FIRST YEAR SYLLABI 2023

B.TECH
CIVIL ENGINEERING

MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

Mar Ivanios Vidyanagar, Nalanchira, Thiruvananthapuram – 695 015

August 2023

DETAILED SYLLABI OF FIRST YEAR

FOR

B. TECH. DEGREE PROGRAMME

IN

CIVIL ENGINEERING

SEMESTERS I & II

2023 SCHEME

(AUTONOMOUS)

MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

(Approved by AICTE, Autonomous Institution Affiliated to APJ Abdul Kalam Technological University)
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MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

DEPARTMENT OF CIVIL ENGINEERING

B.TECH DEGREE PROGRAMME
IN
CIVIL ENGINEERING

DETAILED SYLLABI OF FIRST YEAR
2023 SCHEME

Items	Board of Studies (BoS)	Academic Council (AC)
Date of Approval	14-07-2023	09-08-2023
Date of Approval of Revised version	12/08/2024	19/06/2024

Head of Department
Chairman, Board of Studies

Principal
Chairman, Academic Council

MAR BASELIOS COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

Vision and Mission of the Institution

Vision:

To be an Institution moulding globally competent professionals as epitomes of Noble Values.

Mission:

To transform the Youth as technically competent, ethically sound and socially committed professionals, by providing a vibrant learning ambience for the welfare of humanity.

DEPARTMENT OF CIVIL ENGINEERING

Vision and Mission of the Department

Vision:

To be a Centre of Excellence in Civil Engineering education with a global perspective, creating ethically strong engineers for the service of society.

Mission:

To provide Engineering Education which can create exemplary professional Civil Engineers of high ethics with strong conceptual foundation coupled with practical insight, to serve the industry and community.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Graduates of the Programme will have a successful career as Civil Engineering practitioners, entrepreneurs or professionals, addressing the needs of the industry with a global perspective.

PEO2: They will contribute to society as ethical and responsible citizens with proven expertise

PEO3: They will engage in continuous professional development and advance to leadership roles in their chosen career.

PROGRAMME OUTCOMES (POs)

Engineering graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: Provide feasible and sustainable solutions to problems in various Civil Engineering disciplines such as Structural, Environmental, Geotechnical, Transportation and Construction Engineering.

PSO2: Apply the principles, methods, software and codes of practices to design various Civil Engineering Systems.

CURRICULUM - (FIRST YEAR)

SEMESTER I						
Slot	**Cate-gory Code**	**Course Code**	**Courses**	**L-T-P-J**	**Hours**	**Credit**
A	BSC	23MAL10A	Linear Algebra and Calculus	3-1-0-0	4	4
B	BSC	23CYL10A	Engineering Chemistry	3-1-0-0	4	4
C	ESC	23ESB10A	Engineering Graphics	2-0-2-0	4	3
D	ESC	23ESB10K	Basics of Electrical Engineering B	1-0-2-0	3	2
E	ESC	23ESL10M	Basics of Mechanical Engineering	2-0-0-0	2	2
	ESC	23ESL10N	Basics of Civil Engineering	2-0-0-0	2	2
G	ESC	23ESL1NA	Environmental Science	2-0-0-0	2	1*
S	BSC	23CYP10A	Engineering Chemistry Lab	0-0-2-0	2	1
T	ESC	23ESP10A	Manufacturing and Construction Practices A	0-0-2-0	2	1
				TOTAL	**25**	**20**

***Not to be considered for Grade/GPA/CGPA. Pass or fail only**

SEMESTER II						
Slot	**Cate-gory Code**	**Course Code**	**Courses**	**L-T-P-J**	**Hours**	**Credit**
A	BSC	23MAL10B	Vector Calculus, Differential Equations and Transforms	3-1-0-0	4	4
B	BSC	23PYL10A	Engineering Physics	3-1-0-0	4	4
C	ESC	23ESL10B	Applied Mechanics	2-1-0-0	3	3
D	ESC	23ESB10F	Problem Solving and Programming	2-0-2-0	4	3
E	ESC	23ESL10R	Building Materials and Construction Technology	3-0-0-0	3	3
G	HSC	23HSJ1NB	Professional Communication	2-0-0-2	4	1*
S	BSC	23PYP10A	Engineering Physics Lab	0-0-2-0	2	1
T	ESC	23ESP10C	Design Studio I	0-0-2-0	2	1
				TOTAL	**26**	**20**

***Not to be considered for Grade/GPA/CGPA. Pass or fail only**

SEMESTER 1

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23MAL10A	LINEAR ALGEBRA AND CALCULUS	BSC	3	1	0	0	4	2023

i) COURSE OVERVIEW

This course introduces students to some basic mathematical ideas and tools which are at the core of any engineering course. A brief course in Linear Algebra familiarizes students with some basic techniques in matrix theory which are essential for analysing linear systems. The calculus of functions of one or more variables taught in this course are useful in modelling and analysing physical phenomena involving continuous change of variables or parameters and have applications across all branches of engineering.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Solve systems of linear equations.	Apply
CO 2	Compute maxima and minima using partial derivatives.	Apply
CO 3	Compute areas and volumes of geometrical shapes using multiple integrals.	Apply
CO 4	Identify the convergence or divergence of an infinite series.	Apply
CO 5	Determine the Taylor and Fourier series expansion of functions and learn their applications.	Apply

iii) SYLLABUS

Basics of Linear Algebra – Solution of systems of linear equations, row echelon form, rank, eigenvalues and eigenvectors, diagonalization of matrices, orthogonal transformation, quadratic forms.

Partial Differentiation and Applications – Limit and continuity of functions of two or more variables, partial derivatives, chain rule, total derivatives, maxima and minima

Multiple Integrals – Double and triple integrals, double integrals over rectangular and non-rectangular regions, changing the order of integration, finding areas and volume, mass and centre of gravity.

Infinite series – Convergence and divergence of Infinite series, geometric series and p-series, test of convergence, Alternating series, absolute and conditional convergence.

Taylor series, Binomial series and series representation of exponential, trigonometric, logarithmic functions –Fourier Series– Euler's formulas, Fourier sine and cosine series, Half range expansions.

iv) a) TEXTBOOKS

1) Anton, Bivens & Davis, Calculus, 12th edition, John Wiley & Sons, 2021.
2) Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley & Sons, Inc., 2020.

b) REFERENCES

1) James Stewart, Essential Calculus, 2nd edition, Cengage Learning, 2013.
2) George B. Thomas and Ross L. Finney, Calculus and Analytic geometry, 9th edition, Pearson, Reprint, 2002.
3) Peter V. O'Neil, Advanced engineering mathematics, 8th edition, Cengage learning, 2017.

v) COURSE PLAN

Module	Contents	No. of hours
I	Linear Algebra: Systems of linear equations, Solution by Gauss elimination, row echelon form and rank of a matrix, fundamental theorem for linear systems (homogeneous and non-homogeneous, without proof), Eigenvalues and eigenvectors. Diagonalization of matrices, orthogonal transformation, quadratic forms and their canonical forms.	**12**
II	Multivariable calculus-Differentiation: Concept of limit and continuity of functions of two variables, partial derivatives, Differentials, Local Linear approximations, chain rule, total derivative, Relative maxima and minima, Absolute maxima and minima on closed and bounded sets.	**12**
III	Multivariable calculus-Integration: Double integrals (Cartesian), reversing the order of integration, change of coordinates (Cartesian to polar), finding areas and volume using double integrals, mass and centre of gravity of inhomogeneous laminas using double integral. Triple integrals, volume calculated as triple integral, triple integral in cylindrical and spherical coordinates (computations involving spheres, cylinders).	**12**
IV	Sequences and Series: Convergence of sequences and series, convergence of geometric series and p-series(without proof), test of convergence (comparison, ratio and root tests without proof); Alternating series and Leibnitz test, absolute and conditional convergence.	**12**
V	Series representation of functions: Taylor series (without proof, assuming the possibility of power series expansion in appropriate domains), Binomial series and series representation of exponential, trigonometric, logarithmic functions (without proofs of convergence); Fourier series, Euler formulas, Convergence of Fourier series (without proof), half range sine and cosine series, Parseval's theorem (without proof).	**12**
	Total	**60**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	5 marks
Continuous Assessment Test (2 Numbers)	:	10 marks each
Assignment/Project/Case study etc.	:	15 marks
Total	**:**	**40 marks**

vii) CONTINUOUS ASSESSMENT TEST

No. of Test	:	2
Maximum marks	:	30 Marks
Test Duration	:	1.5 hours
Topic	:	2.5 Module

viii) END SEMESTER EXAMINATION

Maximum marks	:	**60 Marks**
Exam Duration	:	3 Hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23CYL10A	ENGINEERING CHEMISTRY	BSC	3	1	0	0	4	2023

i) COURSE OVERVIEW

The aim of the Engineering Chemistry program is to expose the students to basic concepts of chemistry and its Industrial as well as Engineering applications. It also lets the students familiarize with different topics such as new-generation engineering materials, storage devices, different instrumental methods etc.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO1	Apply the basic concepts of Electrochemistry in various Engineering problems.	Apply
CO2	Apply the basic concepts of UV-Visible, IR and NMR spectroscopic techniques to analyze organic compounds.	Apply
CO3	Explain the significance of conducting polymers, Nanomaterials, Alloys and composite materials in Engineering.	Understand
CO4	Explain relevant techniques used for the identification and separation of chemical compounds and mixtures.	Understand
CO5	Explain the principles of green chemistry and various water treatment methods used for sustainability.	Understand

iii) SYLLABUS

Electrochemistry: Cell prototype- Daniel cell, Nernst equation and its uses, Primary and secondary electrodes- construction and working, applications of electrochemical series. Potentiometric titration – Acid Base titration, Fundamentals of corrosion, Galvanic series, Wet and dry corrosion – types, mechanism and its prevention.

Electrochemical power sources: different types of cells, construction, working and applications– Dry cell, Electrolytic cells, Galvanic cells, Lead-acid cell, accumulator, Lithium ion cell- different electrode materials, Fuel cells, H_2-O_2 fuel cell.

Basics of Spectroscopy: Beer Lambert's law, Principles and applications of UV-Visible spectroscopy, Fluorescence and its applications, Woodward-Feiser rule, instrumentation of UV- Visible spectroscopy, calorimetry, Principles and applications of IR spectroscopy, Number of vibrational modes – CO_2 and H_2O, Determination of force constant of diatomic molecules, Principles and applications of NMR spectroscopy, Shielding, Deshielding, Chemical shift, spin-

spin splitting, MRI technique.

Engineering Materials: Basics of Polymer chemistry, Types of copolymers, Preparation, properties and applications- Butadiene Styrene, Acrylonitrile Butadiene Styrene, Kevlar, conducting polymers- Polyaniline and Polypyrrole - preparation properties and applications, Organic Light Emitting Diode

Nanomaterials: Origin of nanomaterials, Classifications, Chemical synthesis- hydrolysis and reduction, Carbon Nanotubes, Graphene, Quantum dots-applications.

Alloys and Composites: Cast iron, Principal non-ferrous alloys, need, properties and applications of composites, super alloys, Ceramics- structure and applications.

Instrumental methods in chemistry: Thermal methods, ThermoGravimetric Analysis, Differential Thermal Analysis, Chromatography techniques- Thin Layer Chromatography, Column Chromatography, Gas Chromatography, High Performance Liquid Chromatography, Surface characterization using Scanning Electron Microscopy (SEM), X-ray Photoelectron Spectroscopy(XPS), Auger Electron Spectroscopy(AES).

Green Chemistry and Sustainability: Green chemistry – Principles, Matrices to express greenness- E-Factor, Atom Economy, Environmental Quotient, Green chemistry and Catalysis, R_4M_4 Models-Econoburette, Survismeter, E-waste disposal, Life Cycle Analysis, Benefits and limitations of conducting Life Cycle Analysis.

Water Technology: Water characteristics, hardness, disadvantages of hard water, Estimation of hardness- EDTA method, Ion exchange process for water softening, Dissolved Oxygen, Biological Oxygen Demand and Chemical Oxygen Demand, its estimation and significance, Municipal water treatment, disinfection of water, Reverse Osmosis, Sewage water treatment.

iv) a) TEXT BOOKS

1) Dexter Harvey & Nicky Rutledge, Industrial Chemistry, 1st edition, ETP, 2019.
2) Muhammed Arif M., Annette Fernandez, Kavitha P. Nair, Engineering Chemistry, 1st edition, Owl Books, 2019.
3) Shashi Chawla, A text book of Engineering Chemistry, 2nd edition, Dhanpat Rai & Co. 2017.
4) Roy K. Varghese, Engineering Chemistry, 2nd Edition, Crown Plus Publishers, 2019.
5) Prasanta Rath, Engineering Chemistry, 2nd edition, Cengage Learning, 2018.

b) REFERENCES

1) Colin. N. Banwell and Elaine M. McCash, Fundamentals of Molecular Spectroscopy, 4th edition, McGraw- Hill, 2017.
2) Willard, Merritt, Dean, Settle, Instrumental Methods of Analysis,7th edition, CBS Publishers & Distributors Pvt.Ltd., 2023.
3) Andrew Peacock and Allison Calhoun, Polymer Chemistry: Properties and Application, Hanser Gardner Publications, 2012.
4) Chris Binns, Introduction to Nanoscience and Nanotechnology, 2nd edition, John Wiley & Sons, 2021.

5) William D. Callister Jr. and David G. Rethwisch, Material Science and Engineering, 10th edition, John Wiley, 2019.
6) Tom Smolinka & Jürgen Garche, Electrochemical power sources: fundamentals, systems, and applications: hydrogen production by water electrolysis, Elsevier, 2021.

v) COURSE PLAN

Module	Contents	No. of hours
I	Electrochemistry: Cell prototype- Daniel cell, Nernst equation - Derivation and its uses, Primary and secondary electrodes- SHE, Saturated Calomel Electrode, Glass Electrode- construction and working, applications of electrochemical series. Potentiometric titration – Acid Base titration - Principle, Fundamentals of corrosion, Galvanic series, Wet and dry corrosion – types, mechanism and its prevention. Electrochemical power sources**:** Different types of cells, construction, working and applications– Dry cell, Electrolytic cells, Galvanic cells, Lead-acid cell, accumulator, Lithium ion cell- different electrode materials, Fuel cells, H_2-O_2 fuel cell.	**12**
II	Basics of Spectroscopy: Beer Lambert's law, Numericals, Principles and applications of UV-Visible spectroscopy, Fluorescence and its applications, Woodward-Feiser rule and its application to molecules, instrumentation of UV- Visible spectroscopy, colorimetry, Principles and applications of IR spectroscopy, Vibrational modes of linear and non-linear molecules, Number of vibrational modes – CO_2 and H_2O, Determination of Force constant of diatomic molecules, Principles and applications of NMR spectroscopy, Shielding, Deshielding, Chemical shift, spin- spin splitting, Application to molecules, MRI technique- Principle and instrumentation.	**12**
III	Engineering Materials: Basics of Polymer chemistry, Types of copolymers, Preparation, properties and applications- Butadiene Styrene, Acrylonitrile Butadiene Styrene, Kevlar, conducting polymers- Polyaniline and Polypyrrole - preparation properties and applications, Organic Light	**12**

	Emitting Diode – Principle and working. Nanomaterials: Origin of nanomaterials, Classifications based on dimensions and materials, Chemical methods of synthesis- hydrolysis and reduction, Carbon Nanotubes, Graphene, and Quantum dots-applications. Alloys and Composites: Cast iron, Principal non-ferrous alloys- Properties and applications, properties and applications of composites, super alloys, Ceramics- structure and applications.	
IV	Instrumental methods in chemistry: Thermal methods, Principle, instrumentation and applications- ThermoGravimetric Analysis, Differential Thermal Analysis. Chromatography techniques- Principles of Thin Layer Chromatography, Column Chromatography, Principle, instrumentation and applications - Gas Chromatography, High Performance Liquid Chromatography. Surface characterization using Scanning Electron Microscopy (SEM), X-ray Photoelectron Spectroscopy (XPS), Auger Electron Spectroscopy (AES) – Principle, Instrumentation and working.	**12**
V	Green Chemistry and Sustainability: Green chemistry – Principles, Matrices to express greenness- E-Factor, Atom Economy, Environmental Quotient, Green chemistry and Catalysis, R_4M_4 Models-Econoburette, Survismeter, E-waste disposal, Life Cycle Analysis, Benefits and limitations of conducting Life Cycle Analysis. Water Technology: Water characteristics, hardness, determination of hardness – numericals. Disadvantages of hard water in industries, Estimation of hardness- EDTA method, Ion exchange process for water softening, Dissolved Oxygen, Biological Oxygen Demand and Chemical Oxygen Demand, its estimation and significance, Municipal water treatment, disinfection of water, Reverse Osmosis, Sewage water treatment.	**12**
	Total hours	**60**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	5 marks
Continuous Assessment Test (2 Numbers)	:	10 marks each
Assignment/Project/Case study etc.	:	15 marks
Total	**:**	**40 marks**

vii) CONTINUOUS ASSESSMENT TEST

No. of Test	:	2
Maximum marks	:	30 Marks
Test Duration	:	1.5 hours
Topic	:	2.5 Module

viii) END SEMESTER EXAMINATION

Maximum marks	:	**60 Marks**
Exam Duration	:	3 Hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESB10A	ENGINEERING GRAPHICS	ESC	2	0	2	0	3	2023

i) COURSE OVERVIEW

Aim of the course is to enable the student to effectively perform technical communication through graphical representation as per global standards. The student will be able to apply the principles of projection and will be introduced to the fundamentals of Computer Aided Drawing (CAD).

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Construct the orthographic projection of points and lines located in different quadrants.	Apply
CO 2	Prepare orthographic projection of solids by visualizing them in different positions.	Apply
CO 3	Prepare multiview projection and solid models of objects using CAD tools.	Apply
CO 4	Prepare assembly drawing of standard machine components using CAD tools.	Apply
CO 5	Construct drawings of engineering systems with CAD tools.	Apply

iii) SYLLABUS

Introduction: Relevance of technical drawing, basic principles of engineering drawing, BIS code of practice for technical drawing, types of lines, planes of projection, orthographic projection of points in different quadrants. Projection of straight lines.

Orthographic projection of regular solids. Introduction to section, development, isometric and perspective projection

Introduction to Computer Aided Drawing, sketching of simple 2D geometries, editing and dimensioning of 2D geometries, creating 3D models using suitable software.

Assembly drawing of machine components using suitable CAD software.

Plan and elevation of simple building with dimensions, electrical drawing and circuit drawings using suitable CAD software.

iv) a) TEXT BOOKS

1) N.D Bhatt, Engineering Drawing, 54th Edition, Charotar Publishing House Pvt. Ltd, 2023.

2) K.C. John, Engineering Graphics, 1st Edition, Prentice Hall India Publishers, 2009.

3) C. M. Agrawal and Basant Agrawal, Engineering Graphics, 2nd Edition, McGraw-Hill, 2014.

b) REFERENCES

1) G. S. Phull and H. S. Sandhu, Engineering Graphics, 1st Edition, John Wiley & Sons Inc. Pvt. Ltd, 2014.
2) P. I. Varghese, Engineering Graphics, 21st Edition, V.I.P. Publishers, 2010.
3) Dhananjay A. Johle, Engineering Drawing with an Introduction to AutoCAD, 1st Edition, McGraw Hill Education, 2017.

v) COURSE PLAN

Module	Content	Hours
I	Basic principles of engineering drawing, Standards and conventions, types of lines, Introduction, planes of projection, projection of points in all the four quadrants. Projection of straight lines inclined to one plane and inclined to both planes. Trace of line, inclination of lines with reference planes, true length of line inclined to both the reference planes	**8**
II	Orthographic projection of solids: Projection of simple solids such as triangular, rectangle, square, pentagonal and hexagonal prisms, pyramids, cone and cylinder. Projection of solids in simple positions including profile view. Projection of solids with axis inclined to one of the reference planes and with axis inclined to both reference planes. Introduction to section, development, isometric and perspective projection	**11**
III	Introduction to Computer Aided Drawing: Role of CAD in design and development of new products, advantages of CAD. Creating two dimensional drawing with dimensions using suitable software Introduction to Solid Modelling: Creating 3D models of various components using suitable modelling software	**8**
IV	Drawing of Cotter Joints , Knuckle Joint, Shaft couplings and Oldham's coupling	**10**
V	Drawing plan, section and elevation of single storied and two storied residential buildings with flat roof. Electrical Drawing layout for residential buildings. Circuit drawing and wiring drawing of simple systems	**8**
	Total	**45**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
Continuous Assessment Test (2 no.s)	: 10 marks each
Assignment/Project/Case study etc.	: 15 marks
Continuous Lab Assessment	: 20 Marks
Total	**: 60 marks**

vii) CONTINUOUS ASSESSMENT TEST

No. of Test	: 2
Maximum marks	: 30 Marks
Test Duration	: 1.5 hours
Topic	: 2.5 Module

viii) END SEMESTER EXAMINATION

Maximum marks	: **40 Marks**
Exam Duration	: 2 Hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESB10K	BASICS OF ELECTRICAL ENGINEERING B	ESC	1	0	2	0	2	2023

i) COURSE OVERVIEW

This course aims to equip the students with an understanding of the fundamental principles of electrical engineering.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO1	Apply fundamental circuit laws and principles of electromagnetism to solve simple DC electric circuits and magnetic circuits respectively.	Apply
CO2	Solve simple AC circuits using the alternating current fundamentals.	Apply
CO3	Build a simple lighting circuit for domestic buildings using suitable accessories and materials.	Apply
CO4	Make use of an electronic energy meter to measure various parameters of an electric circuit.	Apply
CO5	Explain the working of power generating stations and various protective devices used in domestic wiring.	Understand

iii) SYLLABUS

Basic concepts of DC circuits: Kirchhoff's laws, Star-delta conversion, Analysis of DC circuits, Mesh analysis, Node analysis.

Magnetic Circuits: Basic Terminology, Simple Magnetic circuits, Electromagnetic Induction, Faraday's laws, Lenz's law, Self-inductance and mutual inductance.

Alternating Current fundamentals: Basic definitions, Average, RMS values, AC Circuits, Phasor representation, Analysis of simple AC circuits (R, L, C, RL, RC, RLC Series circuits).

Three phase AC systems, Generation of three phase voltages, star and delta connections.

iv) a) TEXT BOOKS

1) William H. Hayt, Jr., Jack E. Kemmerly, Steven M. Durbin, Engineering Circuit Analysis, 8th Edition, McGraw-Hill, 2012.
2) D. P. Kothari and I. J. Nagrath, Basic Electrical Engineering, 4th Edition, Tata McGraw Hill, 2019.
3) A.E. Fitzgerald, David E. Higginbotham and Arvin Grabel, Basic Electrical Engineering, 5th Edition, Tata McGraw Hill, 2009.

4) Ashfaq Husain and Harroon Ashfaq, Fundamentals of Electrical Engineering, 4th Edition, Dhanpat Rai & Co., 2016.

b) REFERENCES

1) Paul Breeze, Power Generation Technologies, 3rd Edition, Newnes, 2019.
2) Allan R. Hambley, Electrical Engineering: Principles & Applications, 7th Edition, Pearson Education, 2018.
3) V. N. Mittle and Arvind Mittal, Basic Electrical Engineering, 2nd Edition, McGraw Hill, 2006.
4) B L Theraja, A. K. Thereja, A Textbook of Electrical Technology - Volume I (Basic Electrical Engineering), S. Chand Publishing, 2007.

v) COURSE PLAN

Module	Contents	No. of hours
I	Fundamental concepts of DC circuits: Basic Terminology, Current and Voltage Division rules, Kirchhoff's current and voltage laws, Numerical problems. Steady state analysis of DC Circuits: Mesh Current and Node Voltage analysis of circuits with independent sources using Cramer's rule, Simple numerical problems. Laboratory exercises: a) Verification of KVL and KCL. b)Verification of mesh analysis and node analysis.	**10**
II	Magnetic Circuits: Simple magnetic Circuits, analogy between electric and magnetic circuits, Simple numerical problems. Electromagnetic Induction: Faraday's laws, Lenz's law, statically induced and dynamically induced emfs, Self-inductance and mutual inductance, coefficient of coupling (derivation not required), Numerical Problems. Laboratory exercises: a) Measurement of coefficient of coupling of magnetic circuit. b) Determination of B-H Curves of magnetic materials	**10**
III	Alternating Current fundamentals: Generation of alternating voltages, Basic definitions, Average and RMS values of sinusoidal waveforms, Numerical Problems, Phasor representation of sinusoidal quantities, Complex forms. Analysis of AC Circuits: Purely resistive, inductive and capacitive circuits; Analysis of RL, RC and RLC series circuits, active, reactive and apparent powers, Numerical Problems.	**10**

	Laboratory exercises: a) Simple Domestic Wiring. b) Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits.	
IV	Three phase AC systems: Generation of three phase voltages, advantages of three phase systems, star and delta connections (balanced only), relation between line and phase voltages, line and phase currents, Power in three phase circuit. Power measurement using two wattmeter methods. Laboratory exercises: a) Measurement of Active and Reactive Power in a single-phase circuit. b) Demonstration of usage of fire extinguishers and learn about basic first aid procedures.	**8**
V	Power Generating Stations: Hydro-electric and Nuclear power stations, Solar photovoltaic systems and Wind power generation (basic concepts only). Protective Devices: Working of MCB and ELCB Laboratory exercises: a) Wiring of simple solar chargeable circuit and determination of its characteristics. b) Demonstration of wiring of distribution board with ELCB and MCBs.	**7**
	Total hours	**45**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
Continuous Assessment Test (2 no.s)	: 10 marks each
Assignment/Project/Case study etc.	: 5 marks
Continuous lab assessment	: 20 marks
Lab Exam	: 10 marks
Total	**: 60 marks**

vii) CONTINUOUS ASSESSMENT TEST

No. of Test	: 2
Maximum marks	: 30 Marks
Test Duration	: 1.5 hours
Topic	: 2.5 Module

viii) END SEMESTER EXAMINATION

Maximum marks	: **40 Marks**
Exam Duration	: 2 Hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESL10M	BASICS OF MECHANICAL ENGINEERING	ESC	2	0	0	0	2	2023

i) COURSE OVERVIEW:

The goal of this course is to provide insight into the essentials of Mechanical Engineering discipline to the students of Engineering and to provide the students an illustration of the significance of the Mechanical Engineering profession in satisfying societal needs.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Analyse thermodynamic cycles and illustrate the working and features of IC Engines	Understand
CO 2	Explain the basic principles of Refrigeration and Air Conditioning and working of hydraulic machines	Understand
CO 3	Explain the basic manufacturing, metal joining and machining processes	Understand

iii) SYLLABUS

Fundamentals of thermodynamics- System, surroundings, process, cycle. Laws of thermodynamics. Analysis of thermodynamic cycles: Derivation of expression for efficiency of Otto and Diesel cycles. Concept of hybrid engines. Introduction to basic modes of heat transfer- Conduction, convection, and radiation.

Refrigeration: Unit of refrigeration, COP, Vapour compression cycle, Definitions of dry, wet & dew point temperatures, specific humidity, and relative humidity. Layout of unit and central air conditioning systems. Hydraulic machines: Working principle of Reciprocating pump, Centrifugal pump, Pelton turbine, and Francis turbine.

Manufacturing Process: Basic description of the manufacturing processes – Sand Casting, Forging, Rolling, Extrusion. Metal Joining Processes: Description with sketches of Arc Welding, Soldering, and Brazing. Basic Working and Operations: Lathe, Drilling machine. Computer-Aided Machining: CNC Machine. Principle of CAD/CAM, Rapid, and Additive Manufacturing.

iv) a) TEXT BOOKS

1) Pravin Kumar, Basic Mechanical Engineering, 2nd Edition, Pearson India, 2013.
2) Michael Clifford, Kathy Simmons, Philip Shipway, An Introduction to Mechanical Engineering: Part 1, 1st Edition, CRC Press, 2012.
3) Dr. P. Balachandran and Dr. Mohan, Basics of Mechanical Engineering, Owl publications, 2015.

4) J. Benjamin, Basic Mechanical Engineering, 10th Edition, Pentex Publications, 2022.

b) REFERENCES

1) G. S. Sawhney, Fundamentals of Mechanical Engineering, 3rd Edition, PHI Learning, 2015.
2) Wylen, G. J. V., Sonntag, R. and Borgnakke, C., Fundamentals of Classical Thermodynamics, John Wiley & Sons, 2012.

v) COURSE PLAN

Module	Content	No of Hours
I	Fundamentals of thermodynamics: System, surroundings, process, cycle. Laws of thermodynamics. Analysis of thermodynamic cycles: Derivation of expression for efficiency of Otto and Diesel cycles. Concept of hybrid engines. Introduction to basic modes of heat transfer- Conduction, convection, and radiation.	**9**
II	Refrigeration: Unit of refrigeration, COP, Vapour compression cycle, Definitions of dry, wet & dew point temperatures, specific humidity, and relative humidity. Layout of unit and central air conditioning systems. Hydraulic machines: Working principle of Reciprocating pump, Centrifugal pump, Pelton turbine, and Francis turbine.	**9**
III	Manufacturing Process: Basic description of the manufacturing processes – Sand Casting, Forging, Rolling, Extrusion. Metal Joining Processes: Description with sketches of Arc Welding, Soldering, and Brazing. Basic Working and Operations: Lathe, Drilling machine. Computer-Aided Machining: CNC Machine. Principle of CAD/CAM, Rapid, and Additive Manufacturing.	**8**
	Total	**26**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	5 marks
Continuous Assessment Test (2 Numbers)	:	10 marks each
Assignment/Project/Case study etc.	:	15 marks
Total	**:**	**40 marks**

vii) CONTINUOUS ASSESSMENT TEST

No. of Test	:	2
Maximum marks	:	30 Marks
Test Duration	:	1.5 hours
Topic	:	2.5 Module

viii) END SEMESTER EXAMINATION

Maximum marks	:	**60 Marks**
Exam Duration	:	3 Hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESL10N	BASICS OF CIVIL ENGINEERING	ESC	2	0	0	0	2	2023

i) COURSE OVERVIEW

Goal of this course is to provide an insight on the essentials of Civil Engineering discipline to the students of all branches of Engineering and to provide the students an illustration of the significance of the Civil Engineering Profession in satisfying the societal needs.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Explain different types of buildings, their components, building rules, materials and basic infrastructure services.	Understand
CO 2	Estimate plinth area and carpet area from a given plan of a residential building.	Apply
CO 3	Apply the principles of levelling to find the level difference between points.	Apply
CO 4	Explain the concepts of surveying, geotechnical engineering, transportation engineering, environmental and water resources engineering.	Understand
CO 5	Explain the various materials and systems in the context of green buildings and smart infrastructure	Understand

iii) SYLLABUS

General Introduction to Civil Engineering, Introduction to buildings, building rules and regulations, Building area.

Surveying- Classification, Objectives and principles, Instruments used, Leveling.

Building Construction- Load bearing and framed structures, Brick masonry, Basic infrastructure services, Energy efficient buildings, Smart buildings, green buildings.

Basic concepts of Geotechnical Engineering, Transportation Engineering, Environmental and Water Resources Engineering.

Novel Areas in Civil Engineering.

iv) a) TEXTBOOKS

1) Michael S. Mamlouk and John P. Zaniewski, Materials for Civil and Construction Engineering, 4th edition, Pearson Publishers,2017.
2) B. C. Punmia, Ashok K. Jain and Arun K. Jain, Surveying (Vol. I and II), Laxmi Publications (P) Ltd.,16th Edition, New Delhi, 2017.

3) Rangwala, Essentials of Civil Engineering, 1st edition, Charotar Publishing House, 2012.
4) Rangwala, Building Construction, 34th edition, Charotar Publishers, 2022.

b) CODES OF PRACTICE

1) Kerala Municipality Building Rules (2019), Local Self-Government (RD) Department, Government of Kerala.
2) Kerala Panchayat Building Rules (2019), Local Self-Government (RD) Department, Government of Kerala.
3) SP 7: 2016, National Building Code of India 2016 (NBC 2016), Bureau of Indian Standards, New Delhi.
4) Coastal Regulation Zone Rules (CRZ rules) (2019), Ministry of Environment, Forest, and Climate Change (MoEFCC), Government of India.

c) REFERENCES

1) W. F. Chen and J. Y. Richard Liew, The Civil Engineering Handbook, 2nd edition, CRC Press (Taylor and Francis), 2003.
2) W. R. Mckay, Building Construction, Volumes 1 to 4, 5th edition, Pearson India Education Services, 2013.
3) S. K. Khanna, C. E. G. Justo and A. Veeraragavan, Highway Engineering, 10th edition, Nem Chand and Bros., 2018.
4) Gopal Ranjan and A.S.R. Rao, Basic and Applied Soil Mechanics, 3rd edition, New Age International (P) Limited, New Delhi, 2016.
5) Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, Environmental Engineering, McGraw Hill Education, 2017.
6) Eva Kultermann and William P. Spence, Construction Materials, Methods, and Techniques, Building for a Sustainable Future, Cengage, 2022.

v) COURSE PLAN

Module	Contents	No. of hours
I	General Introduction to Civil Engineering- Relevance of Civil Engineering in development of nation, Major disciplines of Civil Engineering. Introduction to buildings-Types of buildings, Selection of site for buildings, Structural elements of a residential building and their functions, Framed and load bearing structures. Building rules and regulations- Relevance of NBC, KMBR & CRZ norms. Building area- Plinth area, Built up area, Floor area, Carpet area and floor area ratio.	**10**

Module	Contents	No. of hours
II	Surveying- Classification, Objectives and principles, Instruments used. Levelling- Principles, Differential levelling. Modern surveying equipment- Total station and GPS surveying. Building Construction- Load bearing and framed structures (concept only). Brick masonry- Header and stretcher bond, English bond and Flemish bond. Basic infrastructure services- MEP, HVAC, elevators, escalators and ramps (Civil Engineering aspects only), Fire safety for buildings. Built-environment- Energy efficient buildings, Smart buildings, Green buildings	10
III	Geotechnical Engineering- Origin and formation of soil, Bearing capacity of soil. Foundations- Importance, Types, Factors to be considered in selection of foundations. Transportation Engineering- Importance and classification of roads and railways, Types of highway pavements. Functions and types of Tunnels, Harbours, Airport. Environmental and Water Resources Engineering- Water supply and sanitary systems, Water quality and security. Air pollution- causes and remedial measures, Waste management. Novel Areas- Concepts of automation and robotics in construction, Concept of Sustainability in Civil Engineering, Concept of Smart, Clean and Safe city	10

vii) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	5 marks
Continuous Assessment Test (2 Numbers)	:	10 marks each
Assignment/Project/Case study etc.	:	15 marks
Total	**:**	**40 marks**

vii) CONTINUOUS ASSESSMENT TEST

No. of Test	:	2
Maximum marks	:	30 Marks
Test Duration	:	1.5 hours
Topic	:	2.5 Module

viii) END SEMESTER EXAMINATION

Maximum marks	:	**60 Marks**
Exam Duration	:	3 Hours

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESL1NA	ENVIRONMENTAL SCIENCE	ESC	2	0	0	0	1	2023

i) COURSE OVERVIEW

The goal of this course is to expose the students to the significance of natural resource management, ecosystem restoration and biodiversity conservation. The course also details the various problems related to environmental pollution, the concept of sustainability, and the role of engineering within sustainable development.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Identify the problems associated with the overutilization of natural resources and the role of engineers in natural resource management.	Apply
CO 2	Explain the concepts related to the ecosystem and the significance of ecosystem restoration and biodiversity conservation.	Understand
CO 3	Explain the causes, impacts and control measures of various types of environmental pollution.	Understand
CO 4	Summarise the various legal provisions for environmental protection.	Understand
CO 5	Discuss the concepts of sustainability and sustainable practices by utilizing engineering knowledge and principles.	Apply

iii) SYLLABUS

Interdisciplinary nature of environmental science: Scope and importance

Natural resources and associated problems: Water resources, Energy resources, Food resources, Land resources

Ecosystems: concept, Types, Functions, Productivity, Energy flow and Food chains of ecosystems. Characteristic features and functions of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem, Ecosystem Services.

Biodiversity and its conservation: Species and ecosystem diversity, Value of biodiversity, Hotspots of biodiversity, Threats to biodiversity, Conservation of biodiversity.

Environmental Pollution: Air, Water and Soil pollution. Solid and Hazardous Waste Management, Role of individuals in prevention of pollution.

Social issues and the environment: Environmental ethics, Contemporary Environmental issues, Water conservation- rainwater harvesting, watershed management, conservation of wetlands, Legal provisions for environmental protection.

Sustainability: Concept, Sustainable Development Goals. Sustainability Practices-Green engineering, Sustainable habitat-Green buildings, Sustainable Urbanisation, Industrial Ecology, Circular Economy- Case studies.

iv) a) TEXT BOOKS

1) Erach Bharucha, Textbook for Environmental Studies, 3rd edition, UGC, New Delhi, 2021.
2) D. D. Mishra, Fundamental Concepts in Environmental Studies, 4th edition, S. Chand & Co. Ltd, 2014.
3) Kurian Joseph and R. Nagendran, Essentials of Environmental Studies, Pearson Education Pvt. Ltd, India, 2017.
4) David Allen and David R. Shonnard, Sustainable Engineering: Concepts, Design and Case Studies, 1st edition, Pearson, 2011.

b) REFERENCES

1) Suresh K. Dhameja, Environmental Engineering and Management, 4th edition, S.K. Kataria & Sons, 2021.
2) Bradley Striebig, Adebayo A. Ogundipe and Maria Papadakis, Engineering Applications in Sustainable Design and Development, 1st edition, Cengage Learning EMEA, 2015.

v) COURSE PLAN

Module	Contents	No. of hours
I	Interdisciplinary nature of Environment: Definition, scope and importance. Natural resources and associated problems: Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources (case studies). Food Resources: effects of modern agriculture, fertilizers-pesticides problems, water logging, salinity.	**6**

Module	Contents	No. of hours
	Land resources: land degradation, man induced landslides, soil erosion and desertification. Role of individuals in conservation of natural resources, Equitable use of resources.	
II	Ecosystems: Concept of an ecosystem, Structure and function of an eco- system. Productivity, Energy flow in the eco systems. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, Types of ecosystems, Characteristic features and function of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem, Ecosystem services. Biodiversity and its Conservation: Introduction-Definition: species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic values. Hotspots of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity.	**6**
III	Environmental Pollution: Definition, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Noise pollution. Solid and Hazardous waste management: Causes, effects and control measures of urban and industrial wastes. 3R concept, zero waste management -case studies. Role of an individual in prevention of pollution.	**6**
IV	Social issues and the Environment: Environmental ethics, Contemporary Environmental issues- global warming, climate change, sea level rise. International efforts for environmental protection, National action plan on climate change. Water conservation - rain water harvesting, watershed management, conservation of wetlands- Ramsar sites in India. Legal provisions for environmental protection. Environment protection Act, Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act, Wildlife	**6**

Module	Contents	No. of hours
	protection act, Forest conservation act. National Action Plan on Climate Change	
V	Sustainability: Introduction, Need and concept of sustainability, Evolution of sustainability, Social, Environmental and Economic sustainability. Sustainable development, Nexus between technology and sustainable development, Challenges for sustainable development, Sustainable Development Goals Sustainability Practices- Green engineering, Sustainable habitat-basic concepts, Green buildings, Green materials for building constructions, Green building certification, Methods of increasing the energy efficiency of buildings, Sustainable Urbanisation, Industrial Ecology, Circular Economy-Case studies.	**6**
	Total hours	**30**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
Assignment (Activity based)	: 15 marks
Course based tasks	
(i) Mini Project	:30 marks
(ii) Case Study	: 20 marks
CAT(one exam at the end of semester)	: 30 marks, 1.5 hrs duration
Total	**: 100 marks**

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23CYP10A	ENGINEERING CHEMISTRY LAB	BSC	0	0	2	0	1	2023

i) COURSE OVERVIEW

This course is designed to familiarize with the basic experiments in industrial chemistry and to accustom the students with the handling and analysing of chemicals and standard laboratory equipment.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Use volumetric titration techniques for quantitative analysis of water.	Apply
CO 2	Use spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds.	Apply
CO 3	Use instrumental techniques for quantitative chemical analysis.	Apply
CO 4	Organize scientific experiments as a team to analyze the results of such experiments.	Analyze
CO 5	Interpret experimental data by themselves to apply them to real world problems.	Analyze

iii) SYLLABUS

1) Estimation of total hardness of water by EDTA method.
2) Analysis of IR and ^{1}H NMR spectra of organic compounds.
3) Determination of wavelength of absorption maximum and colorimetric estimation of Fe^{3+} in solution.
4) Determination of molar absorptivity of a compound.
5) Estimation of chloride in water by argentometric method.
6) Calibration of pH meter and determination of pH of a solution.
7) Potentiometric titration: Acid – base titration.

8) Estimation of dissolved oxygen in water by Winkler's method.

iv) a) REFERENCES

1) R. K. Mohapatra, Engineering Chemistry with Laboratory Experiments, 2015, 1st edition, PHI Learning, New Delhi.
2) S. C. George, R. Jose, Lab Manual of Engineering Chemistry, 1st edition, S. Chand & Company Pvt Ltd, New Delhi, 2019.
3) E. Slowinski, W. C. Wolsey, Chemical Principles in the Laboratory, 11th edition**,** Cengage Learning, New Delhi**,** 2008.

v) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
Class work/ Assessment /Viva-voce	: 55 marks
Final Assessment	: 40 marks
Total	**: 100 marks**

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESP10A	MANUFACTURING AND CONSTRUCTION PRACTICES A	ESC	0	0	2	0	1	2023

i) COURSE OVERVIEW

This subject is for exposing the students to the various practical aspects of manufacturing processes and familiarizing various tools, measuring devices, practices and machines used in the workshop section. The goal of this course is also to introduce the students to the field of Civil Engineering and its importance in the development of the Country. The course is designed to workshop sessions on various construction-related activities including surveying and levelling.

ii) COURSE OUTCOMES

After the completion of the course the student will be able to:

CO 1	Demonstrate general safety precautions in different mechanical workshop trades.	Understand
CO 2	Prepare simple models using fitting, carpentry, sheet metal, welding and 3D printing Techniques.	Apply
CO 3	Identify the tools and equipment used in fitting, carpentry, sheet, welding and various machine tools.	Apply
CO 4	Apply engineering principles and tools to set-out a plan, estimate the area and profile of plots, and construct masonry wall.	Apply
CO 5	Examine the quality of different building blocks.	Apply
CO 6	Make use of plumbing tools to install fixtures like tap, T-Joint, elbow, bend, etc.	Apply

iii) SYLLABUS

Part I – Mechanical Engineering

1) General: Introduction to workshop practice, Safety precautions, Shop floor ethics, Basic First Aid knowledge, Study of mechanical tools

2) Carpentry.

4) Sheet metal

5) Fitting

6) Welding

8) Machine Tools: Demonstration of various machines like shaping and slotting machine, milling machine, Grinding Machine, Lathe, Drilling Machine, CNC Machines, Power Tools.

9) 3D Printer.

Part II – Civil Engineering

1) Compute area of a given plot using tape, EDM etc.
2) Levelling – Plot the longitudinal section of a road.
3) Setting out of a building: Set out a building as per the given building plan. Each group can set out one or two rooms of the building.
4) Construct a wall of height 50 cm and wall thickness 1½ bricks using English bond (No mortar required) – corner portion – length of side walls 60 cm
5) Cast paver blocks using mortar and test for strength (Include sustainable materials also)
6) Tests for strength of various types of building blocks
7) Study on plumbing and install plumbing fixtures like Tap, T-Joint, Elbow, Bend, Threading etc.
8) Plan a rainwater harvesting system (Expert talk)
9) Site visit to a building construction site and prepare a report on the various safety features, Personal protective equipment (PPE) and its proper use.

iv) a) TEXTBOOKS

1) AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual) ISBN: 978-93-91505-332
2) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., Elements of Workshop Technology, Vol. I 2008 and Vol. II 2010, 14th edition, Media promoters and publishers private limited, Mumbai.
3) Kalpakjian S. And Steven S. Schmid, Manufacturing Engineering and Technology, 7th Edition, Pearson Education India Edition, 2018.

b) REFERENCES

1) S. Gowri P. Hariharan and A. Suresh Babu, Manufacturing Technology – I, Pearson Education, 2008.
2) Roy A. Lindberg, Processes and Materials of Manufacture, 4th Edition, Prentice Hall India, 1998.
3) Rao P.N., Manufacturing Technology, Vol. I and Vol. II, 4th Edition, Tata McGraw Hill House, 2017.
4) B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Basic Civil Engineering, 1st Edition, 2003, Laxmi Publications.
5) Rangwala, Essentials of Civil Engineering, 1st Edition, Charotar Publishing House, 2012.
6) W. B. McKay, Building Construction- Volumes 1 to 4, 4 th /5 th Edition, 2013, Pearson Education India.
7) B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Surveying – Volume I, 17th Edition, Laxmi Publications, 2016.
8) W.F. Chen and J.Y. Richard Liew (Eds.), The Civil Engineering Handbook, 2nd Edition, CRC Press (Taylor and Francis), 2002.

v) COURSE PLAN

Cycle No. or Exp. No.	Experiment	No. of hours
1	Machine shop	2
2	Fitting shop	2
3	Carpentry	2
4	Welding shop (Arc welding + Gas welding)	2
5	Sheet Metal	2
6	CNC	2
7	3D Printing	2
8	Compute area of a given plot using tape, EDM etc.	2
9	Levelling – Plot the longitudinal section of a road.	2
10	Setting out of a building: Set out a building as per the given building plan. Each group can set out one or two rooms of the building.	2
11	Construct a wall of height 50 cm and wall thickness 11⁄2 bricks using English bond (No mortar required) – corner portion – length of side walls 60 cm.	2
12	Cast paver blocks using mortar and test for strength (Include sustainable materials also).	2
13	Tests for strength of various types of building blocks.	2
14	Study on plumbing and install plumbing fixtures like Tap, T-Joint, Elbow, Bend, Threading etc.	2
15	Plan a rainwater harvesting system.	2
	Total	**30 hours**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
Continuous Assessment in Lab (Lab work, no lab exam in the continuous assessment)	: 55 marks
Lab exam at the end of the course (Construction practices 20 marks + Manufacturing practices 20 marks)	: 40 marks
Total	**: 100 marks**

SEMESTER 2

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23MAL10B	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	BSC	3	1	0	0	4	2023

i) COURSE OVERVIEW

The objective of this course is to familiarize the prospective engineers with some advanced concepts and methods in Mathematics which include the Calculus of vector valued functions, ordinary differential equations and basic transforms such as Laplace and Fourier Transforms which are invaluable for any engineer's mathematical tool box. The topics treated in this course have applications in all branches of engineering.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Compute the derivatives and line integrals of vector functions and learn their applications.	Apply
CO 2	Evaluate surface and volume integrals and learn their inter- relations and applications.	Apply
CO 3	Solve linear ordinary differential equations.	Apply
CO 4	Apply Laplace transform to solve ODEs arising in engineering.	Apply
CO 5	Apply Fourier transforms of functions to solve problems arising in engineering.	Apply

iii) SYLLABUS

Vector Calculus – Derivative of vector function, Gradient, Divergence, Curl, Line integral, conservative fields.

Green's theorem, surface integral, Gauss divergence theorem, Stokes' theorem.

Ordinary Differential Equations – Homogeneous and Non-Homogeneous linear differential Equations, Euler-Cauchy equations. Method of undetermined coefficients and Method of variation of parameters.

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Laplace transforms – Laplace Transform and its inverse, shifting theorems, Laplace transform of derivatives and integrals, solution of differential equations using Laplace transform, Unit step function. Dirac delta function. Convolution theorem and its applications.

Fourier Transforms – Fourier integral representation, Fourier sine and cosine integrals. Fourier transform and inverse Fourier transform. Fourier sine and cosine transforms, inverse sine and cosine transform. Convolution theorem

iv) a) TEXTBOOKS

1) Anton, Biven, Davis, Calculus,10th edition, Wiley, 2012.
2) Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, John Wiley and Sons, 2016.

b) REFERENCES

1) George F Simmons: Differential Equation with Applications and its historical Notes, 3rd edition, CRC Press, 2017.
2) Hemen Dutta, Mathematical Methods for Science and Engineering, CRC Press, 1st edition, 2020.
3) H. Anton, I. Biven, S. Davis, Calculus, 10th Edition, Wiley, 2015.
4) B.S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, 2018.

v) COURSE PLAN

Module	Contents	No. of hours
I	Calculus of vector functions: Vector valued function of single variable, derivative of vector function and geometrical interpretation, motion along a curve-velocity, speed and acceleration. Concept of scalar and vector fields, Gradient and its properties, directional derivative, divergence and curl, Line integrals of vector fields, work as line integral, Conservative vector fields, independence of path and potential function (results without proof).	12
II	Vector integral theorems: Green's theorem (for simply connected domains, without proof) and applications to evaluating line integrals and finding areas. Surface integrals over surfaces of the form z = g(x, y), y = g(x, z) or x = g(y, z) , Flux integrals over surfaces of the form z = g(x, y), y = g(x, z) or x = g(y, z), divergence theorem (without proof) and its applications to finding flux integrals, Stokes' theorem (without proof) and its applications to finding line integrals of vector fields and work done.	12
III	Ordinary differential equations: Homogeneous linear differential equation of second order, superposition principle, general solution, homogeneous linear ODEs with constant coefficients-general solution. Solution of Euler-Cauchy equations (second order only). Existence and uniqueness (without	12

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	proof). Nonhomogeneous linear ODEs-general solution, solution by the method of undetermined coefficients (for the right-hand side of the form xn, e^{kx}, $sinax$, $cosax$, $e^{kx}sinax$, e^{kx}cosax and their linear combinations), methods of variation of parameters. Solution of higher order equations-homogeneous and non-homogeneous with constant coefficient using method of undetermined coefficient.	
IV	Laplace transforms: Laplace Transform and its inverse, Existence theorem (without proof), linearity, Laplace transform of basic functions, first shifting theorem, Laplace transform of derivatives and integrals, solution of differential equations using Laplace transform, Unit step function, Second shifting theorems. Dirac delta function and its Laplace transform, Solution of ordinary differential equation involving unit step function and Dirac delta functions. Convolution theorem (without proof) and its application to finding inverse Laplace transform of products of functions.	**12**
V	Fourier Transforms: Fourier integral representation, Fourier sine and cosine integrals. Fourier sine and cosine transforms, inverse sine and cosine transform. Fourier transform and inverse Fourier transform, basic properties. The Fourier transform of derivatives. Convolution theorem (without proof).	**12**
	Total hours	**60**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	5 marks
Continuous Assessment Test (2 Numbers)	:	10 marks each
Assignment/Project/Case study etc.	:	15 marks
Total	**:**	**40 marks**

vii) CONTINUOUS ASSESSMENT TEST

No. of Test	:	2
Maximum marks	:	30 Marks
Test Duration	:	1.5 hours
Topic	:	2.5 Module

viii) END SEMESTER EXAMINATION

Maximum marks	:	**60 Marks**
Exam Duration	:	3 Hours

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Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23PYL10A	ENGINEERING PHYSICS	BSC	3	1	0	0	4	2023

i) COURSE OVERVIEW

The aim of the course is to develop scientific attitude in students and offer them an understanding of physical concepts behind various engineering applications. It creates an urge in students to think creatively in emerging areas of Physics.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Describe the characteristics of different types of oscillations and waves.	Understand
CO 2	Explain natural physical processes and related technological advances using principles of optics	Understand
CO 3	Generalise the principles of quantum mechanics to explain the behaviour of matter in the atomic and subatomic level	Understand
CO 4	Describe the fundamentals of lasers and the principles behind various solid state lighting devices and fibre optic communication systems.	Understand
CO 5	Explain the fundamental ideas of Ultrasonic and acoustics in order to facilitate technological advancement.	Understand

iii) SYLLABUS

Oscillations and Waves: Harmonic oscillations – Damped harmonic oscillations, Forced harmonic oscillations, Q- factor, Amplitude resonance, comparison of electrical and mechanical oscillators. Wave motion – Longitudinal waves and Transverse waves, One dimensional wave equation and solution, three-dimensional wave equations, Transverse vibrations along a stretched string.

Wave Optics: Interference of light – Cosine law, Wedge shaped films - Air wedge, Newton's rings, Antireflection coating. Diffraction- comparison of Fresnel and Fraunhofer diffraction, Fraunhofer diffraction due to double slit, grating equation, Rayleigh's criterion, resolving power and dispersive power of grating.

Quantum Mechanics & Nano technology: Wave function, Uncertainty principle, Time dependent and time independent Schrodinger wave equations, Applications of Schrodinger wave equation - particle in one-dimensional potential well, quantum

mechanical tunneling. Introduction to nanoscience and technology, significance of surface to volume.

ratio, Quantum confinement, Characterization techniques – XRD, UV-Visible Spectroscopy, Applications of nanomaterials.

Laser and Photonics: Principles of Laser, Properties of laser, Ruby laser and Helium neon laser, Applications of Laser. Holography-construction of hologram, reconstruction of hologram, Applications. Introduction to photonics - photonic devices - Light Emitting Diode, Solar cells, Optical fibre – Principle of OFC, Numerical aperture, Types of fibers – step index fibre , Graded index fibre, Fibre Optic Communication System, Applications of Optical fibre, Fibre optic sensors.

Acoustics & Ultrasonic: Acoustics - characteristics of musical sounds, absorption coefficient, reverberation time- Sabine's formula (no derivation), significance, factors affecting architectural acoustics and their remedies.

Ultrasonics - production by magnetostriction oscillator and piezoelectric oscillator, detection of ultrasonic waves - thermal and piezoelectric methods, ultrasonic diffractometer-, applications of ultrasonic waves -SONAR, NDT, medical applications.

iv) a) TEXTBOOKS

1) M.N. Avadhanulu, P.G. Kshirsagar, T.V.S Arun Murthy, A Textbook of Engineering Physics, 11th Edition, S. Chand & Co., 2018
2) H.K. Malik, A.K. Singh, Engineering Physics, 2nd Edition, McGraw Hill Education, 2017.

b) REFERENCES

1) Arthur Beiser, Concepts of Modern Physics, 7th Edition, Tata McGraw Hill Publications, 2017.
2) Aruldhas G., Engineering Physics, 11th Edition, Prentice Hall of India Pvt Ltd., 2015.
3) Ajoy Ghatak, Optics, 7th Edition, McGraw Hill Education, 2020.
4) David J. Griffiths, Introduction to Electrodynamics, 4th Edition, Addison-Wesley publishing, 1999.
5) Choudhary, Nityanand, K. R. Deepak, S. H. Abdi, Perspective of Engineering: Physics: I, Acme Learning Pvt Ltd, first edition, 2009.
6) A. S. Vasudeva, A TextBook of Engineering Physics, S. Chand &Co., 2nd Edition: 2011.
7) Premlet B., Advanced Engineering Physics, 10th Edition, Phasor Books, 2017.

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v) COURSE PLAN

Module	Contents	No. of hours
I	Oscillations and Waves: Harmonic oscillations, damped harmonic motion - derivation of differential equation and its solution, over damped, critically damped and under damped cases, Quality factor- expression, forced oscillations - differential equation, derivation of expressions for amplitude and phase of forced oscillations, amplitude resonance - expression for resonant frequency, sharpness of resonance, electrical analogy of mechanical oscillators Wave motion- distinction between transverse and longitudinal waves, derivation of one-dimensional wave equation and its solution, three-dimensional wave equation and its solution (no derivation), transverse vibration in a stretched string, statement of laws of Vibration	**12**
II	Wave Optics: Interference of light- theory of thin films - cosine law (Reflected system), derivation of the conditions of constructive and destructive interference, interference due to wedge shaped films - determination of thickness and test for optical planeness, Newton's rings- measurement of wavelength and refractive index, antireflection coatings. Diffraction of light, Fresnel and Fraunhofer classes of diffraction, diffraction due to double slit, diffraction grating-Grating equation, Rayleigh criterion for limit of resolution, resolving and dispersive power of a grating with expression (no derivation)	**12**
III	Quantum Mechanics & Nanotechnology: Introduction for the need of Quantum mechanics, wave nature of Particles, de-Brogile wavelength, uncertainty principle, Applications-absence of electrons inside a nucleus and natural line broadening mechanism, physical meaning of wave function, formulation of time dependent and independent Schrodinger wave equations, Applications of Schrodinger equation - Particle in a one dimensional box-derivation for normalised wave function and energy Eigenvalues, Quantum mechanical tunnelling (qualitative). Introduction to nanoscience and technology, Effect of surface to volume ratio for nanomaterials, quantum confinement in one dimensional, two dimensional and three dimensional particles - nano sheets, nanowires and quantum dots, characterization	**12**

Module	Contents	No. of hours
	techniques - XRD analysis, UV visible spectroscopy, applications of nanotechnology (qualitative ideas)	
IV	Laser and Photonics: Properties of laser, Absorption and emission of radiation, Spontaneous emission and stimulated emission, Population inversion, Metastable states, basic components of laser, Active medium, pumping mechanism, Optical resonant cavity, working principle. Construction and working of Ruby laser and Helium neon laser, Applications of lasers. Holography – Advantage of hologram over photograph, Recording of hologram, reconstruction of hologram, Applications of hologram. Introduction to photonics - photonic devices - Light Emitting Diode, Solar cells - I-V characteristics, Fiber Optics - Principle of light propagation through optical fiber, Classification of optical fibers - Step index and Graded index fibres, Numerical aperture – Derivation, Fibre optic communication system (block diagram), Applications of optical fiber, Fiber optic sensors.	**12**
V	Acoustics & Ultrasonics: Acoustics - Classification of Sound- Musical Sound-Noise, Characteristics of Musical Sounds-Pitch or Frequency- Loudness or Intensity Measurement of Intensity Level- Decibel- Quality or timbre, Absorption coefficient, Reverberation, Reverberation Time-Significance - Sabine's formula (no derivation). Factors affecting architectural acoustics and their remedies. Ultrasonics - Production- Magnetostriction effect and Piezoelectric effect, Magnetostriction oscillator and Piezoelectric oscillator – Working, Detection of ultrasonic waves - Thermal and Piezoelectric methods. Ultrasonic diffractometer – determination of velocity, Applications of ultrasonic waves – industrial applications - SONAR,NDT, Medical applications.	**12**
	Total hours	**60**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance : 5 marks

Continuous Assessment Test (2 Numbers) : 10 marks each

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Assignment/Project/Case study etc.	:	15 marks
Total	**:**	**40 marks**

vii) CONTINUOUS ASSESSMENT TEST

No. of Test	:	2
Maximum marks	:	30 Marks
Test Duration	:	1.5 hours
Topic	:	2.5 Module

viii) END SEMESTER EXAMINATION

Maximum marks	:	**60 Marks**
Exam Duration	:	3 Hours

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Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESL10B	APPLIED MECHANICS	ESC	2	1	0	0	3	2023

i) COURSE OVERVIEW

Goal of this course is to expose the students to the fundamental concepts of mechanics and enhance their problem-solving skills. It introduces students to the influence of the applied force system and the geometrical properties of rigid bodies while stationary or in motion. Also, stress, strain and strain energy concepts of deformable bodies have been introduced. After this course, students will be able to recognize similar problems in real-world situations and respond accordingly.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Explain the Principles, Theorems and Force systems related to Rigid and Deformable Body Mechanics.	Understand
CO 2	Apply the Resultant and Equilibrium Conditions to solve Rigid Body Static problems	Apply
CO 3	Compute the internal member forces acting on Trusses	Apply
CO 4	Solve problems related with Rectilinear, Circular and Rotational motion using Kinetic principles of Mechanics.	Apply
CO 5	Apply the concepts of Stress, Strain and Strain Energy for Deformable Bodies	Apply

iii) SYLLABUS

Introduction on Statics and Dynamics- Classification of Force Systems, Basic Principles of Statics- Laws-Composition and Resolution of Forces - Resultant of Coplanar Force Systems- Moment- Couple -Introduction to forces in space- Vectorial representation of Forces- Moments -Resultant of concurrent forces in space

Equilibrium of Coplanar Force System –- Types of Loadings- Support Reactions of Statically determinate beams subjected to various types of loads. Friction-Introduction- Sliding Friction- Coulomb's Laws of Friction-Wedge Friction- Analysis of Single Bodies- Analysis of

Analysis of Trusses-Introduction- Analysis of Plane Perfect Trusses by the Method of Joints and by the Method of Sections -Properties of Surfaces- -Centroid of Regular Geometrical Shapes, Composite Areas- Moment of Inertia – Parallel Axis, Perpendicular Axis Theorem, Theorem of Pappus Guldinus

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Dynamics: Kinematics- Rectilinear Translation- Curvilinear Translation- Rotation (Concepts only)-Kinetics - D'Alembert's Principle- Impulse Momentum and Work Energy Principle- Applications to Rectilinear, Curvilinear and Rotation

Concept of stress and strain – Stress - strain relation - Hooke's law. Stress-strain diagram of mild steel -Axially loaded bars with uniform cross section– Deformation of axially loaded bars with varying cross section and bars with varying axial loads -Temperature stress in composite bars- Elastic constants and their relationships- Strain energy – concept- Strain energy due to normal stress - Strain energy due to shear stress.

iv) a) TEXTBOOKS

1) S. Timoshenko, D.H. Young, J.V. Rao and Sukumar Pati, Engineering Mechanics,5th edition, McGraw Hill Publishers, 2017.
2) Beer, Mazurek, Johnston, Cornwell, Self and Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, 12th Edition, Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2019.
3) R.C. Hibbeler, Engineering Mechanics- Statics and Dynamics, 7th edition, Pearson Education Ltd., 2017.
4) Meriam J.L. and Kraige G., Engineering Mechanics - Dynamics, 14th edition, John Wiley & Sons, 2013.
5) Dr. H. J Shah, S B Junnarkar, Mechanics of Structures, 32nd Edition, Charotar Publishers, 2016.
6) Dr. R K Bansal, Strength of Materials, 6th Edition, Laxmi Publications(P) Ltd, 2015.

b) REFERENCES

1) Bhavikkatti, S. S., Engineering Mechanics, New Age International Publishers, 2016.
2) Shames, I. H., Engineering Mechanics Statics and Dynamics, 4th Edition, Prentice Hall of India, 2005
3) Bansal, R. K., A Textbook of Engineering Mechanics, 8th Edition, Laxmi Publications, 2016.
4) Sharma, D. P., Hibbeler, R. C. and Shames, I. H., Engineering Mechanics, Pearson Publishers, 2011.

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v) COURSE PLAN

Module	Contents	No. of hours
I	Introduction to Engineering Mechanics: Introduction on Statics and Dynamics- Classification of Force Systems- Idealization in Mechanics- Basic Principles of Statics- Laws- Newton's Laws, Parallelogram, Triangle, Polygon, Equilibrium, Superposition and Transmissibility, Law of Action and Reaction- Composition and Resolution of Forces Resultant of Coplanar Force Systems: Method of Projections- Resultant of Concurrent Force Systems- Moment- Varignon's Theorem- Parallel Forces- Center of Parallel Forces- Couple- Resultant of Parallel Forces- Resolution of force into Force and couple - Resultant of General Force System (With Numerical Examples) Introduction to forces in space- Vectorial representation of Forces- Moments -Resultant of concurrent forces in space (With Numerical Examples)	9
II	Equilibrium of Coplanar Force System: Free Body Diagrams-Lami's Theorem–Equilibrium- Conditions of- Coplanar Concurrent Force System, Coplanar Parallel Force System, Coplanar Non-Concurrent Force System- (With numerical examples) Types of Beams- Types of Supports- Types of Loadings- Support Reactions of Statically determinate beams subjected to various types of loads- concentrated load, uniformly distributed, concentrated moment (With numerical examples) Friction: Introduction- Sliding Friction- Coulomb's Laws of Friction- Wedge Friction- Analysis of Single Bodies- Analysis of Connected Bodies (With Numerical Examples)	9
III	Analysis of Trusses: Introduction- Classification of Trusses- Analysis of Plane Perfect Trusses by the Method of Joints and by the Method of Sections (With Numerical Examples) Properties of Surfaces: Introduction-Centroid of Regular Geometrical Shapes- Centroid of Composite Areas- Moment of Inertia – Parallel Axis, Perpendicular Axis Theorem,Theorem of Pappus Guldinus (With Numerical Examples)	9

IV	Dynamics: Kinematics: Introduction – Rectilinear Translation- Curvilinear Translation- Rotation (Concepts only) Kinetics: Introduction – D'Alembert's Principle- Applications to Rectilinear, Curvilinear and Rotation (With Numerical Examples) Impulse Momentum and Work Energy Principle- Applications to Rectilinear, Curvilinear and Rotation (With Numerical Examples)	**9**
V	Concept of stress and strain –Types- Stress – strain relation - Hooke's law- Stress-strain diagram of mild steel - Factor of safety, working Stress-Axially loaded bars with uniform cross section–stress, strain and deformation- Deformation of axially loaded bars with varying cross section and bars with varying axial loads - Temperature stress in composite bars. Elastic constants and their relationships. (With Numerical Examples) Strain Energy – concept- Strain energy due to normal stress - Strain energy in bars carrying axial loads -Instantaneous stress in bars due to gradual, sudden and impact loads - Strain energy due to shear stress. (With Numerical Examples)	**9**
	Total hours	**45**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	5 marks
Continuous Assessment Test (2 Numbers)	:	10 marks each
Assignment/Project/Case study etc.	:	15 marks
Total	**:**	**40 marks**

vii) CONTINUOUS ASSESSMENT TEST

No. of Test	:	2
Maximum marks	:	30 Marks
Test Duration	:	1.5 hours
Topic	:	2.5 Module

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viii) END SEMESTER EXAMINATION

Maximum marks	:	**60 Marks**
Exam Duration	:	3 Hours

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Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESB10F	PROBLEM SOLVING AND PROGRAMMING	ESC	2	0	2	0	3	2023

i) COURSE OVERVIEW

The objective of the course is to introduce Python programming and develop programming skills to manage the development of software systems. It covers data processing and data visualization applications in Python.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Explain the fundamental concepts of programming languages and problem-solving strategies	Understand
CO 2	Make use of the fundamental concepts, conditional statements and iterative statements in Python	Apply
CO 3	Develop programs by utilizing the modules Lists, Tuples, Sets and Dictionaries in Python	Apply
CO 4	Develop programs by using function	Apply
CO 5	Implement programs in Python to process data stored in files by utilizing the modules NumPy, Matplotlib, and Pandas	Apply

iii) SYLLABUS

Basics of computer architecture - Von Neumann concept - A simple model of computer, acquisition of data, storage of data, processing of data, output of processed data. Details of functional units of a computer. Storage-primary storage and secondary storage.

Introduction to programming languages - types of programming languages - high level language, assembly language and machine language, System software - Operating systems - objectives of operating systems, compiler, assembler and interpreter.

Problem Solving strategies - Problem analysis - formal definition of problem - Solution - top-down design - breaking a problem into subproblems - overview of the solution to the sub problems by writing step by step procedure (algorithm) - representation of procedure by flowchart

Basic coding skills - Working with data types, Numeric data types and Character sets,

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Keywords, Variables and Assignment statement, Operators, Expressions, Working with numeric data, Type conversions, Comments in the program. Input processing, and output, Formatting output, Using built in functions and modules in math module, Detecting and correcting syntax errors.

Control statements - Selection structure (if,if-else,if-else-if). Iteration structure (for, while), Testing the control statements.

Python Data Structures - Lists - Basic List Operations and Methods, List of lists, Slicing, Searching and sorting list. Work with tuples. Sets. Dictionaries — Dictionary Methods, dictionary literals, adding and removing keys, accessing and replacing values, traversing dictionaries.

Functions and Strings - Hiding redundancy and complexity, Arguments and return values, Variable scopes and parameter passing, named arguments, Main function, Working with recursion, Lambda functions. Strings and number systems - String function, Handling numbers in various formats.

NumPy - Basics, creating arrays, Arithmetic, Slicing, Matrix Operations, Random numbers.

Visualization: Plotting using Matplotlib - Basic plot, Ticks, Labels, and Legends. Working with CSV files with Pandas - Reading, Manipulating, and Processing Data.

iv) a) TEXTBOOKS

1) Kenneth A Lambert., Fundamentals of Python : First Programs, 2/e, Cengage Publishing, 2016
2) David J. Pine, Introduction to Python for Science and Engineering, CRC Press, 2021
3) Rajaraman, V., Computer Basics and C Programming, Prentice-Hall India

b) REFERENCES

1) Wes McKinney, Python for Data Analysis, 2/e, Shroff / O'Reilly Publishers, 2017
2) Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2/e, Schroff, 2016
3) Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
4) David M.Baezly, Python Essential Reference. Addison-Wesley Professional; 4/e, 2009.
5) Charles Severance. Python for Informatics: Exploring http://swcarpentry.github.io/python-novice-gapminder/

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v) COURSE PLAN

Module	Contents	No. of hours
I	Basics of computer architecture - Von Neumann concept - A simple model of computer, acquisition of data, storage of data, processing of data, output of processed data. Details of functional units of a computer. Storage-primary storage and secondary storage. Introduction to programming languages - Types of programming languages - high level language, assembly language and machine language, System software - Operating systems - objectives of operating systems, compiler, assembler and interpreter. Problem Solving strategies - Problem analysis - formal definition of problem - Solution – top down design - breaking a problem into subproblems - overview of the solution to the sub problems by writing step by step procedure (algorithm) - representation of procedure by flowchart	5
II	Basic coding skills - Working with data types, Numeric data types and Character sets, Keywords, Variables and Assignment statement, Operators, Expressions, Working with numeric data, Type conversions, Comments in the program. Input processing, and output, Formatting output, Using built in functions and modules in math module, Detecting and correcting syntax errors.Control statements - Selection structure (if,if-else,if-else-if). Iteration structure (for, while), Testing the control statements.	7
III	Python Data Structures - Lists - Basic List Operations and Methods, List of lists, Slicing, Searching and sorting list. Work with tuples. Sets. Dictionaries — Dictionary Methods, dictionary literals, adding and removing keys, accessing and replacing values, traversing dictionaries.	6

IV	Functions - Hiding redundancy and complexity, Arguments and return values, Variable scopes and parameter passing, named arguments, Main function, Working with recursion, Lambda functions.Strings - Strings and number systems - String function, Handling numbers in various formats.	**6**
V	NumPy - Basics, creating arrays, Arithmetic, Slicing, Matrix Operations, Random numbers. Visualization: Plotting using Matplotlib - Basic plot, Ticks, Labels, and Legends. Working with CSV files with Pandas - Reading, Manipulating, and Processing Data.	**6**
	Total Hours	**30**

Lab
Course Plan

SL. No.	Topics	No of hrs
1.	Programs that use operators, conditional statements and iterative statements in Python. 1. Simulate a simple calculator that performs addition, subtraction, multiplication and division. 2. Implement a program to find the smallest among three numbers. 3. Implement a program to check if the entered number is a palindrome number or not. 4. Implement a program to generate Fibonacci series.	**8**
2.	Programs that use python data structures. 1. Implement a program to find mean and variance of 'n' positive numbers which are entered by the user and stored in a list. Then remove duplicate elements in the list using set. 2. Implement a program to print a dictionary where the keys are numbers between 1 and 15 (both included) and the values are the square of the keys.	**6**
3.	Programs that use user-defined functions and strings. 1. Implement a program to display first n prime numbers using a function. 2. Implement a program to find the sum of digits of a number using recursion 3. Implement a program to check whether the string is palindrome or not.	**6**
4.	Program that performs matrix operations using NumPy.	**4**

5.	Programs in Python to process data stored in files by using modules Matplotlib, and Pandas. 1. Implement a program to read data from existing CSV file 'student.csv' with the columns (rno, name, m1, m2, m3) and then perform the following using Pandas library. a) Read and display the first 10 rows of the CSV file. b) Display the rno and name in the sorted order of name. c) Add a new column total(m1+m2+m3) to the data frame. d) Display rno, name and total marks of all the students in the descending order of total marks. e) Find the highest and lowest mark in m2. f) Plot the marks m3 against name g) Store the data frame in a new CSV file 'studentnew.csv'	**6**
	Total Hours	**30**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
Continuous Assessment Test (2 No.s)	: 10 marks each
Assignment/Project/Case study etc.	: 15 marks
Continuous lab assessment	: 10 marks
Lab Exam	: 10 marks
Total	**: 60 marks**

vii) CONTINUOUS ASSESSMENT TEST

No. of Test	:	2
Maximum marks	:	30 Marks
Test Duration	:	1.5 hours
Topic	:	2.5 Module

viii) END SEMESTER EXAMINATION

Maximum marks	:	**40 Marks**
Exam Duration	:	2 Hours

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Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESL10R	BUILDING MATERIALS AND CONSTRUCTION TECHNOLOGY	ESC	3	0	0	0	3	2023

i) COURSE OVERVIEW

Goal of this course is to provide an insight on construction materials to the students of Civil Engineering and to provide a detailed insight into the construction techniques and equipment used in Civil Engineering practices.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Explain the properties, characteristics, test procedures and behaviour of conventional building materials used in construction.	Understand
CO 2	Explain the properties, characteristics, test procedures and behaviour of modern building materials used in construction.	Understand
CO 3	Identify cost effective and site-specific construction techniques.	Apply
CO 4	Select the equipment for various types of construction practices.	Apply

iii) SYLLABUS

Timber and wood based products, Bricks, Aggregates, Steel- Classification, properties, characteristics, test procedures.

Cement and admixtures, Cement mortars and concrete.

Types, properties and uses of modern construction materials, Smart construction materials and its applications in civil engineering.

Construction techniques: Scaffolding, Formwork, Slip form construction, Plastering, Pointing, Painting, Segmental construction of bridges/flyovers, Box pushing technology for tunnelling, Trenchless technology, Pile construction, Underwater construction.

Prefabricated construction, Construction 3D printing, Cost-effective construction, Construction Equipment.

iv) a) TEXTBOOKS

1) Rangwala, Building Construction, 34th edition, Charotar Publishers, 2022.

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2) Michael S. Mamlouk and John P. Zaniewski, Materials for Civil and Construction Engineering, 4th edition, Pearson Publishers, 2017.
3) P. Purushothama Raj, Building Construction Materials and Technique, Pearson Publishers, 1st edition, Pearson Education India, 2017.
4) M.S. Shetty and A. K. Jain, Concrete Technology: Theory and Practice, 8th edition, S. Chand & Company Pvt. Ltd, 2019.

b) CODES OF PRACTICE

1) IS 383: 2016 Coarse and fine aggregates for concrete- specification, 2nd revision, Bureau of Indian Standards, New Delhi.
2) IS: 4031 - Indian Standard for Methods of physical tests for hydraulic cement, latest revision, Bureau of Indian Standards, New Delhi.

c) REFERENCES

1) David Madsen, Commercial Building Construction: Materials and Methods, McGraw Hill LLC, 2021.
2) S.C. Sharma and S.V. Deodhar, Construction Engineering & Management, 1st edition, Khanna Book Publishing Co. (P) Ltd,2019.
3) Edward Allen and Joseph Iano, Fundamentals of Building Construction: Materials and Methods,Seventh Edition,7th edition, Wiley Publications, 2019.
4) B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Building Construction, 11th edition, Laxmi Publications (P) Ltd, 2016.
5) Eva Kultermann and William P. Spence, Construction Materials, Methods, and Techniques, Building for a Sustainable Future, Cengage, 2022.

v) COURSE PLAN

Module	Contents	No. of hours
I	Timber and wood based products- classification, cross section, seasoning of timber, market forms and uses. Bricks- composition of brick, characteristics of good building brick, classification and testing of bricks, special types of bricks and their uses. Aggregates- classification, IS specifications, tests, properties and uses, recycled Aggregates. steel-different types of steel, steel in civil engineering (Structural, reinforcing bars, wires).	9

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II	Cement and admixtures- chemical composition, IS specification and tests, types and their uses. Mineral and chemical admixtures and plasticizers- uses. Cement Mortars and concrete- constituents, proportioning and preparation and types. Fresh concrete, hardened concrete, factors affecting strength of concrete, testing of concrete (including NDT), transportation and placing.	**9**
III	Modern Construction Materials- types, properties and uses of advanced building materials like aluminum, glass, ceramics and refractories. Geomembranes and geotextiles, neoprene, decorative panels and laminates, ferrocement, PVC, epoxy-coated bar, FAL-G bricks. Polymers in civil engineering-structural plastics and composites, flooring and facade materials- structural glazing, photocatalytic cement. Smart construction materials- shape memory alloys, magneto-strictive materials, piezoelectric materials, electrorheological and electrochromic materials- applications in civil engineering.	**9**
IV	Construction techniques: scaffolding- Uses and classification, Formwork- Requirements of good formwork, classification, slip form construction. plastering, pointing, painting. Segmental construction of bridges/flyovers, Box pushing technology for tunneling, Trenchless technology. Pile Construction-types of piles, construction, pile driving equipment, pile hammers. Underwater construction- site preparation, temporary roads, site drainage. Deep trench and deep basement excavations, bulk excavation.	**9**
V	Prefabricated construction- advantages and disadvantages, Prefabricated building components. Prestressing- fundamental understanding of pre-tensioned and post-tensioned construction. Construction 3D printing (brief discussion only). Cost-effective construction- rapid wall construction, soil-cement block masonry, voided slab technology, filler slab technology. Construction equipment- equipment for excavating, dredging, trenching, tunneling, drilling, blasting, compaction, erection	**9**

	equipment, types of pumps used in construction, equipment for dewatering and grouting, foundation and pile driving equipment, forklifts and related Equipment, portable material conveyors, hauling equipment, hoisting equipment, draglines and clamshells.	
	Total hours	**45**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	5 marks
Continuous Assessment Test (2 Numbers)	:	10 marks each
Assignment/Project/Case study etc.	:	15 marks
Total	**:**	**40 marks**

vii) CONTINUOUS ASSESSMENT TEST

No. of Test	:	2
Maximum marks	:	30 Marks
Test Duration	:	1.5 hours
Topic	:	2.5 Module

viii) END SEMESTER EXAMINATION

Maximum marks	:	**60 Marks**
Exam Duration	:	3 Hours

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Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23HSJ1NB	PROFESSIONAL COMMUNICATION	HSC	2	0	0	2	1	2023

i) COURSE OVERVIEW

The objective of this course is to equip students with the necessary skills to listen, read, write, and speak so as to comprehend and successfully convey any idea, technical or otherwise, as well as give them the necessary polish to become persuasive communicators. The course aims to enhance the employability and career Skills of students and orient the students towards grooming as a professional.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Demonstrate effective language skills relevant to Engineering through writing and making presentations.	Apply
CO 2	Analyze a variety of textual and audio content for specific needs	Analyze
CO 3	Evaluate a given technical/non-technical topic.	Evaluate
CO 4	Create professional and technical documents.	Create
CO 5	Communicate proficiently in interviews and exam situations and all social situations.	Apply

iii) SYLLABUS

Communication Skills: Introducing yourself and others professionally, elevator pitch, recommendation letter, e-mails, netiquettes, telephone etiquettes, demi-official letters.
Business Communication and Technical writing: Product description, narrating an incident, report writing, agenda and minutes, memo, asking for information and giving information, explaining processes and products, giving instructions, planning a course of action.
Creative Thinking, Critical Thinking Skills and problem solving: Expressing opinion, GD, Arguing, reading critical texts (general and academic) and summarizing, listening and responding, Negotiation strategies and decision making skills.
Presentation Skills: Oral Presentation Skills (Proposal presentation), PowerPoint presentation (Projects).
Interviews: CVs and Resumes LinkedIN, Job application, Types of interviews, successful interviews, interview etiquette, dress code, body language, telephone/online interviews,

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one-to-one interview & panel interview, FAQs related to job interviews.

iv) a) TEXTBOOKS

1) Meenakshi Raman and Sangeetha Sharma, Professional Communication, 3rd edition, Oxford University Press, 2018
2) Meenakshi Raman and Sangeetha Sharma, Technical Communication: Principles and Practice, 2nd Edition, Oxford University Press, 2011
3) M. Ashraf Rizvi, Effective Technical Communication, New Delhi: Tata McGraw Hill Publications, 2007.

b) REFERENCES

1) English for Engineers and Technologists (Combined edition, Vol. 1 and 2), Orient Blackswan 2010.
2) Stephen E. Lucas, The Art of Public Speaking, 10th Edition; McGraw Hill Education, 2012.
3) William Strunk Jr. & E.B. White, The Elements of Style, 4th Edition, Pearson, 1999.
4) David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004.
5) Goodheart-Willcox, Professional Communication, 1st Edition, 2017.
6) Training in Interpersonal Skills: Tips for Managing People at Work,6th edition, Pearson Education, India, 2015.
7) The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, 1st edition, Pearson Education, 2013.
8) Anand Ganguly, Success in Interview, 5th Edition, RPH, 2016.
9) Raman Sharma, Technical Communications, 3rd edition, Oxford Publication, London, 2004.

v) COURSE PLAN

Module	Contents	No. of hours
I	Need for Effective Communication, Levels of communication; Flow of communication; Use of language in communication; Communication networks; Significance of technical communication, Types of barriers; Miscommunication; Noise; Overcoming measures Non-verbal Communication and Body Language: Forms of non-verbal communication; Interpreting body-language cues; Kinesics; Proxemics; Chronemics; Effective use of body language Technical Writing: Differences between technical and literary style, Elements of style; Common Errors, Letter Writing: Formal, informal and demi-official letters; business letters, Netiquettes: effective e-mail messages	8
II	Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of	12

	Creativity Critical thinking Vs Creative thinking, Functions of Left Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence. Steps in problem solving, Problem Solving Techniques, Problem Solving through Six Thinking Hats, Mind Mapping, Forced Connections. Problem Solving strategies, Analytical Thinking and quantitative reasoning expressed in written form, Numeric, symbolic, and graphic reasoning, Solving application problems.	
III	Reading, Comprehension, and Summarizing: Reading styles, critical reading, reading and comprehending shorter and longer technical articles from journals, newspapers Listening Skills: Active and Passive listening, listening for general content, to fill up information, intensive listening, for specific information, to answer, and to understand. Developing effective listening skills, barriers to effective listening, listening to longer technical talks, listening to classroom lectures, talks on engineering /technology, listening to documentaries and making notes, TED talks. Telephone etiquettes	**10**
IV	Oral Presentation: Voice modulation, tone, describing a process, Presentation Skills: Oral presentation and public speaking skills, business presentations, Preparation: organizing the material, self-Introduction, introducing the topic, answering questions, individual presentation practice, presenting visuals effectively. Mirroring, Elevator Pitch Introducing Oneself -one's career goals	**15**
V	Formal writing and interview skills: Technical Writing: differences between technical and literary style. Letter Writing (formal, informal and semi-formal), Job applications, Minute preparation, CV preparation (differences between Bio-Data, CV and Resume), and LinkedIn profile. Statements of Purpose, Instructions, Checklists. Interview Skills: types of interviews, successful interviews, interview etiquette, dress code, body language, telephone/online interviews	**15**
	Total Hours	**60**

Lab Activities

1. Activity: SWOT analysis
2. Activity: Creating LinkedIn profile, preparing CV, mock interview
3. Activity: Reading a technical paper and summarizing
4. Activity: Interpret data in tables and graphs
5. Activity: Writing a report
6. Activity: Oral presentation on the given topic using appropriate non-verbal cues
7. Case Analysis of a challenging scenario
8. Problem solving using mind map/six thinking hats

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vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
Regular assessment project report writing	: 10 marks
Technical Presentation through PPT	: 10 marks
Listening Test	: 10 marks
Group Discussion/Mock Job interview	: 10 marks
LinkedIn Submission	: 5 marks
Case Study	: 20 marks
Project	: 30 marks
Total	**: 100 marks**

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23PYP10A	ENGINEERING PHYSICS LAB	BSC	0	0	2	0	1	2023

i) COURSE OVERVIEW

The aim of this course is to enable the students to gain practical knowledge in Physics to correlate with the theoretical studies. It equips the students to utilize the acquired skills in an appropriate way to explore the prospects of modern technology. It brings more confidence in students and develops the ability to fabricate engineering and technical tools.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Determine the frequency of tuning fork using a Melde's string apparatus by setting up a wave pattern in a stretched string.	Apply
CO 2	Determine the Numerical aperture and acceptance angle of optical fiber.	Apply
CO 3	Determine the wavelength of a monochromatic beam of light and thickness of thin wire using principle of interference	Apply
CO 4	Demonstrate diffraction of light using plane transmission grating.	Apply
CO 5	Draw the I-V characteristics of non ohmic devices.	Apply

iii) SYLLABUS

1) Melde's string apparatus- Measurement of frequency in the transverse mode.
2) Wavelength measurement of a monochromatic source of light using Newton's Rings method.
3) Determination of diameter of a thin wire or thickness of a thin strip of paper using air wedge method.
4) Measurement of wavelength of a source of light using grating.
5) Determination of dispersive power and resolving power of a plane transmission grating.
6) Determination of the wavelength of any standard laser using diffraction grating
7) I-V characteristics of solar cells.

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8) To measure the Numerical aperture and acceptance angle of an optical fibre

iv) a) REFERENCES

1) S.L. Gupta and V. Kumar, *Practical physics with viva voce*, Pragati Prakashan Publishers, Revised Edition, 2009.
2) M.N. Avadhanulu, A.A. Dani and Pokely P.M., *Experiments in Engineering Physics*, S. Chand &Co, 2008.
3) S. K. Gupta, *Engineering Physics practicals*, Krishna Prakashan Pvt. Ltd., 2014 4) P. R. Sasikumar, *Practical Physics*, PHI Ltd., 2011.

v) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
Class work/ Assessment /Viva-voce	: 55 marks
Final Assessment	: 40 marks
Total	**: 100 marks**

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESP10C	Design Studio I	ESC	0	0	2	0	1	2023

i) COURSE OVERVIEW

The course is designed to introduce the fundamentals of Civil Engineering drawing and understand the principles of planning. The students will be able to learn the drafting of buildings manually and use drafting software such as AutoCAD. The course also includes 3D modelling and rendering of buildings.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Develop engineering drawings of building components.	Apply
CO 2	Develop engineering drawings of buildings.	Apply
CO 3	Develop site plan and service plan as per the latest building rules.	Apply
CO 4	Develop a 3D model of a residential building and render it using relevant modelling software.	Apply

iii) SYLLABUS

List of exercises/experiments

1. Introduction class: Draw sectional details and elevation of building components.
2. Draw plan, section, and elevation of single-storied residential buildings with flat roofs.
3. Draw plan, section, and elevation of single-storied residential buildings with pitched roofs using AutoCAD.
4. Draft the plan, section, and elevation of a double storied residential building in AutoCAD.
5. Prepare a site plan as per latest building rules (KPBR or KMBR) using AutoCAD.
6. Prepare a service plan as per latest building rules (KPBR or KMBR) using AutoCAD.
7. Draft the plan, section, and elevation of any public building using AutoCAD.
8. Introduction to 3D modelling- Develop a 3D model of a two storied residential building.
9. Render the 3D model of a residential building and develop a report.

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iv) COURSE PLAN

Experiment No.	List of exercises/experiments	No. of hours
I	Introduction class: Draw sectional details and elevation of building components.	**2**
II	Draw plan, section, and elevation of single-storied residential buildings with flat roofs.	**2**
III	Draw plan, section, and elevation of single-storied residential buildings with pitched roofs using AutoCAD.	**4**
IV	Draft the plan, section, and elevation of a double storied residential building in AutoCAD.	**4**
V	Prepare a site plan as per latest building rules (KPBR or KMBR) using AutoCAD.	**2**
VI	Prepare a service plan as per latest building rules (KPBR or KMBR) using AutoCAD.	**4**
VII	Draft the plan, section, and elevation of any public building using AutoCAD.	**4**
VIII	Introduction to 3D modelling- Develop a 3D model of a two storied residential building.	**4**
IX	Render the 3D model of a residential building and develop a report.	**4**
	Total hours	**30**

v) a) TEXTBOOKS

1) Shah, M.G., Kale, C. M. and Patki, S. Y, Building Drawing with an Integrated Approach to Built Environment, Tata McGraw Hill Publishing Company Limited, New Delhi, 2012.
2) Balagopal, T. S. Prabhu, Building Drawing and Detailing, Spades Publishers, Calicut, 2022.
3) Kumar Swamy N and Kameswara Rao, Building Planning and Drawing, 9th Revision, Charotar Publication, 2023.
4) AutoCAD Essentials, Autodesk official Press, John Wiley & Sons, USA.

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b) CODES OF PRACTICE

1) SP 7: 2016: National Building Code of India 2016 (NBC 2016).
2) Kerala Panchayat Building Rules, 2019, Government of Kerala, Local Self-Government (RD) Department.
3) Kerala Municipal Building Rules, 2019, Government of Kerala, Local Self-Government (RD) Department.

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
Class work/ Assessment /Viva-voce	: 55 marks
Final Assessment	: 40 marks
Total	**: 100 marks**

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COURSES OFFERED TO OTHER BRANCHES

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESL10C	ENGINEERING MECHANICS	ESC	2	1	0	0	3	2023

i) COURSE OVERVIEW

Goal of this course is to expose the students to the fundamental concepts of mechanics and enhance their problem-solving skills. It introduces students to the influence of the applied force system and the geometrical properties of rigid bodies while stationary or in motion. After this course ,students will be able to recognize similar problems in real world situations and respond accordingly.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO 1	Explain the Principles ,Theorems and Force systems related to Rigid and Deformable Body Mechanics.	Understand
CO 2	Determine the resultant of force systems.	Apply
CO 3	Apply the Conditions of Equilibrium to solve rigid body statics problems.	Apply
CO 4	Analyze internal member forces acting on Trusses.	Apply
CO 5	Solve problems related with rectilinear, circular and rotational motion using kinematic and kinetic principles of Mechanics.	Apply

iii) SYLLABUS

Introduction on Statics and Dynamics- Newton's Laws-Classification of Force Systems- - Basic Principles of Statics- Laws-Composition and Resolution of Forces - Resultant of Coplanar Force Systems- Moment- Couple

Equilibrium of Coplanar Force System –- Types of Loadings- Support Reactions of Statically determinate beams subjected to various types of loads –Graphical Analysis

Introduction to forces in space- Vectorial representation of Forces- Moments -Resultant of concurrent forces in space - Analysis of Trusses-Introduction- - Analysis of Plane Perfect Trusses by the Method of of Joints and by the Method of Sections

Friction-Introduction- Sliding Friction- Coulomb's Laws of Friction- Wedge Friction- Analysis of Single Bodies- Analysis of Connected Bodies --Properties of Surfaces- -Centroid of Regular Geometrical Shapes, Composite Areas- Moment of Inertia – Mass moment of Inertia- Theorem of Pappus Guldinus

Kinematics -– Rectilinear Translation- Curvilinear Translation- Rotation -Kinetics - D'Alembert's Principle- Impulse Momentum and Work Energy Principle- Applications to Rectilinear, Curvilinear and Rotational- Viscous Friction.

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iv) (a) TEXT BOOKS

1) Timoshenko, S., Young, D. H., Rao, J. V. and Pati, S, Engineering Mechanics, McGraw Hill Publishers, 2017.
2) Beer, F. P. and Johnston, R., Vector Mechanics for Engineers: Statics and Dynamics, Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 12th Edition, 2019.
3) Bansal, R. K., A Textbook of Engineering Mechanics, Laxmi Publications, 8th Edition, 2016.
4) Sharma, D. P., Hibbeler, R. C. and Shames, I. H., Engineering Mechanics, Pearson Publishers, 2011.

(b) REFERENCES

1) Bhavikkatti, S. S., Engineering Mechanics, New Age International Publishers, 2016.
2) Merriam, J. L. and Kraige, L. G., Engineering Mechanics Vols. 1 and 2, John Wiley, 7th Edition, 2006.
3) Hibbeler, R. C. and Gupta, A., Engineering Mechanics, Vol. I Statics, Vol II Dynamics, Pearson Education, 2009.
4) Shames, I. H., Engineering Mechanics Statics and Dynamics, Prentice Hall of India, 4th Edition, 2005

v) COURSE PLAN

Module	Contents	No. of hours
I	Introduction to Engineering Mechanics: Introduction on Statics and Dynamics- Newton's Laws-Classification of Force Systems- Idealization in Mechanics- Basic Principles of Statics- Laws- Parallelogram, Triangle, Polygon, Equilibrium, Superposition and Transmissibility, Law of Action and Reaction- Composition and Resolution of Forces Resultant of Coplanar Force Systems Method of Projections- Resultant of Concurrent Force Systems- Moment- Varignon's Theorem- Parallel Forces- Center of Parallel Forces- Couple- Resultant of Parallel Forces- Resolution of force into Force and couple - Resultant of General Force System (With Numerical Examples)	9
II	Equilibrium of Coplanar Force System: Free Body Diagrams- Lami's Theorem – Equilibrium Conditions of - Coplanar Concurrent Force System, Coplanar Parallel Force System, Coplanar Non-Concurrent Force System-Graphical Analysis of Coplanar Forces-Funicular Polygon (With Numerical Examples) Beams: Types of Beams- Types of Supports- Types of Loadings- Support Reactions of Statically determinate beams subjected to various types	9

	of loads- simply supported, uniformly distributed, uniformly varying, concentrated moment (With numerical examples)	
III	Forces in Space: Introduction – Vectorial representation of Forces, Moments and Couples- Resultant and Equilibrium Equations for Concurrent Forces in Space(With Numerical Examples) Analysis of Trusses: Introduction- Classification of Trusses- Analysis of Plane Perfect Trusses by the Method of Joints and by the Method of Sections (With Numerical Examples)	**9**
IV	Friction: Introduction- Sliding Friction- Coulomb's Laws of Friction- Wedge friction- Analysis of Single Bodies- Analysis of Connected Bodies (With Numerical Examples) Properties of Surfaces: Introduction-Centroid of Regular Geometrical Shapes- Centroid of Composite Areas- Moment of Inertia – Parallel Axis, Perpendicular Axis Theorem (With Numerical Examples) Polar Moment of Inertia, Radius of Gyration- Mass Moment of Inertia of ring, cylinder and uniform disc- Theorem of Pappus Guldinus(Concepts only)	**9**
V	Dynamics: Introduction – Kinematics of – Rectilinear Translation- Curvilinear Motion - Rotation(With Numerical Examples) Kinetics: Introduction – D'Alembert's Principle- Applications to Motion- Rectilinear, Curvilinear and Rotation - Impulse Momentum and Work Energy Principle- Applications to Rectilinear, Curvilinear and Rotation Motion (With Numerical Examples)	**9**
	Total hours	**45**

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	5 marks
Continuous Assessment Test (2 Numbers)	:	10 marks each
Assignment/Project/Case study etc.	:	15 marks
Total	**:**	**40 marks**

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vii) CONTINUOUS ASSESSMENT TEST

No. of Test	:	2
Maximum marks	:	30 Marks
Test Duration	:	1.5 hours
Topic	:	2.5 Module

viii) END SEMESTER EXAMINATION

Maximum marks	:	**60 Marks**
Exam Duration	:	3 Hours

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Course Code	Course Name	Category	L	T	P	J	Credit	Year of introduction
23ESB10P	MANUFACTURING AND CONSTRUCTION PRACTICES B	ESC	1	0	2	0	2	2023

i) COURSE OVERVIEW

- This subject is for exposing the students to the various theoretical and practical aspects of manufacturing processes and familiarizing various tools, measuring devices, practices and machines used in the workshop section.
- The goal of this course is to introduce the students to the field of Civil Engineering and its importance in the development of the Country. The course is designed to have lecture sessions on an introduction to the various fields of Civil Engineering and different aspects of construction. The workshop session will provide hands-on experience in certain construction-related activities including surveying and levelling.

ii) COURSE OUTCOMES

After the completion of the course, the student will be able to:

CO1	Explain the basic manufacturing, metal joining and machining processes.	Understand
CO2	Demonstrate general safety precautions in different mechanical workshop trades.	Understand
CO3	Prepare simple models using fitting, carpentry, sheet metal, welding and 3D printing techniques.	Apply
CO4	Identify the tools and equipment used in fitting, carpentry, sheet metal, welding and various machine tools.	Apply
CO5	Explain the various disciplines of Civil Engineering and its relevance in the development of the nation.	Understand
CO6	Explain the different structural elements of a building and the building rules and regulations.	Understand
CO7	Apply engineering principles and tools to set-out a plan, estimate the area and profile of plots, and construct masonry walls.	Apply
CO8	Examine the quality of different building blocks.	Apply
CO9	Make use of plumbing tools to install fixtures like tap, T-Joint, elbow, bend etc.	Apply

iii) SYLLABUS

Introduction to Workshop practice: Workshop practice, shop floor precautions, ethics and First Aid knowledge. Studies of mechanical tools, components and their applications: Tools: Screw drivers, spanners, Allen keys, cutting pliers etc. and Accessories.

Sheet Metal–Sheet metal forming, Sheet metal cutting, Forging, Rolling, Extrusion. Welding– Elementary ideas of joining process-welding, soldering and brazing. Fitting– Study of tools, Practice in filing, cutting. Male and female joints. Carpentry– Study of tools and joints. Practice in planning, chiseling, marking and sawing.

Machine Tools (Basic elements, Working principle and types of operations), Lathe, Drilling Machine, Shaper, planer, slotter, Milling Machine, Grinding machine Machining processes: turning, taper turning, thread cutting, shaping, drilling, grinding, milling. Introduction to CNC and 3D Printing.

General Introduction to Civil Engineering: Relevance of Civil Engineering in the development of the nation. Brief introduction to major disciplines of Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & Project management, GIS.

Structural elements of a building: Foundation, plinth, lintel, masonry wall, column, beam, slab, sunshade, parapet, staircase. Plinth area, built up area, carpet area, floor area ratio. Permission plan of a building – Demonstration. Building rules and regulations: NBC, KBR & CRZ norms.

Surveying: Principles, instruments used. Levelling: Principles of levelling using dumpy level - simple levelling, differential levelling. Demonstration of Total Station. Brick masonry – Types of bonds, Masonry arches, number of bricks for construction, other types of building blocks. Construction materials – cement, mortar, concrete. Plumbing tools. Types of roofs, Flooring materials.

iv) a) TEXTBOOKS

1) AICTE's Prescribed Textbook: Workshop / Manufacturing Practices (with Lab Manual) ISBN: 978-93-91505-332.

2) Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

3) Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th Edition, Pearson Education India Edition, 2002.

4) B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Basic Civil Engineering, 1st Edition, 2003, Laxmi Publications.

5) Rangwala, Essentials of Civil Engineering, 1st Edition, 2012, Charotar Publishing House.

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6) Mamlouk M. S. and Zaniewski J. P., Materials for Civil and Construction Engineering, Pearson Publishers, 4th Edition, 2017.

7) B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Surveying – Volume I, 17th Edition, 2016, Laxmi Publications.

b) REFERENCES

1) Gowri P. Hariharan and A. Suresh Babu, Manufacturing Technology – I, Pearson Education,2008.

2) Roy A. Lindberg, Processes and Materials of Manufacture, 4th Edition, Prentice Hall India,1998.

3) Rao P.N., Manufacturing Technology, Vol. I and Vol. II, Tata McGraw Hill House, 2017.

4) W. B. McKay, Building Construction- Volumes 1 to 4, 4th /5th Edition, 2013, Pearson Education India.

5) W.F. Chen and J.Y. Richard Liew (Eds.), The Civil Engineering Handbook, 2nd Edition, 2002, CRC Press (Taylor and Francis).

6) Kerala Municipality Building Rules, 2019, Local Self Government (RD) Department, Government of Kerala.

7) Kerala Panchayat Building Rules, 2019, Local Self Government (RD) Department, Government of Kerala.

8) SP 7: 2016, National Building Code of India 2016 (NBC 2016), Bureau of Indian Standards, New Delhi, 2016.

9) Coastal Regulation Zone Rules (CRZ rules), 2019, Ministry of Environment, Forest, and Climate Change (MoEFCC), Government of India.

v) COURSE PLAN

Module	Contents	No. of hours
I	Introduction to Workshop practice: Workshop practice, shop floor precautions, ethics and First Aid knowledge. Studies of mechanical tools, components and their applications: Tools: Screw drivers, spanners, Allen keys, cutting pliers etc. and Accessories.	2
II	Sheet Metal–Sheet metal forming, Sheet metal cutting, Forging, Rolling, Extrusion. Welding– Elementary ideas of joining process-welding, soldering and brazing. Fitting– Study of tools, Practice in filing, cutting. Male and female joints. Carpentry– Study of tools and joints. Practice in planning, chiseling, marking and sawing.	2
III	Machine Tools (Basic elements, working principle and types of operations), Lathe, Drilling Machine, Shaper, planer, slotter, Milling Machine, Grinding machine Machining processes: turning, taper turning, thread cutting, shaping, drilling, grinding, milling. Introduction to CNC and 3D Printing.	3

IV	General Introduction to Civil Engineering: Relevance of Civil Engineering in the development of the nation. Brief introduction to major disciplines of Civil Engineering: Surveying, Structural Engineering, Geotechnical Engineering, Hydraulics & Water Resources, Transportation Engineering, Environmental Engineering, Construction planning & Project management, GIS.	2
V	Structural elements of a building: Foundation, plinth, lintel, masonry wall, column, beam, slab, sunshade, parapet, staircase. Plinth area, built up area, carpet area, floor area ratio. Permission plan of a building – Demonstration. Building rules and regulations: NBC, KBR & CRZ norms.	2
VI	Surveying: Principles, instruments used. Levelling: Principles of levelling using dumpy level - simple levelling, differential levelling. Demonstration of Total Station. Brick masonry – Types of bonds, Masonry arches, number of bricks for construction, other types of building blocks. Construction materials – cement, mortar, concrete. Plumbing tools. Types of roofs, Flooring materials.	4
	Total	**15 hours**

Cycle No. or Exp. No.	**Experiment**	**No. of hours**
1	Machine shop	1
2	Fitting shop	1
3	Carpentry	1
4	Welding shop (Arc welding + Gas welding)	1
5	Sheet Metal	1
6	CNC	1
7	3D Printing	1
8	Compute area of a given plot using tape, EDM etc.	1
9	Levelling – Plot the longitudinal section of a road.	1
10	Setting out of a building: Set out a building as per the given building plan. Each group can set out one or two rooms of the building.	1
11	Construct a wall of height 50 cm and wall thickness 1½ bricks using English bond (No mortar required) – corner portion – length of side walls 60 cm.	1
12	Cast paver blocks using mortar and test for strength (Include sustainable materials also).	1
13	Tests for strength of various types of building blocks.	1

14	Study on plumbing and install plumbing fixtures like Tap, T-Joint, Elbow, Bend, Threading etc.	1
15	Plan a rainwater harvesting system.	1
	Total	**15 hours**

vi) CONTINUOUS ASSESSMENT PATTERN

Attendance	:	5 marks
Continuous Assessment Test	:	20 marks
Assessment of Lab Work	:	25 marks
Assignment	:	10 marks
Total	:	**60 marks**

vii) CONTINUOUS ASSESSMENT TEST

No. of Test	:	2 (CAT 1 Manufacturing Practices and CAT 2 Construction Practices, or vice versa)
Maximum marks	:	20 Marks
Test Duration	:	1 hour
Topic	:	3 Module

viii) END SEMESTER EXAMINATION

Maximum marks	:	**40 Marks** (20 marks for Construction Practices, 20 Marks for Manufacturing Practices)
Exam Duration	:	1 Hour

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