CURRICULUM STRUCTURE

R-2024

FIRST YEAR ENGINEERING
(Common to All Branches)
Academic Year 2024-25

Nomenclature of the courses in the curriculum	
Abbreviation	**Title**
BSC	Basic Science Courses
ESC	Engineering Science Courses
PCC	Program Core Courses
VSEC	Vocational and Skill Enhancement Course
AEC	Ability Enhancement Course
CC	Cocurricular Courses
LLC	Liberal Learning Courses
HSSM	Humanities, Social Science and Management
ISE	In Semester Examination
MSE	Mid Semester Examination
ESE	End Semester Examination
CIAP	Continuous Internal Assessment Practical
ESEP	End Semester Examination Practical

Program Structure for First Year Engineering

W.E.F. A.Y. 2024-25

Semester I

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Pract	Tut.	Theory	Pract.	Tut.	Total
FEC101	Applied Mathematics -I	BSC	3	--	--	3	--	--	3
FEC1021/ FEC1022	Applied Physics/ Applied Chemistry @	BSC	3	--	--	3	--	--	3
FEC103	Basic Electrical & Electronics Engineering	ESC	2	--	--	2	--	--	2
FEC104	C-Programming	ESC	2	--	--	2	--	--	2
FEC105	Applied Mechanics and Robot Dynamics	ESC	2	--	--	2	--	--	2
FEL1011/ FEL1012	Applied Physics Lab/ Applied Chemistry Lab @	BSC	--	1	--	--	0.5	--	0.5
FEL102	Basic Electrical & Electronics Engineering Lab	ESC	--	2	--	--	1	--	1
FEL103	C-Programming Lab	ESC	--	2	--	--	1	--	1
FEL104	Applied Mechanics and Robot Dynamics Lab	ESC	--	2	--	--	1	--	1
FEL105	Engineering Workshop-I	VSEC	--	2	--	--	1	--	1
FEL106	Health, Wellness and Mindfulness	CC	--	2#+2	--	--	2	--	2
FEL107	Induction Cum Universal Human Values	CC	--	5*	--	--	2.5	--	2.5
	Total		**12**	**18**	--	**12**	**9**	--	**21**

Examination Scheme-FY Semester-I

Course Code	Course Name	Examination Scheme						
		Theory				CIAP	ESEP	Total
		Internal Assessment		ESE$	Exam Duration (Hrs.)			
		ISE	MSE					
FEC101	Applied Mathematics -I	20	20	60	3	--	--	100
FEC1021/ FEC1022	Applied Physics/ Applied Chemistry @	20	20	60	3	--	--	100
FEC103	Basic Electrical & Electronics Engineering	15	15	45	2	--	--	75
FEC104	C-Programming	15	15	45	2	--	--	75
FEC105	Applied Mechanics and Robot Dynamics	15	15	45	2	--	--	75
FEL1011/ FEL1012	Applied Physics Lab/ Applied Chemistry Lab@	--	--	--	--	25	--	25
FEL102	Basic Electrical & Electronics Engineering Lab	--	--	--	--	25	25	50
FEL103	C-Programming Lab	--	--	--	--	25	25	50
FEL104	Applied Mechanics and Robot Dynamics Lab	--	--	--	--	25	25	50
FEL105	Engineering Workshop-I	--	--	--	--	25	--	25
FEL106	Health, Wellness and Mindfulness	--	--	--	--	25	--	25
FEL107	Induction Cum Universal Human Values	--	--	--	--	25	--	25
Total		**85**	**85**	**255**		**175**	**75**	**675**

@Physics/Chemistry in one semester.
$ ESE of duration 3 hours are of 80 marks and scaled to 60. ESE duration of 2 hours are of 60 marks and scaled to 45.
Theory 1 credit for 1 hour and practical 1 credit for 2 hours.
*Indicates workload of a learner for UHV. Faculty Load: ½ hour per week per four groups
Two hours of practical class to be conducted for full class as demo/ discussion.
ISE: In Semester Examination**:** To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test etc. of 20/15 marks.
MSE: Mid Semester Examination: To be conducted as written examination for 20/15 marks of duration 1 Hr.
ESE: End Semester Examination
CIAP: Continuous Internal Assessment Practical. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).
ESEP: End Semester Examination Practical. Oral/Practical Examination will be conducted as End Semester Examination Practical (ESEP).

Program Structure for First Year Engineering
W.E.F. A.Y. 2024-25

Semester II

Course Code	Course Name	Category	Teaching Scheme (Contact Hours)			Credits Assigned			
			Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
FEC201	Applied Mathematics -II	BSC	3	--	--	3	--	--	3
FEC2021/ FEC2022	Applied Physics/ Applied Chemistry @	BSC	3	--	--	3	--	--	3
FEC203	Engineering Graphics	ESC	2	--	--	2	--	--	2
FEC204	Digital System Design	ESC	3	--	--	3	--	--	3
FEC205	Professional Communication Techniques	AEC	2	--	--	2	--	--	2
FEL2011/ FEL2012	Applied Physics Lab/ Applied Chemistry Lab @	BSC	--	1	--	--	0.5	--	0.5
FEL202	Engineering Graphics Lab	ESC	--	2	--	--	1	--	1
FEL203	Digital System Design Lab	ESC	--	2	--	--	1	--	1
FEL204	Professional Communication Techniques Lab	AEC	--	1	--	--	0.5	--	0.5
FEL205	Object Oriented Programming Methodology Lab	ESC	--	2*+2	--	--	2	--	2
FEL206	Engineering Workshop-II	VSEC	--	2	--	--	1	--	1
FEL207	Indian Knowledge System	HSSM	--	2*+2	--	--	2	--	2
	Total		**13**	**16**	--	**13**	**8**	--	**21**

Examination Scheme-FY Semester-II

Course Code	Course Name	Examination Scheme						
		Theory				CIAP	ESEP	Total
		Internal Assessment		ESE$	Exam Duration (Hrs.)			
		ISE	MSE					
FEC201	Applied Mathematics -II	20	20	60	03	--	--	100
FEC2021/ FEC2022	Applied Physics/ Applied Chemistry @	20	20	60	03	--	--	100
FEC203	Engineering Graphics	15	15	45	03	--	--	75
FEC204	Digital System Design	20	20	60	03	--	--	100
FEC205	Professional Communication Techniques	15	15	45	02	--	--	75
FEL2011/ FEL2012	Applied Physics Lab/ Applied Chemistry Lab @	--	--	--	--	25	--	25
FEL202	Engineering Graphics Lab	--	--	--	--	25	25	50
FEL203	Digital System Design Lab	--	--	--	--	25	25	50
FEL204	Professional Communication Techniques Lab	--	--	--	--	25	--	25
FEL205	Object Oriented Programming Methodology Lab	--	--	--	--	25	25	50
FEL206	Engineering Workshop-II	--	--	--	--	25	--	25
FEL207	Indian Knowledge System	--	--	--	--	25	--	25
Total		**90**	**90**	**270**	--	**175**	**75**	**700**

@Physics/Chemistry in one semester.
* Two hours of practical class to be conducted for full class as demo/ discussion.
# Course evaluation is an activity based which may be an individual or group of students.
$ ESE of duration 3 hours are of 80 marks and scaled to 60. ESE duration of 2 hours are of 60 marks and scaled to 45.
Theory 1 credit for 1 hour and practical 1 credit for 2 hours.
ISE: In Semester Examination**:** To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test etc. of 20/15 marks.
MSE: Mid Semester Examination: To be conducted as written examination for 20/15 marks of duration 1 Hr.
ESE: End Semester Examination
CIAP: Continuous Internal Assessment Practical. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).
ESEP: End Semester Examination Practical. Oral/Practical Examination will be conducted as End Semester Examination Practical (ESEP).

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEC101	Applied Mathematics-I	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE[$]			
		ISE	MSE				
FEC101	Applied Mathematics-I	20	20	60	--	--	100

Course Objectives:

1. To develop representation and computation with large datasets using matrices in handling and processing data in machine learning and data analysis.
2. To develop the fundamentals of complex numbers required in various fields like communication, signals analysis and control systems, etc.
3. To develop fundamentals of Taylor and Laurent series which are crucial tools for approximating, analyzing, and solving a variety of engineering problems.
4. To learn about maxima and minima which helps engineers to solve practical problems that involve optimization, efficiency, stability, and resource management.
5. To study higher-order derivatives to gain tools to ensure systems are efficient, stable, and perform as required.
6. To study numerical methods which provide practical approaches to find approximate solutions where exact solutions are infeasible.

Course Outcomes:

After successful completion of the course student will be able to

1. Apply principles of basic operations of matrices to find rank and echelon form of matrices to solve system of simultaneous equations.
2. Apply the knowledge of complex numbers to solve problems in hyperbolic functions and logarithmic functions.
3. Apply Taylor's series and Maclaurin's expansion to expand the function.
4. Find maxima and minima using the basic principles of partial differentiation.
5. Evaluate the higher order derivative using successive differentiation.
6. Solve the system linear and simultaneous algebraic equations using numerical methods.

Module No.	Unit No.	Topics	Hrs.
1.0		**Matrices**	**07**
	1.1	Types of Matrices: Symmetric, Skew- Symmetric, Hermitian, Skew-Hermitian, Unitary, Orthogonal Matrices. Rank of a matrix using Echelon form. Normal form (No PAQ form).	
	1.2	System of homogeneous and non–homogeneous equations, their consistency and solutions. Linear dependent and independent vectors.	
2.0		**Complex Numbers, Hyperbolic function and Logarithm of Complex Numbers:**	**11**
	2.1	De' Moivre's Theorem and its application.	

	2.2	Find expansion of $\sin^n\theta, \cos^n\theta$ in terms of sines and cosines of multiples of θ, expansion of $sin\, n\theta, cos\, n\theta$ in powers of $sin\,\theta, cos\,\theta$ and to find sum of the trigonometric series.	
	2.3	Powers and Roots of complex number.	
	24	Hyperbolic functions. Inverse Hyperbolic functions. Separation of real and imaginary parts of all types of functions.	
	2.5	Logarithmic functions, Separation of real and Imaginary parts of Logarithmic functions.	
3.0		**Expansion of Function**	**04**
	3.1	Maclaurin's series (Statement only). Expansion of standard functions.	
	3.2	Taylor's Theorem (Statement only), example using Taylor's series.	
4.0		**Partial Differentiation and its Application**	**09**
	4.1	Partial Differentiation: Partial derivatives of first and higher order, Differentiation of composite function.	
	4.2	Euler's Theorem on Homogeneous functions with two and three independent variables (with proof). Deductions from Euler's theorem.	
	4.3	Maxima and Minima of a function of two independent variables	
5.0		**Successive Differentiation**	**04**
	5.1	The standard functions and their nth derivative.	
	5.2	Leibnitz theorem (without proof) and problem.	
6.0		**Numerical Solutions of Transcendental Equations, System of Linear Algebraic Equations, Curve fitting**	**04**
	6.1	Solution of Algebraic and Transcendental Equations by: Newton Raphson Method.	
	6.2	Solution of system of linear algebraic equations by Gauss Seidel Iteration Method.	
	6.3	Curve fitting: Fitting a straight line, quadratic curve.	
		Total	**39**

Textbooks:

1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication.
2. Advanced Engineering Mathematics, Dennis G. Zill, Warren S. Wright.

Reference books:

1. Foundations of Complex Analysis, S. Ponnusamy, Narosa Publications.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9th Ed.
3. Advanced Engineering Mathematics by H. K. Dass, 28th edition, S. Chand 2010.
4. Introductory Methods of Numerical Analysis, S.S. Sastry, Eastern Economy Edition.
5. Numerical Methods, M. K. Jain, R. K. Jain, S. R. K. Iyengar, New Age International Publishers.
6. Matrices, Shanti Narayan, S. Chand publication.
7. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill.

Course Assessment:

ISE: To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test/ Case Stud etc. of 20 marks.

MSE: To be conducted as written examination for 20 marks of duration 1 Hr. (on 40% - 50% syllabus)

End Semester Examination:

$ ESE of duration 3 hours are of 80 marks and scaled to 60.

1. Question paper will comprise of **6** questions, each carrying 20 marks.
2. The students need to solve a total of **4** questions.
3. Question No.1 will be compulsory and based on entire syllabus.
4. Remaining questions **(Q.2 to Q.6)** will be selected from all the modules.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEC1021	Applied Physics	03	--	--	03	--		03

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE$			
		ISE	MSE				
FEC1021	Applied Physics	20	20	60	--	--	100

Course Objectives:

1. To demonstrate the phenomena of thin film interference
2. To provide students with basic understanding of lasers and signal communication in optical fibers
3. To give exposure to the concepts of semiconductors
4. To build a foundation of quantum mechanics needed for modern technology
5. To impart basic concepts needed for sensor technology
6. To discuss the applications of nanotechnology for nano computing

Course Outcomes:

After successful completion of the course students will be able to

1. Determine the wavelength of light and refractive index of medium using interference phenomenon
2. Illustrate the use of lasers for various applications including optical fibres
3. Apply the knowledge gained in semiconductors in various applications
4. Relate the foundations of quantum mechanics with the development of modern technology
5. Implement the knowledge of sensing mechanism towards various sensors
6. Interpret the concept of nano technology to emerging areas of technology

Module No.	Unit No.	Topics	Hrs.
1.0		**Interference**	**06**
	1.1	**Interference**: Interference in thin film of uniform thickness (reflected system), maxima and minima conditions for variable thickness (wedge-shaped) film (qualitative), fringe width	
	1.2	**Applications:** (i) Newton's rings- determination of wavelength and refractive Index of transparent liquid (ii) Antireflecting and highly reflecting coatings.	
2.0		**Lasers and Optical Fibres**	**07**
	2.1	**Lasers:** absorption, spontaneous and stimulated emissions, light amplification population inversion, pumping, components of laser, characteristics of lasers, He-Ne laser, semiconductor laser. Applications:(i) holography (ii) LiDAR (iii) barcode reader	
	2.2	**Optical fibres**: critical angle, total internal reflection, acceptance angle, acceptance cone, numerical aperture, types of optical fibers: single mode & multimode, step index & graded index, V- number, attenuation, fibre optic communication system.	
3.0		**Semiconductor Physics**	**07**
	3.1	Direct and indirect band gap semiconductors, concept of drift velocity, mobility, conductivity in intrinsic semiconductors, Fermi- Dirac distribution function, position of Fermi level in intrinsic and extrinsic semiconductors, variation of Fermi	

		level in N and P type semiconductors with temperature and concentration, Hall effect and applications.	
	3.2	**Applications:** photo diode, LED, solar cell, Zener diode	
4.0		**Quantum Physics**	**08**
	4.1	**Quantum Physics:** de Broglie hypothesis of matter waves, de Broglie wavelength for electron, Properties of matter waves, Heisenberg's uncertainty principle, Wave function and probability density, mathematical conditions for wave function, Need and significance of Schrödinger's equations, Schrödinger's time dependent and time independent equations, energy of a particle enclosed in a rigid	
	4.2	**Applications:** Quantum mechanical tunneling, Principles of quantum computing: concept of Qubit	
5.0		**Physics of sensors**	**05**
	5.1	**Transducers:** active and passive transducers, sensing mechanism,	
	5.2	**Sensors:** Resistive sensors- PT100, Humidity measurement, proximity sensors, pressure sensors- piezoelectric effect, ultrasonic sensors for distance and velocity measurement in liquid and air, optical sensors- light dependent resistors, wavelength and color sensors	
6.0		**Nanotechnology and Nanocomputing**	**06**
	6.1	**Nanotechnology:** nanoscale, nanomaterial classification, properties, significance of quantum confinement and surface to volume ratio, top down and bottom-up approach ball milling, sputtering, sol-gel, and CVD methods of synthesis, Techniques-SEM, AFM	
	6.2	**Nanocomputing:** Introduction to nano computer, Nano computer Building block, Chemically Assembled Electronic Nanotechnology (CAEN), Single Electron Transfer (SET)	
		Total	**39**

Textbooks:

1. A Textbook of Engineering Physics -Dr. M. N. Avadhanulu, Dr. P. G. Kshirsagar, S. Chand, Revised Edition 2014
2. Modern Engineering Physics - A. S. Vasudeva, S. Chand, Revised Edition 2013
   Engineering Physics D. K Bhattacharya, Poonam Tandon, Oxford Higher Education, 1st Edition 2015
3. Engineering Physics -R. K. Gaur, S. L. Gupta, Dhanpat Rai Publications, 2012
4. Engineering Physics -V. Rajendran, McGraw Hill Educations, 2017
5. A Textbook of Nanoscience and Nanotechnology, T. Pradeep Tata McGraw Hill Education Pvt. Ltd., 2012

Reference books:

1. Semiconductor Physics and Devices – Basic Principles – Donald Neamen – McGraw Hill
2. Fundamentals of optics - Francis A. Jenkins, Harvey E. White, McGraw Hill Publication, India, 4th Edition
3. Fundamentals of Physics, Halliday and Resnick, Wiley publication
4. Concepts of Modern Physics – Arther Beiser, Shobhit Mahajan, S. Choudhury, McGraw Hill, 7thEdition 2017

Online References:

1. https://onlinecourses.nptel.ac.in/noc23_ee95/preview
2. https://archive.nptel.ac.in/courses/115/102/115102124
3. https://archive.nptel.ac.in/courses/115/102/115102025

Course Assessment:

ISE: To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test/ Case Study etc of 20 marks.

MSE: To be conducted as written examination for 20 marks of duration 1 Hr. (on 40% - 50% syllabus)

End Semester Examination:

$ ESE of duration 3 hours are of 80 marks and scaled to 60.

1. Question paper will comprise of **6** questions, each carrying 20 marks.
2. The students need to solve a total of **4** questions.
3. Question No.1 will be compulsory and based on entire syllabus.
4. Remaining questions **(Q.2 to Q.6)** will be selected from all the modules.

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Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEC1022	Applied Chemistry	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE$			
		ISE	MSE				
FEC1022	Applied Chemistry	20	20	60	--	--	100

Course Objectives:

1. To acquire knowledge about superconductors and nanomaterials.
2. To gain knowledge of polymers, conducting and bio-polymers.
3. To understand the concept of phase rule in preparing alloys.
4. To understand the mechanism of corrosion and preventive methods.
5. To acquire knowledge of fuels, green fuels and batteries.
6. To learn the significance of composites and bio-composites.

Course Outcomes

1. Understand the fundamentals of Superconductors and Nanomaterials for device applications.
2. Use of polymers for specific engineering applications based on their properties.
3. Interpret various phase transformations of alloy using thermodynamics.
4. Apply different methods to minimize corrosion in industries.
5. Comparing various energy sources, such as batteries, fuel cells, alternative fuels, and conventional fossil fuels, about their availability, operation, composition, performance efficiency, and environmental impact.
6. Identify different types of composite materials for engineering applications.

Module No.	Unit No.	Topics	Hrs.
1.0		**Engineering Materials and Applications**	08
	1.1	Superconductors: Types of superconductors, Properties of Superconductors.	
	1.2	Applications of superconductors. Preparation and Structure of 1:2:3 superconductor	
	1.3	Optical Fibers, Fullerenes, Organic Electronic Materials	
	1.4	Nanomaterials: A) Definition, Types of Nanostructured materials, Applications of Nanomaterials. B) Graphene	
	1.5	C) Types of Carbon Nanotubes (SWCNTs and MWCNTs) – Properties and Uses.	
2.0		**Introduction to Polymers and Advanced Polymers**	06
	2.1	A) Macro-molecular science, basic concept of polymers, Chemical bonding in polymers, Classification of Polymers.	
	2.2	B) Properties of Polymers: - i) Molecular weight -Number average molecular weight, Weight Average Molecular Weight, Numerical	

	2.3	ii) Crystallinity - Crystalline and amorphous polymers – Glass transition temperature. iii) Mechanical Properties: Hardness, tensile strength, creep, fatigue, impact resistance (introduction)	
	2.4	iv) Electrical properties: dielectric strength, insulation resistance, surface resistivity (Introduction), v) Optical properties: refractive index, transmittance, photoelectric property, color	
	2.5	Conducting polymers, Bio- polymers, Liquid crystal polymers, Intelligent (smart) polymers	
3.0		**Alloys**	**06**
	3.1	Introduction, Purpose of making alloys. i) Gibbs Phase rule – Statement, Terms involved with examples.	
	3.2	ii) Reduced phase rule, Two-component system (Pb Ag) & Numerical.	
	3.3	iii) Merits and Limitations of Phase rule.	
	3.4	Ferrous alloys – Plain-carbon steels, Heat and Shock resisting steels, Stainless steels. Effect of the alloying element- Ni, Cr, Co, Mn, Mo, W and V	
	3.5	Aluminium Aloys – Composition, properties and uses of i) Duralumin, ii) Magnalium.	
	3.6	Alloys of Pb – Composition, properties and Uses of i) Wood's metal ii) Tinman's solder.	
	3.7	Numerical based on Composition, density and weight of an alloy	
4.0		**Corrosion**	**06**
	4.1	A) Introduction: - Definition, Types of Corrosion –(i)Dry or Atmospheric Corrosion, ii) Wet or Electrochemical corrosion (In Acidic medium, In Neutral medium)	
	4.2	B) Factors affecting rate of corrosion: - i) Position of metal in galvanic series, ii) Purity of Metal, iii) Nature of Corrosion product, iv) Temperature, v) pH of medium, vi) concentration of medium, vii) moisture, viii) Relative Cathodic and Anodic area, ix) overvoltage	
	4.3	Methods to control corrosion: - i) Selection of metal, ii) Proper Designing, iii) Cathodic protection, iv) Use of Corrosion Inhibitors, v) Metallic Coating	
	4.4	Corrosion in Electronic devices	
5.0		**Energy Sciences**	**08**
	5.1	Definition and classification of fuels, Calorific value: Definition, Gross or Higher calorific value & Net or lower calorific value, Dulong's formula & numerical for calculations of Gross and Net calorific values.	
	5.2	Disadvantages of fossil fuels, Alternative (Green) Fuels: Biomass, Biogas, Natural Gas and CNG (Description, Utility, advantages and disadvantages)	
	5.3	Green Fuels- Synthesis and advantages of i] Biodiesel ii] Power Alcohol	
	5.4	Combustion- Calculations for requirement of only oxygen and air (by weight and by volume only) for given solid & gaseous fuels.	
	5.5	Batteries: Fuel Cell (H_2-O_2 Fuel Cell), Solar Battery, Electrochemical Sensors.	
6.0		**Composites**	**05**
	6.1	Definition, Characteristics of Composites, Constituents of Composites – Matrix Phase and Dispersed Phase (Definition and Functions)	
	6.2	Classification of Composites	
	6.3	Types of Composites, sub-types and Applications: - i) Fibre- reinforced composites, ii) Layered composites (Laminates), iii) Particulate composites.	
	6.4	Bio-composites – Definition, Classification and Applications.	
		Total	**39**

Recommended Books:

1. Engineering Chemistry, Jain and Jain, Dhanpat Rai Publication
2. A textbook of Engineering Chemistry, S. S. Dara, S. Chand and Company
3. A Textbook of Engineering Chemistry, Shashi Chawla, Dhanpat Rai and Co.
4. Polymer science: Vasant Gowarikar, Wiley Eastern Ltd, new Delhi

Course Assessment:

ISE: To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test/ Case Study etc. of 20 marks.

MSE: To be conducted as written examination for 20 marks of duration 1 Hr. (on 40% - 50% syllabus)

End Semester Examination:

$ ESE of duration 3 hours are of 80 marks and scaled to 60.

1. Question paper will comprise of **6** questions, each carrying **20** marks.
2. The students need to solve a total of **4** questions.
3. Question No.1 will be compulsory and based on entire syllabus.
4. Remaining questions **(Q.2 to Q.6)** will be selected from all the modules.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEC103	Basic Electrical and Electronics Engineering	02	--	--	02	--	--	02

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE$^{\$}$			
		ISE	MSE				
FEC103	Basic Electrical and Electronics Engineering	15	15	45	--	--	75

Course Objectives:

1. To provide knowledge on fundamentals of DC circuits
2. To provide knowledge of single phase and three phase AC circuits.
3. To inculcate fundamental knowledge of 1-Φ transformer.
4. To provide basic knowledge on fundamentals of DC and AC machines.
5. To provide knowledge of special purpose Diodes.
6. To provide knowledge of Transistor.

Course Outcomes:

After successful completion of the course student will be able to

1. Apply various network theorems to determine the circuit response / behavior.
2. Evaluate and analyze 1-Φ and 3-Φ AC circuits.
3. Describe the construction, operation and applications of 1-Φ transformers.
4. Illustrate the working principle of 3-Φ, 1-Φ Induction motors and DC Motors.
5. Explain the construction, operation and applications of some special purpose Diodes.
6. Explain the construction, operation and applications of some Transistors.

Module No.	Unit No.	Topics	Hrs.
1.0		**D. C. Circuits**	08
	1.1	DC Circuits: (Only independent sources) Kirchhoff's Laws, Source Transformation, Mesh and Nodal Analysis (no super node and super mesh) Star-Delta / Delta-Star Transformations	
	1.2	Superposition Theorem, Thevenin's Theorem, Norton's Theorem and Maximum Power Transfer Theorem.	
2.0		**A.C. Circuits**	07
	2.1	AC Circuits: Generation of alternating voltage, basic definitions, average and RMS values, phasor and phase difference, sums on phasors, Single-phase ac series and parallel circuits consisting of R, L, C, RL, RC, RLC combinations, definitions - real, reactive and apparent power, Series resonance (only theory).	
	2.2	Generation of Three-Phase Voltages, voltage & current relationships in Star and Delta Connections	
3.0		**Single phase transformer**	03

	3.1	Single Phase Transformer: (Numerical are not expected) Working principle of single-phase transformer, types of single- phase transformer, transformation ratio, actual (practical) and ideal transformer,	
	3.2	Transformer losses, efficiency and applications of transformer.	
4.0		**Electrical Machines**	**02**
	4.1	Electrical Machines: (Numerical are not expected) principle of operation, constructional details, classification and applications of DC Motor.	
	4.2	Three phase induction motor, Single-Phase induction motors and BLDC motors	
5.0		**Semiconductor Diodes**	**03**
	5.1	Diodes: (Numerical are not expected), Construction, working principle, characteristics and applications of P-N junction diode and Zener diode	
	5.2	Basic structure of LED. Application of LED.	
6.0		**Transistors**	**03**
	6.1	Introduction to Transistors: (Numerical are not expected) structure and operation of BJT. BJT configurations (only common emitter).	
	6.2	FET structure and operation. Application of BJT and FET in amplification and switching.	
		Total	**26**

Textbooks:

1. V. N. Mittal and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill, (Revised Edition)
2. Vincent Del Toro "Electrical Engineering Fundamentals", PHI Second edition, 2011.
3. Edward Hughes "Hughes Electrical and Electronic Technology", Pearson Education (Tenth edition)
4. Edward Hughes "Hughes Electrical and Electronic Technology", Pearson Education (Tenth edition).
5. D P Kothari and I J Nagrath "Theory and Problems of Basic Electrical Engineering", PHI 13th edition 2011.
6. M. Naidu, S. Kamakshaiah "Introduction to Electrical Engineering" McGraw-Hill Education, 2004.
7. B.R Patil "Basic Electrical Engineering" Oxford Higher Education,
8. Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Nashelsky

Reference books:

1. B.L. Theraja "Electrical Engineering "Vol-I and II
2. S.N. Singh, "Basic Electrical Engineering" PHI, 2011.

Course Assessment:

ISE: To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test/ Case Study etc of 15 marks.

MSE: To be conducted as written examination for 15 marks of duration 1 Hr. (on 40% - 50% syllabus)

End Semester Examination:

$ ESE of duration 2 hours are of 60 marks and scaled to 45.

1. Question paper will comprise of **6** questions, each carrying 15 marks.
2. The students need to solve a total of **4** questions.
3. Question No.1 will be compulsory and based on entire syllabus.
4. Remaining questions **(Q.2 to Q.6)** will be selected from all the modules.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEC104	C - Programming	02	--	--	02	--	--	02

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE$			
		ISE	MSE				
FEC104	C - Programming	15	15	45	--	--	75

Course Objectives:

1. To develop problem solving skills using algorithms.
2. To provide exposure to different programming constructs.
3. To provide exposure to writing functions.
4. To understand fundamentals of arrays, strings and structures in C language.
5. To develop the knowledge of pointers, Dynamic memory allocation.
6. To acquaint with the concept of file handling.

Course Outcomes:

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

1. Formulate simple algorithms for arithmetic, and logical problems and translate them to programs in C - language
2. Implement, test and execute programs comprising of control structures.
3. Decompose a problem into functions and synthesize a complete program.
4. Demonstrate the use of arrays, strings and structures in C language.
5. Understand the concept of pointers, Dynamic memory allocation
6. Understand the concept of File Handling

Module No.	Unit No.	Topics	Hrs.
Pre-requisite		**Introduction to Problem Solving**	**1**
	0.1	Steps for Problem Solving. Algorithm and Flowchart. Flow of Control.	
	0.2	Imperative and Declarative Programming Paradigm.	
1.0		**C Programming Fundamentals**	**9**
	1.1	Variables, keywords, Data types, Operators: Arithmetic, Relational and Logical, Assignment, Unary, Conditional, Bitwise, Expression, Statements. Operator Precedence and Expression evaluation.	
	1.2	Branching Structures: if statement, if-else statement, multi-way decision, switch statement, continue statement, break statement	
	1.3	Control/Iterative Structures: while, do-while, for, nested loops, Jump control statements.	
2.0		**Arrays and Strings**	**4**
	2.1	Declaration, Definition, accessing array elements, one-dimensional array, two-dimensional array, array of characters, standard String handling functions.	
3.0		**Functions and Pointer**	**4**
	3.1	Defining a Function, accessing a Function, Function Prototype, Passing Arguments to a Function, call by value, call by reference, Recursion	

	3.2	Declaration and Access of Pointer variables, Pointer arithmetic, Pointer and Arrays.	
4.0		**Structures and Union**	**4**
	4.1	Concept of Structure and Union, Declaration and Initialization of structure and union, Nested structures, Array of Structures, Passing structure to functions	
5.0		**Dynamic Memory Allocation**	**2**
	5.1	Static memory allocation and Dynamic memory allocation, Dynamic allocation of Arrays, Freeing memory, Reallocating memory blocks	
6.0		**File handling**	**2**
	6.1	Concept of streams used in the C file system, Using Files in C, File modes, Working with Text and Binary files	
Total			**26**

Text books:

1. Pradeep Day and Manas Gosh ,—Programming in C‖, Oxford University Press.
2. E. Balaguruswamy, Programming in ANSI C, McGraw-Hill
3. Sumitabha Das, Computer Fundamentals and C Programming, McGraw-Hill

Reference books:

1. Yashavant Kanetkar, “Let Us C”, BPB publication, Sixteenth Edition
2. Venugopal K.R, Prasad Sudeep, —Mastering C, McGraw-Hill
3. Byron Gottfried, —Programing with C, McGraw Hill (Schaum‟s outline series)

Course Assessment:

ISE: To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test of 15 marks.
MSE: To be conducted as written examination for 15 marks of duration 1 Hr. (on 40% - 50% syllabus)

End Semester Examination:

$ ESE of duration 2 hours are of 60 marks and scaled to 45.

1. Question paper will comprise of **6** questions, each carrying 15 marks.
2. The students need to solve a total of **4** questions.
3. Question No.1 will be compulsory and based on entire syllabus.
4. Remaining questions **(Q.2 to Q.6)** will be selected from all the modules.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEC105	Applied Mechanics and Robot Dynamics	02	--	--	02	--	--	02

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE$			
		ISE	MSE				
FEC105	Applied Mechanics and Robot Dynamics	15	15	45	--	--	75

Course Objectives:

1. To acquaint with the concept of force & basic principle of centroid and its application
2. To familiarize with the moment, Resultant and Equilibrium of system of coplanar force.
3. To acquaint with the basic concept of friction and its application in real-life problems.
4. To understand the parameters required to quantify the Kinematics of Particle and Rigid body.
5. To understand forward and inverse kinematics of robotic arm
6. To understand relation between robot joints and parameters

Course Outcomes:

After successful completion of the course student will be able to

1. Determine the equivalent force-couple system for a given system of forces.
2. Calculate reactions forces for various type of beam structure
3. Apply fundamental concept of friction to real world scenario involving inclined plane and connected bodies.
4. Calculate position, velocity and acceleration etc. of particle/rigid body using principles of kinematics
5. Analyze Forward and Inverse Kinematics of robotic arm
6. Establish the relation between robot joints and its parameters.

Module No.	Unit No.	Topics	Hrs.
1.0		**System of Coplanar Forces**	06
	1.1	Concept of force, Principle of transmissibility, Composition and resolution of forces. Moment of force about a point, Varignon's Theorem. Various systems of forces. Couples. Force couple system, Resultant of coplanar force system.	
	1.2	Centroid of plain laminas: Plain lamina consisting of primitive geometrical shapes	
2.0		**Equilibrium**	06
	2.1	Conditions of static equilibrium. Free body diagram. Various types of supports and support reactions. Equilibrium of Connected Bodies.	
	2.2	Types of Beams and various types of loads. Determination of reactions at supports for beams	
3.0		**Friction**	05
		Concept of Static Friction and Dynamic/ Kinetic Friction, Laws of dry friction, Coefficient of Friction, Angle of Friction, Concept of Cone of friction. Angle of Repose, Equilibrium of bodies on horizontal and inclined plane	
4.0		**Kinematics of Particle and Rigid Bodies**	04

	4.1 **4.2**	Motion of particle with variable acceleration, Motion Curve. General Plane motion of Rigid body. The concept of instantaneous center of rotation (ICR) for velocity. Velocity analysis of rigid body using ICR.	
5.0		**Robot Kinematics-I**	**03**
		Fundamental of Robot Mechanics, Degree of Freedom, Classification of Robots, Introduction to Forward Kinematics and Inverse Kinematics, Homogeneous transformation (**Limited to 2 DOF Serial Robot**)	
6.0		**Robot Kinematics- II**	**02**
		Concept of D-H Parameters, robot kinematics (Forward and Inverse), Control system for Robot joint, Adaptive control, Drives and transmission systems, End effectors, Gripers etc..,	
		Total	**26**

Textbooks:

1. Engineering Mechanics by A K Tayal, Umesh Publication.
2. Engineering Mechanics by Kumar, Tata McGraw Hill
3. Engineering Mechanics by Beer &Johnston, Tata McGraw Hill

Reference books:

1. Engineering Mechanics by R. C. Hibbeler.
2. Engineering Mechanics by F. L. Singer, Harper& Raw Publication
3. Engineering Mechanics by Macklin & Nelson, Tata McGraw Hill
4. Engineering Mechanics by Shaum Series
5. Engineering Mechanics (Statics) by Meriam and Kraige, Wiley Bools
6. Engineering Mechanics (Dynamics) by Meriam and Kraige, Wiley Bools
7. Introduction to Industrial Robotics by Ramchandran Nagarajan, Pearson publication

Online References:

1. https://archive.nptel.ac.in/courses/112/106/112106286/
2. https://onlinecourses.nptel.ac.in/noc21_me70/preview
3. https://archive.nptel.ac.in/courses/112/106/112106180

Course Assessment:

ISE: To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test/ Case Study etc. of 15 marks.

MSE: To be conducted as written examination for 15 marks of duration 1 Hr. (on 40% - 50% syllabus)

End Semester Examination:

$ ESE of duration 2 hours are of 60 marks and scaled to 45.

1. Question paper will comprise of **6** questions, each carrying 15 marks.
2. The students need to solve a total of **4** questions.
3. Question No.1 will be compulsory and based on entire syllabus.
4. Remaining questions **(Q.2 to Q.6)** will be selected from all the modules.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL1011	Applied Physics Lab	--	01	--	--	0.5	--	0.5

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL1011	Applied Physics Lab	--	--	--	25	--	25

Lab Objectives:

1. To develop scientific understanding of physics concepts
2. To develop the ability to explain the processes and applications related to science subjects
3. To apply skills and knowledge in real life situations
4. To improve the knowledge about the theory concepts of Physics learned in the class
5. To improve ability to analyze experimental result and write laboratory report
6. To develop understanding about inferring and predicting

Lab Outcomes: Learners will be able to

1. Determine parameters such as numerical aperture / power attenuation of an optical fibre
2. Determine wavelength / divergence of laser beam
3. Perform experiments based on interference in thin film and determine radius of curvature of lens / diameter of wire / thickness of paper
4. Calculate basic parameters / constants using semiconductors
5. Use various sensors such as optical, resistive and piezoelectric
6. Demonstrate the concept for virtual lab and simulation Experiments

List of Experiments (Minimum five experiment required)

Sr. No.	Title of the Experiment
1	Determination of numerical aperture of an optical fibre
2	Determine the divergence of laser beam
3	Determination of radius of curvature of a lens using Newton's ring set up.
4	Determination of diameter of wire/hair or thickness of paper using wedge shape film method
5	Determination of Hall Coefficient using Hall Effect phenomenon
6	Determination of wavelength using Diffraction grating. (Laser source)
7	Determination of Planck's constant using photocell
8	Determine UDM parameters
9	Study of colour sensor
10	Simulation experiments based on nanotechnology using open-source Simulation
11	Measuring optical power attenuation in plastic optical fiber
12	I-V characteristics of PN junction diode/Zener diode/photo diode
13	Study of the characteristics of Resistance Temperature Detector (RTD)/optical sensors

Term Work:

Term work shall consist of at least 5-6 practical based on the above list. Further, term work journal must include at least 2 assignments. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

Term work marks: 25 marks (Total)= 15 marks (Experiment)+ 5 marks (Assignments)+ 5 marks (Attendance)

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL1012	Applied Chemistry Lab	--	01	--	--	0.5	--	0.5

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL1012	Applied Chemistry Lab	--	--	--	25	--	25

Lab Objective:

1. To apply knowledge of quantitative analysis to determine the quality of coal.
2. To analyze experimental results and write laboratory report.
3. To learn about properties of oil to prevent corrosion.
4. To know the significance of viscosity.
5. To understand the significance of pH.
6. To learn to synthesize man-made polymers.

Lab Outcomes: After completion of experiment, the learners will be able to:

1. Understand the significance of proximate analysis of coal and determine quality of coal sample.
2. Learn various quantitative analytical techniques to determine % of elements from alloy samples.
3. Understand the significance of various properties of oil to prevent corrosion.
4. Understand the properties of lubricants and their variation with temperature using Redwood/ Abel's apparatus.
5. Apply knowledge of various quantitative analytical techniques to determine metal ion concentration/ pH
6. Synthesize UF/PF resin at laboratory level/Virtual lab.

Exp. No.	List of Experiments
1.	Determination of Moisture Content in Coal
2.	Determination of Ash Content in Coal
3.	Determination of Zn in Brass
4.	Estimation of Cu in Brass
5.	Determination of Acid Value of Oil
6.	Determination of Saponification Value of oil
7.	Determination of Viscosity of oil by Redwood Viscometer
8.	Determination of Flash point of lubricating oil using Abel's apparatus.
9.	Determination of metal ion concentration using Calorimeter.
10.	Determination of free acid (pH) of acid solution.
11.	Synthesis of Phenol- formaldehyde
12.	Synthesis of Urea- formaldehyde

Term Work: Term Work shall consist of at least 5 to 6 Practical based on the above list. Also, Term work Journal must include at least 2 assignments. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

Term work marks: 25 marks (Total)= 15 marks (Experiment)+ 5 marks (Assignments)+ 5 marks (Attendance)

Course Name	Course Code	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical/ Oral	Tutorial	Total
FEL102	Basic Electrical and Electronics Engineering Lab	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL102	Basic Electrical and Electronics Engineering Lab	--	--	--	25	25	50

Lab Objective:

1. To impart the basic concept of network analysis and its application.
2. To provide the basic concept of AC circuit analysis and its application.
3. To illustrate the operation of the transformer
4. To illustrate the operation of machines.
5. To explain the Zener diode voltage regulation characteristic.
6. To explain the BJT and FET as switches and amplifiers.

Lab Outcomes: After successful completion of the course student will be able to

1. Interpret and analyze the behavior of DC circuits using network theorems.
2. Perform and infer experiments on single-phase and three-phase AC circuits
3. Illustrate the performance of a single-phase transformer
4. Illustrate the performance of A.C. machine and DC Motor
5. Perform an experiment on voltage regulation characteristics of Special diode
6. Perform an experiment on the VI characteristics of Transistor.

Sr. No.	List of Experiments
1	To understand the basic safety precautions in electrical lab and use of electronic components and measuring instruments.
2	Perform and verify Superposition theorem.
3	Perform and verify Thevenin theorem.
4	Perform and verify Norton's & Maximum power transfer theorem.
5	Perform and verify resonance in series RLC circuit.
6	Perform and verify Relationship between IL and I ph and VL and VPL in three phase Star and delta connected load.
7	Perform SC and OC test on single phase transformer using virtual lab
8	To study and understand the concepts of DC motor and generator.
9	To verify results of given electrical circuit using simulation software
10	To demonstrate cut-out sections of the DC machine
11	To plot Zener diode voltage regulation characteristics
12	To demonstrate the application of BJT as a switch
13	To demonstrate BJT/ FET as an amplifier

Online Resources:

1. All About Circuits (https://www.allaboutcircuits.com)
2. Circuit Lab (https://www.circuitlab.com)
3. Tinker cad (https://www.tinkercad.com)

Assessment:

Term Work:

Term Work shall consist of at least 08 to 10 Practical based on the above list. Also, Term work Journal must include at least 6 assignments. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

Term work Marks:

25 Marks (Total Marks) =15 Marks (Experiment) + 05 Marks (Assignments) + 05 Marks (Attendance)

Practical or Oral Exam:

An Oral /Practical exam will be held based on the above syllabus and will be conducted as End Semester Examination Practical (ESEP).

Course code	Course code	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL103	C - Programming Lab	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL103	C - Programming Lab	--	--	--	25	25	50

Course Objectives:

Learner will be able to

1. Translate given algorithms to a program.
2. Correct syntax and logical errors.
3. Write iterative as well as recursive programs.
4. Represent data in arrays, strings and structures and manipulate them through a program.
5. Declare pointers and demonstrate call by reference concept.
6. Use File-handling functions

Course Outcomes:

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

1. Understand and implement basic problem statement using algorithms / flowcharts.
2. Recall and debug syntax and logical errors.
3. Write iterative as well as recursive programs.
4. Understand data in arrays, strings and structures and manipulate them through a program.
5. Understand the concept of pointers and demonstrate call by reference concept program
6. Understand various File handling techniques and methods using C programming language

Unit No.	List of Experiments
1	Write a program to swap two variables' values with and without using third variables. Write algorithm and draw flowchart for the same.
2	Write a program to check odd or even number: (a) using modulus operator (b) using conditional operator.
3	Design and develop a C program to read a year as an input and find whether it is leap year or not. Also consider the end of the centuries. Write algorithm and draw flowchart for the same.
4	Write a C program to find the whether the number is an AMSTRONG number or not
5	Design and develop a flowchart or an algorithm that takes three coefficients (a, b, and c) of a Quadratic equation ($ax^2 + bx + c = 0$) as input and compute all possible roots. Implement a C program for the developed flowchart/algorithm and execute the same to output the possible roots for a given set of coefficients with appropriate messages. .
6	Write a program to calculate 1/1!+2/2!+3/3!+……+n/n!.
7	Write a menu driven program to perform simple arithmetic operations based on the user's choice. The user will indicate the operation to be performed using the signs e.g. + for addition, etc.

	Write an algorithm and draw flowchart for same.
8	Write a program to read a number of more than one digit, reverse the number and display the sum of digits of numbers. Write algorithm and draw flowchart for the same.
9	Write a program to print given number pattern using for loop
10	Write a C program to find maximum and minimum between two numbers using functions. Write algorithm and draw flowchart for the same.
11	Write C program to find GCD of two integers by using recursive function
12	Write a C program to find both the largest and smallest number in a list of integers. Write algorithm and draw flowchart for the same.
13	Develop, implement and execute a C program that reads two matrices A (m x n) and B (p x q) and Compute product of matrices A and B. Read matrix A and matrix B in row major order and in column major order respectively. Print both the input matrices and resultant matrix with suitable headings and output should be in matrix format only.
14	Write a Program for deletion of an element from the specified location from Array.
15	Write a C program using user defined functions to determine whether the given string is palindrome or not.
16	Write C program to count the number of lines, words and characters in a given text.
17	Write a program to swap two numbers using a function. Pass the values to be swapped to this function using the call-by-value method and call-by-reference method.
18	Demonstrate structure and Union to specify data on students like Roll-number, Name, Department, Course, Year of Joining and Print the data of a student according to roll number.
19	Write a program to copy one array to another using pointer.
20	Write a program to read a file and display its contents along with line numbers before each line

Term Work:

Experiments (20 Programs) and Assignments (2 Assignments) should be completed by students on the given time duration. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

Term work Marks:

25 Marks (Total Marks) =15 Marks (Experiment) + 05 Marks (Assignments) + 05 Marks (Attendance)

The final certification and acceptance of TW ensures the satisfactory performance of laboratory work and minimum passing in the TW.

Practical and Oral:

Practical and oral Exam should be conducted for the Lab, on Computer Programming in C subject for given list of experiments and will be conducted as End Semester Examination Practical (ESEP).

Course code	Course code	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL104	Applied Mechanics And Robot Dynamics Lab	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL104	Applied Mechanics And Robot Dynamics Lab	--	--	--	25	25	50

Lab Objectives

1. To acquaint with basic principles of centroid and its application
2. To familiarize with the concepts of force, moment, Resultant and Equilibrium of system of coplanar force.
3. To acquaint with the basic concept of friction and its application in real-life problems.
4. To understand the parameters required to quantify the Kinematics of Particle and Rigid body.
5. To understand the parameters required to quantify the Kinetics of rigid body.
6. To acquaint with the basics of Robot kinematics

Lab Outcomes: Learners will be able to

1. Determine the equivalent force-couple system for a given system of forces
2. Demonstrate the understanding of Centroid and its significance and locate the same.
3. Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two- and three-dimensional systems with the help of FBD.
4. Calculate position, velocity and acceleration etc. of particle and rigid body using principles of kinematics.
5. Analyze particles in motion using force and acceleration, work-energy and impulse momentum principles
6. Establish the relation between robot joints and parameters

List of Experiment:

1. Verification of Polygon law of coplanar forces.
2. Verification of law of Moment using Bell crank lever.
3. Determination of Support reaction for beam.
4. Determination of coefficient of friction using Inclined plane.
5. Verification of Lami's theorem using Jib crane.
6. Resultant of non-concurrent non-parallel coplanar force system.
7. Determination of coefficient of restitution for Collision of elastic bodies (Law of conservation of momentum).
8. Forward and Inverse kinematics Visualization of DH (Denavit–Hartenberg) parameters in Rob analyzer Software.
9. Programming exercises on determination of Resultant of Coplanar Force System.
10. Programming exercise covering the determination of Support Reactions, including Fixed Support, Hinged Support, Roller Support, and other types of structural supports.

Assessment:

Term Work:

Term Work shall consist of at least Six Practical's and Six Assignments. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

Term work Marks:

25 Marks (Total Marks) =15 Marks (Experiment) + 05 Marks (Assignments) + 05 Marks (Attendance)

Practical or Oral Exam:

An Oral /Practical exam will be held based on the above syllabus and will be conducted as End Semester Examination Practical (ESEP) of 2 hours duration for 25 Marks.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL105	Engineering Workshop-I	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL105	Engineering Workshop-I	--	--	--	25	--	25

Course Objectives:

1. To impart training to help the students develop engineering skill sets.
2. To inculcate respect for physical work and Shop Floor.
3. To get exposure to the interdisciplinary engineering domain.
4. To get exposure to handle different tools.
5. To inculcate respect for hard labor.
6. To inculcate the habit working in team for common job/goal.

Course Outcomes:

After successful completion of the course student will be able to …

1. Develop the necessary skills required to handle/use different fitting tools.
2. Develop skill required for hardware operation maintenance.
3. Able to install an operating system and system drives.
4. Able to identify the network components and perform basic networking and crimping.
5. Able to perform simple arc welding operations.
6. Develop the necessary skills to perform plumbing and machining activities.

NOTE:

1. Trade 1 and 2 are compulsory.
2. Select any one trade topics out of trade 3 to trade 5.

Practical demonstrations and hands-on activities will be conducted during the designated periods. A detailed report of the demonstrations, accompanied by appropriate sketches, must also be submitted as part of the term work.

CO evaluation is to be conducted based on the chosen trades as well as compulsory trades.

Trade	Topics	Hrs.
1.0	**Fitting [Compulsory]**	**12**
	Use and setting of fitting tools for chipping, cutting, filing, marking, center punching, drilling, tapping. Term work to include One Job involving following operations: filing to size, drilling and tapping, male- female joint in group of two	
2.0	**Hardware and Networking [Compulsory]**	**06**
	Dismantling of a Personal Computer (PC), Identification of Components of a PC such as power supply, motherboard, processor, hard disk, memory (RAM, ROM), CMOS battery, CD drive, monitor, keyboard, mouse, printer, scanner, pen drives, disk drives etc. Assembling of PC, Installation of Operating System (Anyone) and Device drivers, Boot-up sequence. Installation of application software (at least one) Basic troubleshooting and maintenance Identification of network components: LAN card, wireless card, switch, hub, router, different types of network cables (straight cables, crossover cables, Rollover cables) Basic networking and crimping. NOTE: Hands on experience to be given in a group of not more than Four Students	
3.0	**Welding**	**06**
	Edge preparation for welding jobs. Arc welding for different job like, Lap Welding of two plates, butt-welding of plates with simple cover, arc welding to join plates at right angles.	
4.0	**Plumbing**	**06**
	Use of plumbing tools, spanners, wrenches threading dies, demonstration Of preparation of a domestic line involving fixing of a water tap and use of Coupling, elbow, tee, and union etc..	
5.0	**Machine Shop**	**06**
	At least One Turning Jobon Lathe/ Milling Machine is to be demonstrated and simple job to be made for Term Work in a group of 4 students	

Textbook:

1. Workshop technology volume I, P. N. Rao McGraw Hill publication.
2. Elements of workshop technology volume I, S. K. Hazra Chaudhuri, A K Hazra Chaudhuri, Nirjar
3. Roy media promoters and publishers private limited

Reference books:

1. Workshop Technology Part 2 WAJ Chapman Viva books Pvt ltd.
2. A course in Workshop Technology, B S Raghuvanshi, Dhanpat Rai and CO Ltd

Assessment

Term Work Description:

Term Work will encompass practical exercises covering at least three trades based on the mentioned list. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

Term Work Assessment:

25 Marks (Total marks) = 20 Marks (Workshop Experiment) + 5 Marks (Attendance)

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL106	Health, Wellness and Mindfulness	--	2*+2	--	--	02	--	02

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL106	Health, Wellness and Mindfulness	--	--	--	25	--	25

* Two hours of practical class to be conducted for full class as demo/discussion.

Rationale:

The Health, Wellness and Mindfulness syllabus equips first-year engineering students with essential knowledge to manage their physical, mental and social well-being amidst academic pressures. It emphasizes practical skills in areas such as diet, stress management and hygiene, promoting a balanced lifestyle. The course integrates active learning to ensure students can apply these concepts effectively in their daily lives.

Course Objectives:

1. To recall key concepts of health and wellness, including definitions, importance, and types (physical, mental, social, and spiritual)
2. To explain the role of essential nutrients in maintaining health and the impact of balanced and unhealthy diets.
3. To demonstrate the ability to create a personalized health plan, incorporating proper diet, exercise, and stress management techniques.
4. To analyze the causes and effects of various lifestyle-related diseases and evaluate the effectiveness of prevention and management strategies.
5. To evaluate different stress management techniques and hygiene practices to determine their effectiveness in maintaining mental and physical health.
6. To design mindfulness activities and health improvement strategies, applying their knowledge to real-world scenarios and promoting well-being.

Course Outcomes:

1. Identify and define key concepts related to health and wellness, such as different types of health, common diseases, and essential nutrients.
2. Describe the importance of a balanced diet, healthy lifestyle choices, and the impact of poor nutrition and substance abuse on overall well-being.
3. Implement personalized health plans and practice healthy eating habits, regular exercise, and stress management techniques.
4. Examine and compare different causes of lifestyle diseases and assess the role of physical activity, yoga, and proper diet in disease prevention.
5. Judge the effectiveness of various hygiene practices and different stress management methods.
6. Formulate and propose innovative mindfulness exercises and wellness strategies, tailored to their needs, promoting a holistic approach to health.

Module No.	Unit No.	Topics	Hrs.
1.0		**The foundations of healthful living and Wellness:**	**06**
	1.1	Describe and distinguish between Health and Wellness, Importance of health and wellness Education. Physical, social, mental, spiritual health and its relevance to everyday life Body systems and common diseases. Substance abuse (Drugs, Cigarette, Alcohol), de-addiction, counselling and rehabilitation. Information about Health organizations: World Health Organization (WHO) United Nation Educational Scientific & Cultural Organization (UNESCO) Integrated Child Development Services (ICDS) Ministry of Health & Family Welfare (MHFW)	
	1.2	**Activities:** Divide the students into small groups and assign each group a specific lifestyle choice (Healthy or Unhealthy) to explore. Request that they talk to the class about the possible impacts on health and share their insight.	
2.0		**Diet and Nutrition for Health and Wellness**	**04**
	2.1	Essentials of nutrients and their function in maintaining good health. Components of balanced diet for healthy living. Malnutrition, under nutrition and over nutrition. Processed foods and unhealthy eating habits. Importance of organic foods.	
	2.2	**Activities:** Establish a Customized Health Plan for each student. Pick an Important Subject: Select a certain health-related subject, such as Healthy Diets, Eating Habits, Traditional ways of eating, Impact of unhealthy eating on Health and wellness Script Development: Write a script that blends artistic aspects with educational material.	
3.0		**Management of Health and Wellness**	**04**
	3.1	Healthy foods for prevention and progression of Cancer, Hypertension, Cardiovascular, and metabolic diseases (Obesity, Diabetes, Polycystic Ovarian Syndrome). Importance of Physical Fitness, Spirituality and its Health benefits. Prevention and management of sedentary lifestyle diseases through exercise. Role of Yoga, in maintaining physical and mental health.	
	3.2	**Activities:** Discussion forums for diseases which they came across in the surrounding. Case studies related to health issues	
4.0		**Stress Awareness and Management**	**04**
	4.1	Understanding Stress, Sources and Causes of Stress, Physiological and Psychological Effects, Coping Mechanisms and Strategies, Stress Management Programs, Resilience and Stress Recovery	
	4.2	**Activities:** Discussions about stress-reduction strategies. Role plays on Stress Management and Awareness	
5.0		**Hygiene, Personal Hygiene, Mental Hygiene & Community Hygiene**	**04**
	5.1	Meaning, Concept and types of Hygiene. Importance of Hygiene for healthy life.	

		Personal Hygiene, Mental Hygiene	
	5.2	**Activities:** Students will present their understanding of hygiene and will share ways to improve it.	
6.0		**Mindfulness**	**04**
	6.1	Foundation of Mindfulness, Mindfulness in action, Meditation techniques Brainstorming sessions for improving logical reasoning, thinking ability Activities to recognize and manage thoughts, emotions, and actions	
	6.2	Activities: Groupwise Activities can be conducted	
		Total	**26**

Reference books:

1. Physical Activity and Health by Claude Bouchard, Steven N. Blair, William L. Haskell.
2. Mental Health Workbook by Emily Attached & Marzia Fernandez, 2021.
3. Mental Health Workbook for Women: Exercises to Transform Negative Thoughts and Improve Well-Being by Nashay Lorick, 2022
4. Lifestyle Diseases: Lifestyle Disease Management, by C. Nyambichu& Jeff Lumiri, 2018.
5. Physical Activity and Mental Health by Angela Clow & Sarah Edmunds, 2013
6. Yoga for Beginners: A Practical Guide" by Iyengar B.K.S, Dorling Kindersley,2006
7. Emotional Intelligence: Why It Can Matter More Than IQ By Daniel Goleman,Bantam, 2006
8. Atomic Habits: An Easy & Proven Way to Build Good Habits & Break Bad Ones by James Clear, Penguin,2018

Online References:

1 https://www.psychologytoday.com/us/basics/resilience/building-resilience
2 https://mindfulness.org/relaxation-techniques/
3 https://www.health.harvard.edu/staying-healthy/how-stress-affects-your-health
4 https://www.mindtools.com/pages/article/newLDR_78.htm
5 https://www.mayoclinic.org/symptoms/stress/basics/definition/sym-20050973
6 https://www.nimh.nih.gov/health/topics/stress/index.shtml
7 https://www.stress.org.uk/cognitive-behavioural-therapy-cbt/

Assessment:

Suggested Pedagogy and assessment criteria for Teachers:

1. Project-based activities.
2. Presentation, Group Discussions, and Case studies.
3. Flip class mode/ Roleplay
4. Quiz MCQ
5. Assignment as per the modules: 06
6. Internal Assessment through flipped class and PowerPoint presentation along with documentation

Sample Case Studies:

1. Academic Stress:
2. Workplace Stress
3. Stress and Physical Health
4. Stress Reduction Techniques
5. Stress and Resilience
6. Stress and Academic Performance

Term Work: Total Marks: 25, includes 05 marks for attendance, 10 marks for minimum 6 assignments and 10 marks for mini project. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL107	Induction cum Universal Human Values	--	05*	--	--	2.5	--	2.5

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL107	Induction cum Universal Human Values	--	--	--	25	--	25

Course evaluation is activity-based which may be an individual or group of four students.

Rationale:

"The purpose of the education system is to develop good human beings capable of rational thought and action, possessing compassion and empathy…, with sound ethical moorings and values. It aims at producing engaged, productive, and contributing citizens for building an equitable, inclusive, and plural society as envisaged by our Constitution. Education must develop not only cognitive capacities... but also social, ethical, and emotional capacities and dispositions…. Education is fundamental for achieving full human potential, developing an equitable and just society, and promoting national development… A holistic and multidisciplinary education would aim to develop all capacities of human beings – intellectual, aesthetic, social, physical, emotional, and moral in an integrated manner" [NEP 2020, p 4].

UHV courses are intended to help students to develop a holistic, humane world vision. A self-reflective, explorational methodology is adopted. All content discussed is universal, rational, and verifiable, and leads to harmony.

Holistic education inculcates the following three aspects in the student:

1. Holistic, Humane Vision of Life – harmonious individual to cosmos

2. Human Values– human feelings, participation based on holistic vision

3. Skills– required to live with these values in mutual relationships at all levels of human existence.

Course Objectives:

1. To explore a holistic perspective of oneself, family, society, and nature through self-exploration.
2. To understand the concept of harmony within the individual, family, society, and nature.
3. To reflect on personal values and beliefs to strengthen self-awareness.
4. To commit to taking actions that align with universal human values with courage and integrity.
5. To prepare oneself to reach full human potential and contribute to an equitable, just society and national development.
6. To clarify fundamental universal human values to guide understanding and practice in alignment with national and global aspirations, such as the Constitution, NEP 2020, UN MDGs, and SDGs

Course Outcomes: After completion of the course learner will be able to

1. Recognize basic human aspirations and develop a plan to fulfill them.
2. Describe the existing reality of a human being.
3. Explain human values and relationships and outline a program to ensure mutual happiness.
4. Illustrate harmony within one's surroundings, family, and society.

5. Discuss harmony in nature and coexistence and demonstrate responsibility in solving problems with sustainable solutions.
6. Apply the learned concepts to daily life and professional practices to contribute to a universal human order, and develop holistic technologies, management models, and production systems.

Module No.	Unit No.	Topics	Hrs.
1.0		**Introduction - Need, Basic Guidelines, Content and Process for Value Education**	**05**
	1.1	Purpose and motivation for the course, Self-exploration, Continuous Happiness and Prosperity. The basic Human Aspirations.	
	1.2	Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations.	
2.0		**Understanding Harmony in the Human Being**	**04**
	2.1	Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.	
	2.2	The Body as an instrument of 'I', characteristics and activities of 'I' and harmony in 'I', harmony of I with the Body: Self-regulation and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Self-regulation and Health.	
3.0		**Understanding Harmony in the Family**	**07**
3.0	**3.1**	Understanding values in human, Human relationship and program for its fulfilment to ensure mutual happiness.	
	3.2	Trust and Respect as the foundational values of relationship, the other salient values in relationship	
4.0		Understanding Harmony in the Society	**03**
	4.1	Understanding the harmony in society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive.	
	4.2	Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order from family to world family.	
5.0		**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**	**04**
	5.1	Understanding the harmony in Nature, Interconnectedness and mutual fulfilment among the four orders of nature, cyclability and self-regulation in nature.	
	5.2	Understanding Existence as Co-existence of mutually interacting units in all pervasive space, Holistic perception of harmony at all levels of existence	
6.0		**Implications of the Holistic Understanding of Harmony on Professional Ethics**	**03**
	6.1	Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic. Universal Order, Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order and identify the scope and characteristics of people friendly and eco-friendly production systems	
	6.2	Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order. Sum up.	
		Total	**26**

(In every module one lecture can be used for students sharing and discussion)

Textbooks:

1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 3rd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. The Teacher's Manual Teachers" Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2
3. A Foundation Course in Holistic Human Health – Its Philosophy and Practice, Sharmila Asthana, Akhilesh Shukla, T Sundara Raj Perumall, 1st Edition, October 2023, Published by UHV Publications, , Kanpur, UP.7 A

References:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya
2. Prakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4. The Story of Stuff (Book).
5. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
6. Small is Beautiful - E. F Schumacher.
7. Slow is Beautiful - Cecile Andrews
8. Economy of Permanence - J C Kumarappa
9. Bharat Mein Angreji Raj – Pandit Sunderlal
10. Rediscovering India - by Dharampal
11. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
12. India Wins Freedom - Maulana Abdul Kalam Azad
13. Vivekananda - Romain Rolland (English)
14. Gandhi - Romain Rolland (English)

Online References:

1. https://uhv.org.in
2. NPTEL Course: Exploring Human Values: Visions of Happiness and Perfect Society, By Prof. A. K. Sharma, Department of Humanities and Social Sciences, IIT Kanpur: -Web linkhttps://nptel.ac.in/courses/109104068
3. NPTEL Course: Moral Thinking: An Introduction to Values and Ethics by Prof. Vineet Sahu, IIT Kanpur: -Web linkhttps://onlinecourses.nptel.ac.in/noc23_hs89/preview

Note:

1. This is an audit course.
2. This course is to be taught by faculty from every teaching department.
3. Lecture hours are to be used for interactive discussion, placing proposals about the topics at hand and motivating students to reflect, explore and verify them.
4. In the discussions, the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration
5. One or two periods from each module may be used for tutorials. These are important for the course. The Difference is that the laboratory is everyday life, and practical are how you behave and work in real life.
6. Depending on the nature of topics, worksheets, home assignment and/or activity can be included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to the development of commitment, namely behaving and working based on basic human values.

* Indicates workload of a learner for UHV. Faculty Load: ½ hour per week per four groups

Term Work: Total Marks: 25, includes 05 marks for attendance, 10 marks for Assignments & Quiz on each module and 10 marks for report writing. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

Semester II

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEC201	Applied Mathematics-II	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE$			
		ISE	MSE				
FEC201	Applied Mathematics-II	20	20	60	--	--	100

Course Objectives:

1. To study Differential equations which are fundamental tool in engineering for modeling, analyzing, and designing systems across various disciplines**.**
2. To learn LDE with constant coefficient simplify the mathematical treatment of linear systems, making it easier to model, analyze, and optimize their behavior
3. To develop the knowledge of improper integral, length of the curve and techniques like differentiation under integral sign.
4. To develop the knowledge of multiple integrals in various coordinate systems.
5. To study applications of multiple integrals.
6. To study numerical methods for ordinary differential equations

Course Outcomes: On completion of the course, the learner will be able to

1. Identify and solve the differential equation of first order and first-degree, exact, and linear differential equations.
2. Solve higher-order homogeneous and non-homogeneous differential equations with constant coefficients
3. Evaluate the integrals using Beta-Gamma functions, DUIS and rectify the curve.
4. Evaluate double integral, change the order of integration.
5. Evaluate the multiple integrals by using the different coordinate systems.
6. Apply the principles of numerical methods for solving ODE and numerical integrations analytically.

Module No.	Unit No.	Topics	Hrs.
1.0		**Differential Equations of First Order and First Degree**	**05**
	1.1	Exact differential Equations, Equations reducible to exact form by using four rules of integrating factors.	
	1.2	Linear differential equations (Review), equation reducible to linear form, Bernoulli's equation.	
2.0		**Higher Order Linear Differential Equations with Constant Coefficients and Variable Coefficients:**	**07**
	2.1	Linear Differential Equation with constant coefficient: complementary function, particular integrals of differential equation of the type f(D)y = X, where X is $e^{ax}, sin(ax+b), cos(ax+b), x^m, e^{ax} \cdot V$	

	2.2	Method of variation of parameters.	
3.0		**Beta and Gamma Function, Differentiation under Integral sign and Rectification:**	**10**
3.0	**3.1**	Beta and Gamma functions and its properties. Differentiation under integral sign with constant limits of integration.	
	3.2	Rectification of plane curves in Cartesian form. Rectification of curve in Polar forms.	
4.0		**Multiple Integrals:**	**09**
	4.1	Introduction, Evaluation of Double Integrals. (Cartesian & Polar).	
	4.2	Changing the order of integration.	
	4.3	Evaluation of double integrals over the given region. (Cartesian & Polar).	
	4.4	Evaluation of double integrals by changing to polar coordinates.	
	4.5	Triple Integration: Introduction and evaluation of Triple Integrals using Cartesian coordinate system.	
	4.6	Evaluation of triple integrals using cylindrical and spherical coordinate system.	
5.0		**Application Multiple Integrals:**	**04**
	5.1	Application of double integrals to compute Area.	
	5.2	Application of triple integrals to compute Volume	
6.0		**Numerical solution of ordinary differential equations of first order and first degree, Numerical Integration:**	**04**
	6.1	Numerical solution of ordinary differential equation using: (a) Eulers method (b) Runge-Kutta method of order four.	
	6.2	Numerical integration by (a) Trapezoidal rule (b) Simpson's 1/3rd rule (c) Simpson's 3/8th rule (all without proof).	
		Total	**39**

Textbooks:

1. Higher Engineering Mathematics, Dr. B. S. Grewal, Khanna Publication.
2. Advanced Engineering Mathematics, Dennis G. Zill, Warren S. Wright.

Reference books:

1. Calculus, Thomas and Finney, Pearson Education.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Eastern Limited, 9th Ed.
3. Advanced Engineering Mathematics by H. K. Dass, 28th edition, S. Chand 2010.
4. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven Chapra, McGraw Hill.
5. A First Course in Differential Equations with Modelling Applications, Dennis G. Zill.

Course Assessment:

ISE: To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test/ Case Study of 20 marks.

MSE: To be conducted as written examination for 20 marks. (on 40% - 50% syllabus)

End Semester Examination:

$ ESE of duration 3 hours are of 80 marks and scaled to 60.

1. Question paper will comprise of **6** questions, each carrying **20** marks.
2. The students need to solve a total of **4** questions.
3. Question No.1 will be compulsory and based on entire syllabus.
4. Remaining questions **(Q.2 to Q.6)** will be selected from all the modules.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEC2021	Applied Physics	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE[$]			
		ISE	MSE				
FEC2021	Applied Physics	20	20	60	--	--	100

Course Objectives:

1. To demonstrate the phenomena of thin film interference
2. To provide students with basic understanding of lasers and signal communication in optical fibers
3. To give exposure to the concepts of semiconductors
4. To build a foundation of quantum mechanics needed for modern technology
5. To impart basic concepts needed for sensor technology
6. To discuss the applications of nanotechnology for nano computing

Course Outcomes:

After successful completion of the course students will be able to

1. Determine the wavelength of light and refractive index of medium using interference phenomenon
2. Illustrate the use of lasers for various applications including optical fibres
3. Apply the knowledge gained in semiconductors in various applications
4. Relate the foundations of quantum mechanics with the development of modern technology
5. Implement the knowledge of sensing mechanism towards various sensors
6. Interpret the concept of nano technology to emerging areas of technology

Module No.	Unit No.	Topics	Hrs.
1.0		**Interference**	**06**
	1.1	**Interference**: Interference in thin film of uniform thickness (reflected system), maxima and minima conditions for variable thickness (wedge-shaped) film (qualitative), fringe width	
	1.2	**Applications:** (i) Newton's rings- determination of wavelength and refractive Index of transparent liquid (ii) Antireflecting and highly reflecting coatings.	
2.0		**Lasers and Optical Fibres**	**07**
	2.1	**Lasers:** absorption, spontaneous and stimulated emissions, light amplification population inversion, pumping, components of laser, characteristics of lasers, He-Ne laser, semiconductor laser. Applications:(i) holography (ii) LiDAR (iii) barcode reader	
	2.2	**Optical Fibers**: critical angle, total internal reflection, acceptance angle, acceptance cone, numerical aperture, types of optical fibers: single mode & multimode, step index & graded index, V- number, attenuation, fibre optic communication system.	
3.0		**Semiconductor Physics**	**07**
	3.1	Direct and indirect band gap semiconductors, concept of drift velocity, mobility,	

		conductivity in intrinsic semiconductors, Fermi- Dirac distribution function, position of Fermi level in intrinsic and extrinsic semiconductors, variation of Fermi level in N and P type semiconductors with temperature and concentration, Hall effect and applications.	
	3.2	**Applications:** photo diode, LED, solar cell, Zener diode	
4.0		**Quantum Physics**	**08**
	4.1	**Quantum Physics:** de Broglie hypothesis of matter waves, de Broglie wavelength for electron, Properties of matter waves, Heisenberg's uncertainty principle, Wave function and probability density, mathematical conditions for wave function, Need and significance of Schrödinger's equations, Schrödinger's time dependent and time independent equations, energy of a particle enclosed in a rigid	
	4.2	**Applications:** Quantum mechanical tunneling, Principles of quantum computing: concept of Qubit	
5.0		**Physics of sensors**	**05**
	5.1	**Transducers:** active and passive transducers, sensing mechanism,	
	5.2	**Sensors:** Resistive sensors- PT100, Humidity measurement, proximity sensors, pressure sensors- piezoelectric effect, ultrasonic sensors for distance and velocity measurement in liquid and air, optical sensors- light dependent resistors, wavelength and color sensors	
6.0		**Nanotechnology and Nanocomputing**	**06**
	6.1	**Nanotechnology:** nanoscale, nanomaterial classification, properties, significance of quantum confinement and surface to volume ratio, top down and bottom-up approach ball milling, sputtering, sol-gel, and CVD methods of synthesis, Techniques-SEM, AFM	
	6.2	**Nanocomputing:** Introduction to nano computer, Nano computer Building block, Chemically Assembled Electronic Nanotechnology (CAEN), Single Electron Transfer (SET)	
		Total	**39**

Textbooks:

1. A Textbook of Engineering Physics -Dr. M. N. Avadhanulu, Dr. P. G. Kshirsagar, S. Chand, Revised Edition 2014
2. Modern Engineering Physics - A. S. Vasudeva, S. Chand, Revised Edition 2013
3. Engineering Physics D. K Bhattacharya, Poonam Tandon, Oxford Higher Education, 1st Edition 2015
4. Engineering Physics -R. K. Gaur, S. L. Gupta, Dhanpat Rai Publications, 2012
5. Engineering Physics -V. Rajendran, McGraw Hill Educations, 2017
6. A Textbook of Nanoscience and Nanotechnology, T. Pradeep Tata McGraw Hill Education Pvt. Ltd., 2012.

Reference books:

1. Semiconductor Physics and Devices – Basic Principles – Donald Neamen – McGraw Hill
2. Fundamentals of optics - Francis A. Jenkins, Harvey E. White, McGraw Hill Publication, India, 4th Edition
3. Fundamentals of Physics, Halliday and Resnick, Wiley publication
4. Concepts of Modern Physics – Arther Beiser, Shobhit Mahajan, S. Choudhury, McGraw Hill, 7thEdition 2017

Online References:

1. https://onlinecourses.nptel.ac.in/noc23_ee95/preview
2. https://archive.nptel.ac.in/courses/115/102/115102124
3. https://archive.nptel.ac.in/courses/115/102/115102025

Course Assessment:
ISE: To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test / Case study of 20 marks.
MSE: To be conducted as written examination for 20 marks. (on 40% - 50% syllabus)

End Semester Examination:
$ ESE of duration 3 hours are of 80 marks and scaled to 60.

1. Question paper will comprise of **6** questions, each carrying **20** marks.
2. The students need to solve a total of **4** questions.
3. Question No.1 will be compulsory and based on entire syllabus.
4. Remaining questions **(Q.2 to Q.6)** will be selected from all the modules.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEC2022	Applied Chemistry	03	--	--	03	--	--	03

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE$			
		ISE	MSE				
FEC2022	Applied Chemistry	20	20	60	--	--	100

Course Objectives:

1. To acquire knowledge about superconductors and nanomaterials.
2. To gain knowledge of polymers, conducting and bio-polymers.
3. To understand the concept of phase- rule in preparing alloys.
4. To understand the mechanism of corrosion and preventive methods.
5. To acquire knowledge of fuels, green fuels and batteries.
6. To learn the significance of composites and bio-composites.

Course Outcomes:

1. Understand the fundamentals of Superconductors and Nanomaterials for device applications.
2. Use of polymers for specific engineering applications based on their properties.
3. Interpret various phase transformations of alloy using thermodynamics.
4. Apply different methods to minimize corrosion in industries.
5. Comparing various energy sources, such as batteries, fuel cells, alternative fuels, and conventional fossil fuels, about their availability, operation, composition, performance efficiency, and environmental impact.
6. Identify different types of composite materials for engineering applications.

Module No.	Unit No.	Topics	Hrs.
1.0		**Engineering Materials and Applications**	08
	1.1	Superconductors: Types of superconductors, Properties of Superconductors.	
	1.2	Applications of superconductors. Preparation and Structure of 1:2:3 superconductor	
	1.3	Optical Fibers, Fullerenes, Organic Electronic Materials	
	1.4	Nanomaterials: A) Definition, Types of Nanostructured materials, Applications of Nanomaterials. B) Graphene	
	1.5	C) Types of Carbon Nanotubes (SWCNTs and MWCNTs) – Properties and Uses.	
2.0		**Introduction to Polymers and Advanced Polymers**	06
	2.1	A) Macro-molecular science, basic concept of polymers, Chemical bonding in polymers, Classification of Polymers.	
	2.2	B) Properties of Polymers: - i) Molecular weight -Number average molecular weight, Weight Average Molecular Weight, Numerical	

	2.3	ii) Crystallinity - Crystalline and amorphous polymers – Glass transition temperature. iii) Mechanical Properties: Hardness, tensile strength, creep, fatigue, impact resistance (introduction)	
	2.4	iv) Electrical properties: dielectric strength, insulation resistance, surface resistivity (Introduction), v) Optical properties: refractive index, transmittance, photoelectric property, color	
	2.5	Conducting polymers, Bio- polymers, Liquid crystal polymers, Intelligent (smart) polymers	
3.0		**Alloys**	**06**
	3.1	Introduction, Purpose of making alloys. i) Gibbs Phase rule – Statement, Terms involved with examples.	
	3.2	ii) Reduced phase rule, Two-component system (Pb Ag) & Numerical.	
	3.3	iii) Merits and Limitations of Phase rule.	
	3.4	Ferrous alloys – Plain-carbon steels, Heat and Shock resisting steels, Stainless steels. Effect of the alloying element- Ni, Cr, Co, Mn, Mo, W and V	
	3.5	Aluminum Aloys – Composition, properties and uses of i) Duralumin, ii) Magnalium.	
	3.6	Alloys of Pb – Composition, properties and Uses of i) Wood's metal ii) Tinman's solder.	
	3.7	Numerical based on Composition, density and weight of an alloy	
4.0		**Corrosion**	**06**
	4.1	A) Introduction: - Definition, Types of Corrosion –(i)Dry or Atmospheric Corrosion, ii) Wet or Electrochemical corrosion (In Acidic medium, In Neutral medium)	
	4.2	B) Factors affecting rate of corrosion: - i) Position of metal in galvanic series, ii) Purity of Metal, iii) Nature of Corrosion product, iv) Temperature, v) pH of medium, vi) concentration of medium, vii) moisture, viii) Relative Cathodic and Anodic area, ix) overvoltage	
	4.3	Methods to control corrosion: - i) Selection of metal, ii) Proper Designing, iii) Cathodic protection, iv) Use of Corrosion Inhibitors, v) Metallic Coating	
	4.4	Corrosion in Electronic devices	
5.0		**Energy Sciences**	**08**
	5.1	Definition and classification of fuels, Calorific value: Definition, Gross or Higher calorific value & Net or lower calorific value, Dulong's formula & numerical for calculations of Gross and Net calorific values.	
	5.2	Disadvantages of fossil fuels, Alternative (Green) Fuels: Biomass, Biogas, Natural Gas and CNG (Description, Utility, advantages and disadvantages)	
	5.3	Green Fuels- Synthesis and advantages of i] Biodiesel ii] Power Alcohol	
	5.4	Combustion- Calculations for requirement of only oxygen and air (by weight and by volume only) for given solid & gaseous fuels.	
	5.5	Batteries: Fuel Cell (H_2-O_2 Fuel Cell), Solar Battery, Electrochemical Sensors.	
6.0		**Composites**	**05**
	6.1	Definition, Characteristics of Composites, Constituents of Composites – Matrix Phase and Dispersed Phase (Definition and Functions)	
	6.2	Classification of Composites	
	6.3	Types of Composites, sub-types and Applications: - i) Fibre- reinforced composites, ii) Layered composites (Laminates), iii) Particulate composites.	
	6.4	Bio-composites – Definition, Classification and Applications.	
		Total	**39**

Recommended Books:

1. Engineering Chemistry, Jain and Jain, Dhanpat Rai Publication
2. A textbook of Engineering Chemistry, S. S. Dara, S. Chand and Company
3. A Textbook of Engineering Chemistry, Shashi Chawla, Dhanpat Rai and Co.
4. Polymer science: Vasant Gowarikar, Wiley Eastern Ltd, new Delhi

Course Assessment:

ISE: To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test/ Case Study etc. of 20 marks.

MSE: To be conducted as written examination for 20 marks. (on 40% - 50% syllabus)

End Semester Examination:

$ ESE of duration 3 hours are of 80 marks and scaled to 60.

1. Question paper will comprise of **6** questions, each carrying **20** marks.
2. The students need to solve a total of **4** questions.
3. Question No.1 will be compulsory and based on entire syllabus.
4. Remaining questions **(Q.2 to Q.6)** will be selected from all the modules.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEC203	Engineering Graphics	02	--	--	02	--	--	02

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE$^{\$}$			
		ISE	MSE				
FEC203	Engineering Graphics	15	15	45	--	--	75

Course Objectives:

1. To impart and inculcate proper understanding of the engineering curves
2. To impart the knowledge to read and interpret a drawing
3. To improve visualization skills.
4. To enable students to represent three-dimensional objects on a two-dimensional surface in a way that accurately conveys their shape, size, and orientation.
5. To acquaint students with representing internal features of a three-dimensional object by way of section that accurately conveys their internal orientation.
6. To improve visualization and draw an isometric object.

Course Outcomes:

After successful completion of the learner will be able to

1. Apply basic concepts of geometrical constructions to create engineering curves.
2. Apply the basic principles of projections in Projection of Lines and Planes
3. Apply the basic principles of projections in Projection of Solids.
4. Apply the basic principles of sectional views in Section of solids.
5. Apply the basic principles of projections in converting pictorial views into orthographic Views.
6. Apply the basic principles of projections in converting pictorial views into Isometric Views.

Module No.	Unit No.	Topics	Hrs.
1.0		**Introduction to Engineering Graphics**	**02**
	1.1	Introduction to Engineering Graphics and its significance in Engineering domain. Types of Lines, Dimensioning Systems as per IS convention. Introduction to plain and diagonal scales.	
	1.2	Engineering Curves: Basic construction of Cycloid, Involutes.	
2.0		**Projection of Points and Lines**	**03**
	2.1	Points Projections of points in any quadrants and resting on planes.	
	2.2	Projections of Lines Projections of lines inclined to both the reference planes (Excluding Traces of lines). Simple application-based problems on projection of lines.	
3.0		**Projection of Solids**	**05**
	3.1	Projections of solids with the axis inclined to one and both reference planes. (Prism, pyramid, cylinder and cone only). Triangular to hexagonal prism and pyramids to be considered. Exclude Spheres, Composite, hollow solids and frustum of solids). Use change of position or Auxiliary plane method.	
4.0		**Section of Solids**	**06**

	4.1	Sections of Prism, Pyramid, Cylinder, & Cone cut by plane perpendicular to at least one reference plane (Exclude Curved Section Plane). Use change of position or Auxiliary plane method.	
5.0		**Orthographic Projection**	**05**
	5.1	Orthographic Projections Fundamentals of orthographic projections like concept of quadrants, observer position, horizontal, vertical and profile plane, symbol etc. Different orthographic views, First and Third angle method of projection. Views of a simple machine part as per the first angle projection method recommended by I.S.	
	5.2	Sectional Orthographic Projections Fundamentals of sectional projections like concept of section plane, its representation, section lines and its features, need of sectional views, rib and web in section. Types of section and its representation. Different views of a simple machine part as per the First angle projection.	
6.0		**Isometric Projection**	**05**
	6.1	Basic concept of isometric projection, Difference between isometric projection and isometric views. Conversion of Orthographic views to isometric views (Excluding sphere).	
		Total	**26**

Textbooks:

1. N.D. Bhatt, "Engineering Drawing (Plane and solid geometry)", Charotar Publishing House Pvt. Ltd.
2. N.D. Bhatt & V.M. Panchal, "Machine Drawing", Charotar Publishing House Pvt. Ltd.

References:

1. Narayana, K.L. & P Kannaiah (2008), Textbook on Engineering Drawing, Scitech Publisher.
2. Prof. Sham Tickoo (Purdue University) & Gaurav Verma, "(CAD Soft Technologies).
3. Auto CAD 2012 (For engineers and Designers)", Dreamtech Press New Delhi.
4. Dhananjay A Jolhe, "Engineering Drawing" Tata McGraw Hill.

Online References:

1. https://archive.nptel.ac.in/courses/112/105/112105294/
2. https://nptel.ac.in/courses/1121030193
3. https://archive.nptel.ac.in/courses/112/102/112102304/

Course Assessment:

ISE: To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test/ case study etc. of 15 marks.

MSE: To be conducted as written examination for 15 marks (on 40% - 50% syllabus)

End Semester Examination:

$ ESE of duration 3 hours are of 60 marks and scaled to 45.

1. Question paper will comprise of **6** questions.
2. The students need to solve a total of **4** questions.
3. Question No.1 will be compulsory, is of 15 marks and based on entire syllabus.
4. Remaining questions **(Q.2 to Q.6)** will be of 15 marks each, selected from all the modules.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEC204	Digital System Design	03	-	-	03	-	-	03

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE$			
		ISE	MSE				
FEC204	Digital System Design	20	20	60	--	--	100

Course Objectives:

1. To understand number system representations and their inter-conversions utilized in digital electronic circuits.
2. To understand Boolean algebra, its simplification techniques, and the design of logic circuits using basic and universal gates.
3. To evaluate digital logic processes and implement logical operations using combinational logic circuits.
4. To analyze, design and implement logical operations using sequential logic circuits.
5. To apply Moore and Mealy state machine concepts and design practical sequential circuits.
6. To understand memory types and programmable logic devices.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Explain digital systems, perform number system conversions, and apply binary arithmetic and coding techniques.
2. Simplify Boolean expressions and design logic circuits using various logic gates, including NAND and NOR.
3. Analyze Boolean expressions and design combinational logic circuits.
4. Design and implement various flip-flops, counters, shift registers, and sequential logic circuits.
5. Differentiate between state machine types and design functional sequential circuits.
6. Distinguish memories and programmable logic devices.

Module No.	Unit No.	Topics	Hrs.
1.0		**Introduction to Digital Systems**	06
	1.1	**Introduction:** Overview of Digital Systems, Importance in modern technology, Analog vs. Digital Systems, Examples of analog and digital systems.	
	1.2	**Fundamental Concepts and Logic:** Binary, Octal, Decimal, Hexadecimal Number Systems, their inter-conversion, Binary Arithmetic operations, Codes: Grey, BCD, Excess-3, ASCII.	
2.0		**Logic Gates and Boolean Algebra**	05
	2.1	**Logic Gates:** Basic Logic and Universal Gates (AND, OR, NOT, NAND, NOR, XOR, XNOR), Realization using NAND and NOR gates.	
	2.2	**Boolean Algebra**: Boolean Algebra Rules and Simplification Techniques, De Morgan's Theorem.	

3.0		**Combinational Logic**	**10**
3.0	**3.1**	**Boolean Expression Minimization**: Sum of Products (SOP) and Products of Sum (POS), minimization with Karnaugh Map (up to four variables).	
	3.2	**Arithmetic Circuits:** Half adder, Full adder, Half Subtractor, Full Subtractor, Multiplexer, Demultiplexer, Decoder, Encoder, Comparator (2 bit).	
4.0		**Sequential Logic**	**10**
	4.1	**Flip flops:** SR, JK, Master-slave flip flops, T & D flip flops, Conversion of flip flops.	
	4.2	**Counters and Registers:** Asynchronous and Synchronous counters with State transition diagram, Up/Down, BCD Counter, Introduction to Shift Registers.	
5.0		**Sequential Logic Design**	**04**
	5.1	**Introduction:** Introduction to Moore and Mealy circuits, Clocked synchronous state machine analysis, State reduction techniques (inspection, partition and implication chart method) and state assignment.	
	5.2	**Application of Sequential circuit:** Sequence detector, Clocked synchronous state machine design.	
6.0		**Different Types of Memories and Programmable Logic Devices**	**04**
	6.1	**Memory Types:** Classification and Characteristics of memory, SRAM, DRAM, ROM, PROM, EPROM and Flash memories.	
	6.2	**Introduction to PLD:** Programmable Logic Devices (PLD), Programmable Logic Array (PLA), Programmable Array Logic (PAL).	
		Total	**39**

Textbooks:

1. R. P. Jain, “Modern Digital Electronic”, McGraw-Hill Publication, 4th Edition.
2. John F. Wakerly, “Digital Design Principles And Practices”, Pearson Education.
3. M. Morris Mano, “Digital Logic and Computer Design”, PHI.

Reference books:

1. Malvino, “Digital computer Electronics”, McGraw-Hill Publication, 3rd Edition.
2. A. Anand Kumar, “Fundamentals of Digital Circuits”, PHI, Fourth Edition (2016).
3. Digital Logic Applications and Design – John M. Yarbrough, Thomson Publications, 2006

Online References:

1. Course: Digital Circuits By Prof. Santanu Chattopadhyay (IIT Kharagpur); https://swayam.gov.in/nd1_noc20_ee70/preview
2. https://www.coursera.org/learn/digital-systems
3. https://www.udemy.com/share/104ruW/

Course Assessment:

ISE: To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test/ Case study etc. of 20 marks.

MSE: To be conducted as written examination for 20 marks (on 40% - 50% syllabus)

End Semester Examination:

$ ESE of duration 3 hours are of 80 marks and scaled to 60.

1. Question paper will comprise of **6** questions, each carrying **20** marks.
2. The students need to solve a total of **4** questions.
3. Question No.1 will be compulsory and based on entire syllabus.
4. Remaining questions **(Q.2 to Q.6)** will be selected from all the modules

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEC205	Professional Communication Techniques	02	--	--	02	--	--	02

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE$			
		ISE	MSE				
FEC205	Professional Communication Techniques	15	15	45	--	--	75

Course Objectives:

1. To develop effective communication skills by introducing the basic communication process and its applications.
2. To inculcate effective listening, speaking, reading and writing skills for professional competency.
3. To improve students' linguistic abilities by strengthening vocabulary and grammar proficiency
4. To inculcate reading and writing ability through comprehension of given passage, summarization of technical text and paragraph composition.
5. To train the students in drafting effective business letters and emails for professional correspondence.
6. To create proficiency in technical writing to successfully execute professional responsibilities.

Course Outcomes:

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

1. Exhibit proficiency in identifying and applying core communication principles and overcoming communication barriers.
2. Display improved language skills across listening, speaking, reading, and writing for professional competency
3. Demonstrate enriched vocabulary and proficient grammar usage.
4. Proficiently summarize texts, paraphrase content accurately, and apply appropriate referencing styles while avoiding plagiarism.
5. Draft clear and effective business letters and emails using established correspondence principles.
6. Create accurate technical descriptions and user instructions.

Module No.	Unit No.	Topics	Hrs.
1.0		**Fundamentals of Communication**	08
	1.1	Introduction - Definition, Objectives – Primary & Secondary Objectives	
	1.2	The Process of Communication	
	1.3	Organizational Communication, Formal (Upward, Downward and Horizontal),	
	1.4	Informal Communication (Grapevine)	
	1.5	Methods of Communication, Verbal (Oral & Written)	

	1.6	Non-verbal, Non-verbal cues perceived through the five senses: (Visual, Auditory, Tactile, Olfactory and Gustatory cues), Non-verbal cues transmitted through the use of: (The Body, Voice, Space, Time and Silence)	
	1.7	Barriers to Communication - Psychological, Semantic/Linguistic barriers	
	1.8	Barriers to Communication – Socio-Cultural, Physical, Mechanical barriers	
2.0		**LSRW – Developing Listening, Speaking, Reading, Writing**	**04**
	2.1	Introduction to Active Listening Skills – Hearing vs Listening, Types of Listening, barriers to listening, strategies to improve listening	
	2.2	Effective Speaking Skills – Advantages of Speaking, Characteristics of effective speaking, Different types of speaking – Monologues, conversational, public speaking, extempore.	
	2.3	Techniques to improve Reading skills – Introduction, advantages of reading, Types of reading techniques: intensive, extensive, Skimming, Scanning, Methods – SQ3R (Survey, question, Read, Recite, and Review)	
	2.4	Effective Writing techniques – Introduction, Advantages, features of effective writing skills, strategies to improve writing	
3.0		**Language Skills – Grammar & Vocabulary, Verbal Aptitude**	**03**
	3.1	Vocabulary Building, Root words (Etymology), Meaning of Words in Context, Synonyms & Antonyms, Collocations, Word Form Charts, Prefixes & Suffixes, Standard Abbreviations	
	3.2	Grammar - To enhance students' linguistic abilities by focusing on listening, speaking, reading, and writing skills, as well as vocabulary and grammar proficiency., Tautologies, Pleonasms (Redundancies), Idioms, Clichés	
	3.3	Improving Verbal Ability through Verbal Aptitude test for Competitive Exams	
4.0		**Comprehension, Summarization, Paragraph Writing**	**03**
	4.1	Introduction to Reading with good Comprehension -Comprehending Technical/Non-technical Passages, Identifying the Central Idea	
	4.2	Summarization of passages, reports, chapters, books. Graphic Organizers for Summaries - Radial Diagrams like Mind Maps, Flowcharts, Tree Diagrams, Cyclic Diagrams. Linear Diagrams like Timelines, Pyramids, Venn Diagrams, Point-form Summaries, One-sentence Summaries of Central Idea	
	4.3	Paragraph - Structure of a Paragraph, Paragraph Development	
5.0		**Business Correspondence**	**05**
	5.1	Principles - Seven Cs of Business Correspondence, Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness	
	5.2	Parts of a Formal Letter: Letterheads and/or Sender's Address, Dateline, Inside Address, Reference Line (Optional), Attention Line (Optional), Salutation, Subject Line, Body, Complimentary Close, Signature Block, Enclosures/Attachments	
	5.3	Format: Complete/Full Block Format	
	5.4	Emails, Format of Emails, Features of Effective Emails, Language and style of emails.	
	5.5	Types of Correspondence: Claim and Adjustment, Request/Permissions and Sales Correspondence	
6.0		**Technical Writing**	**03**
	6.1	Introduction, what is Technical Writing? , Importance and Principles of Technical Writing, Difference between Technical Writing & Literary Writing, Framing Definitions,	

	6.2	Types of Expositions: Object / Process Description	
	6.3	Writing Instructions, Hazard Notations Difference between Technical Description & Instructions	
		Total	**26**

Reference Books:

1. Sanjay Kumar Pushp Lata: Communication Skills: Second Edition: Oxford Publication
2. Rizvi Ashraf: Effective Technical Communication: Tata Mc Graw-Hill
3. Sharma R.C Mohan Krishna: Business Communication and Report Writing: Tata McGraw-Hill
4. Geoffrey Leech: English Grammar for Today: Palgrave, UK
5. Norman Lewis: Word Power Made Easy: Anchor Books, New York
6. Raman Meenakshi and Sharma Sangeeta: Communication Skills: Oxford University Press
7. Mark Innoston: Professional English in Use-Engineering: Technical English for Professionals: Cambridge
8. English Grammar by Raymond Murphy
9. Rizvi Ashraf: Effective Technical Communication: Tata Mc Graw-Hill
10. Chaturvedi and Chaturvedi: Business Communication: Pearson Education

Course Assessment:

ISE: To be conducted in any of these forms - Assignment/ Quiz/ Presentation/ Class Test/ case study etc. of 15 marks.

MSE: To be conducted as written examination for 15 marks (on 40% - 50% syllabus)

End Semester Examination:

$ ESE of duration 2 hours are of 60 marks and scaled to 45.

1. Question paper will comprise of **6** questions, each carrying **15** marks.
2. The students need to solve a total of **4** questions.
3. Question No.1 will be compulsory and based on entire syllabus.
4. Remaining questions **(Q.2 to Q.6)** will be selected from all the modules.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL2011	Applied Physics Lab	--	01	--	--	0.5	--	0.5

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL2011	Applied Physics Lab	--	--	--	25	--	25

Lab Objectives:

1. To develop scientific understanding of physics concepts
2. To develop the ability to explain the processes and applications related to science subjects
3. To apply skills and knowledge in real life situation
4. To improve the knowledge about the theory concepts of Physics learned in the class
5. To improve the ability to analyze experimental result and write laboratory report
6. To develop understanding about inferring and predicting

Lab Outcomes: Learners will be able to

1. Determine parameters such as numerical aperture / power attenuation of an optical fibre
2. Determine wavelength / divergence of laser beam
3. Perform experiments based on interference in thin film and determine radius of curvature of lens / diameter of wire / thickness of paper
4. Calculate basic parameters / constants using semiconductors
5. Use various sensors such as optical, resistive and piezoelectric
6. Demonstrate the concept for virtual lab and simulation Experiments

List of Experiments (Minimum five experiment required)

Sr. No.	Title of the Experiment
1	Determination of numerical aperture of an optical fiber
2	Determine the divergence of laser beam
3	Determination of radius of curvature of a lens using Newton's ring set up.
4	Determination of diameter of wire/hair or thickness of paper using wedge shape film method
5	Determination of Hall Coefficient using Hall Effect phenomenon
6	Determination of wavelength using Diffraction grating. (Laser source)
7	Determination of Planck's constant using photocell
8	Determine UDM parameters
9	Study of colour sensor
10	Simulation experiments based on nanotechnology using open-source Simulation
11	Measuring optical power attenuation in plastic optical fiber
12	I-V characteristics of PN junction diode/Zener diode/photo diode
13	Study of the characteristics of Resistance Temperature Detector (RTD)/optical sensors

Term Work:

Term work shall consist of at least 5-6 practical based on the above list. Further, term work journal must include at least 2 assignments. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

Term work Marks:

25 Marks (Total Marks) =15 Marks (Experiment) + 05 Marks (Assignments) + 05 Marks (Attendance)

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL2012	Applied Chemistry Lab	--	01	--	--	0.5	--	0.5

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL2012	Applied Chemistry Lab	--	--	--	25	--	25

Lab Objective:

1. To apply knowledge of quantitative analysis to determine the quality of coal.
2. To analyze experimental results and write laboratory report.
3. To learn about properties of oil to prevent corrosion.
4. To know the significance of viscosity.
5. To understand the significance of pH.
6. To learn to synthesize man-made polymers.

Lab Outcomes: After completion of experiment, the learners will be able to:

1. Understand the significance of proximate analysis of coal and determine quality of coal sample.
2. Learn various quantitative analytical techniques to determine % of elements from alloy samples.
3. Understand the significance of various properties of oil to prevent corrosion.
4. Understand the properties of lubricants and their variation with temperature using Redwood/ Abel's apparatus.
5. Apply knowledge of various quantitative analytical techniques to determine metal ion concentration/ pH
6. Synthesize UF/PF resin at laboratory level/Virtual lab.

Exp. No.	List of Experiments
1.	Determination of Moisture Content in Coal
2.	Determination of Ash Content in Coal
3.	Determination of Zn in Brass
4.	Estimation of Cu in Brass
5.	Determination of Acid Value of Oil
6.	Determination of Saponification Value of oil
7.	Determination of Viscosity of oil by Redwood Viscometer
8.	Determination of Flash point of lubricating oil using Abel's apparatus.
9.	Determination of metal ion concentration using Calorimeter.
10.	Determination of free acid (pH) of acid solution.
11.	Synthesis of Phenol- formaldehyde
12.	Synthesis of Urea- formaldehyde

Term Work:

Term Work shall consist of at least 5 to 6 practical based on the above list. Also, Term work Journal must include at least 2 assignments. Term work will be assessed as Continuous Internal Assessment Practical (CIAP). 25 Marks:15 Marks for Experiment + 5 Marks for Assignments and 5 Marks for Attendance

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL202	Engineering Graphics Lab	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL202	Engineering Graphics Lab	--	--	--	25	25	50

Lab Objective:

1. To impart and inculcate proper understanding of the theory of projection.
2. To impart the knowledge to read and interpret a drawing
3. To improve visualization skills.
4. To enable students to represent three-dimensional objects on a two-dimensional surface in a way that accurately conveys their shape, size, and orientation.
5. To acquaint students with representing internal features of a three-dimensional object by way of a section that accurately conveys their internal orientation.
6. To impart basic AutoCAD skills.

Lab Outcomes: Learners will be able to

1. Apply basic AutoCAD Commands to draw two-dimensional object
2. Apply the basic principles of projections in projection of basic geometric objects.
3. Apply the basic principles of projections in projection of regular solid objects.
4. Apply the basic principles of projections in converting orthographic views.
5. Apply the basic principles of projections in converting sectional orthographic views
6. Apply the basic principles of projections in converting Isometric views

Online Resource:

1. https://archive.nptel.ac.in/courses/112/105/112105294/
2. https://nptel.ac.in/courses/112103019
3. https://archive.nptel.ac.in/courses/112/102/112102304/

List of Experiment:

1. Drawing basic geometrical objects using Auto CAD such as Square, Hexagon, Rectangle etc.
2. Orthographic Projections model 1 Using Auto CAD.
3. Orthographic Projections model 2 Using Auto CAD.
4. Sectional Orthographic Projections model 1 Using Auto CAD.
5. Sectional Orthographic Projections model 2 Using Auto CAD.
6. Sectional Orthographic Projections model 3 Using Auto CAD.
7. Isometric Views model 1 Using Auto CAD.
8. Isometric Views model 2 Using Auto CAD.
9. Isometric Views model 3 Using Auto CAD.
10. Projection of solids (Prism and Pyramid only) model 1 Using Auto CAD.
11. Projection of solids (Prism and Pyramid only) model 2 Using Auto CAD.

(Laboratory work should contain any 6 experiments out of 11 experiments and all printouts to be taken in the CAD Laboratory. Preferably, use A4 size sheets for print out.)

Assessment

Term Work: Term Work shall consist of all the above-mentioned practical. Term work will also include the **A3 size sketch book.** Problems taught in theory class in A3 size sketch book may be considered for term work. Alternatively, subject teachers may give problems on each topic to be solved by students as home assignments in the same **A3 size sketch book**. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

A) Term Work Marks: 25 Marks

1. Assignments [A3 Size Sketchbook] =10 Marks
2. CAD printout = 10 Marks
3. Attendance = 5 Marks

B) Practical Exam: (2 hours/ 25 Marks)

End semester Practical exam will be held using CAD software only and will be conducted as End Semester Examination Practical (ESEP). **This exam will be based on the following syllabus.**

1. Isometric projections. (One Problem, Compulsory)
2. Orthographic Projection (One Problem) OR
3. Sectional Orthographic Projection (One problem)

Note:

1. The examiners may decide the weightage of the questions asked in the practical exam.
2. Printout of the answers must be taken preferably in A4 size sheets and should be assessed by external examiner only.
3. Knowledge of AutoCAD software, concepts of Engineering Graphics related to specified problem and accuracy of drawing should be considered during evaluation.

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL203	Digital System Design Lab	--	02	--	--	01	-	01

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL203	Digital System Design Lab	--	--	--	25	25	50

Pre-requisite:

1. Knowledge of Basic Electrical & Electronics Engineering (FEC103).

Lab Objectives:

1. To verify the truth table of various logic gates using ICs.
2. To simplify Boolean algebraic expressions using Boolean laws.
3. To realize logic gates using universal gates.
4. To implement digital circuits for various arithmetic operations, logical functions, and code conversions.
5. To design and simulate combinational logic circuits.
6. To design and simulate sequential logic circuits.

Lab Outcomes:

After successful completion of the course, students will be able to:

1. Verify truth tables for various logic gates using ICs.
2. Realize logic expressions using basic and universal logic gates.
3. Construct and validate logic gates using universal gates.
4. Design and implement digital circuits for performing various arithmetic operations, logical functions, and code conversions.
5. Design and simulate combinational logic circuits using appropriate tools and techniques. Design and simulate sequential logic circuits effectively.

Suggested List of Experiments:	
Sr. No.	Title of Experiments
1	To verify the truth table of various logic gates using ICs.
2	To implement Boolean function in SOP and POS form.
3	To realize the gates using universal gates.
4	Implement digital circuits to perform Binary to Gray and Gray to Binary operations.
5	To realize half adder and full adder.
6	Design and implement BCD adder using 4-bit Binary Adder IC-7483.
7	To implement logic operation using MUX/Demux.
8	Design and implement 2-bit Comparator.
9	Study of flip flop IC.
10	Flip-flop conversions JK to D, JK to T and D to TFF.
11	Design and implement Up/Down counter.
12	Design and implement shift register using flip flop.
13	Verify encoder and decoder operations.

14	Design of synchronous/asynchronous counter.
15	To implement universal shift register using IC 74194

Online Resources:

1. http://vlabs.iitkgp.ernet.in/coa/#
2. https://circuitverse.org/simulator
3. http://www.cburch.com/logisim/

Term Work:

The term work should include 10 experiments: 6 hardware experiments, and 4 using simulators or virtual labs. At least 02 assignments covering the entire syllabus must be given on the content of theory and practicals of "Digital System Design". The assignments should be students' centric and an attempt should be made to make assignments more meaningful, interesting and innovative. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

Term work Marks:

25 Marks (Total Marks) =15 Marks (Experiment) + 05 Marks (Assignments) + 05 Marks (Attendance)

The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.

Practical Exam: (2 hours/ 25 Marks)

End-semester Practical and oral exam will be held based on the above syllabus and will be conducted as End Semester Examination Practical (ESEP).

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL204	Professional Communication Techniques Lab	--	01	--	--	0.5	--	0.5

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL204	Professional Communication Techniques Lab	--	--	--	25	--	25

Lab Objective:

The learners should be able to

1. Skilfully assess communication dynamics and manoeuvre in professional environments
2. Gain proficiency in active listening by understanding a variety of Speech Acts
3. Evaluate the audience's goal, and communication obstacles critically to speak effectively.
4. Thoroughly understand complex documents, both technical and non-technical, for effective comprehension and summarisation.
5. Use technical writing skills for professional transactions to efficiently arrange and produce relevant content.
6. Compose a paragraph with techniques of unity coherence and development.

Lab Outcomes:

Learner will be able to

1. Utilise the knowledge of communication dynamics to successfully navigate work environments.
2. Use active listening techniques to understand others' perspectives.
3. Examine various obstacles to communication, the target audience, and the purpose to communicate, as a professional speaker.
4. Comprehend and summarise complex technical and non-technical writings to carry out professional responsibilities.
5. Compose technically proficient content for business correspondence.
6. Identify the key parts and develop a paragraph efficiently with supporting details and conclusion.

Sr. No.	Details of Activities
1.	**Grammar, Vocabulary & Verbal Aptitude** Grammar & Vocabulary Practice Worksheet. Online MCQ testing basic grammar skills, vocabulary - based on competitive exams format.
2.	**Reading Comprehension and summarization** Comprehension passages followed by questions for reading practice. To be assigned from competitive exam formats
3.	**Reading Short stories and writing a review of the story** Reading and critical analysis of stories from the short story collection of Indian authors like R.K. Narayan, Ruskin Bond, Sudha Murthy, Aesop Fables, Panchatantra, etc.
4.	**Public Speaking** Students to prepare a speech of 2 minutes on a topic of their choice. To be delivered during tutorial hour.
5.	**Extempore Speech** Simple topics based on day-to-day life experiences or current events will be given - 05

	minutes preparation time before the speech. To be delivered during tutorial hour.
6.	**Listening Exercise** Listening tests to be conducted during tutorial - from IELTS/TOEFL, other language proficiency exams.
7.	**Summarization** Summarising the given passage - text to text, text to graphic and graphic to text
8.	**Creative Writing** Paragraph Writing - Identify the central idea, understanding author's point of view, structure of a paragraph and paragraph development
9.	**Business Correspondence** Exercises based on Language and style, Principles of Correspondence. Writing different types of letters and emails
10.	**Basic Technical Writing** Vocabulary exercises. Writing Technical Definition, Description of objects/processes and Instruction

List of Assignments:

1. Draft of Public Speech
2. Theory of Communication
3. Summarization and Comprehension
4. Listening Exercise
5. Business Correspondence
6. Basic Technical Writing

Term Work:

At least 06 assignments covering the entire syllabus must be given during the "Batch Wise Practical". The assignments should be students' centric, and an attempt should be made to make assignments more meaningful, interesting and innovative.

Term work assessment must be based on the student's overall performance with every assignment graded sometimes. The grades will be converted to marks as per "Credit and Grading System" manual and should be added and averaged. Based on the above scheme grading and term work assessment should be done.

Assessment:

Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

The distribution of marks for term work shall be as follows:

1. Assignments : 20 marks
2. Attendance : 05 marks

Online Resources:

1. https://ielts.org
2. https://www.ets.org/toefl.html
3. https://www.britishcouncil.in/
4. https://www.cambridgeenglish.org/test-your-english/
5. https://onlinecourses.swayam2.ac.in/cec22_cm03/preview

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL205	Object Oriented Programming Methodology Lab	--	2*+2	--	--	02	--	02
* Theory class to be conducted for full class								

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL205	Object Oriented Programming Methodology Lab	--	--	--	25	25	50

Lab Objectives:
The learners should be able to
1. To learn the basic concepts of object-oriented programming
2. To study JAVA programming language
3. To study various concepts of Object Oriented programming like Inheritance , polymorphism and packages, etc.
4. To study concepts of Runtime Error using Exception Handling
5. To Study the concepts of Multithreading
6. To explain components of GUI based programming

Lab Outcomes: At the end of the course, the students should be able to
1. Apply fundamental object oriented programming constructs
2. Illustrate the concept of packages, classes and objects.
3. Elaborate the concept of strings, arrays and vectors
4. Implement the concept of inheritance and interfaces
5. Implement the concept of exception handling and multithreading
6. Develop GUI based application using AWT

Module		Detailed Content	Hours
1		**Introduction to Object Oriented Programming**	**02**
	1.1	OOP concepts: Objects, class, Encapsulation, Abstraction, Inheritance, Polymorphism, message passing	
	1.2	Java Virtual Machine, JIT, Bytecode	
	1.3	Basic programming constructs: variables, data types, operators, unsigned right shift operator, expressions, branching and looping	
2		**Class, Object, Packages and Input/output Classes**	**05**
	2.1	Class, object, data members, member functions, this keyword, Access modifiers, Constructors and its types, static members and static functions, Method overloading Packages in java, user defined packages, Input and output classes and functions in Java like Buffered Reader class, Scanner class	
3		**Array, String and Vector**	**03**
	3.1	Array, 1D-array, 2D-array, String class, String Buffer class and functions, Vector class and its functions	
4		**Inheritance, Polymorphism and Abstraction**	**04**
	4.1	Types of inheritance, Method overriding, super keyword, abstract class and abstract method, final keyword, final class and method, Multiple inheritance using interface, extended interfaces	
5		**Exception handling and Multithreading**	**05**
	5.1	Exception handling using try, catch, finally, throw and throws, Multiple try and catch blocks, user defined exception, Thread lifecycle, thread class methods, creating threads using Thread class and Runnable interface	
6		**GUI programming in JAVA**	**07**
	6.1	AWT: working with windows, using AWT controls for GUI design, Swing class introduction, Graphics class functions, Font and color class, Event handling classes and Listener interfaces, Adapter Classes as Helper Classes in Event Handling. **Introducing Swing:** AWT vs Swings, Components and Containers, Swing Packages, A Simple SwingApplication, Painting in Swing, Designing Swing GUI Application using Buttons, JLabels, Checkboxes, Radio Buttons, JScrollPane, JList, JComboBox, Trees, TablesScroll pane Menus and Toolbar	

Textbooks:

1. Bjarne Stroustrup, “The C++ Programming language”, Third edition, Pearson Education, 2000.
1. Deitel, “C++ How to Program”, 4th Edition, Pearson Education, 2005.
3. D. T. Editorial Services, “Java 8 Programming Black Book”, Dreamtech Press, Edition, 2015.
4. Yashwant Kanitkar, “Let Us Java”, BPB Publications, 4nd Edition, 2019.

Reference Books:

1. Herbert Schidt, “The Complete Reference”, Tata McGraw-Hill Publishing Company Limited, 10th Edition, 2017.
2. Harvey M. Deitel, Paul J. Deitel, Java: How to Program, 8th Edition, PHI, 2009.
3. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified ModelingLanguageser Guide”, Pearson Education.
4. Sachin Malhotra, Saurabh Chaudhary “Programming in Java”, Oxford University Press, 2010

Software Tools:

1. Raptor-Flowchart Simulation: http://raptor.martincarlisle.com/
2. Eclipse: https://eclipse.org/
3. Netbeans: https://netbeans.org/downloads/
4. Code Block: http://www.codeblocks.org/

5. J-Edit/J-Editor/Blue J

Online Repository:

1. Google Drive 2. GitHub 3. Code Guru

Textbooks:

1. Herbert Schildt, 'JAVA: The Complete Reference', Ninth Edition, Oracle Press
2. E. Balagurusamy, 'Programming with Java', McGraw Hill Education.

Reference books:

1. Ivor Horton, "Beginning JAVA", Wiley India.
2. Dietal and Dietal, "Java: How to Program", 8th Edition, PHI .
3. "JAVA Programming", Black Book, Dreamtech Press.
4. "Learn to Master Java programming", Staredu solutions

Online Resources:

1. www.nptelvideos.in
2. www.w3schools.com
3. www.tutorialspoint.com
4. https://starcertification.org/Certifications/Certificate/securejava

Suggested List of Programming Assignments/laboratory Work:	
Sr. No.	**Name of the Experiment**
1	Programs on Basic programming constructs like branching and looping
2	Program on accepting input using Input-Output classes
3	Programs on class and objects
4	Program on method and constructor overloading.
5	Program on Packages
6	Program on 2D array, strings functions
7	Program on String Buffer and Vectors
8	Program on types of inheritance
9	Program on Multiple Inheritance
10	Program on abstract class and abstract methods.
11	Program using super and final keyword
12	Program on Exception handling
13	Program on user defined exception
14	Program on Multithreading
15	Program on Graphics class
16	Program to create GUI application
17	Mini Project based on the content of the syllabus (Group of 2-3 students)

Term Work:

1 Term work should consist of 15 experiments and Journal must include at least 2 assignments

2 Mini Project based on the content of the syllabus (Group of 2-3 students)

3 The final certification and acceptance of term work ensures that satisfactory performance of laboratory work and minimum passing marks in term work.

4 Total 25-Marks (Experiments: 15-marks, Attendance: 05-marks,Mini Project:-5-marks)

Oral & Practical exam

Based on the entire syllabus of FEL 205: **Object Oriented Programming with JAVA** and will be conducted as End Semester Examination Practical (ESEP).

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL206	Engineering Workshop-II	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL206	Engineering Workshop-II	--	--	--	25	--	25

Lab Objective:

1. To impart training to help the students develop engineering skill sets.
2. To inculcate respect for physical work and hard labor.
3. To get exposure to interdisciplinary engineering domain.
4. To get exposure to handle different tools.
5. To inculcate respect for hard labour.
6. To inculcate the habit working in team for common job/goal.

Lab Outcomes: Learners will be able to…

1. Develop the necessary skill required to handle/use different carpentry tools.
2. Identify and understand the safe practices to adopt in electrical environment.
3. Demonstrate the wiring practices for the connection of simple electrical load/ equipment.
4. Design, fabricate and assemble PCB.
5. Develop the necessary skill required to handle/use different masons' tools.
6. Develop the necessary skill required to use different sheet metal and brazing tools.
7. Able to demonstrate the operation, forging with the help of a simple job.

NOTE:

Trade 1 and 2 are compulsory.
Select any one - trade topics out of the topic trade 3 to 5.
Demonstrations and hands-on experience to be provided during the periods allotted for the same.
Report on the demonstration including suitable sketches is also to be included in the term work
CO-1 is related to Trade-1
CO-2 to CO-4 is related to Trade-2 CO-5 is related to Trade-3
CO-6 is related to Trade-4 CO-7 is related to Trade-5
CO evaluation is to be conducted based on the chosen trades as well as compulsory trades.

Trade	Topics	Hrs.
1.0	**Carpentry [Compulsory]**	**12**
	Use and setting of hand tools like hacksaws, jackplanes, chisels and gauges for construction of various joints, wood tuning and modern wood turning methods. Term work to include One carpentry job involving a joint and report on demonstration of a job involving wood turning	
2.0	**Basic Electrical Workshop[Compulsory]**	**06**

	Single phase and three-phase wiring. Familiarization. of protection switchgears and their ratings (fuse, MCB, ELCB).Wiring standards, Electrical safety in the work place safe work practices. Protective equipment, measures and tools. Layout drawing, layout transfer to PCB, etching and drilling and soldering technique.	
3.0	**Mansory**	**06**
	Use of mason's tools like trowels, hammer, spirit level, square, plumbline and pins etc. demonstration of mortar making, single and one and half brick masonry, English and Flemish bonds, block masonry, pointing and plastering.	
4.0	**Sheet Metal Working and Brazing:**	**06**
	Use of sheet metal, working hand tools, cutting, bending, spot welding	
5.0	**Forging (Smithy):**	**06**
	At least One Forging Job to be demonstrated and a simple job to be made forTermWorkinagroupof4students	

Textbooks:

1. Workshop Technology, Volume-I, P. N. Rao, McGraw Hill Publication
2. Elements of Workshop Technology, Vol-I, S. K. Hajra Choudhury, A K Hajra Choudhury, Nirjar Roy, Media Promoters &Publishers Pvt Ltd

Reference books

1. Workshop Technology, Part-II, WAJ Chapman, VIVA Books Pvt Ltd
2. A Course in Workshop Technology, B.S. Raghuvanshi, Dhanpat Rai and Co Ltd

Assessment:

Term Work: Term Work will encompass practical exercises covering at least three trades based on the list. Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

Term Work Assessment: 25 Marks (Total marks) = 20 Marks (Workshop Experiment) + 5 Marks (Attendance)

Course Code	Course Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
FEL207	Indian Knowledge System (IKS)	--	2*+2	--	--	2	--	2

Course Code	Course Name	Examination Scheme					
		Theory Marks			CIAP	ESEP	Total
		Course Assessment		ESE			
		ISE	MSE				
FEL207	Indian Knowledge System (IKS)	--	--	--	25	--	25

Course evaluation is activity based which may be an individual or group of students**.**

*Two hours of theory for whole class.

Rationale:

The Indian Knowledge System (IKS) is vital for preserving India's rich cultural heritage, fostering holistic and sustainable practices, and integrating ancient wisdom with modern science to address contemporary challenges and enrich global knowledge.

Course Objectives:

1. To explore and understand the evolution of Indian scientific thought
2. To evaluate the historical and modern educational systems in our country
3. To analyze sustainable practices in in ancient India
4. To know the richness of Indian Arts and Culture
5. To understand the contributions of Indian Scientists and Nobel Laureates
6. To understand the principles of good governance

Course Outcomes:

1. Recognize the sources and concepts of the Indian knowledge system
2. Learn about our history of Indian ancient knowledge and its significance in the current scenario.
3. Demonstrate sustainable development in various fields like Science, Technology, agriculture, industry, architecture performing arts, etc.
4. Understand and appreciate the rich heritage that resides in literature
5. Learn about the ancient Bhartiya education system in comparison with the modern era
6. Showcase the multi-dimensional nature of IKS and its importance in modern society

Prerequisite:

3. Students should have the foundational knowledge and skills necessary for a comprehensive understanding of IKS
4. Students should be familiar with the Indian Culture, Language, and History of Science and Technology in India.

Module No.	Unit No.	Topics	Hrs.
1.0		**Introduction to the Indian Knowledge System (I.K.S.)**	**03**
	1.1	**Introduction:** Basic knowledge and scope of IKS, IKS in ancient India and modern India, Bhartiya education system – ancient to modern era, Sources of Education, Aim of Education, Curriculum, methods of learning	
	1.2	Educational Institutes, Higher Educational Institutions, Advantages and Disadvantages of the Gurukul System, Distinguish between the Gurukul system And the Modern Education System.	
2.0		**Development of Scientific Thoughts in Ancient India**	**04**
	2.1	Development in Science, Technology, Astronomy, Mathematics.	
	2.2	Development in Life Sciences – Life Science, Physiology, Ayurveda	
3.0		**Development of Arts & Culture in India**	**05**
	3.1	Introduction to Ancient Architecture (Arts, Forts, Paintings, Sculpture, Temple architecture, etc)	
	3.2	Development in performing arts & culture: Music, Art of singing, Art of dancing, Natyakala Cultural traditions and Folk arts.	
4.0		**Good Governance in Ancient India**	**05**
	4.1	Introduction to Indian religions, Moral and Ethical Governance, Vishva Kalyan through Vasudhaiva Kutumbkam	
	4.2	Principles of Good Governance about Ramayana, Mahabharat, Artha Sastra, Kauṭilyan State	
5.0		**Contribution of Indian Scientist & Nobel Laureates**	**05**
	5.1	Boudhayan, Aryabhatta, Brahmgupta, Bhaskaracharya, Varahamihira, Nagarjuna, Susruta, Kanada & Charak	
	5.2	Rabindranath Tagore, C.V. Raman, Har Gobind Khorana, Mother Teresa, Subrahmanyan Chandrasekhar, Amartya Sen, V.S. Naipaul, Venkatraman Ramakrishnan, Kailash Satyarthi and Abhijit Banerjee.	
6.0		**Sustainable Practices in Ancient India**	**04**
	6.1	Agriculture, waste management, water conservation, forest conservation, architecture, urban planning, biodiversity preservation, etc.	
	6.2	Yoga, pranayama, and meditation for health and well-being	
		Total	**26**

Textbooks:

1. A.K Bag, History of technology in India (Set 3 vol), Indian Nation Science Academy, 1997.
2. An Introduction to Indian Knowledge Systems: Concepts and Applications, B Mahadevan, V R Bhat, and Nagendra Pavana R N; 2022 (Prentice Hall of India).
3. Ancient Indian Knowledge: Implications To Education System, Boski Singh; 2019
4. India's Glorious Scientific Tradition by Suresh Soni; 2010 (Ocean Books Pvt.

Ltd.)
5. Indian Art: Forms, Concerns, and Development in Historical Perspective (History of Science, Philosophy and Culture in Indian Civilization), General Editor: D.P. Chattopadhyaya, Ed. By. B.N. Goswamy; 1999 Munshiram Manoharlal Publishers Pvt. Ltd.
6. Indian Knowledge Systems: Vol I and II, Kapil Kapoor and A K Singh; 2005 (D.K. Print World Ltd).
7. Pandey, K.K. Kriya Sarira Comprehensive Human Physiology, Chaukhambha Sanskrit series, Varanasi, 2018
8. Shukla Vidyadhar & Tripathi Ravidatt, Aayurved ka Itihasevam Parichay, Chaukhambha Sanskrit Sansthaan, New Delhi, 2017
9. Textbook on The Knowledge System of Bharata by Bhag Chand Chauhan; 2023 (Garuda Prakashan) 6. Pride of India- A Glimpse of India's Scientific Heritage edited by Pradeep Kohle et al. Samskrit Bharati; 2006
10. Traditional Knowledge System in India, Amit Jha

Online References:

1. https://swayam.gov.in/explorer?searchText=iks
2. https://iksindia.org/book-list.php
3. https://iksindia.org/index.php

Assessment: Suggested Pedagogy and assessment criteria for Teachers**:**

1. Project-based activities.
2. Presentation, Group Discussions, and Case studies.
3. Visit historical places.
4. Flip class mode/ Roleplay
5. Quiz MCQ
6. Assignment as per the modules: 06
7. Internal Assessment through flipped class and PowerPoint presentation along with documentation

Sample Case Studies:

1. Mathematics of Madhava, Nilakantha Somayaji
2. Astronomical models of Aryabhata
3. Wootz steel, Aranumula Mirrors, and lost wax process for bronze castings
4. Foundational aspects of Ayurveda
5. Foundational aspects of Ashtanga yoga
6. Foundational aspects of Sangeeta and Natya-shastra

Term Work:

Term work will be assessed as Continuous Internal Assessment Practical (CIAP).

Term Work Assessment: 25 Marks (Total marks) = 10 Marks (Assignments) + 10 marks (Presentation/Group Discussion) + 05 Marks (Attendance)