



MAR BASELIOS

COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

Mar Ivanios Vidyanagar | Nalanchira P.O. | Thiruvananthapuram - 695 015 | Kerala

MECHANICAL ENGINEERING

S1 S2 SYLLABUS

(AS PER 2023 CURRICULUM)

SEMESTER I

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
23MAL10A	LINEAR ALGEBRA AND CALCULUS	BSC	3	1	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 analyzing linear systems. The calculus of functions of one or more variables taught in this course are useful in modelling and analyzing 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, eigen values and eigen vectors, 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

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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) TEXT BOOKS

- 1) H. Anton, I. Biven, S. Davis, “Calculus”, Wiley, 10th Edition, 2015.
- 2) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2016.

(b) OTHER REFERENCES

1. J. Stewart, Essential Calculus, Cengage, 2nd Edition, 2017
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. Peter V. O’Neil, Advanced Engineering Mathematics, Cengage, 7th Edition 2012.

v) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	:	5 marks
CA Exams (2 numbers)	:	10 marks each
Assignment/Project/Case study etc	:	15 marks
Total	:	40 marks

vi) CONTINUOUS ASSESSMENT EXAMINATION PATTERN

- **Two tests of 30 marks each** (2 ½ modules to be covered in each exam)
- **Duration – 1.5 hours**

vii) END SEMESTER EXAMINATION PATTERN

- There will be Two parts- Part A and Part B – with a **total of 60 marks**.
- Part A contains compulsory questions. Part B contains choice questions.
- **Duration – 3 hours**

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

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 let the students to familiarize with different topics such as new-generation engineering materials, storage devices, different instrumental methods etc.

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

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, H₂-O₂ 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 spectroscope, colorimetry, Principles and applications of IR spectroscopy, Number of vibrational modes – CO₂ and H₂O, 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 Nano Tubes, 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, Thermo Gravimetric 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, R₄M₄ 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.

TEXT BOOKS

- 1) D. Harvey, N. Rutledge, *Industrial Chemistry*, ETP, first edition, 2018. ISBN: 9781788820554
- 2) M. Arif, A. Fernandez, K. P. Nair, *Engineering Chemistry*, first edition, Owl Books, 2019.
- 3) S. Chawla, *A text book of Engineering Chemistry*, second edition, Dhanpat Rai & Co. 2017.
- 4) Roy Varghese., *Engineering Chemistry*, Second Edition, Crown Pubs., 2019.
- 5) Prasanta Rath., *Engineering Chemistry*, First Edition, Cenage Learning, 2015.

REFERENCES

- 1) C. N. Banwell, E. M. Mc Cash, *Fundamentals of Molecular Spectroscopy*, McGraw-Hill, 4th edition, 2017.
 - 2) H. H. Willard, L. L. Merritt, *Instrumental Methods of Analysis*, CBS Publishers, 7th edition, 2023.
 - 3) A. J. Peacock, A. Calhoun, C. Hanser, *Polymer Chemistry: Properties and Application*, Verlag GmbH and Company KG, 2012.
 - 4) C. Binns, *Introduction to Nanoscience and Nanotechnology*, Wiley, 2010.
 - 5) Callister William.D., *Material Science and Engineering*, John Wiley, 2014.
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- 6) Jurgen Garche, Tom Smolinka, *Electrochemical Power Sources- Fundamentals, Systems, and Applications*, Elsevier Science, Second edition, 2021.

CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
CA Exams (2 numbers)	: 10 marks each
Assignment/Project/Case study etc.	: 15 marks
Total	: 40 marks

CONTINUOUS ASSESSMENT EXAMINATION PATTERN

- **Two tests of 30 marks each** (2 ½ modules to be covered in each exam)
- Duration – **1.5 hours**

END SEMESTER EXAMINATION PATTERN

- There will be Two parts- Part A and Part B – with a **total of 60 marks**.
- Part A contains compulsory short answer questions. Part B contains long answer questions with choice.
- 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 objects using CAD tools.	Apply
CO 5	Construct drawings of engineering systems	Apply

iii) SYLLABUS

Introduction to engineering drawing : 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

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

Introduction to Computer Aided Drawing: Introduction to drawing software, sketching of 2D simple geometries, editing and dimensioning of 2D geometries. 3D part development.

3D Assembly of Mechanical Components: Mechanical Joints and Couplings

Residential Building & Electrical Systems Drawing: Plan and elevation of simple buildings with dimensions, electrical drawings and circuit drawings.

iv) (a) TEXT BOOKS

- 1) Bhatt N.D, Engineering Drawing, Charotar Publishing House Pvt. Ltd, 53rd Edition, 2019.
- 2) John K.C., Engineering Graphics, Prentice Hall India Publishers, 1st Edition, 2009.
- 3) C. M.Agrawal, BasantAgrawal, Engineering Graphics, Tata McGraw-Hill, 1stEdition, 2012.

(b) REFERENCES

- 1) G. S. Phull, H. S.Sandhu, Engineering Graphics, John Wiley & Sons IncPvt. Ltd, 1st Edition, 2014.
- 2) P. I. Varghese, Engineering Graphics, V.I.P. Publishers, 21st Edition, 2010.
- 3) Jolhe Dhananjay, Engineering Drawing with an Introduction to AutoCAD, (1e), McGraw Hill Education, 2017

Module	Content	No of Hours
I	Introduction to engineering drawing: 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	12
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 position 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	12
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	14
IV	3D Assembly of Mechanical Components: Drawing of Cotter Joints , Knuckle Joint, Shaft couplings and Oldham's coupling	12
V	Residential Building & Electrical Systems Drawing: Drawing plan, section and elevation of single storied and two storied residential buildings with flat roof. Electrical Drawing layout for residential building. Circuit drawing and wiring drawing of simple systems	10
	Total	60

v) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
CA Exams (2 numbers)	: 10 marks each
Assignment/Project/Case study etc.	: 15 marks
Lab Work	: 20 marks
Total	: 60 marks

vi) CONTINUOUS ASSESSMENT EXAMINATION PATTERN

- **Two tests of 30 marks each** (2 ½ modules to be covered in each exam)
- Duration – **1.5 hours**

vii) END SEMESTER EXAMINATION PATTERN

- End semester exam - **total of 40 marks.**
- 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

v) 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.

vi) 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 working of power transmission elements, basic manufacturing, metal joining and machining processes	Understand

vii) SYLLABUS

Module 1: 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.

Module 2: 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. **Power Transmission Devices:** belt chain, and gear.

Module 3: 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, Milling machine. Computer-Aided Machining: CNC Machine. Principle of CAD/CAM, Rapid, and Additive Manufacturing.

viii)(a) TEXT BOOKS

- 1) Kumar, P., Basic Mechanical Engineering, Pearson India, 2013.
- 2) Clifford, M., Simmons, K. and Shipway, P., An Introduction to Mechanical
- 3) Dr. P. Balachandran, Dr. R. Mohan., Basics of Mechanical Engineering, Owl publications, 2015
- 4) J. Benjamin, Basic Mechanical Engineering, Pentex Publications, 2022.

(b) REFERENCES

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

ix) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
CA Exams (1 number)	: 20 marks
Assignment/Project/Case study etc.	: 15 marks
Total	: 40 marks

x) CONTINUOUS ASSESSMENT EXAMINATION PATTERN

- **One tests of 30 marks** (2 ½ modules to be covered in each exam)
- **Duration – 1.5 hours**

xi) END SEMESTER EXAMINATION PATTERN

- There will be Two parts- Part A and Part B – with a **total of 60 marks**.
- Part A contains compulsory questions. Part B contains choice questions.
- **Duration – 3 hours**

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

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	Determine plinth area and carpet area from a given plan of a residential building.	Apply
CO 3	Explain the concepts of surveying, geotechnical engineering, transportation engineering, environmental and water resources engineering.	Understand
CO 4	Summarise the different materials and systems in the context of green buildings and smart buildings.	Understand

iii) SYLLABUS**Module 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.

Module 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.

Module 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.

iv) a) TEXTBOOKS

- 1) Eva Kultermann and William P. Spence, Construction Materials, Methods, and Techniques, Building for a Sustainable Future, Cengage, 2022.
- 2) Michael S. Mamlouk and John P. Zaniewski, Materials for Civil and Construction Engineering, Pearson Publishers, 4th edition, 2017.
- 3) B. C. Punmia, Ashok K. Jain and Arun K. Jain, Surveying (Vol. I and II), Laxmi Publications (P) Ltd., New Delhi, 16th Edition, 2017.
- 4) Rangwala, Essentials of Civil Engineering, Charotar Publishing House, 1st edition, 2012.

b) REFERENCES

- 1) W. F. Chen and J. Y. Richard Liew, The Civil Engineering Handbook, CRC Press (Taylor and Francis), 2nd edition, 2003.
- 2) W. R. McKay, Building Construction, Volumes 1 to 4, Pearson India Education Services, 5th edition, 2013.
- 3) S. K. Khanna, C. E. G. Justo and A. Veeraragavan, Highway Engineering, Nem Chand and Bros., 10th edition, 2018.
- 4) Gopal Ranjan and A.S.R. Rao, Basic and Applied Soil Mechanics, New Age International (P) Limited, New Delhi, 3rd edition, 2016.
- 5) Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, Environmental Engineering, McGraw Hill Education, 2017.
- 6) Kerala Municipal Building Rules, LSGD, Govt. of Kerala, 2019.
- 7) SP 7: 2016, National Building Code of India, BIS, New Delhi, 2016.

v) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
CA Exams (1 number)	: 15 marks
Assignment/Project/Case study etc.	: 20 marks
Total	: 40 marks

vi) CONTINUOUS ASSESSMENT EXAMINATION PATTERN

- **One tests of 30 mark** (2 ½ modules to be covered in each exam)
- **Duration – 1.5 hours**

vii) END SEMESTER EXAMINATION PATTERN

- There will be Two parts- Part A and Part B – with a **total of 60 marks**.
- Part A contains compulsory questions. Part B contains choice questions
- **Duration – 3 hours**



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

i) COURSE OVERVIEW

Goal of this course is to expose students to the significance of natural resource management, ecosystem restoration and biodiversity conservation. The course details the various problems related to environmental pollution and the legal provisions for environmental protection. The course also introduces the concept of sustainability, sustainable practices and the role of engineering in attaining 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	Summarize 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 Urbanization, Industrial Ecology, Circular Economy- Case studies

iv) a) TEXTBOOKS

- 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	<p>Interdisciplinary nature of Environment: Definition, scope and importance.</p> <p>Natural resources and associated problems: Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water.</p> <p>Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources (case studies).</p> <p>Food Resources: effects of modern agriculture, fertilizers-pesticides problems, water logging, salinity.</p> <p>Land resources: land degradation, man induced landslides, soil erosion and desertification.</p> <p>Role of individuals in conservation of natural resources, Equitable use of resources.</p>	6
II	<p>Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem. Productivity, Energy flow in the ecosystems. 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.</p> <p>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.</p>	6



III	<p>Environmental Pollution: Definition, Causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Noise pollution.</p> <p>Solid and Hazardous waste management: Causes, effects and control measures of urban and industrial wastes. 3R concept, Zero waste management -case studies.</p> <p>Role of an individual in prevention of pollution.</p>	6
IV	<p>Social issues and the Environment: Environmental ethics, Contemporary Environmental issues- Global warming, Climate change, Sea level rise. International efforts for environmental protection. Water conservation - rain water harvesting, watershed management, conservation of wetlands- Ramsar sites in India.</p> <p>Legal provisions for environmental protection. Environment protection Act, Air (prevention and control of pollution) Act, Water (prevention and control of pollution) Act, Wildlife protection act, Forest conservation act. National Action Plan on Climate Change</p>	6
V	<p>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</p> <p>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.</p>	6
	Total hours	30

VI) CONTINUOUS ASSESSMENT

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, Module 4 & Module 5 only)	: 30 marks, 1.5 hrs duration
Total	: 100 marks

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
23CYP10A	ENGINEERING CHEMISTRY LAB	BSC	0	0	2	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 analyzing chemicals and standard laboratory equipments.

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 analyzing 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 ^1H 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) REFERENCES

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

v) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
Class work/ Assessment /Viva-voce	: 55 marks
Written Examination	: 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 $1\frac{1}{2}$ 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, 4th / 5th 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

v) 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 II

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

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) TEXT BOOKS

- 1) H. Anton, I. Biven S.Davis, “Calculus”, Wiley, 10th edition, 2015.
- 2) Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2016.

(b) OTHER REFERENCES

- 1) George F Simmons: Differential Equation with Applications and its historical Notes, 2e McGraw Hill Education India 2002.
- 2) Hemen Datta, Mathematical Methods for Science and Engineering, Cengage Learning, 1st. ed .
- 3) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2018.

v) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
CA Exams (2 numbers)	: 10 marks each
Assignment/Project/Case study etc.	: 15 marks
Total	: 40 marks

vi) CONTINUOUS ASSESSMENT EXAMINATION PATTERN

- **Two tests of 30 marks each** (2 ½ modules to be covered in each exam)
- **Duration – 1.5 hours**

vii) END SEMESTER EXAMINATION PATTERN

- There will be Two parts- Part A and Part B – with **a total of 60 marks**.
- Part A contains compulsory questions. Part B contains choice questions.
- **Duration – 3 hours**

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

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.

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 system.	Understand
CO 5	Explain the fundamental ideas of Ultrasonics and acoustics in order to facilitate technological advancement.	Understand

SYLLABUS

Oscillations and Waves: Harmonic oscillations – Damped harmonic oscillations, Forced harmonic oscillations, Q- factor, Amplitude resonance, comparison of electrical and mechanical oscillator. 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.

(a) TEXT BOOKS

- 1) M.N. Avadhanulu, P.G. Kshirsagar, T.V.S Arun Murthy, *A Text book of Engineering Physics*, S. Chand &Co., Revised Edition, 2014
- 2) H.K. Malik, A.K. Singh, *Engineering Physics*, McGraw Hill Education, 2nd Edition, 2017

(b) REFERENCES

- 1) Arthur Beiser, *Concepts of Modern Physics*, Tata McGraw Hill Publications, 6th Edition, 2003.
- 2) Aruldas G., *Engineering Physics*, Prentice Hall of India Pvt Ltd., 2015
- 3) Ajoy Ghatak, *Optics*, Mc Graw Hill Education, 6th Edition, 2017
- 4) David J. Griffiths, *Introduction to Electrodynamics*, Addison-Wesley, 4th Edition 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 Text Book of Engineering Physics*, S. Chand &Co., first edition:
- 7) Premlet B., *Advanced Engineering Physics*, Phasor Books, 10th Edition, 2017.

CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
CA Exams (2 numbers)	: 10 marks each
Assignment/Project/Case study etc.	: 15 marks
Total	: 40 marks

CONTINUOUS ASSESSMENT EXAMINATION PATTERN

- **Two tests of 30 marks each** (2 ½ modules to be covered in each exam)
- **Duration – 1.5 hours**

END SEMESTER EXAMINATION PATTERN

- There will be Two parts- Part A and Part B – with a **total of 60 marks**.
- Part A contains compulsory short answer questions. Part B contains long answer questions with choice.
- **Duration – 3 hours**

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 applied force system and the geometrical properties of the 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.

COURSE OUTCOMES

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

CO 1	Explain the principles and theorems related to rigid body mechanics.	Understand
CO 2	Apply the principles of statics to solve problems involving different force systems.	Apply
CO 3	Apply the properties of distributed areas and masses for solving problems involving rigid bodies.	Apply
CO 4	Analyse rigid body motion under translation and rotation.	Apply
CO 5	Analyse rigid body motion under simple harmonic motion and plane motion.	Apply

ii) SYLLABUS

Module 1: Introduction to engineering mechanics - Basic principles of statics, Composition and resolution of forces. Resultant of coplanar concurrent and coplanar non-concurrent forces- Varignon's Theorem of Moments. Equilibrium conditions- Analysis of single and connected bodies.

Module 2: Parallel coplanar forces - Couple - Resultant of parallel forces - Centre of parallel forces - Equilibrium of parallel forces. Equilibrium of beams- Support reactions- Principle of virtual work. Friction- Analysis of wedge and ladder friction.

Module 3: Forces in space - Vectorial representation of forces, moments and couples - Resultant and equilibrium equations for concurrent forces in space - Concurrent forces in space. Properties of surfaces- Centroid of regular and composite areas. Area moment of inertia- Parallel axis theorem - Perpendicular axis theorem -Polar moment of inertia, Radius of gyration. Mass moment of inertia of ring, cylinder and uniform disc.

Module 4: Introduction to kinematics - Rectilinear translation. Curvilinear translation – tangential and centripetal accelerations. Impulse momentum equation and work energy equation. Projectile motion. Introduction to kinetics - Equation of motion - D'Alembert's principle- Motion on horizontal and inclined surfaces - Motion of connected bodies in a plane.

Module 5: Rotation - Kinematics of rotation- Equation of motion for a rigid body rotating about a fixed axis - Rotation under a constant moment.

Oscillation of bodies having Simple Harmonic Motion- Time period of simple and compound pendulum. Mechanical vibrations- degree of freedom – spring mass model- free vibration- natural frequency. Plane motion of rigid body- Instantaneous centre of rotation- Motion of connecting rod.

iii) (a) TEXT BOOKS

- 1) F.P. Beer & E.R. Johnston, “Vector Mechanics for Engineers-Statics and Dynamics”, 11/e, McGraw Hill International Book Co, 2017.
- 2) R.C. Hibbeler, “Engineering Mechanics- Statics and Dynamics”, 7/e, Pearson Education Ltd., 2017.
- 3) I. H. Shames, Engineering Mechanics – Statics and Dynamics, 4/e, Prentice Hall of India, 2005.
- 4) J.L. Meriam and G. Kraige, “Engineering Mechanics - Dynamics”, 14/e, John Wiley & Sons, 2013.

(b) REFERENCES

- 1) Timoshenko and Young, “Engineering Mechanics”, McGraw Hill Publishers.
- 2) I.B. Prasad, “A textbook of Applied Mechanics – Statics & Dynamics”, Khanna Publishers
- 3) Tayal A.K., “Engineering Mechanics - Dynamics”, Vols 1 and 2- John Wiley.
- 4) S.S.Bhavikkatti., “Engineering Mechanics”, New age International Publishers.

iv) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
CA Exams (2 numbers)	: 10 marks each
Assignment/Project/Case study etc.	: 15 marks
Total	: 40 marks

v) CONTINUOUS ASSESSMENT EXAMINATION PATTERN

- **Two tests of 30 marks each** (2 ½ modules to be covered in each exam)
- **Duration – 1.5 hours**

vi) END SEMESTER EXAMINATION PATTERN

- There will be Two parts- Part A and Part B – with **a total of 60 marks.**
- Part A contains compulsory questions. Part B contains choice questions.
- **Duration – 3 hours**

Course Code	Course Name	Category	L	T	P	J	Credit	Year of Introduction
23ESB10D	PROBLEM SOLVING AND PROGRAMMING IN C	ESC	2	1	2	0	4	2023

i. COURSE OVERVIEW:

This course aims to introduce the concepts of structured programming. It covers basic concepts of C programming language including arrays, functions, pointers and files. This course involves a lab component, which equips the learner to solve computational problems through programming.

ii. COURSE OUTCOMES

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

CO 1	Explain the fundamentals of computer architecture and types of software.	Understand
CO 2	Develop a solution using algorithm /flowchart to a computational problem.	Apply
CO 3	Construct programs with control statements and arrays.	Apply
CO4	Make use of user defined data types or functions to solve computational problems.	Apply
CO5	Develop programs using files and pointers.	Apply

iii. SYLLABUS

Computer architecture & Programming Languages Basics of Computer architecture, Types of Programming Languages, System Software, Application Software, Introduction to structured programming, Algorithms, Flowcharts

C Programming Language Data Types, variables, keywords, Constants, Operators and Expressions, Control Flow Statements- Conditional statements, Iterative statements, programs

Arrays and Strings Multidimensional arrays and matrices, String processing, searching and sorting in 1D array.

Functions Scope of variable, Pass by reference and value methods, Recursive functions. Structures and union, Storage Classes

Pointers and Files- File Operations, Sequential access and random access, programs covering pointers and files

iv. a) TEXT BOOKS

1. Byron Gottfried, *Programming with C* (Schaum's Outlines Series), Mcgraw Hill Education, 3rd Edition, 2017.
2. H. M. Deitel, P. J. Deitel, *C: How to program*, 7th Edition, Pearson Education, 2010.
3. Anita Goel, *Computer Fundamentals*, Pearson, 1st Edition, 2010.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson Freed, *Fundamentals of Data Structures in C*, 2nd Edition, 2008.

b) REFERENCES

1. Brian W. Kernighan and Dennis M. Ritchie, *C Programming Language*, Pearson, 2nd Edition, 2015.
2. Rajaraman V, PHI, *Computer Basics and Programming in C*, 1st Edition, 2007.
3. Anita Goel and Ajay Mittal, *Computer fundamentals and Programming in C*, 1st Edition, 2013.

v. COURSE PLAN

Module	Contents	No. of hours
I	Basics of Computer architecture: Von-Neumann Architecture-Processor, Memory, Input and Output devices. Types of Programming Languages, System Software, Application Software: Compilers, Interpreters, high level and low level languages Introduction to structured programming, -Algorithms, flow charts, examples.	8
II	Basic structure of C program: Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf, Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence. Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue statements.	9
III	Arrays: One-dimensional Arrays, Declaration of One- dimensional Arrays, Initialization of One-dimensional Arrays, Example programs- Bubble sort, Linear search, Two-dimensional Arrays, Declaration of Two-dimensional Arrays, and Initialization of Two-dimensional Arrays. String processing: In built string handling functions Simple programs covering arrays and strings.	9

IV	Functions : The prototype declaration, Function definition. Function call: Passing arguments to a function, by value, by reference. Scope of variable names. Recursive function calls. Storage Classes. Structure and union in C, Array of structures	9
V	Pointers : Pointer variables. Declaring and dereferencing pointer variables. Accessing arrays through pointers. File Operations : open, close, read, write, append Sequential access and random access to files: In built file handling functions (rewind (), fseek (), ftell (), feof (), fread (), fwrite ()), simple programs.	10
	Total hours	45

C PROGRAMMING LAB

No	Experiment	Hours
1	Familiarization of console I/O and operators in C <ul style="list-style-type: none"> Display "Hello world " Read two numbers, add them and display their sum Read the radius of a circle, calculate its area and display it Area of triangle after reading its sides 	3
2	Familiarization of conditional statements in C <ul style="list-style-type: none"> Read 3 integer values and find largest of three numbers. Check whether given year is leap year or not Display the grade of a student after reading his mark for a subject. (Use switch) 	3
3	Familiarization of looping statements in C <ul style="list-style-type: none"> Read a Natural Number and check whether the number is prime or not Read a Natural Number and check whether the number is Armstrong or not 	3
4	Familiarization of Array in C <ul style="list-style-type: none"> Display second largest number after reading n numbers from user. (Without array). Read n integers, store them in an array and find their sum and average 	3
5	Implementation of Algorithms using array in C <ul style="list-style-type: none"> Implementation of Linear Search Implementation of Bubble Sort algorithm 	3
6	Familiarization of 2D Array in C	3

	<ul style="list-style-type: none"> Write a program for performing matrix addition, multiplication and finding the transpose. Display sum of diagonal elements of a matrix 	
7	Familiarization of Strings in C <ul style="list-style-type: none"> Read a string (word), store it in an array and check whether it is a palindrome word or not. Read a string (ending with a \$ symbol), store it in an array and count the number of vowels, consonants and spaces in it. 	3
8	Familiarization of Functions in C <ul style="list-style-type: none"> Display first n prime numbers using Function. Program to find the sum of digits of a number using recursion 	3
9	Familiarization of Structure in C <ul style="list-style-type: none"> Using structure, read and print data of n employees (Name, Employee Id and Salary) Read the marks of three subjects for n students of a class and display their names in the order of rank. (Use array of structure) 	3
10	Familiarization of Pointers and files in C <ul style="list-style-type: none"> Input and Print the sum of elements of an array using pointers Create a file and perform the following <ul style="list-style-type: none"> Write data to the file Read the data in a given file & display the file content on console 	3
	Total	30

vi. CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	5 Marks
CA Exams (CAT1 and CAT2)	10 Marks Each
Assignment	15 Marks
Lab Work	10 Marks
Lab exam	10 Marks
Total	60 Marks

vii. END SEMESTER EXAMINATION PATTERN

There will be an end semester examination of duration 2 hours for 40 marks.

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
23ESL10J	BASICS OF ELECTRICAL ENGINEERING - A	ESC	2	0	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:

CO 1	Apply fundamental circuit laws and principles of electromagnetism to solve simple DC electric circuits and magnetic circuits respectively.	Apply
CO 2	Solve simple AC circuits using the alternating current fundamentals.	Apply
CO 3	Explain the principle of operation and characteristics of DC Motors	Understand

iii) SYLLABUS

Basic concepts of DC circuits: Ohm's Law and 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.

DC Motors-Constructional details of DC machines, Principle of operation, Back EMF, Torque equation, Types, Performance characteristics, Applications

iv) (a) TEXT BOOKS

- 1) William H. Hayt., Jr., Jack E. Kemmerly, Steven M. Durbin., *Engineering Circuit Analysis*, McGraw-Hill, 8th Edition, 2012.
- 2) Kothari D. P. and Nagrath I. J., *Basic Electrical Engineering*, Tata McGraw Hill, 2010.
- 3) Fitzgerald A.E., David Higginbotham E., Arvin Gabel, *Basic Electrical Engineering*, Tata McGraw Hill, 5th Edition, 2009.
- 4) Bimbra P. S., *Electric Machines*, Khanna Publishers, 2nd Edition, 2017.

(b) REFERENCES

- 1) Paul Breeze, *Power Generation Technologies*, Newnes, 3rd Edition, 2019.
- 2) Allan Hambley R., *Electrical Engineering: Principles & Applications*, Pearson Education, 7th Edition, 2018.
- 3) Mittle V. N. and Arvind Mittal, *Basic Electrical Engineering*, McGraw Hill, 2nd Edition, 2006.
- 4) Clayton A. E. and Hancock N. N., *The Performance and Design of Direct Current Machines*, CBS Publishers & Distributors, New Delhi, 3rd Edition, 2004.

v) COURSE PLAN

Module	Contents	No. of hours
I	DC circuits: Review of Elementary concepts of DC circuits, Current and Voltage Division Rules, Star-delta conversion (resistive networks only-derivation not required), Numerical problems.	9
	Analysis of DC circuits: Mesh current method, Node voltage method. Solution of network equations by matrix method, Numerical problems.	
	Magnetic Circuits: Review of Magnetic Circuits, Series magnetic circuits with composite materials, Numerical problems.	
II	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.	9
	Alternating Current fundamentals: Generation of alternating voltages, Basic definitions, Average and RMS values of sinusoidal waveforms, Numerical Problems.	
	Analysis of AC Circuits: Phasor representation of sinusoidal quantities, Complex forms, Purely resistive, inductive and capacitive circuits; Analysis of RL, RC and RLC series circuits, active, reactive and apparent power. Numerical problems.	
III	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 circuits, Numerical problems.	12
	DC Machines- Constructional details of DC machines, Principle of operation of DC generator and DC motor, Back EMF, Torque equation, Types, Performance characteristics, Applications.	
Total hours		30

vi) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
CA Exams (1 number)	: 20 marks
Assignment/Project/Case study etc.	: 15 marks
Total	: 40 marks

vii) CONTINUOUS ASSESSMENT EXAMINATION PATTERN

- One test of 30 marks (2 ½ modules to be covered in each exam)
- Duration – 1.5 hours

viii)END SEMESTER EXAMINATION PATTERN

- There will be Two parts- Part A and Part B – with a **total of 60 marks**.
- Part A contains compulsory questions. Part B contains choice questions.
- Duration – **3 hours**

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
23ESL10L	BASICS OF ELECTRONICS ENGINEERING	ESC	2	0	0	2	2023

COURSE OVERVIEW

This course aims to equip the students with an understanding of the fundamental principles of electronics and communication engineering.

COURSE OUTCOMES

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

CO1	Describe the principles of semiconductor devices, its characteristics and various electronic circuits	Understand
CO2	Explain the basic working of Op-Amp, logic gates, radio and cellular communication systems.	Understand

SYLLABUS

PN Junction diode: Principle of operation, V-I characteristics, breakdown mechanisms, Zener diode and its characteristics. Rectifiers and Power supplies: Block diagram of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator. Bipolar Junction Transistors: structure, principle of operation, relation between current gains in Common Emitter (CE), Common Base (CB) and Common Collector (CC) configurations, input and output characteristics of CE configuration. Amplifiers: Concept of voltage divider biasing, circuit diagram and working of CE (RC coupled) amplifier with its frequency response. Integrated Circuits: Analog IC; Operational Amplifier, block diagram, ideal characteristics, inverting and non-inverting Amplifier. Digital IC: Logic Gates AND, OR, NOT, Universal Gates; truth table, De-Morgans law, Realization of simple Boolean functions. Radio communication: Modulation, need for modulation, Principle of AM, mathematical expression, waveform, frequency spectrum and bandwidth of AM, Principle of FM, mathematical expression, waveform. Radio Receivers: block diagram of super heterodyne receiver (AM&FM). Mobile communication: Basic principles of cellular communications, concept of cells, frequency reuse, hand off.

(a) TEXT BOOKS

- 1) Boylested, R. L. and Nashelsky, L., *Electronic Devices and Circuit Theory*, Pearson Education, 10th Edition, 2009.
- 2) Thomas I Floyd, *Digital Fundamentals*, Pearson Education, 11th Edition, 2018.
- 3) Ramakant A Gaykwad, *Op-Amps and Linear Integrated Circuits*, Pearson Education, 4th Edition, 2015.
- 4) Wayne Tomasi and Neil Storey, *A Textbook on Basic Communication and Information Engineering*, Pearson, 5th Edition, 2010.

(b) REFERENCES

- 5) N.N. Bhargava , D.C. Kulshreshtha , S.C. Gupta, *Basic Electronics and Linear Circuits*, Tata McGraw - Hill Education, New Delhi, 2nd Edition, 2014.

vi) COURSE PLAN

Module	Contents	No. of hours
I	PN Junction diode: Principle of operation, V-I characteristics, breakdown mechanisms, Zener diode and its characteristics	10
	Rectifiers and Power supplies: Block diagram of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator	
	Bipolar Junction Transistors: structure, principle of operation, relation between current gains in Common Emitter (CE), Common Base (CB) and Common Collector (CC) configurations, input and output characteristics of CE configuration.	
II	Amplifiers: Concept of voltage divider biasing, circuit diagram and working of CE (RC coupled) amplifier with its frequency response	10
	Integrated Circuits: Analog IC; Operational Amplifier, block diagram, ideal characteristics, inverting and non-inverting Amplifier	
	Digital IC: Logic Gates AND, OR, NOT, Universal Gates; truth table, De-Morgans law, Realization of simple Boolean functions	
III	Radio communication: Modulation, need for modulation, Principle of AM, mathematical expression, waveform, frequency spectrum and bandwidth of AM, Principle of FM, mathematical expression, waveform	10
	Radio Receivers: block diagram of super heterodyne receiver (AM&FM).	
	Mobile communication: Basic principles of cellular communications, concept of cells, frequency reuse, hand off.	
	Total hours	30

vii) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
CA Exams (1 number)	: 20 marks
Assignment/Project/Case study etc.	: 15 marks
Total	: 40 marks

viii) CONTINUOUS ASSESSMENT EXAMINATION PATTERN

- **One tests of 30 marks** (2 ½ modules to be covered in each exam)
- Duration – **1.5 hours**

ix) END SEMESTER EXAMINATION PATTERN

- There will be Two parts- Part A and Part B – with a **total of 60 marks**.
- Part A contains compulsory questions. Part B contains choice questions.
- Duration – **3 hours**

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) COURSEOUTCOMES

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

CO 1	Demonstrate effective communication skills relevant to Engineering through writing and making presentations.	Create
CO 2	Analyze a variety of textual and audio content for specific needs.	Analyze
CO 3	Evaluate a given technical/non-technical topic.	Analyze
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), Power point presentation (Projects).

Interviews: CVs and Resumes, LinkedIn, Job application, Types of interviews, successful interviews, interview etiquette, dress code, body language, telephone/online interviews, one-to-one interview & panel interview, FAQs related to job interviews.

iv)

a) TEXT BOOKS

1. Meenakshi Raman and Sangeetha Sharma (2018). "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: TataMcGrawHill Publications, 2007.

(b) OTHER 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. & Bobwhite, "The Elements of Style", 4th Edition, Pearson, 1999.
4. David F. Beer and David McMurrey, Guide to writing as an Engineer, John Wiley. New York, 2004.
5. Goodheart-Willcox, "Professional Communication", First Edition, 2017.
6. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India, 6 editions, 2015.
7. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1 edition, 2013.
8. Anand Ganguly, "Success in Interview", RPH, 5th Edition, 2016.
9. Raman Sharma, "Technical Communications", Oxford Publication, London, 2024

v) COURSEPLAN

Module	Contents	No. of hours
I	<p>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</p> <p>Non-verbal Communication and Body Language: Forms of nonverbal communication; Interpreting body-language cues; Kinesics; Proxemics; Chronemics; Effective use of body language</p> <p>Technical Writing: Differences between technical and literary style, Elements of style; Common Errors.</p> <p>Letter Writing: Formal, informal and demi-official letters; business letters, Netiquettes: Effective mail messages</p>	8

II	<p>Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of Creativity</p> <p>Critical thinking vs. Creative thinking, Functions of Left Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence.</p> <p>Steps in problem-solving, Problem-Solving Techniques, Problem Solving through Six Thinking Hats, Mind Mapping, Forced Connections.</p>	12
	<p>Problem Solving strategies, Analytical Thinking and Quantitative reasoning expressed in written form, Numeric, symbolic, and graphic reasoning, Solving application problems.</p>	
III	<p>Reading, Comprehension, and Summarizing: Reading styles, critical reading, reading and comprehending shorter and longer technical articles from journals, newspapers.</p> <p>Listening Skills: Active and Passive listening, listening for general content, to fill up information, intensive listening, for specific information, to answer, and to understand.</p> <p>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.</p>	10
IV	<p>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</p>	15
V	<p>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</p>	15
	Total Hours	60

vi) 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

vii) Continuous Assessment

Attendance: 5marks

Regular assessment

Project report writing:10marks

Technical presentation through PPT:10marks

Listening Test: 10 marks

Group discussion/mock job interview:10marks

LinkedIn submission: 5 marks

Case Study:20marks

Project:30 marks

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

- Melde's string apparatus- Measurement of frequency in the transverse mode.
- Wavelength measurement of a monochromatic source of light using Newton's Rings method.
- Determination of diameter of a thin wire or thickness of a thin strip of paper using air wedge method.
- Measurement of wavelength of a source of light using grating.
- Determination of dispersive power and resolving power of a plane transmission grating.
- Determination of the wavelength of any standard laser using diffraction grating
- I-V characteristics of solar cell.
- To measure the Numerical aperture and acceptance angle of an optical fibre

iv) REFERENCES

- 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
Written Examination	: 40 marks
Total	: 100 marks

Course Code	Course Name	Category	L	T	P	Credit	Year of Introduction
23ESP10B	ELECTRICAL AND ELECTRONICS WORKSHOP	ESC	0	0	2	1	2023

i) COURSE OVERVIEW:

To expose the students to the commonly used accessories and components in electrical installations and to provide hands on experience of wiring of electrical circuits. Further, to enable the students to familiarize, identify, construct, and debug the electronic components, devices and circuits. It also enables the student's engineering skills by soldering practices of electronic circuits.

ii) COURSE OUTCOMES

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

CO 1	Choose the appropriate tools, electrical accessories, protective elements for electrical wiring and study the different types of earthing and safety measures.	Remember
CO 2	Build a simple lighting circuit for domestic buildings using suitable accessories and materials.	Apply
CO 3	Identify the faults in electric circuits and batteries using appropriate devices.	Analysis
CO 4	Make use of a solar powered circuit and obtain its VI characteristics.	Apply
CO 5	Construct the performance characteristics of DC Motors by performing load test.	Apply
CO 6	Test various electronic components.	Understand
CO 7	Implement basic electronic circuits on breadboard .	Apply
CO 8	Implement basic electronic circuits on general purpose PCB .	Apply

iii) SYLLABUS (Electrical workshop)

Familiarization/Identification of electrical accessories and protective elements, wiring of circuits using PVC conduits, wiring of simple solar chargeable circuit and determination of its characteristics, Demonstration of power distribution arrangement and earthing schemes, Identification of different types of batteries.

Experiment No.	PART I ELECTRICAL WORKSHOP List of exercises/experiments	No. of hours
1	Familiarization/Identification of electrical components with specification (Functionality, type, size, colour coding, symbol, cost etc. of Wires, Cables, Connectors, Fuses, MCB, ELCB, Switches and other electrical installation equipments with ratings).	2
2	Understand the safety precautions to be observed in the workshop. Demonstration of usage of fire extinguishers and learn about basic first aid procedures.	1
3	Wiring of one lamp controlled by one SPST switch and a plug socket (PVC conduit wiring).	2
4	Wiring of light/fan circuit controlled by two SPDT switches (Staircase wiring).	2
5	Wiring of a light circuit and a power circuit for domestic applications.	2
6	Wiring of simple solar chargeable circuit and determination of its characteristics.	2
7	a) Demonstration of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and Energy meter. b) Application of tester and test lamp for identifying simple faults in electrical systems.	1
8	a) Demonstration of Pipe and Plate Earthing Schemes. b) Testing of batteries using hydrometer.	1
9	Load Test on a DC Shunt/Series Motor	2
Total hours		15

iv) REFERENCES (Electrical workshop)

- 1) Singh R. P., Electrical Workshop: Safety, Commissioning, Maintenance & Testing of Electrical Equipment, Dream tech Press, 3rd Edition, 2019.
- 2) John H. Watt, Terrell Croft American Electricians' Handbook: A Reference Book for the Practical Electrical Manual, McGraw-Hill, 9th Edition, 2002.

v) SYLLABUS (Electronics workshop)

Familiarization of electronic equipment and commonly used tools, Familiarization and testing of electronic components, Interconnection using bread board, Diode Characteristics, Single stage RC coupled Amplifier, Truth table verification of Logic Gates, Soldering Practice, DC Power Supply, Inverting and Non Inverting amplifier using Op-amp.

Experiment No.	PART 2 ELECTRONICS WORKSHOP List of exercises/experiments	No. of hours
1	Familiarization of electronic equipment and commonly used tools	2
2	Familiarization and testing of electronic components	2
3	Interconnection using bread board a. Diode Characteristics b. Single stage RC coupled Amplifier c. Truth table verification of Logic Gates	6
4	Soldering Practice a. DC Power Supply b. Inverting and Non Inverting amplifier using Op-amp	5
Total hours		15

vi) REFERENCES (Electronics workshop)

- 1) Navas K A, Electronics Lab Manual, , Volume 1, PHI Learning Private Limited, 5th Edition, 2015.

vii) CONTINUOUS ASSESSMENT EVALUATION PATTERN

Attendance	: 5 marks
Class work/ Assessment /Viva-voce	: 55 marks
Written Examination	: 40 marks
Total	: 100 marks