Nutan Maharashtra Vidya Prasarak Mandal's (NMVPM's)

NUTAN MAHARASHTRA INSTITUTE OF ENGINEERING AND TECHNOLOGY (NMIET)

An

Autonomous Institute

Affiliated to Savitribai Phule Pune University

Governing
Under Graduate (B. Tech.) Programmes

First Year Engineering (2025 Pattern)

[Applicable to regulations 2023, 2021 & 2020]

(With effect from Academic Year 2025 – 26)

PREFACE

Nutan Maharashtra Vidya Prasarak Mandal (NMVPM) was established in the year 1906. The Great Freedom Fighter Lokmanya Bal Gangadhar Tilak was the Founder and President of the Governing Body for almost 12 years. National Education Promotor Guruvarya Annasaheb Vijapurkar was the Founder and Secretary of the Governing Body for almost 23 years. The Institute was established in the year 2008. The institute envisions being a dynamic-leading institute of practice engineering and industrial research in the learning system that promotes learners towards the development of self-esteem, self-learning, creativity & innovation leading to the development of successful professionals and members of society. The curriculum is meticulously crafted to provide a holistic learning experience, blending theoretical concepts with hands-on applications. It aims to foster critical thinking, problem-solving abilities, enabling graduates to contribute meaningfully to the advancement and responsible deployment of emerging technologies. The syllabus falls in line with the objectives of NEP - 2020, Savitribai Phule Pune University, AICTE New Delhi, UGC, and var- ious accreditation agencies by keeping an eye on the technological developments, innovations, and industry requirements. We believe that this well-structured and comprehensive syllabus will serve as a robust foundation for aspiring Engineering professionals, enabling them to contribute significantly to the techno- logical progress and address the challenges of the 21st century.

We would like to place on record our gratefulness to the faculty, alumini, industry experts and stakeholders for having helped us in the formulation of this syllabus.

Vision

To be a notable institution for providing quality technical education and ensuring ethical, moral and holistic development of students.

Mission

To nurture engineering graduates with state of the art competence, professionalism and problem solving skills to serve needs of industry as well as society.

Dr.Shekhar Rahane
Chairman,
Board of Studies – First Year Engineering.

Members of Board of studies – First year Engineering

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CURRICULUM FRAMEWORK
(Regulations 2023)

List of Abbreviations

Sr. No.	Abbreviation	Type of Course
1.	BSC	Basic Science Course
2.	ESC	Engineering Science Course
3.	PCC	Programme Core Course
4.	VSEC	Vocational and Skill Enhancement Course
5.	AEC	Ability Enhancement Course
6.	IKS	Indian Knowledge System
7.	CC	Co-curricular Courses/Liberal Learning Courses
8.	PEC	Programme Elective Course
9.	MDM	Multidisciplinary Minor
10.	OPE	Open Elective
11.	EEM	Entrepreneurship/Economics/Management Course
12.	VEC	Value Education Course
13.	ELC	Experiential Learning Courses

Course Wise Credit Distribution

Sr. No.	Abbreviation	Type of Course	No. of Courses	Credits	
				Credit Points	% of Credits
1.	BSC	Basic Science Course	08	12	30%
2.	ESC	Engineering Science Course	10	15	37.5%
3.	PCC	Programme Core Course	02	03	7.5%
4.	VSEC	Vocational and Skill Enhancement Course	02	04	10%
5.	AEC	Ability Enhancement Course	01	02	5%
6.	IKS	Indian Knowledge System	01	02	5%
7.	CC	Co-curricular Courses	02	02	5%
Total			**26**	**40**	**100%**

Curriculum Structure

First Year B. Tech.

CURRICULUM STRUCTURE
First Year B. Tech.

Semester – I
(With effect from Academic Year 2025-26)

Course Code	Course	Course Type	Credits			Teaching Scheme			Examination Scheme				Total
									Continuous Evaluation (CE)		SA (50)	TW	
			TH	PR	TU	L	P	T	UT (25)	FA (25)			
FE25BS101	Linear Algebra and Multivariable Calculus	BSC	2	-	-	2		-	25	25	50	-	100
FE25BS101L	Linear Algebra and Multivariable Calculus Lab	BSC	-	1	-	-	2	-	-	-	-	25	25
FE25BS102/ FE25BS103	Engineering Physics/ Engineering Chemistry	BSC	2	-	-	2		-	25	25	50	-	100
FE25BS102L/ FE25BS103L	Engineering Physics Lab/ Engineering Chemistry Lab	BSC	-	1	-	-	2	-	-	-	-	25	25
FE25ES101/ FE25ES102	Elements of Electronics / Electrical Engineering	ESC	2		-	2		-	25	25	50	-	100
FE25ES101L/ FE25ES102L	Elements of Electronics Lab/ Electrical Engineering Lab	ESC	-	1	-	-	2	-	-	-	-	25	25
FE25ES103/ FE25ES104	Engineering Graphics / Engineering Mechanics	ESC	2		-	2		-	25	25	50	-	100
FE25ES103L/ FE25ES104L	Engineering Graphics Lab / Engineering Mechanics Lab	ESC	-	1	-	-	2	-	-	-	-	25	25
FE25ES105	Fundamentals of Programming Languages	ESC	2	-	-	2	-	-	25	25	50	-	100
FE25ES105L	Fundamentals of Programming Languages Lab	ESC	-	1	-	-	2	-	-	-	-	25	25
FE25VS101/ FE25VS102	Design Thinking and Innovation/Workshop	VSEC	1	1	-	1	2	-	-	-	-	50	50
FE25AE101	Communication skills in Corporate World	AEC	2	-	-	2	-	-	-	-	-	50	50
FE25CC101	Life Skills - I	CC	-	1	-	-	2	-	-	-	-	25	25
			20			**27**			**125**	**125**	**250**	**250**	**750**

L-Lecture, P-Practical, UT-Unit Test, FA-Formative Assessment, SA-Summative Assessment, TW-Term Work, Lab-Laboratory.

***Exit Policy: Available as a separate document.**

CURRICULUM STRUCTURE
First Year B. Tech.

Semester – II (With effect from Academic Year 2025-26)													
Course Code	**Course**	**Course Type**	**Credits**			**Teaching Scheme**			**Examination Scheme**				**Total**
									Continuous Evaluation (CE)		**SA (50)**	**TW**	
			TH	**PR**	**TU**	**L**	**P**	**T**	**UT (25)**	**FA (25)**			
FE25BS104	Differential Equations and Applied Calculus	BSC	2	-	-	2		-	25	25	50	-	100
FE25BS104L	Differential Equations and Applied Calculus Lab	BSC	-	1	-	-	2	-	-	-	-	25	25
FE25BS102/ FE25BS103	Engineering Physics/ Engineering Chemistry	BSC	2	-	-	2		-	25	25	50	-	100
FE25BS102L/ FE25BS103L	Engineering Physics Lab/ Engineering Chemistry Lab	BSC	-	1	-	-	2	-	-	-	-	25	25
FE25ES101/ FE25ES102	Elements of Electronics / Electrical Engineering	ESC	2	-	-	2		-	25	25	50	-	100
FE25ES101L/ FE25ES102L	Elements of Electronics Lab/ Electrical Engineering Lab	ESC	-	1	-	-	2	-	-	-	-	25	25
FE25ES103/ FE25ES104	Engineering Graphics / Engineering Mechanics	ESC	2	-	-	2		-	25	25	50	-	100
FE25ES103L/ FE25ES104L	Engineering Graphics Lab / Engineering Mechanics Lab	ESC	-	1	-	-	2	-	-	-	-	25	25
FE25PC101	Programming and Problem Solving	PCC	2	-	-	2		-	25	25	50	-	100
FE25PC102L	Programming and Problem Solving Lab	PCC	-	1	-	-	2	-	-	-	-	25	25
FE25VS101/ FE25VS102	Design Thinking and Innovation/Workshop	VSEC	1	1	-	1	2	-	-	-	-	50	50
FE25IK101	Indian Knowledge System	IKS	2		-	2		-	-	-	-	50	50
FE25CC102	Life Skills - II	CC	-	1	-	-	2	-	-	-	-	25	25
			20			**27**			**125**	**125**	**250**	**250**	**750**

L-Lecture, P-Practical, UT-Unit Test, FA-Formative Assessment, SA-Summative Assessment, TW-Term Work, Lab-Laboratory.

***Exit Policy: Available as a separate document.**

Course Syllabus

First Year B. Tech.

Semester I

Program	B.Tech (All Programs)				Semester : I		
Course	Linear Algebra and Multivariable Calculus				Code	FE25BS101	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites :

1. Elementary Mathematics
2. Basics of Mathematics

Course Objectives:

1. To strengthen the concepts of Linear algebra, multivariable calculus and its application in maxima & minima, error & approximation, area and volume.
2. To make students acquainted with advanced Mathematical techniques to represent the Fourier series and to evaluate integrals.

Course Outcomes:

After learning the course, the students should be able to:

1. Apply the concept of the linear system of equations for dependence/independence of vectors, Eigen values and Eigen vectors.
2. Evaluate Partial Differentiation and its concept in Euler's theorem.
3. Apply the concept of partial differentiation to find Jacobian, Maxima & Minima and Error & Approximation.
4. Represent Fourier series for the periodic time domain continuous and discrete function into signal form.

Course Contents

Unit	Description	Duration [Hrs]
I	**Linear Algebra** Rank of a Matrix, System of Linear Equations and application to electric circuit (L-R & C-R). Linear Dependence and Independence, Eigen Values and Eigen Vectors, Cayley Hamilton Theorem, Diagonalization of a matrix.	08
II	**Partial Differentiation** Introduction to the function of several variables, partial derivatives, Euler's theorem on homogeneous functions, and partial derivatives of composite functions, total derivatives	07
III	**Applications of Partial Differentiation** Jacobian, Functional Dependence and independence, Errors and Approximations, maxima and minima of the function of two variables, Lagrange's method of Undetermined Multipliers.	08
IV	**Fourier Series and Applications** Periodic functions, Even and odd functions, Dirichlet's conditions, Fourier series, Harmonic Analysis and Applications to problems in Engineering.	07
	Total	30

Text Books:

1. Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill)
2. Advanced Engineering Mathematics by Peter V. O'Neil (Thomson Learning)

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.)
2. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication)
3. Elementary Linear Algebra. by Ron Larson and David C. Falvo (Houghton Mifflin Harcourt Publishing Company).
4. Linear Algebra and Its Applications by Gilbert Strang, WELLESLEY -CAMBRIDGE PRESS Box 812060 Wellesley MA 02482.
5. Thomas' Calculus by George B. Thomas (Addison-Wesley, Pearson).
6. Elements of Partial Differential Equations by Ian N. Senddon, Dover Publications, Inc. Mineola, New York.

e-sources:

A NPTEL course on Engineering Mathematics I by Prof. Jitendra Kumar Link: https://archive.nptel.ac.in/courses/111/105/111105121/

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Program	B.Tech (All Programs)				Semester : I		
Course	Linear Algebra and Multivariable Calculus Laboratory				Code	FE25BS101L	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	-	25

Pre-requisites:

1) Elementary Mathematics.
2) Elementary Calculus

Course Objectives:

1) Understanding MATLAB for mathematical computations, visualization, and data analysis.
2)Ability to apply MATLAB to solve engineering problems related to matrices, Partial differentiation

Course Outcomes:

After learning the course, the students should be able to:

1) Solve problems related to the concepts of matrices, partial differentiation and its application & Fourier series.
2) Use MATLAB/Open source software to solve problems such as matrices, partial differentiation.

Course Contents

Experiment No.	Suggested List of Experiments
1	Solve a System of Linear Equations, Dependence and Independence & its applications.
2	Eigen Values and Eigen Vectors, Cayley Hamilton Theorem, and Diagonalization of a matrix.
3	Introduction to MATLAB & Matrix operation using MATLAB.
4	Solve a System of Linear Equations using MATLAB.
5	Eigen Values and Eigen Vectors using MATLAB.
6	Partial derivatives, Euler's theorem on homogeneous functions and its properties.
7	To find Jacobians' Functional Dependence and independence, Errors and Approximations.
8	To find Maxima and Minima Lagrange's method of Undetermined Multipliers,
9	Find derivatives using MATLAB.
10	Fourier series and its applications.

Reference Books:

1) Introduction to MATLAB for Engineers and Scientists by Sandeep Nagar, Springer.
2) MATLAB – An Introduction with Applications by Amos Gilat, JOHN WILEY & SONS, INC.

Program	B. Tech (All Programs)				Semester : I/II		
Course	Engineering Physics				Code	FE25BS102	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites:

1. Basics of Physics
2. Basics of Mathematics

Course Objectives:

The objective of the course is to impart the knowledge of fundamentals of physics through hands-on experiments and extend it to relevant engineering applications.

Course Outcomes:

After learning the course, the students should be able to:

1. **Understand** the fundamentals of semiconductors, electrical properties, concepts to key semiconductor devices.
2. **Apply** quantum principles such as wave-particle duality, uncertainty, and Schrödinger's equation to wave functions and particles in potential wells.
3. **Develop** the Understanding the fundamentals of quantum computing and superconductivity and their applications in emerging technologies
4. **Interpret** the principles and applications of lasers, optical fibers, and nanomaterials in various engineering fields.

Course Contents

Unit	Description	Duration [Hrs]
I	**Semiconductor Physics:** Band theory of solids, Conductivity, Resistivity and Mobility, Concept of Fermi Level & Fermi Energy in metals & Semiconductors. Types of Semiconductor, Position of Fermi level in intrinsic & extrinsic semiconductors (qualitative), p-n junction diode, application of p-n junction: solar cell, Hall effect, Expression for Hall coefficient (derivation), Numericals.	08
II	**Quantum Physics:** Wave-Particle duality, de-Broglie Hypothesis, de Broglie wavelength expression in terms of kinetic energy and accelerating potential (V), Heisenberg's Uncertainty Principle, Uncertainty Principle in terms of Energy & Time, Wave Function, Physical Significance of a wave function, Time Independent Schrodinger wave equation, Motion of a particle in Rigid Box, Numericals.	07
III	**Quantum Computing and Superconductivity:** **Quantum Computing:** Classical & Quantum information comparison, Introduction to Quantum Computing, Principle of Quantum Computing Superposition, Entanglement and concept of qubit. Applications in Quantum Computing. **Superconductivity:** Introduction to Superconductors, Temperature dependence of resistivity, Meissner Effect, Isotope Effect, Critical Field, Temperature dependence of Critical field, Types of Superconductors, Applications of Superconductors, Numericals.	08
IV	**Photonics & Physics of Nanoparticles:** **Photonics:** Laser: Introduction, Characteristics of LASER, Basic concepts of LASER, population	07

	inversion, pumping, metastable state, He-Ne laser, Applications of Laser. Optical fibers: Introduction, Total Internal reflection, critical angle, Acceptance angle, Numerical aperture, Numericals. **Physics of Nanoparticles:** Introduction, surface to volume ratio, quantum confinement, properties of nanomaterials- optical properties, electrical properties, mechanical properties, magnetic properties; Synthesis methods of nanomaterials- Physical Vapor Deposition, Applications of nanomaterials.	
	Total	**30**

Text Books:

1. **M.N. Avadhanulu and P.G. Kshirsagar** - A Text book of Engineering Physics, S.Chand & Company Ltd, New Delhi, 10th revised edition.
2. **Gaur and Gupta** - Engineering Physics, Dhanpat Rai Publishers, New Delhi, 8th revised edition, 2017.
3. **S O Pillai** - Solid State Physics, 8th edition, New Age International Publishers-2018.

Reference Books:

1. **Resnick, Halliday and Jearl Walker** - Fundamentals of Physics, John Wiley & Sons, Inc., 11th edition, 2018
2. **Kenneth S.Krane** - Modern Physics, Wiley-India, 3rd edition, 2019.
3. **Maria Luisa** - Quantum Computation and Logic: How Quantum Computers Have Inspired Logical Investigations, 2018
4. **Dr. S. K. Kulkarni**-Nanotechnology: Principles and Practices,Capital Publishing.

e-sources:

- https://archive.nptel.ac.in/courses/115/102/115102124/
- https://archive.nptel.ac.in/courses/108/106/108106167/
- https://nptel.ac.in/courses/115102023
- https://archive.nptel.ac.in/courses/115/101/115101107/
- https://archive.nptel.ac.in/courses/108/108/108108122/
- https://archive.nptel.ac.in/courses/115/103/115103108/
- https://archive.nptel.ac.in/courses/115/105/115105131/
- https://nptel.ac.in/courses/118104008
- https://nptel.ac.in/courses/106106232

Program	B. Tech (All Programs)				Semester : I/II		
Course	Engineering Physics Laboratory				Code	FE25BS102L	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	-	25

Pre-requisites:

1. Basics of Physics
2. Basics of Mathematics

Course Objectives:

1. To provide better understanding of concepts, principles of Physics by giving hands on experience
2. To develop an insight in scientific experimental methodologies.

Course Outcomes:

After learning the course, the students should be able to:

1. To demonstrate concepts of optics by performing experiments using optical instruments.
2. To formulate and solve Engineering Physics problems by applying experimental method

Course Contents

Experiment No.	List of Experiments (Any eight)
1	An experiment based on Laser: To determine the divergence of a laser beam or to determine diameter of a thin wire or to perform beam profile analysis of a laser beam.
2	An experiment based on Laser: To find out the number of lines per cm of given grating.
3	An experiment based on optical fiber: To determine the numerical aperture or attenuation coefficient or critical angle of incidence for given a glass slab or any experiment to calculate parameters of optical fiber.
4	To determine the band gap energy of a semiconductor sample using a PN junction diode.
5	To Plot I-V characteristics and determine fill factor of a given solar cell.
6	Study of Photocell characteristics.
7	To determine the radius of curvature of Plano- convex lens given in Newton's Ring's arrangement.
8	To determine the speed of ultrasonic waves in a given medium and Determination of compressibility of given liquid.
9	Determination of Planck's Constant Virtual Lab- https://mp-amrt.vlabs.ac.in/exp/determination-plancks-constant/
10	Case Study on Quantum Computing/Physics of Nanoparticles/Superconductivity.

Reference Books:

1. Lasers & nonlinear Optics-B. B. Laud-Third edition, New Age International (P)Ltd. Publishers.
2. Fundamentals of Optics- Francis A. Jenkins, Harvey E. White, Fourth edition, McGraw Hill Education (India) Pvt. Ltd.
3. Sensors Handbook- Sabrie Soloman, second edition, Mc Grew Hill Publications
4. Fundamentals of Physics- Resnick & Halliday (John Wiley &sons)
5. An introduction to Laser‟s theory and applications – Dr. M. N. Avdhanulu, Dr. P.S. Hemne– Revised edition 2017-S. Chand & Company Pvt. Ltd.
6. Introduction to solid states Physics - Charles Kittel, Eighth Edition, Wiley India Pvt Ltd.

Program	B.Tech (All Programs)				Semester : I/II		
Course	Engineering Chemistry				Code	FE2SBS103	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites:

1. Basics of chemistry
2. Basics of Mathematics

Course Objectives:

This course aims at enabling students,

1. To describe the technology for water quality enhancement, study structure, properties, and applications of specialty polymers and nanomaterials.
2. To illustrate the conventional and alternative fuels, their properties, and applications, as well as corrosion mechanisms and preventive methods for corrosion control.

Course Outcomes:

After learning the course, the students should be able to:

1. **Understand** the practical approaches and techniques required to effectively monitor water quality for various engineering applications and the techniques used for water softening and purification.
2. **Explain** the structure and properties of advanced engineering materials for various Engineering and Technological applications.
3. **Analyze** different types of conventional and alternative fuels.
4. **Identify** the causes of corrosion and methods for minimizing corrosion.

Course Contents

Unit	Description	Duration [Hrs]
I	**Water Technology** a) Introduction: Water quality parameters- Physical, Chemical and Biological, Hardness of water- Types, Unit and Numerical. Determination of hardness by using EDTA method. Alkalinity of water and its determination. Numerical on EDTA method and alkalinity. Boiler introduction, Scale, Sludge and Caustic Embrittlement. Water softening techniques -Ion exchange method. Water purification by reverse osmosis and membrane based purifications (Electrodialysis). b) Brief Introduction to Green chemistry, Water for cooling systems in data centers and Ultrapure water in semiconductor manufacturing.	08
II	**Specialty Polymers and Nanomaterials** a) Polymers: Introduction, Important properties (Tm, Tg, Solubility), Specialty polymers: Introduction, preparation, properties and applications of Engineering Thermoplastic: Polycarbonate, Bio-degradable polymer: Poly(hydroxybutyrate-hydroxyvalerate), Conducting Polymer: Polyacetylene, Electroluminescent polymer: PPV. b) Nanomaterials: Introduction, Surface to volume ratio, Quantum confinement, Classification of nanomaterials based on dimensions (0D, 1D, 2D, 3D). Structure, properties and applications of Graphene, Carbon nanotubes and Quantum dots. Introduction to top-down and bottom-up approaches for preparation of Nanomaterials.	07
III	**Energy Sources and Fuels** a) Introduction (definition, classification of fuel based on chemical reactions and characteristics of an ideal fuel), Calorific value, Higher calorific value and Lower calorific value, Determination of calorific value - Bomb calorimeter, Boy's	08

	colorimeter and numerical, Analysis of Coal- Proximate and Ultimate analysis with numerical. b) Alternative fuels: Power alcohol and biodiesel. Hydrogen gas as a future fuel, production by steam reforming of methane and Coke. Classification of batteries, Li-ion batteries- construction, working and applications.	
IV	**Corrosion Science and Control** a) Corrosion: Introduction, Mechanism of Dry corrosion and wet corrosion, Factors affecting corrosion: nature of metal and nature of environment. b) Methods of prevention of corrosion - Cathodic and Anodic protection, Metallic coatings and its types - Anodic and Cathodic coatings. Methods to apply metallic coatings - hot dipping, metal cladding & electroplating.	**07**
	Total	**30**

Text Books:

1. Textbook of Engineering Chemistry by Dr. S. S. Dara, Dr. S. S. Umare, S. Chand & Company Ltd.
2. Engineering Chemistry by O. G. Palanna, Tata Magraw Hill Education Pvt. Ltd
3. Textbook of Engineering Chemistry by Dr. Sunita Rattan, S. K. Kataria& Sons Publisher.
4. P. C. Jain and Monica Jain A text Book of Engineering Chemistry, Dhanapat Rai Publications, New Delhi, 17th edition, 2018.

Reference Books:

1. Water and Wastewater Technology: Mark J. Hammer
2. Water Pollution Control: A Guide to the Use of Water Quality Management Principles" by David H. Paull
3. Polymer Science, V. R. Gowarikar, N. V. Viswanathan, jayadev Sreedhar, Wiley Eastern Limited.
4. Introduction to Nanotechnology: Charles P. Poole, Frank J. Owens.
5. F.W. Billmeyer Text Book of Polymer Science, John Wiley & Sons, 4th edition, 2007.
6. M.G. Fontana, N. D. Greene Corrosion Engineering, McGraw Hill Publications, New York, 3rd edition, 2005
7. G.A.Ozin and A.C. Arsenault - Nanochemistry: A Chemical approach to Nanomaterials, RSC Publishing, 2005..

e-sources:

1. https://chem.nju.edu.cn/_upload/article/files/b5/6f/01f0f2434d708df797208aea2613/83f2b441-65ee-44a6-ac47-ed21db462c5d.pdf.

MOOC / NPTEL:

2. https://nptel.ac.in/courses/113104082
3. https://nptel.ac.in/courses/1221060252
4. http://msrit.edu/study-material/chemistry.html

https://nptel.ac.in/courses/122/101/12210100

Program	B.Tech (All Programs)				Semester : I/II		
Course	Engineering Chemistry				Code	FE2SBS103L	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	-	25

Pre-requisites:

1) Basics of chemistry
2) Basics of Mathematics

Course Objectives:

After learning the course, the students should be able to:

1. Practical course focuses on developing hands-on laboratory skills in chemical analysis, including water quality assessment, instrumental analysis using techniques like pH meters and colorimeters, and the synthesis/characterization of materials. `
2. Practical experience in applying theoretical concepts to real-world problems.

Course Outcomes:

After learning the course, the students should be able to:

1) **Understand** the practical approaches and techniques required to effectively monitor water quality for various engineering applications and the techniques used for water softening and purification
2) **Apply** concepts related to water quality, acid-base chemistry, colorimetry, polymer science, and coal analysis.

Detail Syllabus

Experiment No.	Suggested List of Experiments
1	To determine the hardness of water by the EDTA method.
2	To measure the alkalinity of water.
3	To quantify the Dissolve Oxygen in the given water sample by Winkler's Method.
4	To determine the strength of strong acid using a pH meter.
5	To calculate the λmax & find the unknown concentration of the given sample using colorimeter.
6	Titration of a Strong acid with strong base using a conductometer.
7	Preparation of phenol-formaldehyde or urea-formaldehyde resin.
8	Proximate analysis of coal sample.
9	Find the relation between loss in weight of Aluminum strip in acidic medium and rate of corrosion.
10	To Study Chemsketch Software.

Reference Books:

1) Water and Wastewater Technology: Mark J. Hammer
2) Water Pollution Control: A Guide to the Use of Water Quality Management Principles" by David H. Paull
3) Instrumental Methods of Chemical Analysis, G. R. Chatwal& S. K. Anand, Himalaya Publishing House.
4) Polymer Science, V. R. Gowarikar, N. V. Viswanathan, jayadev Sreedhar, Wiley Eastern Limited.
5) F.W. Billmeyer Text Book of Polymer Science, John Wiley & Sons, 4th edition, 2007.
6) M.G. Fontana, N. D. Greene Corrosion Engineering, McGraw Hill Publications, New York, 3rd edition, 2005
7) B.R. Puri, L.R. Sharma & M.S. Pathania, - Principles of Physical Chemistry, S Nagin Chand & Co., 48th edition, 2019

Program	B.Tech (All Programs)				Semester : I/II		
Course	Elements of Electronics Engineering				Code	FE25ES101	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites :

1. Basics of Semiconductors
2. Basics of Logic Gates

Course Objectives:

This course aims at enabling students, to impart the knowledge of electronics components, devices, instruments, circuits and its applications in industry.

Course Outcomes:

After learning the course, the students should be able :

1. To explain active and passive electronic components along with its applications.
2. To classify semiconductor devices and choose applications in industry.
3. To recommend Operational amplifier and sensor for society related application.
4. To choose microprocessor or microcontroller for Embedded System.

Course Contents

Unit	Description	Duration [Hrs]
I	**Basics of Electronics:** Evolution of Electronics, Current trends in Electronics, Application of Electronics, Introduction to active and passive components, P-type Semiconductor, N-type Semiconductor. **P-N Junction Diode**: P-N Junction diode construction and its working in forward and reverse bias conditions, V-I characteristics of P-N Junction Diode, Diode as a switch, Half wave rectifier, Full wave and Bridge rectifier. **Special Purpose Diodes:** Light Emitting Diode (LED) and photo diode, along with V-I characteristics and their applications.	07
II	**Transistors and Technology** **Bipolar Junction Transistor:** Construction, types, Operation, region of operation, BJT as a switch, and CE amplifier. Configurations(CE) V-I Characteristics in CE mode, Current Gain Parameters **Metal Oxide Semiconductor Field Effect Transistors (MOSFET):** Construction, Types, Operation, V-I characteristics, Regions of operation, and MOSFET as a switch and amplifier.	07
III	**Integrated Circuits** **Operational amplifier:** Functional block diagram of operational amplifier, ideal operational amplifier, Op-amp as Inverting and Non-inverting amplifier, Applications of Op-Amp – Differentiator, Integrator. **Classification of sensors:** Active /Passive Sensors, Selection Criteria/Characteristics of sensors. Motion Sensors (LVDT), Temperature Sensors (RTD), Mechanical Sensors (Strain Gauge). **Electronic Instruments:** Block diagram of Digital Multimeter, Function Generator, Digital Storage Oscilloscope (DSO).	08
IV	**Logic Gates and Digital Circuits (08 Hours)** **Number System:** Introduction of Binary, Decimal, Octal, Hexadecimal, Conversion of Binary to Decimal, Decimal to Binary, Binary addition, Subtraction. (1's and 2's	08

	complement) **Logic Gates** - AND, OR, NOT, XOR, XNOR. Universal Gates – NAND, NOR. De-Morgan's theorem. **Logic circuits** - Half & Full adders, Boolean Expressions, SR, JK, T & D Flip Flops. Microprocessor (8085), Microcontroller (8051), (Block Diagram, PIN diagram and Explanation)	
	Total	**30**

Text Books:

1. Electronics Devices by Thomas.` L. Floyd, 9th Edition, Pearson
2. Modern Digital Electronics by R. P. Jain, 4th Edition, Tata McGraw Hill
3. Electronic Instrumentation by H. S. Kalsi, 3rd Edition, Tata McGraw Hill
4. Sensors and Transducers by D. Patrnabis, 2nd Edition, PHI
5. Mahumad Ali Mazadi, Janice Gillispie Mazadi, Rolin D McKinlay, "The 8051 Microcontroller & Embedded Systems (Using Assembly and C)", PHI, 2 nd Edition

Reference Books:

1. Digital Fundamentals by Thomas. L. Floyd, 11th Edition, Pearson
2. Sensors Handbook, by S. Soloman, 2nd Edition
3. CMOS Circuit Design, Layout & Simulation, by Baker, 2nd Edition, Wiley IEEE Press

e-sources:

1. https://nptel.ac.in/courses/117103063

2. https://nptel.ac.in/courses/117103064

3. https://archive.nptel.ac.in/courses/106/105/106105166/

Program	B.Tech (All Programs)				Semester : I/II		
Course	Elements of Electronics Engineering Laboratory				Code	FE25ES101L	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	-	25

Pre-requisites:

1) Basics of Electronics.
2) Basics of Logic Gates.

Course Objectives:

After learning the course, the students should be able to develop skills in handling the electronics components, devices, instruments and design of Electronics circuits.

Course Outcomes:

After learning the course, the students should be able to:

1) Able to demonstrate multimeter, Function generator, CRO and DSO for component testing and waveform analysis.
2) Able to make the use of logic gates in designing of logic circuits.

Course Contents

Experiment No.	Suggested List of Experiments
1	Study and identification of electronic components (resistors, capacitors, diodes, transistors, etc.) .
2	Measurement of resistance using multi meter and verification of Ohm's law.
3	Plotting V-I characteristics of a P-N junction diode in forward and reverse bias.
4	Design and analysis of Half-wave and Full-wave rectifier circuits.
5	Plotting input and output characteristics of BJT in CE configuration.
6	Implementation of BJT as a switch and amplifier.
7	Build inverting and non-inverting amplifier using op-amp.
8	Implementation of logic gates using discrete components and verification of truth tables.
9	Design and verification of Half Adder and Full Adder circuits.
10	Case Study on: 1. Automatic Washing Machine 2. Smart Home.

Reference Books:

1) Digital Fundamentals by Thomas. L. Floyd, 11th Edition, Pearson.
2) Electronic Instrumentation by H. S. Kalsi, 3rd Edition, Tata McGraw Hill.

Program	B.Tech (All Programs)				Semester : I/II		
Course	Elements of Electrical Engineering				Code	FE25ES102	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites :

1. Basics of electricity
2. Basics of magnetism

Course Objectives:

This course aims at enabling students,

1. To impart the fundamental knowledge of electrical engineering and give comprehensive idea about AC and DC circuit analysis, working principles and applications of basic electric machines.
2. To familiarize students with different smart energy meter and Arduino.

Course Outcomes:

After learning the course, the students should be able to:

1. Apply Kirchhoff's Laws, Superposition theorem and network simplification techniques for DC Circuit analysis in electrical network systems.
2. Analyse R-L, R-C ,R-L-C circuits and represent it using mathematical equations, waveforms and phasor diagrams.
3. Recognize the working principle of Electrical Machines and their practical applications.
4. Understand programming concepts and role of Microcontroller in embedded systems and develop interfacing of LED, LCD, LM35 sensors with Atmega328p based Arduino Board.

Course Contents

Unit	Description	Duration [Hrs]
I	**DC Circuits and Electromagnetism** Classification of network, simplifications of networks using star delta transformation, Kirchhoff's Laws and their applications for network solutions using loop analysis, Superposition theorem. Electromagnetism and Electromagnetic Induction.	08
II	**Single Phase AC Circuit** AC fundamentals, Circuit analysis of Pure resistance, pure inductance, Pure capacitance. Series R-L, R-C and R-L-C circuits (No derivation), Concept of impedance, Power factor, Phasor diagrams, Voltage, Current and power waveforms, voltage triangle, power triangle, impedance triangle, Concept of active, Reactive and apparent power.	07
III	**Electrical Machine Fundamentals** Single Phase Transformer: Construction, working principle, EMF equation, transformation ratio, rating, types, losses, regulation and efficiency at different loading conditions, (Numerical on Efficiency) Electrical Motors: a) D.C. Motors: Construction, working principle, types, voltage equation, characteristics and Applications. b) Construction, working principle of single phase Induction motor. Applications of split phase, capacitor start and capacitor run motors.	08
IV	**Introduction to Arduino & Peripheral Interface** Introduction to microcontroller, Introduction to Arduino IDE- features, Programming concepts: variables, functions, conditional statements, Concept of GPIO in	07

	Atmega328 based Arduino board, digital input and output Interfacing ofAtmega328 based Arduino Board with LED and LCD/ serial monitor ,serial communication using Arduino , interfacing of Atmega328 based Arduino board with temperature sensor (LM35)	
	Total	**30**

Text Books:

1. V.N.Mittal and Arvind Mittal,"Basic Electrical Engineering",2nd Edition.(Mc Graw- Hill),2010.
2. D.P.Kothari and Nagrath,"Basic Electrical Engineering",Tata McGrawHill,2010
3. B.L.Theraja , A K Theraja" ABC of Electrical Engineering",S Chand Publications,2012
4. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill Education, 2ndedition2019.
   HillBarret Steven F, "Arduino Microcontroller Processing for Everyone!", 3rd Ed, Morgan and Claypool Publishers

Reference Books:

1. S K Bhattacharya,"Electrical Machines",Mc Graw Hill Education,2nd edition,2008
2. B. L.Theraja and A. K. Theraja S.Chand & Co.Pvt. Ltd. New Delhi, "A text book of Electrical Technology Vol I" 2021
3. B. L.Theraja and A. K.Theraja S.Chand & Co.Pvt. Ltd. New Delhi, "A textbook of Electrical Technology Vol II",2020
4. K. Nagsarkar,M.S.Sukhija,"Basic Electrical Engineering",Oxford University Press,2nd edition 2018.
5. C. L. Wadhwa, "Basic Electrical Engineering", New Age International (P) Limited 5th edition 2024
6. Deshmukh Ajay,"Microcontrollers Theory and Applications",Tata McGraw.

E sources:

1. Basic Electrical Technology: https://nptel.ac.in/courses/108108076
2. FundamentalsofElectricalEngineering:https://onlinecourses.nptel.ac.in/noc22_ee113
3. https://www.schandpublishing.com/books/tech-professional/electrical-engineering-electronics/abc-electrical-engineering/9788121939096/
4. https://nptel.ac.in/courses/108105112

Program	B.Tech (All Programs)				Semester : I/II		
Course	Elements of Electrical Engineering Laboratory				Code	FE25ES102L	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	-	25

Pre-requisites:

1. Basics of electricity
2. Basics of magnetism

Course Objectives:

1. To impart Comprehensive understanding of the fundamentals of electrical circuits / machines.
2. To elaborate the concept of Arduino and its industrial applications.

Course Outcomes:

After learning the course, the students should be able to:

1) Analyse AC/ DC circuits by using different theorem.
2) Demonstrate different sensors with Arduino for performing experiments.

Course Contents

Experiment No.	Suggested List of Experiments
1	To verify Kirchhoff's laws experimentally
2	To verify the Superposition theorem experimentally.
3	Demonstrate the working of smart energy meter
4	Study of cut view section of single phase Induction motor.
5	To measure steady state response of series RL and RC circuits.
6	Interfacing of LED to blink after every 1 sec.
7	Interfacing of DC motor with Arduino.
8	Interfacing of temperature sensor (LM35) and show output on LCD screen.
9	Interfacing of LCD and display output on LCD/serial monitor.
10	Speed control of DC shunt motor by armature and field resistance control. Please refer: 1. http://www.vlab.co.in/broad-area-electrical-engineering 2. http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/Sadhya/experimentlist.html

Reference Books:

1) Deshmukh Ajay,"Microcontrollers Theory and Applications",Tata McGraw.
2) B. L.Theraja and A. K. Theraja S.Chand & Co.Pvt. Ltd. New Delhi, "A text book of Electrical Technology Vol I" 2021

Program :	B.Tech (All Programs)				Semester: I/II		
Course :	Engineering Graphics				Code:	FE25ES103	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites :

1. Basic Geometric Shapes.
2. Basic geometrical measurements (linear and angular), Construction.
3. Computer literacy.

Course Objectives:

1. To understand the basics of engineering drawing including projection principles, drawing instruments, and CAD software to create 2D and 3D drawings.
2. To interpret and create orthographic projections, engineering curves, development of lateral surfaces isometric views to visualize and represent objects.

Course Outcomes:

After learning the course, the students should be able to:

1. Accurately draw projection of points, lines using standard conventions and apply line types, dimensioning and acquaintance with CAD software.
2. Classify the engineering curves and draw the development of the lateral surface of solid.
3. Utilise the concept of orthographic projection to draw the orthographic views for engineering components.
4. Create an isometric view from given orthographic projections to perceive three-dimensional visualization of given object.

Course contents

Unit	Description	Duration [Hrs]
I	**Fundamentals, Projection of Point, Line and CAD software** **Introduction:** Introduction to drawing instruments and their uses, Line types, methods of dimensioning, Geometric constructions (lines, angles, polygons, circles), Theory of projection, Projection of points (First and Third angle Projection). Projections of line: Line perpendicular and parallel to HP and VP, line inclined to one and both the planes. (First Angle method only) **Computer Aided Drawing**: Introduction to CAD software and basic commands.	07
II	**Engineering Curves and Development of Lateral Surfaces** **Conic Sections:** Ellipse, Parabola, and Hyperbola by focus-directrix and rectangle method, Helix on Cylinder and Cone (one convolution), Cycloid (one revolution), Involute of circle, Archimedean spiral (one convolution) **Development of Lateral Surfaces** - Introduction, Method of development, Development of lateral surfaces of right solids: prisms, pyramids, cylinder, and cone (with cutting plane), Real life applications of development of surfaces.	08
III	**Orthographic Projections** Introduction to Orthographic Projection, Projection Planes, First and Third angle methods of projection, Hidden features, curved features, circular features, etc., Typical problems by first angle projection method, Sectional orthographic projection (only full sectional orthographic view).	08
IV	**Isometric Projection** Introduction of isometric view, Isometric scale, Isometric projection and view,	07

	Isometric lines, planes, Non-isometric lines and planes, Construction of isometric view from given orthographic views. Application:3D modelling, UI/UX, product visualization etc.	
	Total	**30**

Text Books:

1. Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charotar Publication, Anand, India
2. Johle, D. A., (2015), "Engineering Drawing with introduction to AutoCAD", Tata McGraw Hill, New Delhi
3. Venugopal, K., (2015), "Engineering and Graphics", New Age International, New Delhi
4. Rathnam, K., (2018), "A First Course in Engineering Drawing", Springer Nature Singapore Pte. Ltd., Singapore

Reference Books:

1. Madsen, D. P. and Madsen, D. A., (2016), "Engineering Drawing and design", Delmar Publishers Inc., USA
2. Bhatt, N. D., (2018), "Machine Drawing", Charotar Publishing House, Anand, India
3. Dhawan, R. K., (2020), "A Textbook of Engineering Drawing's", S. Chand, New Delhi

e-sources:

1. Engineering Drawing and Computer Graphics - https://nptel.ac.in/courses/112105294
2. Engineering Drawing - https://nptel.ac.in/courses/112103019
3. Engineering Graphics and Design https://onlinecourses.nptel.ac.in/noc24_me140/preview

Program	B.Tech (All Programs)				Semester : I/II		
Course	Engineering Graphics Laboratory				Code	FE25ES103L	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	-	25

Pre-requisites:

1. Knowledge of basic geometric shapes, measurements (linear and angular), construction.
2. Use of drawing instruments.
3. Basic computer literacy.

Course Objectives:

To introduce the drawing instruments, tools for an engineering drawing. To enhance digital drafting skills by using GUI of CAD software.

Course Outcomes:

After learning the course, the students should be able to:

1. Accurately draw projection of points, lines using standard conventions and apply line types, dimensioning, elaborate & discuss engineering curves and draw the development of the lateral surface of solid.
2. Apply the concept of orthographic projection to draw the orthographic views, construct an isometric view from given orthographic projections and make use of CAD software.

Course Contents

Sr. No.	Description
1	Sheet on geometric construction of circle, polygons and dimensioning.
2	Sheet on projection of lines (Two problems)
3	Sheet on engineering curves and development of lateral surface of a solid (Two problems each).
4	Sheet on Orthographic view and sectional view.
5	Sheet on Isometric view from given Orthographic views.
6	Draw orthographic/isometric views using CAD software.
	*Instructions- 1) Use A2 size drawing sheet recommended. 2) CAD software: Students should first learn GUI and basic commands before drafting.

Text Books:

1) Bhatt, N. D. and Panchal, V. M., (2016), “Engineering Drawing”, Charotar Publication, Anand, India
2) Johle, D. A., (2015), “Engineering Drawing with introduction to AutoCAD”, Tata McGraw Hill, New Delhi
3) Venugopal, K., (2015), “Engineering and Graphics”, New Age International, New Delhi
4) Rathnam, K., (2018), “A First Course in Engineering Drawing”, Springer Nature Singapore Pte. Ltd., Singapore

Reference Books:

1. Madsen, D. P. and Madsen, D. A., (2016), “Engineering Drawing and design”, Delmar Publishers Inc., USA
2. Bhatt, N. D., (2018), “Machine Drawing”, Charotar Publishing House, Anand, India
3. Dhawan, R. K., (2020), “A Textbook of Engineering Drawing’s”, S. Chand, New Delhi

e-sources:

1. Engineering Drawing and Computer Graphics - https://nptel.ac.in/courses/112105294
2. Engineering Drawing - https://nptel.ac.in/courses/112103019
3. Engineering Graphics and Design https://onlinecourses.nptel.ac.in/noc24_me140/preview

Program	B.Tech (All Programs)				Semester : I/II		
Course	Engineering Mechanics				Code	FE25ES104	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites:

1. Trigonometry, Derivative, Integration
2. Basic concepts of Physics, Newton's Laws

Course Objectives:

To Inculcate concepts and applications of force system, equilibrium, friction, motion of particle.

Course Outcomes:

After learning the course, the students should be able to:

1. To Illustrate Fundamental Engineering concepts for Resolution of System of Forces
2. To analyse concept of Equilibrium on Rigid Bodies
3. To apply Friction concepts to real-world scenarios involving Inclined Planes and Ladders
4. To Evaluate motion of the object in the real life situations and the systems using Work-Energy and Impulse-Momentum Principles.

Course Contents

Unit	Description	Duration [Hrs]
I	**Force systems** Fundamentals of Statics, Classification of Force Systems (Concurrent, Parallel and General Force Systems), Principle of Transmissibility, Composition and Resolution of Forces **Resultant of Force Systems**: Resultant of Coplanar Force System (Concurrent, Parallel and Non- Concurrent Non-Parallel Force System), Moment of Force about a Point, Couple, Varignon's Theorem and Its Significance **Centroid**: - Plane and Composite Section	07
II	**Equilibrium** Introduction, Free Body Diagram, Lami's Theorem, Conditions of Equilibrium for Concurrent, Parallel and General Force System **Equilibrium of Beams**: Different Types of Beam, Supports and Loads, Determination of Reactions at Supports for various Types of Loads for Simply supported and Overhanging Beams	07
III	**Friction and Trusses** **Friction:** Types, Laws of Friction, Concept of Angle of Friction, Angle of Repose, Cone of Friction. Equilibrium of Bodies kept on Horizontal and Inclined Plane **Application**s: Ladder Friction and Belt Friction **Trusses:** Types of Trusses, Assumptions, Method of Joint , Method of Section	07
IV	**Dynamics** **Kinematics:** Basic concepts, Rectilinear Motion: Motion with Uniform and Variable Acceleration, Gravitational Acceleration, Curvilinear Motion, Projectile Motion **Kinetics :** Introduction to Basic Concept of D' Alembert's Principle , Work Energy Principle, Impulse Momentum Principle , Impact and Collision	09
	Total	30

Text Books:

1. Engineering Mechanics, Ferdinand Singer, 3rd edition, Harper and Row

2. Engineering Mechanics (Statics and Dynamics) by Hibbeler R. C., Pearson Education
3. Engineering Mechanics, S. S. Bhavikatti, New Age International Pvt. Ltd.
4. Engineering Mechanics, R. K. Bansal and Sanjay Bansal, Jain Bros. Publishers, Delhi

Reference Books:

1. Engineering Mechanics, S Timoshenko and Young, Tata McGraw Hill Edu. Pvt. Ltd new delhi.
2. Engineering Mechanics - Statics and Dynamics, Meriam J. L. and Kraige L.G., John Wiley and Sons
3. Vector Mechanics for Engineers – Dynamics, Beer and Johnston, Tata McGraw Hill

e-sources:

1. https://nptel.ac.in/courses/112106286
2. https://www.coursera.org/learn/engineering-mechanics-statics.

Program	B.Tech (All Programs)				Semester : I/II		
Course	Engineering Mechanics Laboratory				Code	FE25ES104L	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	-	25

Pre-requisites:

1) Trigonometry, Derivative, Integration.
2) Basic concepts of Physics, Newton's Laws .

Course Objectives:

1) To apply theoretical concepts in conducting experiments on force system, equilibrium and friction.
2) To introduce the fundamental principles of engineering mechanics through hands-on experiments.

Course Outcomes:

After learning the course, the students should be able:-

1) To Demonstrate the principles of engineering mechanics through force systems, equilibrium and friction.
2) To Apply vector and graphical methods to solve numerical on concurrent and non-concurrent force systems.

Course Contents

Experiment No.	Suggested List of Experiments
1	Verification of Parallelogram Law of Forces.
2	Verification of Polygon Law of Forces.
3	Determination of support reaction of simply supported beam.
4	Determination of Coefficient of Friction.
5	Determination of Coefficient of Restitution.
6	Graphical Method of Equilibrium of Concurrent Force System.
7	Graphical Method of Equilibrium of Parallel Force System.
8	Graphical Method of Forces in the member of pin jointed truss.
9	Assignments on each unit.

Reference Books:

1) Engineering Mechanics, S Timoshenko and Young, Tata McGraw Hill Education Pvt. Ltd. New Delhi.
2) Vector Mechanics for Engineers – Statics, Beer and Johnston, Tata McGraw Hill.

Program	B.Tech (All Programs)			Semester : I			
Course	Fundamentals of Programming Languages			Code:		FE25ES105	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites :

1. Basics of Computer
2. Basics of Mathematics

Course Objectives:

To impart the knowledge of the C programming language that emphasizes problem-solving and empirical skills through the process of designing, implementing, and executing the C programs.

Course Outcomes:

After learning the course, the students should be able to:

1. **Illustrate** the basic elements of 'C' programming construct and **Demonstrate** the use of Operators & Expressions.
2. **Apply** appropriate branching construct and looping construct to solve the problem related to iteration.
3. To **make the use** of array and string manipulation techniques for efficient data processing across various applications.
4. **Elaborate** the concept of modular programming and develop applications based on this approach.

Course Contents

Unit	Description	Duration [Hrs]
I	**Introduction to Program Planning & C Programming -** Introduction computing: Introduction to program, History and importance of C, Algorithms, Flowcharts and pseudo codes. **Basics Concepts:** Structure of C Program, Editing, Compiling/Interpreting/Running Programs, Errors, Declarations. Variables, Data types, Declaration of variables, Character Set, C Tokens, Keywords and Identifiers, Constants. **Input Output function:** scanf() and printf() Functions. **Operators and Expressions:** Expressions Types of Operators, Precedence of Operators, Type Conversion.	08
II	**Decision Making and Branching:** Simple If Statement, if-else, else-if, switch statement, goto Statement. **Decision Making and Looping:** While Statement, Do-While, For Statement, Break and Continue.	07
III	**Arrays and String - Arrays:** One Dimensional Arrays, Declaration of One-dimensional Arrays, Initialization of One-dimensional Arrays, Two –dimensional Arrays, Declaration of Two-dimensional Arrays, Initialization of Two- dimensional Arrays. **Character Arrays and Strings:** Declaration and Initialization String Variables, Reading Strings from Terminal, Writing Strings to Screen, String Handling Functions.	08
IV	**Functions and Structure - Overview of functions:** Definition of Functions, Scope of Functions, Types of Functions. Built-in Functions: main(), printf(), scanf(), clrscr(), abs(int x), floor(), ceil(), sqrt(), pow(), exp(), log()**.** **User Defined Functions:** Need for User-defined Functions. **Elements of User defined functions:** Function Declaration, Function Definition, Function Calls. **Category of Functions:** Functions with argument and with return value, functions	07

	with argument and without return value, functions without argument and with return value, functions without argument and without return value, Nesting of Functions, Recursion Function. **Structures:** Introduction, Defining a Structure, Structure Declarations, Access Structure members. Structure Initialization, Array within structure, Array of Structure.	
	Total	**30**

Text Books:

1. R.G.Dromey, How to Solve it by Computer, 1ed, PHI, 2008.
2. B W Kernighan, D M Ritchie, The Programming language C, 2ed, PHI, 2004.
3. Programming in ANSIC, 8e –E. Balagurusamy.

Reference Books:

1. B. S. Gottfried, Programming with C (Schaum's Outline Series), 2nd ed. McGraw-Hill, 1996.
2. S. C. Kochan, Programming in C, Sams Publishing, 3rd ed. 2004.
3. B. W. Kernighan and D. M. Ritchie, The C Programming Language, 2 nd ed. UK: Prentice Hall, 1988..
4. W. Kernighan and B. Pike, The Practice of Programming, UK: Addison-Wesley, 1999Etc

e-sources:

e-Books:https://studylib.net/doc/25796931/programming-in-ansic--8e---balagurusamy

MOOC / NPTEL/YouTube Links:

https://onlinecourses.nptel.ac.in/noc22_cs40/preview

https://onlinecourses.nptel.ac.in/noc23_cs53/preview

Program	B.Tech (All Programs)				Semester : I		
Course	Fundamentals of Programming Language Laboratory				Code	FE25ES105L	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	-	25

Pre-requisites :.

1) Basics of Computer
2) Basics of Mathematics

Course Objectives:

1) To develop, compile, and debug C programs using an IDE or terminal.
2) To apply fundamental programming concepts such as:
   - Data types and variables
   - Operators and expressions
   - Control structures (if-else, switch-case loops) for various application.

Course Outcomes:

After learning the course, the students should be able to:

1. Identify a problem solution by using the 'C' programming language.
2. To decide and apply optimized solutions for various problems.

Course Contents

Experiment No.	Suggested List of Experiments
1	Write a C program for employee salary calculation given, Basic, H.R.A. 20 % of Basic and D.A. 150 % of Basic.
2	Write a C program to perform various operations on operators.
3	To accept a student's marks for five subjects, compute his/her result. A student is passing if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinguished. If aggregate is 60>= and <75 then the Grade of first division. If aggregate is 50>= and <60, then the grade is second division. If aggregate is 40>= and <50, then the grade is third division.
4	Write a C program that accepts an alphabet character and uses a switch-case to determine whether it is a vowel (a, e, i, o, u) or a consonant.
5	Write a C program to calculate the factorial of a given number.
6	Write a C program to find maximum and minimum elements in an array.
7	Write a C program to check whether a given string is Palindrome or not.
8	Write a C program to generate the first n terms of the Fibonacci sequence using function.
9	Write a program in C to find the GCD of two numbers using recursion.
10	Create a structure in a C program named Book to store book details like title, author, and price. Write a C program to input details for three books, find the most expensive and the lowest priced books, and display their information.

Reference Books:

1) Reema Thareja - Computer fundamentals and programming in C, Oxford University, 2nd edition, 2017.
2) Yashvant Kanetkar, Let us C ,15th ed, BPS Publication, 2016**.**

Program	B.Tech (All Programs)				Semester : I		
Course	Design Thinking & Innovation				Code	FE25VS101	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
2	1	2	-	50	-	-	50

Course Objectives.

1. To **Develop** team building capacity through problem statement solutions, prototype and testing with creative minds.
2. To **Enable** continuous learning by applying iterative and user centric innovations to real word challenges.

Course Outcomes :

After learning the course, the students should be able:

1. To Explain the five phases and the process of design thinking in identifying the problem solutions.
2. To Formulate the optimized and effective solutions for the problems related to society.
3. To make use of human centered design tools to focus on designing the solutions as per the user's need.
4. To Take Part in the team for critical thinking to share ideas, model making and testing.

Course Contents

Expt.No.	Experiments/Activities
[Week 1 & 2]	**Introduction to Design Thinking and the Innovation Process.** 1. **Lecture:** Overview of Design Thinking: The 5 Phases (Empathize, Define, Ideate, Prototype & Test) 2. **Key Concepts:** User-centered design, iterative process, empathy, problem solving 3. **Practical:** Selected case studies highlighting the process of Design Thinking. [Industrial Revolution, Vaccination, Evolution of Vehicle Industry, AMUL, Tata Nano, Mangalyaan, etc.
[Week 3 & 4]	**Empathy and User-Centric Design.** **1. Lecture:** Explain how to understand user's feelings and needs to help create better and more useful and effective solutions. 2. **Key Concepts:** Empathy, Problem-Solving Through Empathy, User Centric Design. 3. **Practical:** Field Visit in neighboring community to identify the social challenges, through interaction, discussion, various surveys etc
[Week 5 & 6]	**Problem Definition and Creative Ideation.** 1. **Lecture:** Finding the Right Problem and Creating Ideas: Problem Definition & Ideation. 2. **Practical:** One to one interaction with students on defining the real challenges identified during the field visit and to exploring the ideas for the effective solution. 3. **Key Concepts:** Clear Problem Statement, Visualization and Idea Generation with appropriate soft wares like TRIZ. 4. **Assignment:** Well defined problem statement and description of probable solutions with creative ideas.

[Week 5 & 6]	Problem Definition and Creative Ideation. 1. **Lecture:** Finding the Right Problem and Creating Ideas: Problem Definition & Ideation. 2. **Practical:** One to one interaction with students on defining the real challenges identified during the field visit and to exploring the ideas for the effective solution. 3. **Key Concepts:** Clear Problem Statement, Visualization and Idea Generation with appropriate soft wares like TRIZ. 4. **Assignment:** Well defined problem statement and description of probable solutions with creative ideas.
[Week 7 & 8]	**Prototyping.** 1. **Lecture:** This lecture explains how to conduct SWOT Analysis and preparing the Decision Matrix before final work. 2. **Practical:** Conduct SWOT Analysis of the Ideas and preparing the Decision Matrix 3. **Assignment:** Power Point Presentation on SWOT Analysis and Decision Matrix.
[Week 9 to 12]	**Testing, Communication and Collaboration.** 1. **Lecture:** Testing in Design Thinking: Try, Learn, and Improve. 2. **Key Concepts:** User testing, Honest Feedback, Improve the Design 3. **Assignment:** Write a report on entire design thinking process on identified real life challenge and effective feasible solution and present this report with Power Point presentation.

Reference Books:

1. Design Thinking: Understanding How Designers Think and Work by Nigel Cross
2. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation" by Tim Brown
3. Design Thinking for Visual Communication" by Ranjan Nayar and Jaidip Subedi
4. The Design of Everyday Things" by Don Norman• "Design Thinking: Creativity and Innovation" by S. Balaram
5. Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days" by Jake Knapp
6. Creative Confidence: Unleashing the Creative Potential Within Us All" by Tom Kelley and David Kelley (with a foreword by Ratan Tata)

e-Resources:

https://www.designdisciplin.com/the-story-of-design-thinking/
https://online.hbs.edu/blog/post/what-is-design-thinking

Suggested Case Studies:

1. Redesigning the Coffee Cup Lid
2. Design Thinking in Healthcare: Redesigning a patient's waiting room experience.
3. Design Thinking in Product Development: The evolution of the smartphone.
4. Design Thinking in Social Innovation: Improving access to clean drinking water in rural areas.
5. Tata Nano: The People's Car: Explore how Tata Motors aimed to revolutionize the automobile industry by creating an affordable and compact car for the masses, known as the Tata Nano.
6. Aravind Eye Care System: Investigate how Aravind Eye Care System in India used innovative desig thinking to provide high-quality, affordable eye care services to a large population, often in remote areas.
7. Project Shakti by Hindustan Unilever: Analyze how Hindustan Unilever's Project Shakti empowered rural women in India by turning them into micro-entrepreneurs, distributing Unilever products in their communities.
8. Aadhaar: India's Unique Identification Program: Explore how the Aadhaar program used biometric data and

design thinking to provide millions of Indians with a unique identification system, enhancing access to government services and benefits.

9. Ola Cabs: Transforming Transportation in India: Learn how Ola, an Indian ride-sharing platform, disrupted the traditional taxi industry by applying innovative design thinking to its services and business model.
10. Swiggy: Redefining Food Delivery: Investigate how Swiggy, an Indian food delivery platform, leveraged design thinking to enhance the food delivery experience for customers and partner restaurants.
11. Lifebuoy: Promoting Hygiene in Rural India: Explore how Lifebuoy, a brand under Unilever, used design thinking to develop innovative marketing campaigns and products to promote handwashing and hygiene in rural India.
12. Amul: The White Revolution in India: Analyze how the Amul cooperative transformed the dairy industry in India through a unique business model, design thinking, and innovative marketing strategies.
13. Flipkart: E-commerce Success Story: Study how Flipkart, one of India's leading e-commerce platforms, employed design thinking to grow its business and offer a wide range of products and services.
14. ISRO's Mars Orbiter Mission: Learn about how the Indian Space Research Organization (ISRO) Successfully launched the Mars Orbiter Mission (Mangalyaan) on a limited budget, displaying innovation and design thinking in space exploration.
15. Designing Google's Self-Driving Car: Explore how Google used design thinking to develop autonomous vehicles that redefine transportation.
16. Dyson: Revolutionizing Vacuum Cleaners and Hand Dryers: Investigate how Dyson's innovative design thinking has transformed household appliances.

Guidelines for Term work:

Work Report.	Report presentation.	Assignments.	Total.
20 Marks.	20 Marks.	10 Marks.	**50 Marks.**

Program	B. Tech (All Programs)				Semester : I/II		
Course	Workshop				Code	FE25VS102	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
2	1	2	-	50	-	-	50

Prerequisite Courses:

- Basic Physics Concepts of electricity, magnetism, current, voltage, resistance, power, and mechanical forces.
- Basic measurements and understanding of technical drawing line, angle, area, volume, unit's conversion.
- Electric Circuits (Introductory Level), Basic knowledge of Ohm's law, series and parallel circuits, and circuit components (resistors, capacitors, diodes).
- Computer literacy, Computer Basics.

Course Objectives:

1. To introduce and familiarize with basic joints of woods, metals and various manufacturing processes.
2. To develop skills in electrical wiring, electronic circuits and compute assembly with software installation..

Course Outcomes: After completing this course, students will be able To_

1. Develop the skills in carpentry and sheet metals making.
2. Classify welding's and its joints with the introduction of tools use in welding operations.
3. Make the use of multi-meter in Electronic circuits for testing of electronics components and introduce electrical wiring systems
4. Illustrate on the computer hardware, components types of networks and operating systems.

Course Contents

Module	Description	Duration Hours
I	**Basic of Mechanical and Manufacturing Engineering** Introduction of carpentry and carpentry tools and operations. Sheet metal work introduction, metals used, tools and joining methods. Welding introduction, Types of welding's, types of welding joints, tools use in welding operation especially Electric arc welding. Introduction of advance manufacturing process i.e. injection molding and 3D printing.	05
II	**Basic of Electrical and Electronic Circuits** Introduction to Electrical Wiring Systems, Types of wiring (cleat, casing-capping, conduit, etc.), Wiring tools, wires, cables, switches, and fuses. Safety Precautions in Electrical Wiring, ISI standards, Shock prevention and earthing systems. Basic Electronic Components, Resistors, capacitors, inductors, diodes, transistors: symbols, types, ratings, Identification, polarity, and testing with multimeter. Electronic Circuit Design, understanding basic analog/digital circuits, Reading and drawing circuit diagrams	05

III	**Introduction to Computer Hardware and Software** 1. Overview of computer hardware components: CPU, RAM, motherboard, HDD/SSD, SMPS, BIOS, Input/output devices: keyboard, mouse, monitor, printers, etc., Internal components: chipset, processor types, buses, ports. 2. Types of Networks: LAN, MAN, WAN – characteristics and differences, Introduction to Networking Devices: Router, Switch, Hub, Modem, Access Point. Wired vs. Wireless communication standards. 3. Introduction to operating systems: Windows vs. Linux, Understanding system software vs. application software, Driver installation and system compatibility.	**05**
	Total	**15**

Practical Content

Experiment No.	**Experiments/Activities**
Part A	**Perform minimum two practical from each trades*** **Basic of Mechanical and Manufacturing Engineering: (Any two)** **1. Carpentry:** i. Demonstration of Cross half lap and T joints. ii. Demonstration of power tools. **2. Sheet metal & soldering:** iii. Preparation of complete funnel using sheet metal and practice of soldering. iv. Preparation of a square box using sheet metal and practice of soldering. **3. Welding:** v. Preparation of Corner Joint using arc welding process. vi. Preparation of "T" joint using arc welding process. **4. Manufacturing processes:** Demonstration of manufacturing a simple model using injection molding process or 3D printing process.
	Basic of Electrical and Electronic Circuits: **1. Electrical Wiring** i. Fundamentals of Electric wiring and practice of Series wiring. ii. Practice of stair case wiring and connecting a fluorescent Tube. **2. Electronic Circuit** i. The identification & Testing of Electronic component like R, L, C, Diodes, Transistors. Study of CRO, function generator, regulated power supply etc.,
	Introduction to Computer Hardware and Software **1. PC Hardware** i. Identify the peripherals of a computer, components in a CPU and its functions ii. disassemble and assemble the PC back to working condition **2. Computer Network** i. Setting up a personal Wi-Fi network using a wireless router, Connecting and configuring a Wired LAN using Ethernet cables and switches, Assigning IP addresses manually and through DHCP, Network sharing: folders, printers, and internet access **3. System Software and Application Software** i. Install MS windows, Drivers, application software on the personal computer. ii. Install Linux on the personal computer

Part B	**GROUP ACTIVITY** Students must prepare a Prototype / Working model / Assembly using the knowledge gained from the above trades.

Text Books:

1. Elements of Workshop Technology, Vol.I and II, Hajra Chaudhary, Media promoters and
2. Publishers Pvt. Ltd., 2013
3. Kannaiah P. & Narayana K. C., "Manual on Workshop Practice", Scitech Publications, Chennai, 1999.
4. Nasib Singh Gill, "Handbook of Computer Fundamentals", 2016, Khanna Publishing House
5. Venkatachalapathy, V. S., "First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.

Reference Books:

1. Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice – Theory, Practice and Work Book", Suma Publications, Chennai, 2005.
2. Noam Nisan, Shimon Schocken , "The Elements of Computing Systems", second edition: Building a Modern Computer from First Principles, MIT Press, 2021.

E-resources:

1. https://dsceme.files.wordpress.com/2016/08/workshop-practice-manual-2016-17-1.pdf
2. https://www.protosystech.com/rapid-prototyping.htm
3. https://www.arduino.cc/en/Tutorial/Foundations
4. https://www.tutorialspoint.com/arduino/
5. https://data-flair.training/blogs/basics-of-computer-hardware-and-software/
6. https://www.instructables.com/Computer-Assembly/

Program	B. Tech (All Programs)				Semester : I		
Course	Communication Skills in Corporate World				Code	FE25AE101	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
2	2	-	-	50	-	-	50

Prerequisite Courses:
12th English - Basic knowledge of English Language is essential.

Course Objectives:

1. To develop basic LSRW skills for effective communication.
2. To train the students in acquiring interpersonal communication skills by focusing on language skill acquisition techniques and error feedback.

Course Outcomes:

1. To **develop** effective communication and listening skills in societal and professional life.
2. To **make use of** the Phonetic skills necessary to be a competent Interpersonal communicator.
3. To **apply** effective reading strategies to comprehend and analyse literary and non-literary texts.
4. To **develop** writing skills to comprehend and convey the message for effective process of communication

Course Content

Unit	Description	Duration Hours
I	**Introduction to Communication & Listening Skills:** Introduction, Meaning, Process, Characteristics of Communication, Principles of Communication, Barriers to communication & Remedies **Activities**: Communication Case Studies Importance of Listening Skills, Types of Listening: Active / Selective / Passive Listening, Barriers to Listening, Tips to Improve Listening Skills. **Activities**: Listen to the audio and answer the questions (IELTS), Listen to the audio and Summarize (Ted Talks)	08
II	**Speaking Skills:** Sound System of English -IPA, Word Stress, Intonation, and Language Functions (Requesting, Apologizing, Complaining, Complementing, Thanking, etc.) Art of Asking and Responding to Questions, Impromptu Speaking, Art of Presentations, Role Play, Delivering Speech, Vote of Thanks, Group Discussion. **Activities**: IPA Pronunciation and Phonetics Exercises, Preparing and Participating Group Discussions / Elevator Speeches, PPT Presentation with Q&A Session	08
III	**Reading Skills:** Importance of Reading, Techniques of Reading, Reading Comprehension: Factual / Expository / Informative texts, Case Studies, Reading Research Articles. Lesson: 1 The Story of An Hour by Kate Chopin, Lesson: 2 The Classical Student by Anton Chekhov. **Activities:** Literary Reading and Discussion, IELTS based Comprehension Skills.	08
IV	**Writing Skills :** Grammar & Vocabulary: Common Errors in English, Modal Auxiliaries, and Words often Confused. Elements of Effective Writing, Writing Styles (Formal & Informal), Paragraph Writing. Professional Writing: Job Application, Resume Writing, Leave Application, Enquiry and Complaint Letter, Report Writing. **Activities**: Activities on Writing Skills	06
	Total	30

Text Books:

1. Sunita Mishra, C. Muralikrishna, Communication Skills for Engineers, Pearson Education; 2011
2. Adair, John. Effective Communication, London: Pan Macmillan Ltd. 2003.

Reference Books:

1. Michael Swan, Practical English Usage, Oxford, 3rd Edition; 2005
2. David F. Beer, Writing and Speaking in the Technology Professions: A Practical Guide, Wiley-IEEE Press; 2nd Edition, 2003
3. Clifford Whitcomb, Leslie E. Whitcomb, Effective Interpersonal and Team Communication Skills for Engineers, Wiley–Blackwell; Nil edition, 2013.
4. Krishnaswami, N and Sriraman, T, Creative English for Communication, Macmillan.

Guidelines for Term Work Evaluation

Mandatory-

1. Activity Reports (Any Six Activities Conducted in the classroom)
2. Group Project

Optional-

1. Research paper / Poem/ Blog Publication
2. Attending Workshops/ Seminars on Communication Skills

Certificate course (MOOC) in communication skills or soft skills

Program	B.Tech (All Programs)				Semester : I		
Course	Life Skills - I				Code:	FE25CC101	
Credits:	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	-	25

Course Objectives:

1. To provide the key skills for the holistic development.
2. To cultivate essential life skills to foster personal development, resilience, and achievement throughout their academic journey and future endeavours.

Course Outcomes:

1. To **analyse** ethical, professional and real-life problems using critical and creative thinking tools.
2. To **apply** decision-making techniques and problem-solving frameworks to generate logical solutions.
3. To **demonstrate** effective communication skills through listening, speaking, and interpersonal activities.
4. To **adapt** team-building skills to address challenges, resolve conflicts, and enhance interpersonal relationships

Experiment No.	List of Experiments
Week 1	**Critical Thinking- Case Study Analysis** – Students analyse an engineering ethics case (e.g., data privacy, AI bias) and suggest pros and cons of different actions.
Week 2	**Assumption Challenge** – Given a controversial statement (e.g., "Technology always improves life"), students list assumptions and counter them with evidence.
Week 3	**Creative Thinking- Innovation Brainstorming (Mind Mapping)** – Students create a mind map to solve a real-world problem (e.g., reduce campus plastic use).
Week 4	**Reverse Engineering Challenge** – Given a finished product (e.g., bicycle, app UI), students work backward to identify components and purpose.
Week 5	**Decision Making- Decision Tree Exercise** – Students build a decision tree for a personal choice (e.g., job vs higher studies).
Week 6	**Scenario-Based Simulation** – Students are given time-critical business or crisis situations and must choose actions with reasoning.
Week 7	**Problem Solving- Five Whys Technique** – Students analyse a recurring problem in student life (e.g., procrastination) using root cause analysis.
Week 8	**Team-Based Challenge** – E.g., builds the tallest tower using only paper and tape; evaluate teamwork and problem-solving.
Week 9	**Effective Communication- Elevator Pitch** – Students prepare and deliver a 60-second self-introduction as if meeting an industry leader.
Week 10	**Listening & Paraphrasing** – Pairs take turns sharing stories; the listener must paraphrase accurately and empathetically.
Week 11	**Interpersonal Relationships- Peer Appreciation Circle** – In groups, students appreciate one strength of each peer; helps team bonding.
Week 12	**Conflict Resolution Role-Play** – Teams act out workplace or team conflicts and practice resolution strategies.

Guidelines for Term Work Evaluation: 1. Experiment Book (All experiments to be recorded) Peer Evaluation report

Course Syllabus

First Year B. Tech.

Semester II

Program	B.Tech (All Programs)				Semester : II		
Course	Differential Equations and Applied Calculus				Code	FE25BS104	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites :

1. Basic calculus (derivatives and integrals).
2. Single variable integration and standard techniques.

Course Objectives:

This course aims to enable students,

1. To familiarizewith advanced techniques of integration, multiple integrals and their applications in mathematical modelling of physical systems using differential equation.
2. To equipwith the concepts and tools to understand advanced-level mathematics and its applications, this would enhance their thinking power, useful in their disciplines.

Course Outcomes:

After learning the course, the students should be able to:

1. **Formulate** the ordinary differential equations to orthogonal trajectories, electrical circuits and one-dimensional heat flow.
2. **Solve** higher order linear differential equations with constant coefficient and to evaluate the current for electrical circuits.
3. **Compute** definite improper integrals like Gamma, Beta function, Differentiation Under Integral Sign.
4. **Apply** multiple integration techniques to analyze area and volume.

Course Contents

Unit	Description	Duration [Hrs]
I	**Ordinary Differential Equations and Applications** Exact differential equation, Equations reducible to exact differential equation. **Applications**: Orthogonal trajectories, Kirchhoff's law of electrical circuits (L-R and R-C circuits), One-dimensional conduction of heat (steady state)., Rectilinear Motion.	07
II	**Linear Differential Equations with constant coefficient** Linear differential equation of nth order with constant coefficients, General method, Shortcut methods, Method of variation of parameters, Application of linear differential equations in engineering viz. mass spring system, electrical circuits etc.	08
III	**Integral Calculus** Gamma functions, Properties of Gamma Functions, Transformation of Gamma functions, Beta functions, Properties of Beta functions, Relation between Gamma and Beta Functions, Differentiation Under Integral Sign (DUIS).	07
IV	**Multiple Integrals and Applications** Introduction of Double integration, Properties, Direct Evaluation, Double integration when limits are not given, Transformation of Cartesian into Polar form, Triple integration, Applications to find Area and Volume.	08
	Total	30

Text Books:

1. Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill)
2. Advanced Engineering Mathematics by Peter V. O'Neil (Thomson Learning)

Reference Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.)
2. Elementary Linear Algebra. by Ron Larson and David C. Falvo (Houghton Mifflin Harcourt Publishing Company).
3. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication)
4. Linear Algebra and Its Applications by Gilbert Strang, WELLESLEY -CAMBRIDGE PRESS Box 812060 Wellesley MA 02482.
5. Thomas' Calculus by George B. Thomas (Addison-Wesley, Pearson).
6. Elements of Partial Differential Equations by Ian N. Senddon, Dover Publications, Inc. Mineola, New York.

e-sources:

A NPTEL course on Engineering Mathematics I by Prof. Jitendra Kumar Link:
https://archive.nptel.ac.in/courses/111/105/111105121/

Program	B.Tech (All Programs)				Semester : II		
Course	Differential Equations and Applied Calculus Laboratory				Code	FE25BS104L	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	-	25

Pre-requisites:.

1) Elementary Mathematics
2) Elementary Calculus

Course Objectives:

This course aims to enable students;

1) To apply MATLAB to solve engineering problems related to linear differential equations and Integration
2) To equip with advanced techniques to evaluate multiple integrals

Course Outcomes:

After learning the course, the students should be able to:

1) Solve problems related to the concepts of ordinary differential equations and multiple integrals
2) Use MATLAB/Open source software to solve problems such as linear differential equations and Integration

Course Contents

Experiment No.	Suggested List of Experiments
1	Exact differential equation, Equations reducible to exact differential equation,
2	Orthogonal trajectories, Kirchhoff's Law of Electrical Circuits
3	Rectilinear Motion and One-dimensional conduction of Heat.
4	Linear differential equations of nth order with constant coefficients and methods..
5	Method of variation of parameters and its application.
6	Gamma functions, Beta functions, and DUIS
7	Plotting the solution of linear differential equations using MATLAB
8	Integration using MATLAB
9	Double & Triple integration to find Area and volume
10	Double and triple Integration using MATLAB

Reference Books:

1) Introduction to MATLAB for Engineers and Scientists by Sandeep Nagar, Springer.
2) MATLAB – An Introduction with Applications by Amos Gilat, JOHN WILEY & SONS, INC.

Program	B.Tech (All Programs)			Semester : II			
Course	Programming and Problem Solving			Code		FE25PC101	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	UT	FA	SA	Total
2	2	-	-	25	25	50	100

Pre-requisites :

1. Fundamental of Programming Language
2. Basic Mathematics

Course Objectives:

This course aims at enabling students,

1. To build a strong foundation in Python programming to develop efficient and logical solutions to the computational problems.
2. To develop proficiency in structured and object-oriented programming using Python and fundamental data analysis techniques for solving real-world problems.

Course Outcomes:

After learning the course, the students should be able to:

1. **Illustrate** the core programming concepts including variables, data types, operators, and expressions.
2. **Make** the use of conditional statements and loop constructs in the development of software for various applications.
3. **List out** the functions in python programming and functional programming tools to solve the computational problems.
4. **Elaborate** classes and objects to **implement** object-oriented programming features and **demonstrate** Python's file handling operations.

Course Contents

Unit	Description	Duration [Hrs]
I	**Basics of Python Programming** **Introductions:** History and Future of Python,Features, Writing and executing Python program. **Variables and Expressions:** Variables and identifiers, Literal constants. **Advance Data Types :** Tuples, Lists, Sets and Dictionary. **Operators and expressions:** Expressions in Python.	07
II	**Decision Control Statements** **Decision Control Statements:** Selection/conditional branching, if, if-else, nested if, if-elif-else statements. **Basic loop Structures/Iterative:** while loop, for loop, selecting appropriate loop. Nested loops **Loop Manipulation Statements:** The break, continue, pass, else statement used with loops.	08
III	**Functions and String** Overview of functions, Types of Functions, User Defined functions: Definition of Functions, Scope of Functions, Return Statement **Built In Functions:** lambda(), reduce(), map(), Mathematical Functions, Iterables and Sequences. **String and Operations:** concatenation, appending, multiplication and slicing. Strings are immutable, strings formatting operator, built in string methods and functions. **String Handling Functions:** Case Conversion, Trimming and Padding, Search & Replace, Testing (Returns Boolean), Splitting and Joining, Formatting.	07
IV	**File Handling and Object Oriented Programming** **Files:** Introduction, File path, Types of files, Opening and Closing files, Reading and Writing files. File Positions, Renaming and deleting files.	08

	Directory Methods: Common Directory Methods in windows, Common Directory Methods in Unix **Object Oriented Programming Basics:** Features of OOPs, methods and message passing, class method,Static Method and self-argument, __init__() method, class variables and object variables, __del__() method, Access Specifier, Garbage collection. **Four Main Pillars of OOPs:** inheritance, polymorphism, data abstraction and encapsulation.	
	Total	**30**

Text Books:

1. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press, ISBN 13: 978-0-19-948017-6
2. R. Nageswara Rao, "Core Python Programming", Dreamtech Press.

Reference Books:

1. R. G. Dromey, "How to Solve it by Computer", Pearson Education India; 1st edition, ISBN10: 8131705625, ISBN-13: 978-8131705629 Maureen Spankle, "Problem Solving and Programming Concepts", Pearson; 9th edition, ISBN-10: 9780132492645, ISBN-13: 978-0132492645
2. Romano Fabrizio, "Learning Python", Packt Publishing Limited, ISBN: 9781783551712,1783551712
3. Paul Barry, "Head First Python- A Brain Friendly Guide", SPD O'Reilly, 2nd Edition, ISBN:978-93-5213-482-3
4. Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education, ISBN-10:9789387572942, ISBN-13: 978-9387572942, ASIN: 9387572943

e-sources:

eBook - https://github.com/jakevdp/PythonDataScienceHandbook

NPTEL – Python for Data Science

Program	B.Tech (All Programs)				Semester: II		
Course	Programming and Problem Solving Laboratory				Code	FE25PC102L	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	-	25

Pre-requisites :

1) Python Programming Language
2) Basic Math

Course Objectives:

After learning the course, the students should be able to:

1) To develop the problem-solving skills by using python programming and data structures.
2) To apply programming constructs and techniques for data processing, analysis, and visualization to solve real-world problems.

Course Outcomes:

After learning the course, the students should be able to:

1) **Apply** Python programming concepts such as expressions, control statements, and data structures to **solve computational problems**.

2) To recommend object-oriented principles and data analysis techniques to **analyse and visualize real-world datasets**.

Course Contents

Experiment No.	List of Experiments
1	Program to perform all operation (addition, multiplication, subtraction, division, modules) and expression.
2	Program to demonstrate operation on lists, tuple, set and dictionary.
3	Write a Python program that allows a user to enter the names and marks of multiple students. 1. Store student records in a dictionary where the key is the student name and the value is their mark. 2. Print each student's mark and calculate the class average. 3. Use expressions to assign a grade based on their marks.
4	A. Program to demonstrate slice operation on string objects. **B.** Write a python program that accepts a string from user and perform following string operations- i. Calculate length of string ii. String reversal iii. Equality check of two strings iii. Check palindrome ii. Check substring
5	A. Write a Python function that checks whether a given string is a palindrome. Ignore spaces, punctuation, and case sensitivity. **B.** Write a Python function that counts the frequency of each word in a given sentence and returns the result as a dictionary.
6	Create class EMPLOYEE for storing details (Name, Designation, gender, Date of Joining and Salary). Define function members to compute a) Total number of employees in an organization b) Count of male and female employees c) Employee with salary more than 10,000 d) Employee with designation “Asst Manager”.
7	Program to illustrate the use of __int__() method Program to illustrate the use of __del__() method.
8	**Student Grade Management System** **Level:** Beginner **Topics Covered:** Lists, dictionaries, file handling, functions **Description:**

	Create a system that stores student names, marks in various subjects, and calculates total marks, average, and grades. Include options to add, update, delete, and search records.
9	**COVID-19 Data Analysis Dashboard** **Level:** Intermediate–Advanced **Topics Covered:** Pandas, Matplotlib, Seaborn, NumPy, data visualization **Description:** Analyze and visualize real or sample COVID-19 data. Show daily case trends, top affected countries, recovery rates, etc., using charts.
10	**Data Visualization Project: Titanic Dataset** **Level:** Intermediate–Advanced **Topics Covered:** Pandas, Seaborn, Matplotlib **Description:** Load the Titanic dataset and perform exploratory data analysis (EDA). Visualize survival rate by gender, class, age group, etc.

Reference Books:

1) "Python Programming: An Introduction to Computer Science" by John Zelle, Franklin Beedle & Associates.
2) "Think Python: How to Think Like a Computer Scientist" by Allen B. Downey, O'Reilly Media.
3) "Core Python Programming" by Wesley J. Chun, Pearson Education.

Dataset : Kaggle : 1) https://www.kaggle.com/code/georgyzubkov/covid-19-exploratory-data-analysis/input
2) https://www.kaggle.com/code/alexisbcook/titanic-tutorial/input

Program	B. Tech (All Programs)				Semester : II		
Course	Indian Knowledge System				Code	FE25IK101	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
2	2	-	-	50	-	-	50

Course Objectives:

To introduce students to the rich and diverse Indian Knowledge Systems and encourage them to explore these traditions.

Course Outcomes:

1. To **classify** the ancient Indian knowledge systems and their foundational literatures.
2. To **classify** the ancient Indian knowledge systems and their foundational literatures.
3. To **illustrate** the key contributions of ancient India in mathematics, astronomy and Architecture.
4. To **interpret** the knowledge of ancient Indian governance, administrative frameworks, educational institutions, and health systems.
5. To **analyse** the cross-cultural transmission and enduring contributions of ancient Indian knowledge systems.

Course Content

Module	Description	Duration Hours
1	**Sources and Transmission of Ancient Knowledge:** **Introduction & importance of IKS**- Various IKS Systems of Shashtra – Foundational Literature of Bharatvarsha, What is Shashtra? - Importance of Shashtra Classification of Shashtra – Vaidic & Avaidic (with examples of imp. Literature. **Vedic Period and Philosophical Systems**- Vedas, Upanishads, and the six schools of Indian Philosophy (Nyaya, Vaisheshika, Sankhya, Yoga, Purva Mimamsa, Uttara Mimamsa/Vedanta). **Indian Languages and Literature:** Sanskrit and other Indian languages, their evolution, grammar (Panini), and important literary works (Vedas, Puranas, Mahabharata, Ramayana, Arthashastra, Yoga Shastra).	08
2	**Mathematics, Astronomical & Architectural Contributions:** **Mathematics**-Mathematics in Indus Valley Civilization, Aryabhata and His Contributions, Brahmagupta and His Contributions, Bhaskaracharya and His Contributions, Geometry in Vedic Rituals, Mathematics in Ancient Indian Architecture, Ancient Indian Mathematics in Trade and Commerce, Innovations in Number Systems and Zero **Astronomy**: Jyotisha- Astronomical Mathematics, Aryabhata: The Pioneer of Indian Astronomy, Indian Lunar and Solar Calendars, Panchang System, Dating System, Astronomy in Indian Architecture. **Ancient Indian Architecture**-Vastu Shastra, Architecture & Pancha Mahabhutas, Types of Architecture- Religious, Civil, Urban Planning	08

3	**Governance, Public Administration & Health Science:** **Governance-** Concept of Dharma in Governance, Rajya (State) and Raja (Ruler) , Decentralized Administration (Chola and Maurya periods) Public Administration and Arthashastra- Kautilya's Arthashastra (4th century BCE), **Structure of government:** King, council of ministers (*Mantriparishad*), departments, Revenue and taxation system (*samāharta*, *sannidhāta*), City administration: Trade regulation, market inspection, sanitation, Espionage system: Use of spies to maintain internal stability and foreign intelligence, Welfare and infrastructure: Irrigation, roads, granaries, and disaster relief. **Education and Knowledge Systems-** Gurukul System, Centers of Higher Learning: Nalanda, Takshashila, Vikramashila **Health-** Health as balance (*samyavastha*) of mind, body, and spirit, Ayurveda: The Science of Life, *Charaka Samhita* – Internal medicine (*Kayachikitsa*), *Sushruta Samhita* – Surgery (*Shalya Tantra*), *Ashtanga Hridaya* – General Ayurvedic principles	**08**
4	**Ancient Indian Knowledge Systems: Global Influence:** Influence on Mathematics, Influence on Astronomy, Influence on Medicine and Wellness, Influence on Philosophy and Spirituality, Influence on Language, Influence on Art and Culture, Influence on Trade and Governance, Influence on Warfare and Weaponry	**06**
	Total	**30**

Reference Books:

1. Mahadevan, B., Introduction to Indian Knowledge Systems: Concepts and Applications, PHI Learning, 2022.
2. Radhakrishnan, S., Indian Philosophy, Vols. 1 & 2, Oxford University Press, 1923.
3. Aryabhata, The Aryabhatiya of Aryabhat, Translated by Walter Eugene Clark, University of Chicago Press, 1930.
4. Rao, S. Balachandra, A History of Indian Astronomy, National Book Trust, 2008.
5. Kautilya, Arthashastra, Translated by R. Shamasastry, Penguin Books, 1991.
6. Kapoor, Kapil, Essence of Indian Knowledge Tradition, Indian Institute of Advanced Study, 2005.

Guidelines for Term Work Evaluation

Mandatory-

1. Research Oriented Assignment (On Every Module)
2. Educational Visit Report

Optional-

1. Research paper Publication
2. Attending Workshops/ Seminars on IKS
3. Innovative Project or Poster Presentation on IKS

Program	B.Tech (All Programs)				Semester : II		
Course	Life Skills - II				Code	FE25CC102	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	25	-	-	25

Course Objectives:

1. To provide the key skills for the holistic development.
2. To cultivate essential life skills to foster personal development, resilience, and achievement throughout their academic journey and future endeavours.

Course Outcomes:

1. To **analyse** SWOC of an individual.
2. To e**valuate** emotional responses and apply strategies to manage anger, stress, and difficult emotions constructively.
3. To **demonstrate** empathy and perspective taking through reflective activities and role-based exercises.
4. To **adapt** team-building skills to address challenges, resolve conflicts, and enhance interpersonal relationships

Course Contents

Exp. No	List of Experiments
Week 1	Self-Awareness-**SWOC Analysis** – Each student completes a personal SWOT and writes an action plan to improve.
Week 2	**Values Ranking Exercise** – From a list of 20 values, students select and rank their top 5, then reflect in groups.
Week 3	Empathy-**Empathy Mapping** – Students map thoughts, feelings, and pain points of someone facing a challenge (e.g., a differently-abled commuter).
Week 4	**Role Reversal Dialogue** – Students take opposite roles in a heated issue and explain the other side's view.
Week 5	Coping with Emotions-**Anger Journal** – For 3 days, students record situations where they felt anger and their responses, then reflect on alternatives.
Week 6	**Emotion Cards Game** – Students randomly draw cards with emotional situations and discuss constructive responses.
Week 7	Coping with Stress-**Guided Meditation or Breathing Session** – A 10-minute relaxation session followed by feedback.
Week 8	**Stress Diary** – For one week, students track stressful events, triggers, responses, and identify stress patterns.
Week 9	**Digital Detox Challenge (48 hours)** – Students log off social media or gaming and reflect on the experience.
Week 10	Johari Window Exercise-Students fill out a Johari Window grid with self-selected adjectives and compare it with peer feedback to explore known and unknown traits.
Week 11	"I" Statements Role-Play-Students practice replacing blameful or aggressive statements with assertive "I feel…" messages in emotionally charged situations.
Week 12	Trust Building Game (Blindfold Walk) -In pairs, one student is blindfolded and guided verbally by a partner through an obstacle course.

Guidelines for Term Work Evaluation : Mandatory- 1)Experiment/Practical Book (All experiments/ Practical's to be recorded) 2) Peer Evaluation report**s.**