INDIRA COLLEGE OF ENGINEERING AND MANAGEMENT
(**An Autonomous Institute Affiliated to Savitribai Phule Pune University Pune)**
Approved by AICTE & Government of Maharashtra, Accredited by NAAC
Parandwadi, Pune – 410506, Ph. 02114 661500, www.indiraicem.ac.in
Department of Basic Engineering Science

First Year Engineering-B.Tech

Structure and Syllabus

Prepared by: - Board of Studies for First Year Engineering

Approved by: - Academic Council, ICEM, Pune

(With effect from Academic Year 2025-26)

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Vision of the Institution

The institute envisions to develop itself into a center of academic excellence in the field of Engineering and Management education in order to develop future technocrats and managers having right knowledge, skill and attitude to serve the society and industries to fulfil their ever-changing requirements.

Mission of the Institution

- To train our students to become best Engineering Entrepreneurs today, who will lead the organizations successfully into the future; locally, nationally and globally.
- To provide an environment which fosters continuous improvement & innovation with related technical support & facilities to enhance student and faculty effectiveness.
- To provide programs focusing on the holistic development of the individual with the emphasis on personality grooming, physical fitness and a strong sense of social and environmental responsibility.
- To improve logic & scientific reasoning and to develop global mindset amongst the students and prepare them to work in heterogeneous environment.

Quality policy

We are committed to quality engineering / management education and continual quality enrichment by establishing and applying mechanisms for satisfaction of our stakeholders.

Vision of the Department

- Our vision is to achieve excellent standards of quality education and support students to achieve professional and personal goals.

Mission of the Department

- To build the academic foundation of the UG course through interactive and sensible teaching.
- To increase cognizance of the students towards the academic learnings and its ramifications in professional development.
- To enhance overall awareness about individuals' inclination to make right choices in professional and personal growth.

Revised BOS Members (AY 2025-26)

Sr. No	Name	Category
1	Dr. Vikas Mathe	VC Nominee
2	Dr. Poorna Shankar	BoS Chairman
3	Dr. Amrut Gaikwad	Industry Expert
4	Dr. Neeta Kankane	Subject Expert
5	Dr. Nandkumar Mandlik	Subject Expert
6	Dr. Nagbhushan Patil	Subject Expert
7	Dr. Chhaya Lande	Subject Expert
8	Mr. Avinash Sukhwani	Alumni Member
9	Dr. Manjusha Tomar	Member
10	Prof. Pratima Uplaonkar	Member
11	Dr. Avinash Bansode	Member
12	Dr. Mandakini Dahiwade	Member
13	Mrs. Supriya Kumbhar	Member
14	Mr. Ashwin Dharme	Member
15	Dr. Dinkar Chaudhari	Member
16	Mrs. Priyanka Mahajan	Member
17	Ms. Pragati Kharbade	Member
18	Mrs. Trupti Kathale	Member
19	Mr. Swapnil Chaudhari	Member
20	Mr. Suresh Renge	Member
21	Mr. Raghunandan Kale	Member
22	Mr. Sudhir Sawarkar	Member
23	Mrs. Priyanka Patil	Member
24	Mrs. Meenal Patil	Member
25	Ms. Vidya Menoki	Member
26	Mr. Vijay Kumar Saini	Member

Programme Outcomes [PO]

PO1	**Engineering knowledge**	Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.
PO2	**Problem analysis**	Identify, formulate, review research literature and analyse complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
PO3	**Design / Development of Solutions**	Design solutions for complex Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and Environmental considerations.
PO4	**Conduct Investigations of Complex Problems**	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern Tool Usage**	Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modelling to complex Engineering activities with an understanding of the limitations.
PO6	**The Engineer and Society**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
PO7	**Environment and Sustainability**	Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics**	Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.
PO9	**Individual and Team Work**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication Skills**	Communicate effectively on complex Engineering activities with the Engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project Management and Finance**	Demonstrate knowledge and understanding of Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary Environments.
PO12	**Life-long Learning**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological

Abbreviations

AEC	Ability Enhancement Course
BSC	Basic Science Course
MSE	Mid Semester Exam
CC	Co-curricular Course
CO	Course Outcome
ESC	Engineering Science Course
IKS	Indian Knowledge System
NEP	National Education Policy
PCC	Programme Core Course
PO	Program Outcomes
PR	Practical
PSO	Programme Specific Outcome
TAE	Teacher Assessment Evaluation
TH	Theory
TUT	Tutorials
VSEC	Vocational and Skill Enhancement Course

First Year B.Tech Semester-I Structure

Course Code	Name of Course	Course Category (As per NEP)	Teaching Scheme				Credits	Evaluation Scheme					
			L	T	P	Total		Theory			Practical/Tut		Total Marks
								TAE	MSE	ESE	INT	EXT	
25UBSL101	Linear Algebra and Univariate Calculus	Basic Science Course	3	1	-	4	4	15	10	50	25	-	100
25UBSL103	Engineering Physics	Basic Science Course	3	-	-	5	4	15	10	50		-	100
25UBSP103	Engineering Physics Lab		-	-	2						25	-	
25UBSL104	Chemistry for Technology		3	-	-	5	4	15	10	50		-	
25UBSP104	Chemistry for Technology Lab		-	-	2						25	-	
25UBSL105	Basic Electrical Engineering	Engineering Science Course	3	-		5	4	15	10	50		-	100
25UBSP105	Basic Electrical Engineering Lab				2						25	-	
25UETL106	Basic Electronics Engineering		3	-		5	4	15	10	50		-	
25UETP106	Basic Electronics Engineering Lab				2						25	-	
25UMEL111	Engineering Graphics & Design Thinking	Engineering Science Course	2	-	-	2	2	15	10	25	-	-	50
25UBSL112	Basic of Civil Engineering & Mechanics		2	-	-	2	2	15	10	25	-	-	
25UCEL107	Introduction to C Programmig	Engineering Science Course	2	-	-	4	3	15	10	25	-	-	75
25UCEP107	Introduction to C Programmig Lab				2			-	-	-	25	-	
25UBSP109	Technology Enhancement Course	Vocational and Skill Enhancement Course-I	-	-	2	2	1	-	-	-	25	-	25
25UMEP110	Model Making and Fabrication Workshop Lab		-	-	2	2	1	-	-	-	25	-	
25UBSL113	Professional Communication	Ability Enhancement Course-I	1	-	-	1	1	15	10	-	-	-	25
25UBSP114	Yoga/Music/Dance/Sports	Co-curricular Course-I	-	-	2	2	1	-	-	-	25	-	25
	Total		14	1	10	25	20						500

HoD	Principal	VC Nominee
Dr. Poorna Shankar	Dr. Nilesh Uke	Dr. Vikas Mathe

Department of Basic Engineering
Indira College of Engineering & Management
Parandwadi, Pune-410 506.

Professor
Department of Physics
Savitribai Phule Pune University
Pune - 411 007

First Year B.Tech Semester-II Structure

Course Code	Name of Course	Course Category (As per NEP)	Teaching Scheme				Credits	Evaluation Scheme					
			L	T	P	Total		Theory			Practical/Tut		Total Marks
								TAE	MSE	ESE	INT	EXT	
25UBSL202	Multiivariate Calculus	Basic Science Course	3	1	-	4	4	15	10	50	25	-	100
25UBSL103	Engineering Physics	Basic Science Course	3	-	-	5	4	15	10	50		-	100
25UBSP103	Engineering Physics Lab		-	-	2						25	-	
25UBSL104	Chemistry for Technology		3	-	-	5	4	15	10	50		-	
25UBSP104	Chemistry for Technology Lab		-	-	2						25	-	
25UBSL105	Basic Electrical Engineering	Engineering Science Course	3	-		5	4	15	10	50		-	100
25UBSP105	Basic Electrical Engineering Lab				2						25	-	
25UETL106	Basic Electronics Engineering		3	-		5	4	15	10	50	-	-	
25UETP106	Basic Electronics Engineering Lab				2						25	-	
25UMEL111	Engineering Graphics & Design Thinking	Engineering Science Course	2	-	-	2	2	15	10	25	-	-	50
25UBSL112	Basic of Civil Engineering & Mechanics		2	-	-	2	2	15	10	25	-	-	
25UCEL208	Introduction to Python Programming	Engineering Science Course	2	-	-	4	3	15	10	25	-	-	75
25UCEP208	Introduction to Python Programming Lab				2			-	-	-	25	-	
25UBSP109	Technology Enhancemnet Course	Vocational and Skill Enhancement Course-II	-	-	2	2	1	-	-	-	25	-	25
25UMEP110	Model Making and Fabrication Workshop Lab		-	-	2	2	1	-	-	-	25	-	
25UBSL215	Vedic Mathematics	Indian Knowledge System	1	-	-	1	1	15	10	-	-	-	25
25UBSP216	Yoga/Music/Dance/Sports	Co-curricular Course-II	-	-	2	2	1	-	-	-	25	-	25
	Total		14	1	10	25	20						500

HoD	Principal	VC Nominee
Dr. Poorna Shankar	Dr. Nilesh Uke	Dr. Vikas Mathe

Department of Basic Engineering
Indira College of Engineering & Management
Parandwadi, Pune-410 506.

Professor
Department of Physics
Savitribai Phule Pune University
Pune - 411 007

Contents of the Syllabus

Indira College of Engineering and Management (An autonomous Institute)								
First Year of Engineering Curriculum								
Course	**Linear Algebra and Univariate Calculus**			**Course Code**	**25UBSL101**			
Credits	**4**	**TH**	**3 hrs.**	**Scheme**	**TH**			**TUT**
		TUT	**1 hr**		**TAE**	**MSE**	**ESE**	**INT**
					15	**10**	**50**	**25**

Prerequisite: Matrices, Basic differentiation and standard formulae, Basic concept of complex number.

Course Objectives:

Enable the student to acquire the knowledge in the following topics

1.To develop the ability to use matrices in solving systems of linear equations and real-world applications.

2.To understand Eigen value concepts and their application in matrix transformations and quadratic forms.

3.To introduce advanced differentiation techniques and their use in function approximation and modeling.

4.To enable students to apply Jacobians, and optimization techniques to multivariable functions.

5.To build foundational knowledge and enable understanding of key concepts in complex analysis.

Course Outcomes:

On the completion of the course, the students will be able to

CO1: Understand matrix operations to solve linear systems and engineering applications.

CO2: Apply matrix concepts using Eigen values and diagonalization for quadratic form simplification.

CO3: Calculate higher-order derivatives and series expansion in function analysis.

CO4: Evaluate extrema of multivariable functions using Jacobians and optimization techniques.

CO5: Write concepts of analytic functions and C-R equations in solving complex engineering problems.

Course Content

Unit-I	**Matrices**	**9 Hours**
Rank, Normal form, System of linear Equation, linearly independent and dependent vector, Application of Matrices.		
Unit-II	**Eigen values and Eigen vector**	**9 Hours**
Eigen values, Eigen vector, Caley-Hamilton Theorem, Diagonalization of Matrix, Quadratic form of Matrix.		
Unit-III	**Differential Calculus-I**	**9 Hours**
Successive differentiation, Taylor's & McLaurin's series, Indeterminate form, Partial derivative, Euler's Theorem, Total Derivatives		

Unit-IV	Differential Calculus-II	9 Hours
Jacobians & It's Applications, Maxima and Minima of two variable functions, LaGrange's Method for finding the Extreme value of the function.		
Unit-V	**Complex Analysis**	**9 Hours**
Basic of complex number, Demovier's theorem, Complex function, Differentiation of complex function ,Analytic function, C-R equation, Harmonic function .		

Reference Books:

1. Linear Algebra –An Introduction, Ron Larson, David C. Falvo (Cenage Learning, Indian edition).
2. Applied Mathematics (Vol. I & Vol. II) by P.N. Wartikar and J.N. Wartikar Vidyarthi Griha Prakashan, Pune.
3. Thomas' Calculus by George B. Thomas, (Addison-Wesley, Pearson).

Text Books:

1. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
2. Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill).

Tutorial Session: (Minimum 10 problems in each assignment).
Assignment 1: Problems on Matrices.
Assignment 2: Problems on Eigen values and Eigen vector.
Assignment 3: Problems on Differential Calculus -I.
Assignment 4: Problems on Differential Calculus -II.
Assignment 5: Problems on Complex Analysis.

E-Content:

1. **Differential Calculus-** (https://youtu.be/439NgymYJIw?si=nWDlQYHKO172DDmW)
2. **Matrices:** (https://youtu.be/SK17H2w3fKA?si=rLB7a-w0182cZi3O)
3. **Eigen values and Eigen vector**:(https://youtu.be/h5urBuE4Xhg?si=dN-K2QfBQ_CWuVi_)
4. **Complex Number:** (https://youtu.be/tu-2W40Kg5Y?si=EQ_OGSKwCdILoRnc)

Indira College of Engineering and Management (An autonomous Institute)							
First Year of Engineering Curriculum							
Course	**Engineering Physics**			**Course Code**	**25UBSL103**		
Credits	**3**	**TH**	**3 hrs.**	**Scheme**	**TH**		
					TAE	**MSE**	**ESE**
					15	**10**	**50**

Prerequisite: Fundamentals of: Optics, wave-particle duality, semiconductors, basics of p-n junction and magnetism

Course Objectives:

To enable the student to acquire knowledge in the following topics

1. To teach students basic concepts and principles of physics, relate them to laboratory experiments and their applications.
2. To make the students aware of basic terms of current technology like nanotechnology.

Course Outcomes:

On the completion of the course, students will be able to

CO1: Describe the fundamentals of lasers and optical fibers and **explain** their applications in modern technology.

CO2: **Explain** key concepts and principles of quantum mechanics and **analyze** their relevance to physical systems.

CO3: **Illustrate** the working principles of semiconductors and **evaluate** their applications in a few semiconductor devices.

CO4: **Interpret** the principles of magnetism and superconductivity with reference to their practical significance.

CO5: **Apply** fundamental concepts to **analyze** the properties and technological applications of nanomaterials.

Course Content

Unit-I	Laser & Fibre Optics	9 Hours

Laser: Basics of laser and its mechanism, characteristics of laser - Semiconductor laser: Single Hetro-junction laser - Gas laser: CO2 laser - Applications of lasers: Holography, IT, industrial, medical

Optic Fiber: Introduction, parameters: Acceptance Angle, Acceptance Cone, Numerical Aperture - Types of optical fiber- step index and graded index - Attenuation and reasons for losses in optic fibers (qualitative) - Communication system: basic building blocks Advantages
of optical fibre communication over conventional methods. Numerical problems.

Unit-II	Quantum Physics	9 Hours

De-Broglie hypothesis, Heisenberg Uncertainty Principle, Wave-function and its physical significance - Schrodinger's equations: time independent and time dependent - Application of Schrodinger's time independent wave equation - Particle enclosed in infinitely deep potential well (Particle in Rigid Box) - Particle in Finite potential well (Particle in Non-Rigid box)
(qualitative) - Tunnelling effect, Tunnelling effect examples (principle only): Alpha Decay, Tunnel Diode, Numerical problems.

Unit-III	Semiconductor Physics	9 Hours

Free electron theory (Qualitative), Band theory of solids (Kroning-Penny Model), Fermi Dirac distribution function, Conductivity of conductors and semiconductors, Position of Fermi level in intrinsic and extrinsic semiconductors (with derivations based on carrier concentration), Working of PN junction based on band diagram, Expression for barrier potential (derivation), Solar Cell, Numerical problems.

Unit-IV	Magnetism and Superconductivity	9 Hours

Magnetism: Origin of magnetism - Classification of magnetic materials viz. Ferromagnetic, Paramagnetic and Diamagnetic (qualitative), Characteristic features of Magnetic Materials, Applications of magnetic devices: transformer cores, magnetic storage, magneto-optical recording, Numerical problems.

Superconductivity: Introduction to superconductivity; BCS theory (Qualitative), Properties of superconductors: zero electrical resistance, critical magnetic field, persistent current, Meissner effect, Type I and Type II superconductors.

Unit-V	Nanotechnology & Quantum Computing	9 Hours

Nanotechnology: Introduction to nanotechnology, Quantum confinement and surface to volume ratio, Properties of nanoparticles: optical, electrical, mechanical. Applications of nanomaterials: Medical (targeted drug delivery), electronics, space and defence, automobile.

Quantum Computing: Principles of quantum computing: concept of qbit, superposition and entanglement, comparison of classical & quantum computing, potential applications of quantum computing.

Reference Books:

1. Fundamentals of Physics, Resnick and Halliday (John Wiley and Sons)
2. Principles of Physics, Serway and Jewett (Saunders college publishing)
3. Introduction to Solid State Physics, C. Kittel (Wiley and Sons)
4. Principles of Solid State Physics, H. V. Keer, New Age International
5. Laser and Non-Linear Optics, B. B. Laud (Oscar publication)

Text Books:

2. Engineering Physics, Avadhanulu, Kshirsagar, S. Chand Publications
3. A Textbook of Optics – N Subrahmanyam and BriLal, S. Chand Publications
4. Nanotechnology: Principles and practices, Springer Publications, by S. K. Kulkarni
5. Engineering Physics, Gaur, Gupta, Dhanpat Rai and Sons Publications

E-Content:

1. http://www.coursera.org/specializations/quantum-mechanics-for-engineers Quantum Mechanics
2. http://www.coursera.org/learn/semiconductor-physics Fundamentals of Semiconductor
3. A Brief Course On Superconductivity - Course (nptel.ac.in) Superconductivity
4. http://www.coursera.org/learn/introduction-to-quantum-informationQuantum Computing

Indira College of Engineering and Management (An autonomous Institute)					
First Year of Engineering Curriculum					
Course	Engineering Physics Lab			Course Code	25UBSP103
Credits	1	PR	2 hrs.	Scheme	PR
					INT
					25

List of Practical's (Any 6)

1. Ultrasonic Interferometer: Determination of wavelength, velocity of ultrasonic waves.
2. Finding of radius of curvature of Plano convex lens using Newton ring method.
3. Finding values of numerical aperture and acceptance angle.
4. Calculation of divergence angle of laser beam.
5. Determination of number of lines on grating surface using Laser
6. Malus cosine square Law.
7. Semiconductor Energy band gap.
8. Characteristics of solar cells.

Indira College of Engineering and Management (An autonomous Institute)							
First Year of Engineering Curriculum							
Course	Chemistry for Technology			Course Code	25UBSL104		
Credits	3	TH	3 hrs.	Scheme	TH		
					TAE	MSE	ESE
					15	10	50

Pre-requisites:
The students should have Basic knowledge of Periodic table, Molecular weight of element, Acid/Base-strong and weak, pH scale, conductance,, anode, cathode, cell, Monomer, conjugation in the molecules, basic fuels.

Course Objectives:
To bring the adaptability to developments in Engineering Chemistry and to acquire skills of chemical analysis to apply for engineering applications.

1. To identify the types and application of batteries
2. To study advanced fuels with respect to their properties and applications
3. To understand the structure, properties and applications of materials
4. To encourage awareness of the latest advancements in smart sensor technology for future innovation.
5. To provide students with a solid foundation in analytical reasoning required to solve societal Problems

Course Outcomes:
On the completion of the course, students will be able to
CO1: To apply the knowledge of batteries to design the suitable system
CO2: Analyze the fuel and suggest the applications of fuel
CO3: Demonstrate the structure, properties of materials for Engineering and technological applications
CO4: Evaluate the advantages and limitations of different sensor technologies with respect to modern electronic devices.
CO5: Propose and interpret solutions for the challenges connected to energy, smart, green and sustainable technologies

Course Content

Unit I	Battery technology	9 Hours

Introduction of cell, Electrolytic and Galvanic cells, cell reaction and electrode potential, Applications of Nernst equation to electrode potential and emf of cells. Conductometry: Introduction, basic terms, applications

Batteries: introduction and types of batteries- primary, secondary, construction, working and applications of Lithium-ion battery, nickel cadmium battery, Zinc battery and sodium batteries

Unit II	Energy Technology	9 Hours
Definition of fuel, Classification of fuel, characteristic of ideal fuel, octane number and cetane number of fuel, Preparation, properties, advantages, disadvantages and applications of – Liquid Petroleum gas, Power alcohol, compressed natural gas, Fuel cell -Hydrogen gas, solar cell		
Unit III	**Material Technology**	**9 Hours**
Nanomaterials: Introduction, classification on the basis of dimension, characteristic properties of nanomaterial – electrical, thermal, chemical, optical, magnetic, applications of nanomaterials, **Polymer:** Introduction, Monomer, Polymerization, Functionality of monomer, Molecular weight of polymer, Thermosetting and Thermo-softening polymer, **specialty polymer** – Conducting Polymer – Introduction, structural requirements, applications, Poly-aceytylene – Synthesis, properties, applications, Polymer composites- Introduction, Matrix phase and reinforced phase, Example – properties and application, Biopolymer-Environmental impact, applications		
Unit IV	**Mechanism and reactivity of sensors**	**9 Hours**
Metal ion sensors (detect ions like Pb^{2+}, Hg^{2+}) Inductive proximity sensors (detect metal objects) Optical metal sensors **Humidity Sensors**: Capacitive (e.g., Al_2O_3-based sensors), Resistive (e.g., metal oxide films like SnO_2 or ZnO). **Light Sensors:** Photodiodes, Phototransistors, Photo-resistors (LDRs), Semiconductor light Electrochemical sensors (e.g., using TiO_2, ZnO) (Automatic lighting systems, Mobile phones (brightness control), Optical communication, Solar cells) **Gas Sensors:** Metal Oxide Semiconductor (MOS); Use metal oxides like SnO_2, ZnO, TiO_2 as sensing elements. Detect gases like CO, NO_2, H_2, CH_4, and NH_3 by changes in resistance due to gas adsorption. (Industrial safety (leak detection) Environmental monitoring, Breath analyzers (e.g., alcohol sensors)Smart home devices)		
Unit V	**Sustainability Chemistry and E waste management**	**9 Hours**
Introduction, sources of e-waste, Composition, Characteristics, and Need of e waste management. E-waste: Hazards and toxicity in environment materials, segregation and recycling (Hydrometallurgy, pyro metallurgy and direct recycling). Extraction of valuable metals from E- waste. Battery waste management and recycling, circular economy- case studies. SDG-17, QSTR, EPR norms Reduce, Recycle, Reuse projects		

Assignments:
Assignment on the completion of each unit (Four units)

Text Books:
1. 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

Reference Books:

1.Engineering Chemistry by S.S. Dara, S. Chand Publications (2010).
2.Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Co. (2016).
3.Engineering Chemistry, Tata McGraw-Hill Publication, New Delhi. O. G. Palanna
4.Engineering Chemistry, Dhanpat Rai & Sons, Delhi, 1992. Jain P.C & Jain Monica.
5. Polymer Science by V. R. Gowariker, New Age International Publication (2015).
Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGraw Hill, 2008.
7. Hydrogen as a fuel by Ram D. Gupta, C. R. C. Publication (2009)
8.Introduction to Nanotechnology by Charles P. Poole, Frank Owens, John Wiley & Sons (2003).
9. Instrumental Methods of Analysis by H. H. Willard, L. L. Merritt, J. A. Dean, F. A. Settle, 6 th Edition, CBS Publisher.

E-Content:

1. NPTEL Course : https://onlinecourses.nptel.ac.in/
2. Virtual Lab https://chemcollective.org/vlabs, https://www.vlab.co.in/broad-area-chemical-sciences
3. Executive diploma in Chemical technology https://www.igmpi.ac.in/chemical-technology

Indira College of Engineering and Management (An autonomous Institute)					
First Year of Engineering Curriculum					
Course	Chemistry for Technology Lab			Course Code	25UBSP104
Credits	1	PR	2 hrs.	Scheme	PR
					INT
					25

List of Experiments: (Any 8)

1. To determine the strength of acid by Conductometric measurements
2. Construction of galvanic cell
3. Determination of molecular weight and Viscosity of Liquids by Ostwald's Viscometer
4. Preparation of polystyrene/phenol-formaldehyde/urea-formaldehyde resin
5. Synthesis and characterization of nano sized ZnO by precipitation method
6. Estimation of iron by colorimetric method
7. To estimate the amount of copper from E-waste using Colorimeter
8. To determine Saponification/acid value of an oil.
9. Determination of flash point of oil.
10. Colloidal synthesis of 2-6 or 3-5 semiconductor quantum dots nanoparticles
11. Introduction to Chemistry software. Draw a chemical structure, reaction scheme, reaction mechanism etc. using ChemSketch / Chemdraw or any other software.
12. Estimation of acid-neutralizing capacity of antacids like Gelusil tablet/ Gelusil Syrup

Project List:

1. Battery construction and application
2. Preparation of composite material
3. Solar cell-based applications
4. Reduce, recycle and reuse from waste material
5. Adsorption studies of Methylene blue on bio adsorbents prepared from agricultural waste.
6. Synthesis of nano-materials
7. Determination of active ingredients from medicines / concentration of dyes in commercial samples
8. Soil analysis of agricultural soil samples
9. Colloidal synthesis of 2-6 or 3-5 semiconductor quantum dots nanoparticles.
10. Detection of presence of carbohydrates, fats and proteins in given foodstuffs. Preparation of biodiesel.

Indira College of Engineering and Management (An autonomous Institute)							
First Year of Engineering Curriculum							
Course	Basic Electrical Engineering			Course Code	25UBSL105		
Credits	3	TH	3 hrs.	Scheme	TH		
					TAE	MSE	ESE
					15	10	50

Prerequisite: Basic Physics and Mathematics

Course Objectives:

Enable the student to acquire the knowledge in the following topics

1.To introduce fundamental knowledge of electrical quantities and energy conversion techniques.
2.To impart the basics of magnetism, electromagnetic induction and transformer.
3.To develop skills that can assist in the analysis of DC and AC electric circuits.
4.To familiarize students with different wiring components and wiring schemes.
5.To inculcate skills that aid to understand electricity bill and related calculations.

Course Outcomes:

On the completion of the course, the students will be able to

CO1: Explain basic electrical quantities (resistance, current, voltage, power, energy) and compute energy consumption in household appliances.
CO2: Apply and Analyze DC electrical circuits using series-parallel combinations, Kirchhoff's laws, and network theorems.
CO3: Describe the generation and characteristics of AC signals and represent them using phasors.
CO4: Solve AC circuits consisting of R, L, and C components and determine impedance, power factor, and power in these circuits.
CO5: Analyze three-phase AC systems and calculate voltage, current, and power for balanced star and delta connected loads, and describe the construction, working principle, and performance (including efficiency) of a single-phase transformer

Course Content

Unit-I	Elementary Concepts of Electricity:	9 Hours

Elementary concepts: Resistance, EMF, current, potential, potential difference, and Ohm's law. Effect of temperature on resistance, Insulation Resistance.

Work Power Energy: Elementary concept of work-power-energy, calculations for energy consumption in household appliances, electric heater and motor-pump set. Generalized block diagram of elementary power system showing stages such as Generation, Transmission, and Distribution of electrical energy, UPS, SMPS.

Unit-II	DC Circuits	9 Hours

Classification of electrical networks, Energy sources – ideal and practical voltage and current sources, Simplifications of networks using series and parallel combinations and star-delta conversions, Kirchhoff's laws and their applications for network solutions using loop analysis, Superposition theorem, Thevenin's theorem.

Unit-III	AC Fundamentals	9 Hours
Generation of single-phase sinusoidal voltages and currents, their mathematical and graphical representation, Concept of cycle, period, frequency, instantaneous, peak, average and RMS. values, peak factor and form factor. Phase, Phase difference, lagging, leading in phase quantities and their phasor representation. Rectangular and polar representation of phasor.		
Unit-IV	**AC Circuits**	**9 Hours**
Study of AC circuits consisting of pure resistance, pure inductance, pure capacitance. Series R-L, R-C and R-L-C circuits, concept of impedance, power factor, phasor diagrams, Voltage, current and power waveforms. Concept of active, reactive, apparent and complex power. Resonance in RLC series circuits.		
Unit-V	**Polyphase A.C. Circuits & Transformer**	**9 Hours**
Polyphase A.C. Circuits: Concept of three-phase AC symmetrical system, phase sequence, balanced and unbalanced load. Voltage, current and power relations in three phase balanced star and delta connected loads along with phasor diagrams. **Transformer:** Principle, construction and working of single phase transformer, types (based on construction), EMF equation, losses, (Numerical related to EMF equation and Efficiency)		
Reference books: 1. C. L. Wadhwa, "Basic Electrical Engineering", New Age International (P) Limited 2. E. Hughes, "Electrical and Electronics Technology", Pearson 3. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill Education 4. T. K. Nagsarkar, M. S. Sukhija, "Basic Electrical Engineering", Oxford University Press		
Text Books: 1.B.L. Theraja, "A textbook on Electrical Technology, Vol-I", S Chand Publications 2.V. K. Mehta, Rohit Mehta, "Basic Electrical Engineering", S Chand Publications 3.J. B. Gupta, "A textbook of Electrical Engineering", S. K. Kataria & Sons 4.S. K. Bhattacharya, "Electrical Machines", McGraw Hill Education		
E-Content: **1.AC Circuits:** http://nptel.ac.in/courses/115104088/36 **2.Transformer:** https://nptel.ac.in/courses/108105017/		

Indira College of Engineering and Management (An autonomous Institute)					
First Year of Engineering Curriculum					
Course	Basic Electrical Engineering Lab			Course Code	25UBSP105
Credits	1	PR	2 hrs.	Scheme	PR
					INT
					25

List of Practical: (Any 6)

1. Wiring Exercise

a) Study of various wiring components (wires, switches, fuses. sockets, plugs lamp holders etc. Their uses and ratings.

b) Control of two lamps from two switches (looping in system).

c) Staircase wiring.

d) Use of meggers for insulation test and continuity test of wiring installations and machines.

2.To study safety precautions while working on electrical systems, handling of various equipment's such as multimeter, ammeters, voltmeters, wattmeter's, real life resistors, inductors and capacitors 3. To derive resonance frequency and analyze resonance in series RLC circuit.

4. To verify the relation between phase and line quantities in three phase balanced star delta connections of load.

5. To determine efficiency and regulation of transformer by direct loading test of a single phase transformer.

6. To verify KVL and Superposition theorem.

7. To verify Thevenin's theorem in a DC network

8. To demonstrate different types of electrical protection equipment's such as fuses, MCB, MCCB, ELCB.

9. To measure of earth resistance at substation earthing using fall of potential method with IS 3043 standards.

10. To study of LT and HT electricity bills.

Indira College of Engineering and Management (An autonomous Institute)							
First Year of Engineering Curriculum							
Course	Basic Electronics Engineering			Course Code	25UBSL106		
Credits	3	TH	3 hrs.	Scheme	TH		
					TAE	MSE	ESE
					15	10	50

Prerequisite: Basic Electronics

Course Objectives:

Enable the student to acquire the knowledge in the following topics

1.To impart basic knowledge for conceptual understanding of working of various active and passive elements.

2.To make students describe the basics of semiconductor devices.

3.To apply digital logic gates theory in forming digital circuits.

4. Study sensors & There application.

5.To introduce students to the basics of communication systems.

Course Outcomes:

On the completion of the course, the students will be able to

CO1: Understand the working and functionality of PN junction diodes, rectifiers & special purpose diodes

CO2: Discuss the transistor and MOSFET working with its characteristics

CO3: Apply the knowledge of different digital logic gates to implement digital circuits for application.

CO4: Analyse the working and functionality of sensors for specific applications.

CO5: Write basic principles and block diagrams of communication systems.

Course Content

Unit-I	Diode Circuits	9 Hours

PN junction Diode, working and VI characteristics, Rectifiers circuits and performance parameters. Block diagram of linear regulated DC power supply. Zener diode, Zener voltage regulator, Light Emitting Diode, Photodiode along with their V-I characteristics. Seven segment display.

Unit-II	BJT and MOSFET Transistors	9 Hours

Bipolar Junction Transistor: Construction, types, Operation, V-I Characteristics, region of Operations, BJT as switch, BJT CE amplifier. Metal Oxide Semiconductor Field Effect Transistors (MOSFET): Construction, Types, Operation, V-I characteristics, regions of Operation, MOSFET applications, Functional block diagram of operational amplifier, Inverting and Non-inverting amplifier.

Unit-III	Digital Electronics and Number System	9 Hours

Introduction to digital electronics. Analog and discrete signals and sampling theorem. Number System: - Decimal, Binary, Octal, Hexadecimal their conversion and arithmetic. Basic and universal gates, DE-Morgan's theorems. Adders, Flip Flops, MUX and Demux introduction. Introduction to microprocessor and microcontroller.

Unit-IV	Sensors and Electronic Instrumentation	9 Hours
Classification of a sensors, Active /Passive Sensors, Analog/Digital Sensors, Motion Sensor LVDT, Temperature Sensors (Thermocouple, Thermistor, RTD), Semiconductor GAS Sensors, Agriculture and Biosensors with examples. Block Diagram of Instrumentation system.		
Unit-V	**Modern Communication Systems**	**9 Hours**
Communication System and Mobile communication: Block Diagram, Communication Medium, IEEE frequency band for different applications, AM and FM Modulation. GSM system ,Wireless Network & Protocols, Wired and Wireless, Electromagnetic Spectrum, Allotment of frequency band for different applications,		
Reference Books: 1.. "Digital Fundamentals" by Thomas. L. Floyd, 11th Edition, Pearson 2."Mobile Communication" by J. Schiller, 2nd Edition, Pearson 3.David A. Bell, "Electronic Devices and Circuits",5th Edition, Oxford press. 4.R. L. Boylstad, L. Nashlesky, "Electronic Devices and circuits Theory", 9th Edition, Prentice Hall of India, 2006.		
Text Books: 1.. "Electronics Devices" by Thomas. L. Floyd, 9th Edition, Pearson 2."Modern Digital Electronics" by R.P. Jain, 4th Edition, TMH. 3."Electronic Instrumentation" by H.S. Kalsi, 3rd Edition, TMH 4."Sensors and Transducers" by D. Patrnabis, 2nd Edition, PHI 5."Electronic Communication Systems" by Kennedy & Davis, 4th Edition, Tata McGraw Hill 6."Power Electronics" by MD Singh, K B Khanchandani, 2nd edition, McGraw Hill		
E-Content: 1.Fundamentals of semiconductor devices https://nptel.ac.in/courses/108108122 2.Analog Electronic Circuits https://nptel.ac.in/courses/108106188		

Indira College of Engineering and Management (An autonomous Institute)					
First Year of Engineering Curriculum					
Course	**Basic Electronics Engineering Lab**			**Course Code**	**25UETP106**
Credits	**1**	**PR**	**2 hrs.**	**Scheme**	**PR** **INT** **25**

List of Practical: (Any 8)

1.Study of Active and Passive Electronic components

2.Use of Electronic Measuring Lab Instruments.

3.V-I characteristics of P-N Junction Diode and Zener Diode.

4.Bridge rectifier using diodes, effect of capacitor filter on rectifier output.

5.BJT CE amplifier and calculation of voltage gain and Bandwidth

6.Study of Autotransformer, its uses and measurement of voltage output.

7.Sensor application RPM Measurement using photo transistor sensor.

8.Test and verify the truth tables of Basic and Universal Gates, Half / Full Adder using digital gate ICs.

9.Study of transducer.

10.Study of simulation software to make electronic Circuit.

Indira College of Engineering and Management (An autonomous Institute)							
First Year of Engineering Curriculum							
Course	Engineering Graphics & Design Thinking			Course Code	25UMEL111		
Credits	2	TH	2 hrs.	Scheme	TH		
					TAE	MSE	ESE
					15	10	25

Prerequisites:

1. Basic Geometry Constructions like division and bisection of geometrical entities, triangle, square, pentagon, hexagon, curved features
2. Using geometrical instruments
3. Use of basic mathematical operators and geometrical terms like, periphery, surfaces, tangents, normal, parallelism, planer, and co-planer, non-coplanar concepts

Course Objectives:

1. To acquire basic knowledge about engineering drawing language, line types, dimension methods, and simple geometrical construction and draw conic sections by various methods, involutes, cycloid and spiral.
2. To acquire basic knowledge about the physical realization of engineering objects and shall be able to draw different 2-D views.
3. To imagine visualization of lateral development of truncated solids.
4. To Introduce the foundational principles of design thinking and highlight the importance of empathy in problem-solving.
5. Foster creativity and introduce practical methods for idea generation and prototyping.

Course Outcomes:

On completion of the course, learner will be able to

CO1: Describe the fundamental engineering objects and construct the various engineering curves using the drawing instruments.

CO2: Draft the orthographic projection of an object to draw several 2D views and its sectional views for visualizing the physical state of the object.

CO3: Illustrate the development of lateral surfaces of truncated geometrical solids.

CO4: Identify user needs and challenges through empathy-driven problem analysis.

CO5: Generate innovative ideas and create basic prototypes using design thinking to address the identified problems.

Course Content

Unit 1	Drawing Basics and Curves	6 hrs.

Instruments, Basic Geometry constructions, Dimensioning, Lettering, Sheet Sizes, Scales, Line types, construction of polygon, drawing conventions, Conics by directrix focus method (Ellipse, Parabola and Hyperbola), Helix on Cylinder, cycloid, Involute, Spiral (for one convolution only).

Unit 2	Orthographic Projection	6 hrs

Projection Methods: First angle method, Symbol, orthographic views, sectional views (Full sectional views only).

Unit 3	Development of Lateral Surfaces of Solids	6 hrs
Introduction to development of lateral surfaces and their industrial applications. Draw the development of lateral surfaces of geometrical shapes. Draw the DLS for cut section of cone, pyramid, prism and Cylinder (limited to single cutting plane) by AIP.		
Unit 4	**Introduction to Design Thinking and Empathy**	**6 hrs**
Design Thinking – Overview of the process and its relevance to engineering, **Stages of Design Thinking** – Emphasizing Empathy, Define, Ideate, Prototype, and Test; **Empathy in Engineering** – Understanding user needs and perspectives through real-life examples.; **Case Study** – Discussion of a successful design thinking project to inspire students.		
Unit 5	**Ideation and Prototyping Techniques**	**6hrs**
Ideation Methods – Brainstorming, mind mapping, and SCAMPER technique; **Idea Selection Matrix**: Prioritize ideas based on impact vs feasibility; **Prototyping Basics –** Types of prototypes and their role in refining solutions; **Rapid Prototyping Tools** – Introduction to simple tools or software suitable for beginners; **Feedback Loop –** Role-playing where peers evaluate each other's prototypes.		

Textbooks:

1. Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charter Publication, Anand, India
2. K. Venugopal, K, (2015), "Engineering and Graphics", New Age International, New Delhi
3. Jolhe, D. A., (2015), "Engineering Drawing with introduction to AutoCAD", Tata McGraw Hill, 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", Charter Publishing house, Anand, India
3. Dhawan, R. K., (2000), "A Textbook of Engineering Drawing", S. Chand, New Delhi
4. Luzadder, W. J. and Duff, J. M., (1992), "The Fundamentals of Engineering Drawing: With an Introduction to Interactive Computer Graphics for Design and Production", Peachpit Press, USA 5. Giesecke, F. E., Mitchell, A., Spencer, H. C., Hill, I. L., Loving, R. O., Dygon, J. T., (1990), "Principles of engineering graphics", McMillan Publishing, USA
6. Jensen, C., Helsel, J. D., Short, D. R., (2008), "Engineering Drawing and Design", McGraw-Hill International, Singapore
7· Change by Design: How Design Thinking Creates New Alternatives for Business and Society by Tim Brown, CEO of IDEO, published by Harvard Business Review Press, First Edition (2009), ISBN: 978-1422177808
8· The Design of Everyday Things by Don Norman, published by Basic Books, Revised and Expanded Edition (2013), ISBN: 978-0465050659.
9· Design Thinking for Engineers and Designers by Devdas Shetty and Richard A. Kolodny, published by Cengage Learning, 2nd Edition (2015), ISBN: 978-1305259403
10· Engineering and Product Design by Nigel Cross, published by Wiley, 4th Edition (2021), ISBN: 978-1119716334.

Activities:

Can be utilized to teach the basic commands of any drafting package, by using this knowledge student shall be able to complete the five assignments on the CAD software. (Minimum 2 problems in each assignment)
Activity 1: Construct of Engineering Curve.
Activity 2: Draw Orthographic views.
Activity 3: Draw the development of the lateral surface of a truncated solid.
Activity 4: Any **One** from below mentioned:

- Role-playing scenarios to understand user perspectives.
- Idea generation logs
- Interactive Activity – Group exercise where students conduct empathy interviews for problem identification.

Activity 5: Any **One** from below mentioned:

- SCAMPER exercises
- Empathy maps and journey mapping exercises.

Tools:

- MIRO, Lucid Charts – collaborative mapping,
- CANVA for visualization,

E-Content:

Coursera Links:
1 AutoCAD for Design and Drafting Exam https://www.coursera.org/learn/autodesk-autocad-design-drafting
2 3D CAD Fundamental https://www.coursera.org/learn/3d-cad-fundamental
3 Autodesk CAD/CAM/CAE https://www.coursera.org/specializations/autodesk-cad-cam-cae-mechanical-engineering
4 CAD and Digital Manufacturing https://www.coursera.org/specializations/cad-design-digital-manufacturing
Videos:
· IDEO's Design Thinking Process – Short, engaging videos explaining the stages of design thinking.
45 Design Thinking Resources for Teachers and Students
· TED Talks on empathy and innovation, such as Brené Brown's talk on vulnerability.
Journal Articles:
1 http://www.cimt.org.uk/journal/sinanolkun.pdf
2 https://www.sciencedirect.com/science/article/abs/pii/0734189X90901118
3. https://www.jstor.org/stable/pdf/jeductechsoci.9.3.149.pdf?seq=1
4. https://www.jstor.org/stable/3106007?seq=1
5. https://www.tandfonline.com/doi/abs/10.1080/22054952.2010.11464037
E-books:
https://www.sdcpublications.com/Textbooks/Engineering-Graphics-Essentials-Fifth-Edition/ISBN/978-1-63057-052-1/
https://www.pearson.com/store/en-us/pearsonplus/p/9780138187521.html

Indira College of Engineering and Management (An autonomous Institute)							
First Year of Engineering Curriculum							
Course	Basic Civil and Engineering Mechanics			Course Code	25UBSL112		
Credits	2	TH	2 hrs.	Scheme	TH		
					TAE	MSE	ESE
					15	10	25

Prerequisites:
Basic Mathematics, Geography, Environmental studies, Trigonometry, Geometry, Algebra, Linear differentiation and integration, Principles of Physics (equations of motions)

Course Objectives:
1. To understand the principles of building planning and regulations as per bye-laws.
2. To identify and analyze different force systems and calculate resultants using laws of statics
3. To apply equilibrium conditions on various structural members including beams and trusses
4. To evaluate the effects of friction in mechanical systems and structural elements
5. To apply and analyze motion principles of particles using laws of kinematics and kinetics.

Course Outcomes:
On completion of the course, learner will be able to:
CO1. Explain the key elements of building planning, bye-laws, and sustainable development concepts.
CO2. Calculate the resultant of a coplanar force system using composition and resolution of forces.
CO3. Analyze free body diagrams to evaluate equilibrium in various loading conditions.
CO4. Solve problems related to structural analysis of trusses, beams, and cables.
CO5. Select Newton's laws, impulse-momentum, and energy principles to solve dynamic problems involving impact and motion.

Course Content

Unit I	Fundamentals of Building Planning and Regulations	6 Hours

Fundamentals of Building Planning and Regulations
Principles of building planning, viz. aspect, prospect, roominess, grouping, privacy, circulation, sanitation, orientation, elegance, economy, furniture requirement.
Introduction to building bye laws and role of bye laws in regulating the environment, MAHARERA concepts of built-up area, carpet area and floor space index. Concept of green building, smart city/village.

Unit II	Resultants and Equilibrium Equations	6 Hours

Resultant of Coplanar Force System
Introduction and Principle of statics, System of Forces, resolution and composition of forces, resultant of concurrent forces, moment of a force, Varignon's theorem, couple, resultant of general force system

Unit III	Equilibrium of General Force System	6 Hours
Free body diagram, equilibrium of forces, Lami's Theorem, equilibrium of concurrent and parallel forces, types of loads, types of supports, types of beams: simple and compound beams, equilibrium of general force system,		
Unit IV	**Analysis of Structures and Friction**	**6 Hours**
Analysis of Structures: Two force members: Analysis of plane trusses by method of joint & section, cables with supports at same level subjected to point loads, **Friction:** Friction: laws of friction, Friction on inclined surfaces and ladders friction.		
Unit V	**Kinematics and Kinetics of Particle**	**6 Hours**
Newton's Laws, D'Alembert's Principle, Work energy principle and impulse momentum equation, Projectile Motion, Impact, Types of Impact, law of conservation of momentum, coefficient of restitution, Numerical on Direct central Impact.		

Text Books:

1. G K Hiraskar, Basic Civil Engineering, Edition 2004, Danpat Rai Publication
2. Building Construction and Drawing- Bindra and Arora, Edition 2012, Dhanapat Rai Publications.
3. Basic Civil Engineering by S.S. Bhavikatti, New Age publications, 2020.
4. Engineering Mechanics ¬ Bhavikatti, Newage Publications, 8th Edition, (2017)
5. Engineering Mechanics, S. Ramamurtham, Dhanpat Rai Publication (2016)
6. Strength of Materials by S. Ramamurtham and R. Narayanan, Dhanpat Rai Publication (2008)
7. Engineering Mechanics A. K. Tayal, Umesh Publications

Reference Books:

1. Building Construction and Drawing- Sushil Kumar, Edition 2010, Standard Publications, Delhi.
2. National Building Code –Bureau of Indian Standards (latest)
3. Engineering Mechanics R.S. Khurmi, S. Chand Publications
4. Engineering Mechanics Singer Harper & Row, Hill Publishers
5. Engineering Mechanics Meriam and Crage, Wiley Publications
6. Engineering Mechanics Timoshenko and Younge, McGraw Hill Publications
7. Introduction of Engineering Mechanics S. Rajshekaran and G Sankarasubramanian, Vikas Publications.

Tutorial Session: (Minimum 5 problems in each assignment)

Assignment 1: Problems on Building Planning and Regulations
Assignment 2: Problems on Resultant of Coplanar Force System
Assignment 3: Problems on Equilibrium of General Force System
Assignment 4: Problems on Analysis of Structures and Cables
Assignment 5: Problems on Friction and Kinematics of Particle

E-Content:

1. https://archive.nptel.ac.in/courses/124/107/124107001/
2. https://archive.nptel.ac.in/courses/112/103/112103109/
3. https://onlinecourses.nptel.ac.in/noc25_me20/preview

Indira College of Engineering and Management (An autonomous Institute)							
First Year of Engineering Curriculum							
Course	Introduction to C Programming			Course Code	25UCEL107		
Credits	2	TH	2 hrs.	Scheme	TH		
					TAE	MSE	ESE
					15	10	25

Prerequisite: Basic knowledge of Mathematics

Course Objectives:

Enable the student to acquire the knowledge in the following topics

1.To introduce fundamentals of problem solving and basics of C programming.
2.To use control structures effectively in modular programming
3.To solve computational problems using arrays
4.To develop an understanding of pointers to manage dynamic memory
5.To implement structures, unions and enums for efficient organization and data management

Course Outcomes:

On the completion of the course, the students will be able to

CO1: Understand basic problem-solving techniques to create simple algorithms and flowcharts.
CO2: Describe C programs using control structures and modular programming concepts.
CO3: Solve problems using one-dimensional and multi-dimensional arrays.
CO4: Explain pointers for memory access and dynamic memory management through C programs.
CO5: Implement structures, unions, and enums to manage and organize data effectively

Course Content

Unit-I	Introduction to Algorithm and 'C' Language	7 Hours

Introduction to Problem solving- Problem solving process- Basics of Algorithm and flowchart: Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/ Pseudo-code with examples.

Introduction to 'C' Language: Importance of 'C' Language, Sample 'C' Program, Structure of 'C' Program, Constants, variables and data types. Operators and expressions – I/O statements - Managing input/output operations.

Unit-II	Control Structures	5 Hours

Decision making and branching (if, if-else, switch case), Decision making and looping (while, do-while, for), Unconditional control statement.

Unit-III	Functions and Arrays	6 Hours

Basics of function, definition, declaration and calling of function, Function prototype, Method of parameter passing- call by value, Recursion.

Array: Basics of Array, Array declaration and initialization, Types of arrays: One and Two-dimensional arrays, Character arrays, String, Passing array to function.

Unit-IV	Structures, Union and Enumeration	6 Hours
Structures: Need of Structure, Structure declaration and initialization, typedef, Array of structure variable, Methods of passing structure to function, Nested structure. **Union:** Need of union, union declaration and initialization. **Enumeration**: Need of Enumeration, Enumeration declaration and initialization.		
Unit-V	**Pointers**	**6 Hours**
Pointer: Fundamentals, Pointer declaration, Operations on pointer, Pointer to an array, Pointer to structure, Method of parameter passing- call by reference. Capstone Project. **CAPSTONE PROJECTS-** 1) Student Record Management System 2) Bank Management System 3) Hospital Management System 4) Library Management System 5) Employee Payroll System		
Text Books: 1.Yashavant P. Kanetkar, Let us C, BpB publications 2.Yashavant P. Kanetkar, Understanding Pointers in C, BpB publications 3.K. Balaguruswamy, Programming in ANSI C, TGMH Publication. 4.A. M Padma Reddy, C Programming Techniques Sri Nandi Publication		
Reference Books: 1.B.W. Kernigghan, D. M. Ritchie, The 'C' Programming Language, Pearson Education. 2.Greg Perry, C Programming Absolute Beginner's guide, Que Publishing 3.Mike McGarth, C Programming in easy steps, In easy steps Ltd. 4.Herbert Schildt, The Complete Reference, McGraw Hill Education		
E-content: 1.https://www.coursera.org/specializations/c-programming_ 2.https://karadev.net/uroci/filespdf/files/Programming-in-ANSI-C.pdf 3.https://www.coursera.org/learn/c-for-everyone 4.https://www.coursera.org/learn/programming-c		

Indira College of Engineering and Management (An autonomous Institute)					
First Year of Engineering Curriculum					
Course	Introduction to C Programming Lab			Course Code	25UCEP107
Credits	1	PR	2 hrs.	Scheme	PR
					INT
					25

List of Practical: (Any 8)

1. Write a program to read the values of a, b, c and display value of x where x=a/b-c.
2. Write a program to check entered number is positive, negative or zero.
3. Write a program to accept student's five subject's marks and compute his/her result. Student clears the exam, if he/she scores marks equal to and above 40 in each course. If student scores aggregate greater than 75%, then the grade is distinction. If aggregate is 60>= and <75 then the grade if 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. Implement a simple calculator program that performs addition, subtraction, multiplication, and division using functions and switch-case.
5. Write a C program to find the factorial of a given number using recursion.
6. Implement a program to find the Fibonacci series up to a specified limit.
7. Write a program that reads a 5x5 array integer and prints the row and column sum.
8. Write a program to find the sum of two matrices.
9. Write a program that accepts a string from the user and counts the number of vowels and consonants in it.
10. Write a program to check whether the given string is palindrome or not.
11. Write a program in C to show the various pointer operations.
12. Write a program in C to swap numbers using call by reference (use pointer to function).
13. Write a program to store information of employee using structure (compile time initialization).
14. Create a program that manages the storage and retrieval of different types of data (integer, float, or character) using a union based on user input. The program should allow the user to choose the type of data to store and then input and display the stored value accordingly.
15. Create a program that uses an enumeration to represent days of the week. Implement functions to print the name of a day based on its numerical value and to determine if a given day is a weekday or a weekend day.

Indira College of Engineering and Management (An autonomous Institute)					
First Year of Engineering Curriculum					
Course	**Technology Enhancement Course**			**Course Code**	**25UBSP107**
Credits	**1**	**PR**	**2 hrs.**	**Scheme**	**PR** **INT** **25**

Pre-requisites:
Basic knowledge of computers and operating systems.

Course Objectives:

1. Equip students with hands-on skills in MS Word, MS Excel, and MS PowerPoint for academic and professional use.
2. Develop the ability to create professional documents, analytical spreadsheets, and impactful presentations.

Course Outcomes: After completing this course student will be able to

CO1: Make structured, professional documents with advanced formatting, tables, references, and visual elements using MS Word.

CO2: Apply formulas, functions, conditional formatting, and pivot tables in MS Excel to analyze and interpret data.

CO3: Design and deliver effective presentations with charts, images, multimedia, and interactive features using MS PowerPoint.

Content: (Any 8)

1: Resume Preparation

Task: Create a professional resume.

- Use proper headings (Education, Skills, Experience, Hobbies).
- Insert a table to organize academic details.
- Add bullets/numbering for listing skills.
- Insert a header with the student's name and a footer with page number.

2: Report Writing with TOC

Task: Prepare a 2–3 page report on any topic (e.g., "Digital India", "Artificial Intelligence").

- Use styles (Heading 1, Heading 2, etc.) for headings.
- Generate an automatic Table of Contents.
- Insert at least one image, chart, or table with a caption.
- Add footnotes and references.

3: Poster/Brochure Design

Task: Design an event poster or brochure (e.g., College Fest / Workshop).

- Use WordArt, shapes, and SmartArt.
- Add page border and background color/watermark.
- Insert text boxes to organize information.
- Use different font styles and sizes for creative effect.

4: Basic Data Entry and Formatting

Task: Create a **student marksheet**.

- Enter names of 10 students with marks in 5 subjects.
- Use formulas to calculate **total marks, percentage, and grade**.
- Apply **cell formatting** (bold headings, borders, colors).
- Use conditional formatting to highlight students scoring below 40%.

5: Data Analysis with Charts

Task: Prepare a **sales report** for 6 products over 12 months.

- Enter monthly sales data.
- Use formulas to calculate **monthly totals** and **average sales**.
- Create a **bar chart** for product-wise sales.
- Create a **line chart** to show monthly sales trend.

6: Functions and Pivot Tables

Task: Create an **employee salary sheet**.

- Enter employee details (Name, Department, Basic Salary, Allowances, Deductions).
- Use formulas to calculate **Net Salary = Basic + Allowances – Deductions**.
- Apply **functions** like SUM, AVERAGE, MAX, MIN, IF condition.
- Insert a **Pivot Table** to analyze average salary per department.

7: Topic-Based Presentation with Charts

Task: Prepare a **7–8 slide presentation** on any topic (e.g., "Climate Change", "Digital Transformation", "Space Exploration").

- Use **title and content slides** with proper headings.
- Insert at least **one chart/graph** (from Excel data).
- Insert at least **two images** with captions.
- Use **slide master** for uniform formatting.
- End with a **summary/conclusion slide**.

8: Poster/Advertisement Design in PowerPoint

Task: Design a **poster or advertisement slide** (e.g., College Fest, Tech Workshop, Cultural Event).

- Use **WordArt, shapes, and SmartArt** creatively.
- Insert **icons and pictures**.
- Apply **gradient background or design template**.
- Use **text boxes** to arrange details (date, venue, contact).

9: Interactive Presentation with Hyperlinks & Multimedia

Task: Create an **interactive quiz or e-learning module** using PowerPoint.

- Slide 1: Title and instructions.

- Slide 2–6: Multiple-choice questions (with 3–4 answer options).
  - Use **action buttons or hyperlinks** so clicking on the correct answer goes to a "Correct!" slide, and the wrong answer goes to a "Try Again" slide.
- Insert **audio/video** on at least one slide.
- Add **slide transitions and animations** to enhance interactivity.

End with a **result/thank you slide**

Indira College of Engineering and Management (An autonomous Institute)					
First Year of Engineering Curriculum					
Course	**Model Making and Fabrication Workshop Lab**			**Course Code**	**25UMEP110**
Credits	**1**	**PR**	**2 hrs.**	**Scheme**	**PR**
					INT
					25

Prerequisites:
Basic abilities of handling machines and electrical equipment, awareness of safety procedures.

1. Study of Fire and Floor Safety at workshop
2. Demonstration of CNC Lathe Operations (Turning, Facing, Boring, Threading Etc.)
3. Demonstration of 3D Printing
4. Students create a basic prototype for a chosen problem.
5. Prototype demonstrations – using pixel art
6. Prototype demonstrations – using puzzles
7. Prototype demonstrations – using sketch
8. Prototype demonstrations – using Tinker CAD
9. Prototype demonstrations – using paper/craft

Indira College of Engineering and Management (An autonomous Institute)							
First Year of Engineering Curriculum							
Course	Professional Communication			Course Code	25UBSL113		
Credits	1	TH	1 hr.	Scheme	TH		
					TAE	MSE	ESE
					15	10	-

Prerequisite :
12th English - Basic knowledge of Listening, Speaking, Reading, and Writing. (LSRW) skills.

Course Objectives:
To train the students in acquiring interpersonal communication skills by focusing on language skill acquisition techniques and error feedback.

Course Outcomes:
On completion of the course, learner will be able to:
CO1: Recognize, identify, and express advanced skills of Technical Communication in English through Language Laboratory.
CO2: Understand, categorize, differentiate, and infer listening, speaking, reading, and writing skills in societal and professional life.
CO3: Articulate and present the skills necessary to be a competent Interpersonal communicator.
CO4: Deconstruct, appraise, and critique communication behaviours.
CO5: Adapt, negotiate, and facilitate with multifarious socio-economical and professional arenas with effective communication and interpersonal skills.

Content

Unit I	Introduction to communication	3 Hours

Clarity in speaking and active listening techniques, understanding non-verbal cues, building rapport and developing relationships, Questioning and providing constructive feedback, Conflict resolution and negotiation strategies, Self-awareness and emotional intelligence for managing emotions, and Developing assertiveness to express opinions respectfully while setting clear boundaries.

Unit II	Listening Skills	3 Hours

Introduction to Listening Skills: Definition, importance, and types of listening (Passive, Active, Critical, Empathetic)
Basic Listening Skills: Overview, the listening process, and its importance.
Effective Listening: Principles, common barriers, and guidelines to enhance listening.
Active Listening: Definition, techniques (Paraphrasing, Summarising, Clarifying), and role-playing activities.
Understanding Accents and Dialects: Exposure to different accents and overcoming comprehension challenges.

Unit III	Speaking	3 Hours
Fluency and sound scripting: enhance smooth and natural speech, reducing pauses and filler words, Stress and Intonation, JAM (Just a Minute), conversational role plays, and speaking using picture/audio-visual inputs. Communication Skills: Practice greetings, making requests, giving and accepting praises, offering suggestions, and handling various social interactions. Public Speaking: Learn to structure and deliver presentations effectively, using visual aids and confident body language. Group Discussion: Develop skills for effective participation, active listening, and managing diverse viewpoints in group discussions.		
Unit IV	**Reading and Writing Skills**	**3 Hours**
Effective Reading: Techniques for various reading processes, adjusting reading rates, and improving comprehension Effective Written Communication: Types of writing (essays, reports, letters), structure, and writing tasks (articles, presentations). Letter and Report Writing: Crafting letters, official correspondence, and reports, including abstracts and conclusions. Editing and Proofreading: Self-editing, peer review, and using digital tools for grammar and punctuation. Digital Tools: Utilize grammar checkers and writing software to enhance writing skills and precision.		
Unit V	**Professional Communication:**	**3 Hours**
Non-Verbal Communication: Focus on body language, facial expressions, and professional attire to convey confidence and professionalism. Written Communication: Master email etiquette, report writing, and business correspondence, including proofreading and editing techniques. Interpersonal Communication: Develop networking, negotiation, and conflict resolution skills. Cultural Sensitivity: Learn to communicate effectively with diverse individuals and avoid bias. Professional Etiquette: Emphasize proper meeting, phone, video call, and social media conduct		

List of Experiments/Assignments

Minimum eight practical/ assignments should be performed to cover entire curriculum of the course. The list of practicals given below is just a guideline.

1. Speech/Seminar presentation
2. Observation of a recorded seminar and suggestions for improvement.
3. Technical Report Writing and presentation.
4. Role Plays
5. Interview Simulations
6. Reading and Listening Comprehension
7. Group Discussions
8. Resume Building
9. Business Correspondence
10. Cross-Cultural Communication

11. Situational Writing 12. SWOT analysis 13. Public Speaking Exercises 14. Greetings for different occasions. 15. Participation in institute/National level Elocution/Essay/G.D. Competitions
Text Books: 1. Communication Skills for Engineers by S. Mishra & C. Muralikrishna (Pearson) 2. Communication Skills for Technical Students by T.M. Farhatullah (Orient Longman) 3. Written Communication in English by Saran Freeman (Orient Longman) 4. Essential English Grammar (Elementary & Intermediate) Raymond Murphy (CUP) 5. Communication for Business: A Practical Approach by Shirley Tailor (Longman)
Reference Books: 1. Developing Communication Skills by Krishna Mohan & Meera Banerji (Macmillan) 2. Business Correspondence and Report Writing, R. C. Sharma & Krishna Mohan (Tata McGraw Hill) 3. Sasikumar et al. A Course in Listening and Speaking. New Delhi: Foundation Books, 2005. 4. Tony Lynch, Study Listening. Cambridge: Cambridge UP, 2004.

Indira College of Engineering and Management (An autonomous Institute)								
First Year of Engineering Curriculum								
Course	Multivariate calculus			Course Code	25UBSL202			
Credits	4	TH	3 hrs.	Scheme	TH			TUT
		TUT	1 hr		TAE	MSE	ESE	INT
					15	10	50	25

Prerequisite: Basic Mathematics

Course Objectives:

Enable the student to acquire the knowledge in the following topics

1.To develop the ability to model physical systems using differential equations and apply advanced techniques of integration in solving engineering problems.

2.To explain and apply methods of curve tracing, multiple integrals, and their applications in engineering contexts.

3.To compute and interpret statistical measures such as central tendency, and apply probability concepts including Bayes' Theorem in decision-making scenarios.

4.To construct and utilize Fourier series for representing periodic physical phenomena in engineering analysis.

Course Outcomes:

On the completion of the course, the students will be able to

CO1: Solve exact and non-exact differential equations to find solution for real-world problems.

CO2: Use reduction formulas and special functions like beta and gamma to **evaluate** complex integrals.

CO3: Evaluate double integrals and apply change of order and variables in integration.

CO4: Compute and interpret statistical measures and apply probability theories including Bayes' Theorem.

CO5: Construct Fourier series representations of periodic functions in both full and half range.

Unit-I	Differential Equation	9 Hours
Exact differential equation, Non-Exact differential equation, linear differential equation and reducible form of linear differential equations, Application of differential equation.		
Unit-II	**Integral Calculus I**	**9 Hours**
Reduction formula, beta function, gamma function, relation between beta function & gamma function. Differentiation under integral sign (DUIS RULE)		
Unit-III	**Integral Calculus II**	**9 Hours**
Curve Tracing, Double integration, change of order of integration, change of variables in double integral.		
Unit-IV	**Statistics & Probability**	**9 Hours**
Data and Data Types, Measures of central tendency, Measures of dispersion and coefficient of variation. Probability, Baye's Theorem, Random variables, Mathematical Expectation.		

Unit-V	Fourier Series	9 Hours
Introduction of Fourier series, some Basic formulae, even function & odd function, full range Fourier series, Half Range Fourier series.		

Reference Books:

1.Applied Mathematics (Vol. I & Vol. II) by P.N. Wartikar and J.N. Wartikar Vidyarthi Griha Prakashan, Pune.
2. Thomas' Calculus by George B. Thomas, (Addison-Wesley, Pearson).
3.Differential Equations by S. L. Ross (John Wiley and Sons)

Text Books:

1. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).
2. Higher Engineering Mathematics by B. V. Ramana (Tata McGraw Hill).

Tutorial Session: (Minimum 10 problems in each assignment).
Assignment 1: Problems on Differential Equation.
Assignment 2: Problems on Integral Calculus I.
Assignment 3: Problems on Curve Tracing/ Integral Calculus II
Assignment 4: Problems on Statistics & Probability.
Assignment 5: Problems on Fourier Series

E-Content:

1. **Differential Equation:** (https://youtu.be/NBcGLLU90fM)
   Integral Calculus:
   (https://youtu.be/1ipcBkRRXbg?si=PrASKzmkEGHqVd-f)
   (https://youtu.be/w_KiHgultbM?si=rtUQ79i8dh90J4CH)
2. **Solid Geometry:** (https://youtu.be/zwtAWNWrEZY?si=Ew1iFHcQzGYDHd77)
3. **Curve Tracing:** (https://youtu.be/ixDGaEqWuA0?si=FJSetlAltLJCGTX-

Indira College of Engineering and Management (An autonomous Institute)							
First Year of Engineering Curriculum							
Course	**Introduction to Python Programming**			**Course Code**	**25UCEL208**		
Credits	**2**	**TH**	**2 hrs.**	**Scheme**	**TH**		
					TAE	**MSE**	**ESE**
					15	**10**	**25**

Prerequisite: Basic Programming Skills

Course Objectives:

Enable the student to acquire the knowledge in the following topics

1.To introduce students with foundational Python coding.
2.To implement program using control structures and functions in Python.
3.To enable students to organize code efficiently through modules, namespaces, and packages.
4.To make them understand the use of files, error handling and exceptions.
5.To create awareness on python libraries such as numpy, pandas, matplotlib and seaborn.

Course Outcomes:

Upon completion of the course, students will be able to

CO1: Understand Python's data structures and write simple Python programs.
CO2: Use control structures in python to solve real world problems.
CO3: Decompose a Python program into functions, modules and packages.
CO4: Apply file operations, error and exception handling in Python applications.
CO5: Create python applications using numpy, pandas and visualization libraries.

Content

Unit-I	Introduction to Python fundamentals	7 Hours

Introduction to Python – Role of Python in AI and Data Science – Python Installation – Working Python IDLE, Python syntax, Python comments, Identifiers-Numbers-Variables, Python data types and data structure, Python casting, Python Operators, Building python blocks-Python statements.

Unit-II	Python Decision-Control Statements, Functions	7 Hours

Selection/conditional branching Statements: if, if-else, nested if, if-elif-else statements, Basic loop Structures/Iterative statements: while loop, for loop, selecting appropriate loop. Nested loops, break, continue, pass, else statement used with loops.

Python methods - Built in functions – user defined function building blocks – Lambda expressions – Map and Filter functions – Function scope and its types – *args and **kwargs.

Unit-III	Modules and Packages, Files and Exception Handling	6 Hours

Creating modules-built in modules – name spaces – user defined modules and packages

Basic file handling operations-read, write, read lines, write lines and seek operations, accessing excel, csv and text files.

Standard errors – Exception handling- Try-except-Finally-else-Block – Multiple exceptions -Type of Error codes.

Unit-IV	Numerical Computing and Data Analysis	5 Hours
NumPy: Introduction to NumPy arrays – creation, attributes and indexing. Array mathematical operations- array manipulations -shaping-stacking and splitting– Built-in methods - array transposition – universal arrays – Broad casting. Pandas: Basics – Series – Data Frame structure – attributes - Index – Re index- Drop entry-select entry-data alignment, rand and sort – summary statistics -Group by operations.		
Unit-V	**Pointers**	**5 Hours**
Creating effective data visualizations- Identification of Plots – Data Visualization in Data Frames- Built in libraries – Matplotlib and Seaborn, Capstone Project. **CAPSTONE PROJECTS-** 1) Student Performance Analysis 2) Sales Data Dashboard 3) EDA on Flight Information 4) Real Estate Price Analysis 5) Weather Pattern Visualizer		
Textbooks: - 1.Data Science and Machine Learning using Python by Dr Reema Thareja.Publisher: McGraw Hill, ISBN: 9789355322142 Edition: 1, 2022 2.Python for Data Science for Dummies, 2ed Paperback – 1 January 2019 by Luca Massaron and John Paul Mueller, Wiley Publication, ISBN: 8126524936 3.Charles Dierbach, "Introduction to Computer Science Using Python		
Reference Books: 1.Programming and Problem Solving with Python" by Amit Ashok Kamthane, Ashok Namdev Kamthane 2nd Edition Publisher: McGraw Hill ISBN: 978939011306, 939011302 2.Practical Python Projects by Yasoob Khalid 3.Practical python programming – Emenwa global		
MooC: The joy of computing using python -NPTEL / SWAYAM course by Sudarshan Iyengar, IIT ROPAR		
E-content: 1.https://www.coursera.org/learn/introducton-r-programming-data-science 2.https://www.coursera.org/learn/machine-learning-with-python 3.https://www.coursera.org/learn/python-crash-course 4.https://www.coursera.org/learn/get-started-with-python 5.https://www.coursera.org/learn/r-programming		

Indira College of Engineering and Management (An autonomous Institute)					
First Year of Engineering Curriculum					
Course	Introduction to Python Programming Lab			Course Code	25UCEP208
Credits	1	PR	2 hrs.	Scheme	PR
					INT
					25

List of Practical's: (Any 15)

1. **List Exercises**
   - Create a list of your favourite movies and print the third movie in the list.
   - Add a new movie to the list and print the updated list.
   - Remove the second movie from the list and print the updated list.
   - Sort the list in alphabetical order and print the sorted list.
   - Create a new list that contains only the first and last movie in the original list and print it.
2. **Tuple Exercises:**
   - Create a tuple of your favourite foods and print the second food in the tuple.
   - Try to change the second food in the tuple and see what happens.
   - Create a new tuple that contains only the first and last foods in the original tuple and print it.
   - Use the **len()** function to find the number of foods in the tuple and print it.
   - Convert the tuple to a list and print the list.
3. **Set Exercises:**
   - Create a set of your favourite colors and print it.
   - Add a new color to the set and print the updated set.
   - Remove a color from the set and print the updated set.
   - Create a new set that contains only the colors that start with the letter "B" and print it.
   - Use the **len()** function to find the number of colors in the set and print it.
4. **Dictionary Exercises:**
   - Create a dictionary of your favourite books and their authors and print it.
   - Add a new book to the dictionary and print the updated dictionary.
   - Remove a book from the dictionary and print the updated dictionary.
   - Use the **keys()** method to print a list of the book titles in the dictionary.
   - Use the **values()** method to print a list of the author names in the dictionary.
5. Write a program to read number from user and check its even or odd
6. Program to Find the GCD of Two Positive Numbers
7. Program to read year from user and Check If a Given Year Is a Leap Year or not
8. Write Python Program to Find the Sum of Digits in a Number
9. Write a program that prints the first 10 multiples of 3.

10. Write a program that asks the user to enter a number and then prints all the even numbers from 0 to that number.
11. Write a program to read percentage from user and print Grade-

percentage	Grade
percentage >=80	O
percentage >=75	A+
percentage >=70	A
percentage >=65	B+
percentage >=60	B
percentage >=55	Pass

12. Write a lambda function that takes two arguments and returns their sum.
13. Write a function called product that accepts any number of arguments and returns their product.
14. Write a function called print_info that accepts any number of keyword arguments and prints them.
15. Write a program to compute compound interest using **keyword arguments**
16. Write a Python function to Implement Stack Operations using *args.
17. Write a Python function to print the age of a person for a given date of birth using **kwargs
18. Write a Python Program to Add two lists using **map** function.
19. Create a Python module named math_operations.py that contains functions for basic mathematical operations (addition, subtraction, multiplication, division).
20. Create a package named library and implement few functions of library in python.
21. Write a Python Program to Read the Contents of a text File and display the following information. Total number of characters, digits, special symbols, words, spaces and lines.
22. Path of the current file. Write a python program to copy contents of one file to other. While copying a) all full stops are to be replaced with commas b) lower case are to be replaced with upper case c) upper case are to be replaced with lower case.
23. Write a Program to illustrate following numpy array attributes-
    ndarray.ndim
    ndarray.shape
    ndarray.size
    ndarray.dtype
    ndarray.itemsize
    ndarray.data
24. Write a Program to Basic Arithmetic Operations on NumPy Arrays.
25. Write a Program to demonstrative NumPy Arrays Creation Functions:

np.zeros() Creates an array of zeros
np.ones() Creates an array of ones
np.empty() Creates an empty array
np.full() Creates a full array
np.eye() Creates an identity matrix
np.random.random() Creates an array with random values

26. Use Automobile Dataset (Automobile_data.csv) and perform following operations for data analysis. This Dataset has different characteristics of an auto such as body-style, wheel-base, engine-type, price, mileage, horsepower, etc.
    - From the given dataset print the first and last five rows
    - Find the most expensive car company name
    - Print All Toyota Cars details
    - Count total cars per company
    - Find each company's Highest price car
    - Find the average mileage of each car making company
27. Scatter Plot Analysis
    - Load a dataset containing students' scores in two subjects.
    - Create a scatter plot using Matplotlib to visualize the relationship between the scores.
    - Add labels and a title to the plot, and analyze if there's any correlation between the scores.
28. Bar Plot Visualization
    - Load a dataset containing sales data for different products.
    - Use Seaborn to create a bar plot showing the total sales for each product category.
    - Customize the plot with appropriate labels and colors, and interpret the results.
29. Histogram Analysis
    - Load a dataset containing ages of individuals.
    - Use Matplotlib to create a histogram showing the distribution of ages.
    - Adjust the bin size and labels, and analyze the age distribution in the dataset.
30. Create a heat map for flight passenger data using Seaborn

Indira College of Engineering and Management (An autonomous Institute)							
First Year of Engineering Curriculum							
Course	Vedic Mathematics (IKS)			Course Code	25UBSL215		
Credits	1	TH	1 hr.	Scheme	TH		
					TAE	MSE	ESE
					15	10	-

Course Objectives:

1.Foster the love for mathematics by creating a positive attitude through Vedic and ancient Indian Mathematics
2.Help students appreciate ancient Indian Mathematics and its contribution to the world.
3.Enhance computational proficiency by involving procedures in Linear Algebra
4.Improve geometrical thinking by understanding the basic tenets of geometry such as construction of line segments, angles, triangles and circles as used in Ancient India
5.Develop conceptual knowledge of mathematical concepts
6.Appreciate the need of conceptual knowledge over procedural processes

Course Outcomes:

Upon completion of the course, students will be able to

CO1: Understand the basic techniques in Vedic maths
CO2: Illustrate mathematical solution of algebraic expressions
CO3: Solve system of linear equations faster and with ease.
CO4: Discover the Mathematical advancements of Ancient India.

Content

Unit I	Basic in Vedic Mathematics	5 Hours

Addition, Subtraction, Multiplication, Fractional Arithmetic, Algebraic Techniques

Unit II	Easy Solution of linear equations	5 Hours

Introduction of simple equation, Solutions of simple equations , Solutions of linear equations in two variables , Practical application of linear equations in two variables

Unit III	Vedic Geometry	5 Hours

Different forms of straight lines, The Triangle, The Cyclic Quadrilateral, Squares, and the Circle, Geometrical constructions, Transformation of simple shapes.

List of Books:

1."Vedic Mathematics" by Jagadguru Swami Sri Bharati Krishna Tirthaji Maharaja -
2."The Cosmic Calculator Course: Vedic Mathematics Demystified" by Kenneth Williams
3."Vedic Mathematics for All Ages: A Beginners' Guide" by Bharti Krishna Tirthaji, Michael M. Williams - 4."The Complete Idiot's Guide to Vedic Mathematics" by Kenneth Williams
5."Vedic Mathematics Made Easy" by Dhaval Bathia
6."Speed Mathematics Using the Vedic System" by Vali Nasser
7."Vedic Mathematics: The Ancient Art of Superfast Calculations" by Rajesh Kumar Thakur
8."The Power of Vedic Maths" by Atul Gupta -
9."Vedic Mathematics Secrets: Fun Applications of Vedic Math in Your Everyday Life!" by William Q.