13/9/22

CHAIRPERSON
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Agenda 4: Panel of Examiners for 2022-23

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

Agenda 5: Any Other subject with the permission of Chair: Nil

The meeting ended with a word of thanks.

13/9/22

(Prof. B. Shankar)
Chairman
BoS in Civil Environmental Engineering

CHAIRPERSON
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Sl No	Name	Chairman/ Member	Signature
1	Prof. Shankar B	Chairman	13/9/22
2	Prof. Ananthapadmanabha T	Member	
3	Prof. Naveen G M	Member	
4	Dr. Punith B Kotagi	Member	
5	Prof. M. K. Nagaraj	Member	
6	Prof. Anjaneyappa	Member	
7	Prof. B. Manoj Kumar	Member	13/09/2022
8	Prof. B. M. Sadashiva Murthy	Member	13/9/22

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Scheme of Teaching and Examination2021-2022 (As per NEP-2020)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year2021–2022)

B.E in CIVIL ENVIRONMENTAL ENGINEERING [CEE]

III SEMESTER

Sl No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theorylectures	Tutorial	Practical/ Drawing	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	BSC	21MAT31	Engineering Mathematics-III	Basic Science	Basic Science	2	2	0	03	50	50	100	3
2	IPCC	21CV32	Surveying and Geomatics	CEE	CEE	3	0	2	03	50	50	100	4
3	IPCC	21CV33	Earth Resources Engineering	CEE	CEE	3	0	2	03	50	50	100	4
4	PCC	21CV34	Building Materials& Construction	CEE	CEE	3	0	0	03	50	50	100	3
5	IPCC	21CV35	Strength of Materials	CEE	CEE	3	0	2	03	50	50	100	4
6	PCC	21CVL36	Computer Aided Building Drawing	CEE	CEE	2	0	2	04	50	50	100	2
7	BSC	21CIV37	Environmental Studies	CEE	CEE	1	0	0	0	50	-	50	1
8	UHV	21UHV38	Universal Human Values and Professional Ethics	Basic Science	Basic Science	1	0	0	NA	50	-	50	1
Total						**18**	**02**	**08**	**19**	**400**	**300**	**700**	**22**

Note: BSC: Basic Science Courses, ESC: Engineering Science Courses, PCC: Professional Core Courses, IPCC: Integrated Professional Core CoursesUHV: Universal Human Values, HSMC: Humanity, Social Science and Management Courses. NCMC: Non-credit mandatory course, INT: Internship, Pro

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 Diplomaholders admitted to III semester of BE programs, shall attend the classes during the respective semesters to complete all the formalities of thecourse and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40 % of theprescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the student has to fulfil the requirements duringsubsequentsemester/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** 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.

DIRECTOR
Mysore University
School of Engineering
Manasagangotri, Mysuru - 09

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 year2021–2022)

B.E in CIVIL ENVIRONMENTAL ENGINEERING [CEE]

IV SEMESTER

Sl No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theorylectures	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	21CV42	Fluid Mechanics & Hydraulics	CEE	CEE	3	0	2	03	50	50	100	4
3	IPCC	21CV43	Environmental Engineering I	CEE	CEE	3	0	2	03	50	50	100	4
4	PCC	21CV44	Analysis of Structures	CEE	CEE	3	0	0	03	50	50	100	3
5	IPCC	21CV45	Transportation Engineering	CEE	CEE	3	0	2	03	50	50	100	4
6	PCC	21CV46	Geographic Information System	CEE	CEE	2	0	2	03	50	50	100	2
7	HSMC	21CPH47	Constitution of India, Professional Ethics and Cyber Law	Basic Science	Basic Science	1	0	0	NA	50	-	50	1
8	AEC	21AEC48	Ability Enhance Course-II	CEE	CEE	1	0	0	NA	50	-	50	1
9	INT	21INT49	Summer Internship-I	(To be carried out during the intervening vacations of IV and V semesters)					-	-	-	-	-
Total						**18**	**02**	**08**	**18**	**400**	**300**	**700**	**22**

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

Summer Internship-I (21INT59): shall be carried out at industrial (State and Central Government /Non-government organizations (NGOs)/Micro, Small and Medium Enterprise (MSME)/Innovation centers/ Incubation centers. The internship can also be Rural internship.All the students admitted shall have toundergo 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 Vsemesterandtheprescribedcreditshallbeincludedin the Vsemester.The internshipshallbeconsideredasaheadofpassingandshallbeconsideredforthe award of degree. Those, who do not take up/complete the internship shall be declared fail and shall have to complete during subsequent Universityexaminationafter satisfyingthe internshiprequirements. (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 Diplomaholders admitted to III semester of BE programs, shall attend the classes during the respective semesters to complete all the formalities of thecourse and appear for the University examination. In case, any student fails to register for the said course/ fails to secure the minimum 40 % of theprescribed CIE marks, he/she shall be deemed to have secured F grade. In such a case, the student has to fulfil the requirements duringsubsequentsemester/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** courses 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.

Text and 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 Variables:** Definitions and properties. Modulus and amplitude of a complex number, Argand's diagram, De-Moivre's theorem (withoutproof). **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 vectorfields-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:

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

Text and Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2015
2. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 10th Edition, 2016

3. N.P.Bali and Manish Goyal, A Text Book of Engineering Mathematics, Laxmi Publications, 6thEdition, 2014
4. RohitKhurana , Engineering Mathematics Vol.I, Cengage Learning, 1st Edition, 2015.

SURVEYING AND GEOMATICS (21CV32)

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

Modules	Course Content	Teaching Hours
Module 1	**Module 1:** ***Introduction to Surveying*** *Fundamentals of Maps:* Maps - types; scales-types; measuring distance; finding direction and use of symbols. Map projection - Latitude, Longitude and time, Topographical survey – Toposheets and Principles of topo sheet numbering, Analysis of landforms using maps. *History of Surveying:* Definition of Surveying, Uses of Surveying, Basic principles of surveying, Classification of Surveys. Introduction to Chain surveying, Compass surveying, Plane table surveying and Theodolite surveying. **Levelling:** Principles of levelling- booking and reducing levels; Types of levelling- differential, reciprocal levelling, profile levelling and cross sectioning. Numerical problems. **Contouring:**Contours and their characteristics, Uses of contours.Introduction to areas and volumes	**6 hours**
Module 2	**Curve Surveying:**Elements of simple and compound curves – Method of setting out of simple and compound curves, Elements of Reverse and Transition curve.	**8 hours**
Module 3	***Modern Field Survey Systems*** *(8 Hours)*: Principle of Electronic DistanceMeasurement, Modulation, Types of EDM instruments,Total Station – Parts of a Total Station – Accessories –Advantages and Applications, **Global Positioning Systems-** Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations. Introduction to DGPS, Dronesurveying and LiDAR	**8 hours**
Module 4	***Photogrammetry Surveying***: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.	**6 hours**
Module 5	***Remote Sensing and GIS***: Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation. Introduction to GIS, Digital Elevation Model (DEM),	**10 hours**

LABORATORY EXPERIMENTS

I. Chain Surveying

1. Measure distance between two points using direct ranging and setting out perpendiculars.
2. Marking central line of a building using grid plan using chain and its accessories.

II. Levelling

3. Determine difference in elevation between two points using differential levelling technique, using height of the instrument method and rise and fall methods.
4. Perform profile levelling and to draw the longitudinal section and cross section to determine thedepth of cut and height of filling for a given formation level.

III Total station

5. Contour surveying using total station.
6. Determine the elevation, Distance and gradient between two inaccessible points using totalstation.
7. Traversing using total station.

IV Curves

8. Set out simple curves using linear methods-perpendicular offsets from long chord and offsetsfrom chord produced methods.
9. Set out simple curve using Rankine's deflection angles method.
10. Set out compound curve by angular method.

V. GIS

11. Generate thematic map using GIS Software

Course outcomes:

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

1. Apply fundamental concepts of Surveying, Levelling, Total station, Remote Sensing and GIS to engineering and surveying activities
2. Evaluate principles and components of all types of surveying
3. Interpret the concepts of measurements in engineering problems
4. Demonstrate the application of Surveying in , Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing, and
5. Adopt GIS & remote sensing techniques for field measurements and other applications in Civil Engineering.

Text/Reference Books:

1. Surveying Vol.I and Vol.II, Punmia B.C, 16th Edition, 2016, Laxmi Publications, (P) Ltd, New Delhi ISBN-10: 9788170088530 ISBN-10: 8170088836
2. Fundamentals of Remote Sensing, George Joseph, 3rd Edition, 2018, Universities press, ISBN10: 9386235463, ISBN-13: 978-9386235466.
3. Surveying Vol.I&II,, Duggal S.K, 8th Edition, 2017, Tata Mc Graw Hill Publishing Co., ISBN10: 9781259028991 ISBN-10: 978125902899
4. Remote sensing and Geographical information system, Anji Reddy, M, B.S. Publications, 2001.
5. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
6. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011

EARTH RESOURCES ENGINEERING (21CV33)

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

Modules	Course Content	Teaching Hours
Module 1	**Introduction, scope of earth science in Engineering** Geohazards and disasters, Mitigation and management Earths internal dynamics ,Plate tectonics, Earth quakes types, causes iso-seismal line, seismic zonation map, seismic proof structures, volcanic eruption, landslides, tsunamis, cyclones – Causes & management.	**10 Hours**
Module 2	**Earth Resources** Minerals -Industrial, rock forming and ore minerals. Physical properties, composition and uses Rocks as a construction materials- physical properties, texture, composition, applications for aggregate, decorative (facing/polishing), railway ballast, rocks for masonry work, monumental/architecture, rocks as aquifers, water bearing properties igneous, sedimentary.	**10 Hours**
Module 3	**Surface investigation for Civil Engineering projects** Weathering, type, causes, soil in-situ, drifted soil, soil profile, soil mineralogy , structure, types of soil, Black cotton soil v/s Lateritic soil; effects of weathering on monumental rocks, River morphology and basin investigation for engineering Projects like earthen dam, gravity dam, arch dam, features of river erosion, deposition and their influences on river valley projects, morphometric analysis of river basin, selection of site for artificial recharge,, interlinking of river basins, coastal process and landforms, sedimentation /siltation, erosion.	**10 Hours**
Module 4	**Subsurface investigation for deep foundation** Borehole data(and problems), Dip and strike, and outcrop problems(numerical problem geometrical/ simple trigonometry based), Electrical Resistivity meter, depth of water table, (numerical problems) seismic studies, faults, folds, unconformity, joints types, recognition and their significance in Civil engineering projects like tunnel project, dam project, , Ground improvements like rock bolting, rock jointing, grouting.	**10 Hours**
Module 5	**Introduction to Mining and Its Impact** Mining – definition and economic importance; Mine – definition, different types and classification; Mine life cycle; Mineral deposit – different types and their classification; Mineral resources of India; Modes of entry to a mine – shaft, incline, decline, adit and box-cut. Overview of surface mining: Types of surface mines, unit operations, basic bench geometry, applicability & limitations and advantages & disadvantages. Granite mining and Mining Impacts	**10 Hours**

LABORATORY EXPERIMENTS

1. Evaluation of minerals based on physical properties for basic raw material for construction, industrial application (2 classes)
2. Investigation of rock based on physical, textural, and mineralogical properties for construction (2 classes)
3. Geologic maps studies (6 classes) Cross-section studies of Geological maps for suitability evaluation and subsurface investigation of geological conditions for Dams, tunnels water harvesting, aqua duct, bridges under conditions of Horizontal strata, inclined strata, Folded and Faulted beds, Unconformity, Intrusion relevant–; construction/ generation of Geological maps based on borehole data
4. Geospatial data analysis (3 classes)
    - Interpretation of topo sheets
    - Visual interpretation of FCCs (Geomorphology and Land use/land cover mapping) and TCCs,
5. Geophysical exploration – (2 classes)
    - Electrical resistivity methods for subsurface investigation – and its Interpretation, lateral and vertical sounding

Course outcomes:

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

- Comprehend the relations between minerals and rocks based on their physical properties
- Assess the suitability of materials used in building construction
- Differentiate geological investigations necessary for the construction of dams, bridges, and tunnels and mining
- Demonstrate the groundwater investigation using resistivity methods
- Appraise the applications of Geospatial technology in Civil and Environmental Engineering.

Text and Reference Books:

1. Engineering Geology, by Parthasarathy et al, Wiley publications
2. A textbook of Engineering Geology by ChennaKesavulu, Mac Millan India Ltd
3. Principle of Engineering Geology, by K.M. Bangar, Standard publishers
4. Physical and Engineering Geology, by S.K. Garg, Khanna publishers
5. Principles of Engineering Geology, by KVGK Gokhale, BS Publications
6. Introduction to Mining Engineering, Hartmann, 2nd edition.

BUILDING MATERIALS & CONSTRUCTION (21CV34)

SemesterIII			
No. of Teaching hour/Week	3	**CIE Marks**	50
No. of Practical 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 to Building materials** Aggregates, Bricks, concrete blocks, Cement, Mortar, Concrete, Timber, steel, Glass, MDF, Ply wood. **Painting**: Characteristics of an ideal paint, classification & types of paints, painting on different surfaces, defects in painting, varnishing, distempering, white washing &colour washing. **Green and Smart Materials***:* Passive Products & Materials include glazing, insulation, paints & coatings, adhesives & sealants, fly-ash blocks, cement, concrete, composite wood, filler slabs, certified new wood, housekeeping chemicals, false ceiling materials, flooring materials, furniture, gypsum-based products, high reflective materials & coatings, glass etc.	**08 Hours**
Module 2	**Foundations** Introduction, Depth of footings, Strip footing, Isolated footing, Eccentrically loaded footings, Grillage foundations, Combined footings, Strap footing, Raft foundation, Foundations for black cotton soils, stepped footings, Adjacent footings.	**08 Hours**
Module 3	**Masonry, Doors & Windows** Stone masonry: Definition of terms, Classification of stone masonry, dressing of stones, joints in stone masonry. Brick Masonry: Terminologies, types of bonds: stretcher bond, header bond, English bond, Flemish bond, brick laying, defects in brick masonry, Thickness of a brick wall, buttresses, thresholds, window sills, corbels, copings, jambs. Concrete masonry, Hollow clay block masonry. Doors& windows: Terminologies, Location of doors & windows, size of doors, door frames, types of doors & windows.	**08 Hours**
Module 4	**Formwork & scaffolding, Plastering & pointing** Formwork: requirements, IS standards on form work, Loads on form work, shuttering for:columns-beam & slab floor-stairs-walls. Shoring, under pinning, scaffolding. Plastering & pointing: plastering, terminologies, tools for plastering, number of coats of plaster, methods of plastering, types of plaster finishes, defects in plastering, pointing.	**08 Hours**
Module 5	**Green Building:** Concept of Green building, Principles of green buildings, Eco-friendly materials, Certification systems – Green Rating for Integrated Habitat Assessment (GRIHA) and Leadership in Energy and Environmental Design (LEED).	**08 Hours**

Course outcomes:

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

- Assess the suitability of building and construction materials and green materials used construction
- Differentiate types of footings used for buildings.
- Describe the erection of masonry work along with doors & windows.
- Appreciate the process involved in formwork & scaffolding work and plastering, painting, plumbing & sanitary works.
- Gain Knowledge on Green Buildings

Text and Reference Books:

1. Building Construction, by W B McKay, Pearson Publications, 2013.
2. Building Construction, by Dr. B C Punmia, Lakshmi Publications, 11 th edition, 2016.
3. Building Construction, by Rangwala, Charotar Publications, 2016.
4. Building Construction, by Sushil Kumar, Standard publications, 20th edition.
5. Building Construction& Material, byGurucharan Singh, Standard Book House, 2019.
6. IGBC and NBC Codes & Specifications.

STRENGTH OF MATERIALS (21CV35)

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

Modules	Course Content	Teaching Hours
Module 1	**Simple Stresses and Strains:** Introduction, Properties of Materials, Stress, Strain, Hook's law, Poisson's Ratio, Stress – Strain Diagram for structural steel, Principles of superposition, Total elongation of tapering bars of circular and rectangular cross sections. Composite section, Volumetric strain, expression for volumetric strain, Elastic constants, relationship among elastic constants, Thermal stress and strains **Compound stresses:** Introduction, Stress components on inclined planes, General two-dimensional stress system, Principal planes and stresses, maximum shear stresses and their planes (shear planes). Compound stress using Mohr's circle method.	**10 Hours**
Module 2	**Bending moment and shear force diagrams in beams**: Definition of shear force and bending moment, Sign convention, Relationship between loading, shear force and bending moment, Shear force and bending moment equations, development of Shear Force Diagram (SFD) and Bending Moment Diagram (BMD) with salient values for cantilever, simply supported and overhanging beams for point loads, UDL (Uniformly Distributed Load), UVL (Uniformly Varying Load) and Couple.	**10 Hours**
Module 3	**Bending stress in beams:** Introduction – Bending stress in beam, Pure bending, Assumptions in simple bending theory, derivation of Simple bending equation (Bernoulli's equation), modulus of rupture, section modulus, Flexural rigidity, Problems **Shear stress in beams:** Derivation of Shear stress intensity equations, Derivation of Expressions of the shear stress intensity for rectangular, triangular and circular cross sections of the beams. Problems on calculation of the shear stress intensities at various critical levels of T, I and Hollow rectangular cross sections of the beam.	**10 Hours**
Module 4	**Torsion:** Twisting moment in shafts, simple torque theory, derivation of torsion equation, tensional rigidity, polar modulus, shear stress variation across solid circular and hollow circular sections, Problems **Thin cylinders:** Introduction: Longitudinal, circumferential (hoop) stress in thin cylinders. Expressions for longitudinal and circumferential stresses. Efficiency of longitudinal and circumferential joints. Problems on estimation of change in length, diameter and volume when the thin cylinder subjected to internal fluid pressure. **Thick cylinders:** Concept of Thick cylinders Lame's equations applicable to thick cylinders with usual notations,	**10 Hours**

	calculation of longitudinal, circumferential and radial stresses – simple numerical examples. Sketching the variation of radial stress (pressure) and circumferential stress across the wall of thick cylinder.	
Module 5	**Elastic stability of columns:** Introduction – Short and long columns, Euler's theory on columns, Effective length, slenderness ratio, radii of gyration, buckling load, Assumptions, derivations of Euler's Buckling load for different boundary conditions, Limitations of Euler's theory, Rankine's formula and related problems. **Deflection of determinate Beams:** Introduction, Elastic curve –Derivation of differential equation of flexure, Sign convention, Slope and deflection using Macaulay's method for statically determinate beams subjected to various vertical loads, moment, couple and their combinations. Numerical problems.	**10 Hours**

LABORATORY EXPERIMENTS

1. Dimensionality of bricks, Water absorption, Initial rate of absorption
2. Specific gravity of coarse and fine aggregate
3. Fineness modulus of Fine and Coarse aggregate
4. Compressive strength tests on building blocks (brick, solid blocks and hollow blocks)
5. Tension test on Mild steel and HYSD bars
6. Compression test on HYSD, Cast iron
7. Bending Test on Wood under two-point loading.
8. Shear Test on Mild steel – single and double shear
9. Impact test on Mild Steel (Charpy& Izod)

Course outcomes:

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

- Evaluate the behaviour when a solid material is subjected to various types of forces (namely Compressive, Tensile, Thermal, Shear, flexure, Torque, internal fluid pressure) and estimate stresses and corresponding strain developed. (L3)
- Estimate the forces developed and draw schematic diagram for stresses, forces, moments for simple beams with different types of support and are subjected to various types of loads (L3).
- Evaluate the behaviour when a solid material is subjected to Torque and internal fluid pressure and estimate stresses and corresponding strain developed. (L3)
- Distinguish the behaviour of short and long column and calculate load at failure & explain the behaviour of spring to estimate deflection and stiffness (L3)
- Examine and evaluate the mechanical properties of various materials under different loading conditions.

Text and Reference Books:

1. Timoshenko and Young, "Elements of Strength of Materials",East West Press, 5t edition 2003
2. R. Subramanyam, "Strength of Materials", Oxford University Press, 3rd Edition -2016
3. B.C Punmia Ashok Jain, Arun Jain, "Strength of Materials", Laxmi Publications, 10th Edition-2018
4. S. Ramamrutham, "Strength of Materials", Dhanpath Rai Publications, 20th edition, 2020.
5. S. S Rattan, "Strength of Materials", Mc Graw Hill Publications, 3rd edition, 2017.

COMPUTER AIDED BUILDING DRAWINGS (21CVL36)

Semester III			
No. of Lecture hour/Week	02	**CIE Marks**	50
No. of Practical hours/week	02	**SEE Marks**	50
Total No. of Lecture hours	26	**Exam Hours**	03
L: T:P	2:0:2	**Credits**	02

Sl No.	Course Content	
Module 1	**Drawing Basics:** Selection of scales for various drawings, thickness of lines, dimensioning, abbreviations and conventional representations as per IS: 962. **Simple Engineering Drawings with CAD** Drawing Tools**:** Lines Circle, Arc, Poly line, Multiline, Polygon, Rectangle, Spline, Ellipse. Modify tools: Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet. Using Text: Single line text, Multiline text, Spelling, Edit text. Special Features: View tools, Layers concept, Dimension tools, Hatching, Customizing Toolbars, Working with multiple drawings.	**8 hours**
Module 2	**Drawings of Different Building Elements:** Following drawings are to be prepared for the data given using CAD Software a) Cross section of Foundation, masonry wall, RCC columns with isolated & combined footings. b) Different types of staircases – Dog legged, Open well, c) Lintel and chajja. d) RCC Slabs and beams.	**8 hours**
Module 3	**Building Drawings :**Principles of planning, Planning regulations and building bye-laws, factors affecting site selection, Functional planning of residential and public buildings, design aspects for different public buildings. Recommendations of NBC. Drawing of plan, elevation and sectional elevation including electrical, plumbing and sanitary services using CAD software for 1. Single and double story residential building. 2. Hostel building. 3. Hospital building. 4. School building. Submission drawing (sanction drawing)of two storied residential building with access to terrace including all details and statements as per the local bye-laws Industry Applications : 3D Modelling and Rendering, 2D Animation, Construction site Simulation **Environmental Engineering Drawings** e) Septic Tank and sedimentation Tank. f) Layout plan of Rainwater recharging and harvesting system. g) Layout of Typical Water Supply System. f) Drawing of Hydraulic Profile for Water Treatment Unit. **Note:** Students shall sketch to dimension the above in a sketch book before doing the computer drawing and undertake one compulsory field visit/exercise. (Single line diagrams are given in the examination).	**10 hours**

Course Outcomes

At the end of the course the student will able to

1. Understand the basics of CAD Drawing and
2. Prepare, read and interpret the drawings in a professional set up.
3. Know the procedures of submission of drawings and Develop working and submission drawings for building.
4. Build the skills on elements of building Plan and design of residential or public building as per the given requirements including 2D and 3D Animation.
5. Prepare layout plans of environmental engineering using CAD

Text Books:

- MG Shah, CM Kale, SY Patki, "Building drawing with an integrated approach to Built Environment Drawing", Tata McGraw Hill Publishing co. Ltd, New Delhi.
- Gurucharan Singh, "Building Construction", Standard Publishers, & distributors, New Delhi.
- Malik RS and a Meo GS, "Civil Engineering Drawing", Asian Publishers/Computech Publication Pvt Ltd.
- Time Saver Standard by Dodge F.W, F.W Dodge Corp.
- IS: 962-1989 (Code of practice for architectural and building drawing).
- National Building Code, BIS, New Delhi.

ENVIRONMENTAL STUDIES [21CIV37]

Semester III			
No. of Teaching hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	-
Total No. of Lecture hours	16	**Exam Hours**	-
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:

After Studying this course, students will be able to

1. Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale.
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment.
3. Demonstrate Solid Waste Management.
4. Apply knowledge and technology in environmental practices
5. Build inquisitiveness to protect environment through societal interventions

Text 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.

UNIVERSAL HUMAN VALUE & PROFESSIONAL ETHICS [21UHV38]

Semester III			
No. of Teaching hour/Week	1	**CIE Marks**	50
No. of Tutorial hours/week	-	**SEE Marks**	-
Total No. of Lecture hours	16	**Exam Hours**	-
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 and the 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:

The course and further follow up is expected to positively impact common graduate attributes like:

- 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

Textbook/ Reference Books

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

ENGINEERING MATHEMATICS-IV [21MAT41]

Semester IV			
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	**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 3	**Probability Distributions:** Review of basic probability theory. 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.

Text and Reference Books:

Text 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.

Reference Books:

1. Srimanta Pal & Subodh C. Bhunia: *"Engineering Mathematics"* Oxford University Press, 3rd Reprint, 2016.
2. N.P Bali and Manish Goyal: *"A textbook of Engineering Mathematics"* Laxmi Publications, Latest edition.
3. H.K.Dass and Er. Rajnish Verma: *"Higher Engineering Mathematics"* S.Chand Publication (2014).

ADDITIONAL MATHEMATICS-II (21MATDIP41)

Semester IV			
No. of Lecture hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	1	**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 integral calculus. 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.

Text 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.

Reference Books:

1. N.P Bali and Manish Goyal: *"A textbook of Engineering Mathematics"* Laxmi Publications, Latest edition.
2. H.K.Dass and Er. Rajnish Verma: *"Higher Engineering Mathematics"* S.Chand Publication (2014).

FLUID MECHANICS & HYDRAULICS (21CV42)

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

Modules	Course Content	Teaching Hours
Module 1	Fluids and their properties, Fluid pressure measurements, Pascal's law, Measurement of pressure using manometer, Total pressure and centre of pressure on vertical and inclined plane surfaces.	**10 Hours**
Module 2	Kinematics- Types of fluid flow, continuity equation in Cartesian coordinates, flow nets, Dynamics- Euler's equation of motion, Bernoulli's equation, Application-Venturimeter, Orificemeter, Pitot tube	**10 Hours**
Module 3	Classification of orifice and mouth piece, Hydraulic coefficients, Discharge over Rectangular, Triangular and Cipoletti notch. Flow through pipes-Major and minor losses, pipes in series and parallel, concepts of water hammer and surge tanks	**10 Hours**
Module 4	Open Channel Hydraulics- Classification of Flow through channels, Most economical channel sections: Rectangular, Triangular and Circular. Uniform flow, Specific energy. Non-Uniform flow- Hydraulic jump, Analysis of GVF equation.	**10 Hours**
Module 5	Impact of jet on curved vanes,momentum equation, Impact of jet on stationary and moving curved vanes. Turbines- Pelton wheel and components, Velocity triangle Reaction turbine-Francis turbine,Working proportions. Centrifugal Pumps-Work done and efficiency, Multi stage pumps	**10 Hours**

LABORATORY EXPERIMENTS

1. Determination of Cd for Venturimeter or Orificemeter
2. Determination of Hydraulic coefficients of small vertical orifice
3. Calibration of Triangular notch
4. Determination of Major & Minor losses in pipes
5. Determination of Cd for ogee or broad crested weir
6. Determination of force exerted by a jet on flat and curved vanes
7. Determination of efficiency of centrifugal pump
8. Determination of efficiency of Kaplan or Francis turbine
9. Determination of efficiency of Pelton wheel turbine

Course outcomes:

After studying this course, students will able to:

1. Understand fundamental properties of fluids and solve problems on Hydrostatics.
2. Apply Principles of Mathematics to represent Kinematics and Bernoulli's principles.
3. Compute discharge through pipes, notches and weirs.
4. Design of open channels of various cross sections.

5. Design of turbines for the given data and understand their operation characteristics.

Text and Reference Books:

1. P.N.Modi and S.M.Seth-Hydraulics and Fluid Mechanics, including Hydraulic machines, standard Book House,New Delhi
2. K Subramanya- Fluid Mechanics and Hydraulic Machines, Tata McGrawhill, New Delhi
3. R.K. Bansal- A text book of Fluid Mechanics and Hydraulic Machines- Laxmi Publications, New Delhi
4. Victor L. Streeter, Benjamin Wyile E and Keith W. Bedford- Fluid Mechanics ,Tata McGraw Hill publishing Co Ltd,New Delhi

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ENVIRONMENTAL ENGINEERING – I (21CV43)

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

Modules	Course Content	Teaching Hours
Module 1	**Introduction**: Water: Need for protected water supply, Demand of Water: Types of water demands -domestic demand, industrial, institutional and commercial demand, public use and fire demand estimation, factors affecting per capita demand, Variations in demand of water, Peak factor. **Design period** and factors governing design period. Methods of population forecasting and numerical problems. Physico-chemical characteristics of water (Analysis to be conducted in laboratory session). Sampling.	**10 Hours**
Module 2	**Water Treatment:** Objectives, Unit flow diagrams – significance of each unit, Aeration process- Limitations and types **Sedimentation -** Theory, settling tanks, types and design, Coagulation and flocculation, types of coagulants,(Optimization of coagulant to be carried out in the laboratory), Clari-flocculator. **Filtration:** mechanism, theory of filtration, types offilters: slow sand, rapid sand andpressure filters. Operation and cleaning. Design of slow and rapid sand filter without under drainage system	**10 Hours**
Module 3	**Disinfection:** Methods of disinfection with merits and demerits. Breakpoint of chlorination (Analysis to be conducted in laboratory session) Softening: Lime soda and Zeolite process. **Wastewater:** **Introduction:** Need for sanitation, methods of sewage disposal, types of sewerage systems. **Treatment of municipal waste water:** Waste water characteristics (Analysis to be conducted in laboratory session): sampling, significance and techniques, physical, chemical and biological characteristics,Numericals on BOD.	**10 Hours**
Module 4	**Treatment Process:** flow diagram for municipal waste water Treatment unit operations andprocess,Screens: types, disposal. Grit chamber, oil and grease removal. Primary and secondary settling tanks, Suspended growth system - conventional activated sludge process and its modifications.	**10 Hours**
Module 5	Attached growth system – trickling filter, Trickling filters, bio-towers and rotating biological contactors. SBBR, SBR, MBR.	**10 Hours**

LIST OF DRAWINGS

1. Drawing of Distribution Systems for simple network.
2. Drawing of Flocculator and Sedimentation Units (Circular and Rectangular)
3. Plan and Sectional Elevation, Clariflocculator.
4. Drawing of Rapid Sand Filters (Plan and Section).
5. Layout showing hydrants, valves, bends and chlorination point in water treatment plant.

LABORATORY EXPERIMENTS

1. Determination of Acidity and Alkalinity
2. Determination of Calcium, Magnesium and Total Hardness.
3. Determination of Dissolved Oxygen / BOD / COD.
4. Determination of Chlorides.
5. Determination of percentage of available chlorine in bleaching powder sample,Determination of Residual Chlorine and chlorine demand.
6. Determination of Solids in Sewage: (i) Total Solids, (ii) Suspended Solids, (iii) Dissolved Solids, (iv)Volatile Solids, Fixed Solids (v) Settleable Solids.
7. Determination of optimum coagulant dosage using Jar test apparatus.
8. Determination Nitrates and Iron by spectrophotometer

Course outcomes:

- After studying this course, students will able to:
- Estimate average and peak water demand for a community.
- Evaluate water quality and environmental significance of various parameters and plan suitable treatment system.
- Design the different units of water treatment plant
- Understand and design the various units of wastewater treatment plant
- Acquire capability to conduct experiments and estimate the concentration of different parameters and compare the obtained results with the concerned guidelines and regulations.

Text and Reference Books:

1. Howard S. Peavy, Donald R. Rowe, George T, “Environmental Engineering” - Tata McGraw
2. Hill, New York, Indian Edition, 2013
3. S. K. Garg, Environmental Engineering vol-I, Water supply Engineering – M/s Khanna Publishers, New Delhi2010
4. B.C. Punmia and Ashok Jain, Environmental Engineering I-Water Supply Engineering,Laxmi Publications (P) Ltd., New Delhi2010.
5. B C Punmia, “Environmental Engineering vol-II”, Laxmi Publications 2nd, 2016

ANALYSIS OF STRUCTURES (21CV44)

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

Modules	Course Content	Teaching Hours
Module 1	**Deflection of Beams:** ***Moment area method***– Derivation, Mohr's theorems, Sign convention; Application of moment area method to determinate prismatic beams, beams of varying cross section; Use of moment diagram by parts; ***Conjugate beam method***– Real beam and conjugate beam, conjugate beam theorems; Application of conjugate beam method to determinate beams of varying cross sections.	**10 Hours**
Module 2	**Energy Principles and Energy Theorems:** ***Principle of virtual displacements***; *Principle of virtual forces*, Strain energy and complementary energy; Strain energy due to axial force, bending shear and torsion; Deflection of determinate beams and trusses using total strain energy; Deflection at the point of application of single point load; ***Castigliano's theorems***, application of Castigliano's theorems to calculate deflection of trusses, frames; Special application – Dummy unit load method.	**10 Hours**
Module 3	**Arches and Cables:** Three-hinged circular and parabolic arches with supports at the same and different levels; Determination of normal thrust, radial shear and bending moment; Analysisof cables under point loads and UDL; Length of cables with supports at the same and different levels; Stiffening trusses for suspension cables.	**10 Hours**
Module 4	**Slope Deflection Method:** Introduction, sign convention, development of slope deflection equation; Analysis of continuous beams including settlement of supports; Analysis of orthogonal rigid plane frames including sway frames with kinematic indeterminacy up to 3	**10 Hours**
Module 5	**Matrix Methods of Structural Analysis:** Definition of stiffness and flexibility methods, comparison to classical methods. **Stiffness Method:** Stiffness matrix, Analysis of continuous beams and plane trusses using system approach; Analysis of simple orthogonal plane frames using system approach with kinematic indeterminacy up to 3.	**10 Hours**

Course outcomes:

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

1. Evaluate slope and deflections in beams using geometrical methods.
2. Determine deflections in trusses and frames using energy principles.
3. Analyze arches and cables for stress resultants.

4. Apply slope defection method in analyzing indeterminate structures and construct bending moment diagram.
5. Analyze continuous beams, frames and trusses using stiffness matrix method of analysis.

Reference Books:

1. Reddy, C.S., “Basic Structural Analysis”, 3rd ed., Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2011.
2. Hibbeler, R.C., “Structural Analysis”, 9th edition, Pearson publications, New Delhi, 2012.
3. Thandavamoorthy, T.S., “Structural Analysis”, 6th edition., Oxford University press., New Delhi,2015.
4. Charles Head Norris, John Benson Wilbur and SenolUtku., “Elementary Structural Analysis”, 4th edition, Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2003.
5. Hall, A. and Kabaila, A.P., “BasicConcepts of Structural Analysis”, Pitman Publishing, London, John Wiley & Sons, New York, 1977.
6. Wang, C.K., “Intermediate Structural Analysis”, McGraw-Hill International Book Co., 1985.

TRANSPORTATION ENGINEERING (21CV45)

Semester IV			
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	3:0:2	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Principles of Transportation Engineering**: Importance of transportation, Different modes of transportation. Characteristics of road transport, Importance of Roads in India, Current Road development Programmes in India. Highway Development and Planning: Highway Development in India, Highway Planning, Planning Surveys and Interpretation, Highway Planning in India. Highway Alignment and Project preparation: Highway Alignment, Engineering Surveys for Highway Alignment, Drawings and Reports, Highway Projects, Preparation of Detailed Project Report	**08 Hours**
Module 2	**Highway Geometric Design of horizontal alignment elements**: Cross sectional elements, Sight distance, Design of Horizontal alignment, Design of vertical alignment. Pavement Design: Pavement types, component parts of flexible and rigid pavements and their functions, ESWL and its determination (Graphical method only)-Examples.	**08 Hours**
Module 3	**Pavement Materials**: Sub grade soil-grade soil -desirable properties-HRB soil classificationdetermination of CBR and modulus of sub grade reaction with Problems. Aggregates- Desirable properties. Bituminous Binders & Mixes- Types, desirable properties. Pavement Quality concrete- Materials, Requirements. Pavement Construction: General features, Embankment and Subgrade, Construction of Flexible pavements, Construction of CC pavements	**08 Hours**
Module 4	**Highway Drainage:** Significance and requirements, Surface drainage system and Design-Examples, sub surface drainage system, design of filter materials, Types of cross drainage structures, their choice and location. Highway Economics: Highway user benefits, VOC using charts only-Examples, Economic analysis - annual Cost method-Benefit Cost Ratio method-NPV-IRR methods- Examples, Highway financing-BOT-BOOT concepts	**08 Hours**
Module 5	**Elements of Traffic Engineering** – Traffic characteristics, Traffic Engineering Studies and Analysis, Traffic Regulation and Control. Elements of Railways and Airport Engineering - Railways: Introduction, classification of routes; railway gauge, coning of wheels and canting of rails, train resistance and hauling power; track components: rails, sleepers, fastenings, ballast and formation. Airports: Introduction, Layout of an airport with component parts and functions of each, Aircraft Characteristics – Airport Classifications, - Site selection- regional Planning. Orientation of runway by using wind rose diagram with examples	**08 Hours**

Lab Experiments

1. Tests on Aggregates a. Aggregate Crushing value b. Los Angeles abrasion test c. Aggregate impact test d. Aggregate shape tests (combined index and angularity number)
2. Tests on Bituminous Materials a. Penetration test b. Ductility test c. Softening point test d. Specific gravity test

3. Tests on Soil a. Wet sieve analysis b. CBR test
4. Tests on Bituminous Mixes a. Marshall Method (Demo Experiment)

Course outcome

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

1. Acquire the capability of proposing a new alignment or re-alignment of existing roads, conduct necessary field investigation for generation of required data.
2. Evaluate the engineering properties of the materials and suggest the suitability of the same for pavement construction.
3. Design road geometrics, structural components of pavement and drainage.
4. Evaluate the highway economics by few select methods and also will have a basic knowledge of various highway financing concepts.

Text Books

1. S K Khanna and C E G Justo, “Highway Engineering”, Nem Chand Bros, Roorkee.
2. L R Kadiyali, “Highway Engineering”, Khanna Publishers, New Delhi.
3. R Srinivasa Kumar, “Highway Engineering”, University Press.
4. K. Subramaniam, “Transportation Engineering”, SciTech Publications, Chennai.
5. Saxena Subhash C and Satyapal Arora, “A Course in Railway Engineering”, Dhanpat Rai and Sons, Delhi.
6. Chandra S. and Agarwal M.M. “Railway Engineering”, Oxford University Press India.
7. Khanna S K, Arora M G and Jain S S, “Airport Planning and Design”, Nem Chand and Bros.
8. Khanna S.K. and Justo C.E.G. Highway Material Testing, Nem Chand & Bros

GEOGRAPHIC INFORMATION SYSTEM (21CV46)

Semester IV			
No. of Lecture hour/Week	02	**CIE Marks**	50
No. of Practical hours/week	02	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T:P	2:0:2	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Geographic Information System-** Introduction, Functions and advantages, sources of data for GIS. Database – Types, advantages and disadvantages. Data Analysis.-overlay operations, network analysis, spatial analysis. Outputs and map generation. GPS- components and working principles.	**05 Hours**
Module 2	**Applications of GIS**, Remote Sensing and GPS: Water Resources engineering and management (prioritization of river basins, water perspective zones and its mapping), Highway and transportation (highway alignment, Optimization of routes, accident analysis), Environmental Engineering 2 (Geostatistical analysis of water quality, rainfall).	**05 Hours**
Module 3	**Applications of GIS, Remote Sensing and GPS:** Urban Planning & Management, urban sprawl, Change detection studies, forests and urban area, floods, drainage system agriculture, Disaster Management.	**05 Hours**
Module 4	**QGIS Introduction:** Definition of GIS and its use. Introduction to a free and open source desktop geographic information system software. Types of data (vector and raster formats), web services, useful commands and utilities for geo-processing, extending its capabilities to digital satellite image processing and analysis. **About QGIS** Characteristics of QGIS Start using QGIS. QGIS TOOLS QGIS Configuration, General tools, Working with projections QGIS Browser. WORKING WITH RASTER DATA Introduction, Display raster data, Raster calculator, Working with images, Practical exercises: Working with raster data and operations with images.	**10 Hours**
Module 5	**CREATE MAPS AND RELATED PRODUCTS**: Creation tools, Graphic elements, Atlases generation, and Graphic output creations. Practical exercises: Map creation with QGIS. Teaching-Learning Process Chalk and talk, PowerPoint Presentation & PBL **RELATIONAL DATABASE MANAGEMENT SYSTEMS AND SPATIAL DATA**. Database design, Database connections, Table joins Spatial joins, generate new statistics and new data using table and spatial data information. Practical exercises: Creation of thematic maps like population data of taluk, Watershed map with drainage and water bodies, Highway with other 2 road intersection details	**15 Hours**

Course Outcomes:

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

1. Understand principles Geographical Information Systems (GIS) data acquisition and its applications.
2. Apply GIS technologies in various fields of engineering and social needs for creating a feasible solution in the different fields of application of GIS
3. Use open source software for civil environmental engineering applications of various tools in QGIS software
4. Create thematic layers with attribute data and generate maps using QGIS for decision making

Reference Books:

1. Geographic Information System-An Introduction, Tor Bernharadsen, 2009, 3rd Edition, Wiley India Pvt. Ltd. New Delhi, ISBN - 9788126511389.
2. Principles of Remote sensing and Image Interpretation, Lillesand and Kiefer, 2011, 6th Edition, John Wiley Publishers, New Delhi, ISBN – 8126532238. Web links and Video Lectures (e-Resources):
3. https://docs.qgis.org/3.16/pdf/en/QGIS-3.16-DesktopUserGuide-en.pdf for QGIS manual
4. NPTEL Lectures

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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