

SNJB's
Late Sau. Kantabai Bhavarlalji Jain
College of Engineering

(An Autonomous Institute Affiliated to Savitribai Phule Pune University, Pune)

Shri Neminath Jain Brahmacharyashram (SNJB) (Jain Gurukul)

Neminagar, Chandwad - 423101, Dist. Nashik (MS, India).

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Curriculum Structure and Evaluation Scheme for F.Y. B.
Tech. in Electronics and Telecommunication Engineering
with Multidisciplinary Minor
To be implemented for 2025-29 Batch
(With Effect from Academic Year 2025-26)

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Vision of the Institute

Transform young aspirant learners towards creativity and professionalism for societal growth through quality technical education.

Mission of the Institute

1. To transfer the suitable technology, particularly for rural development.
2. To enhance diverse career opportunities among students for building a nation.
3. To acquire the environment of learning to bridge the gap between industry and academics.
4. To share values, ideas, beliefs by encouraging faculties and students for welfare of society.

The vision of the Electronics and Telecommunication Engineering Department

To prepare Electronics & Telecommunication Engineers for the benefit of the society.

Mission of the Electronics and Telecommunication Engineering Department

1. To provide quality education to students
2. To enrich the skill in collaboration with industry for better career opportunity
3. To inculcate ethics, values and environment awareness

Program Outcomes (POs) for an engineering graduate:

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)



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P04: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

P05: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

P06: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

P07: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

P08: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

P09: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

P010: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

P011: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8).



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Table 1: Abbreviations

Abbreviation	Meaning
CIE	Continuous Internal Evaluation
MSE	Mid Semester Examination
SEE	Semester End Examination
BSC	Basic Science Courses
ESC	Engineering Science Courses
VSEC/VSC	Vocational and Skill Enhancement Courses
VEC	Value Education Courses
AEC	Ability Enhancement Courses
PCC	Program Core Courses
ELC	Research Methodology
	Computer Engineering Project (CEP)/ Field Project (FP)
	Project
	Internship/ On Job Training (OJT)
IKS	Indian Knowledge System
CC/CCC	Co-Curricular Courses
HOC	Honor Courses
EXT	Exit Courses
AC	Audit Courses
SIP	Student Induction Program
L	Lecture
T	Tutorial
P/PR	Practical
TH	Theory
Lab	Laboratory
TW	Term Work
OR	Oral
CE	Civil Engineering
CS	Computer Engineering
ME	Mechanical Engineering
AD	Artificial Intelligence and Data Science Engineering
ET	Electronics and Telecommunication Engineering

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Semester – I

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	BSC	25-BSC-1-01	Engineering Physics	3	-	-	3	3	20	20	60	100	-	-	-	100
2	BSC	25-BSC-1-03	Linear Algebra And Differential Calculus	3	1	-	4	4	20	20	60	100	-	-	-	100
3	ESC	25-ESC-1-01	Basic Electrical and Electronics Engineering	3	-	-	3	3	20	20	60	100	-	-	-	100
4	ESC	25-ESC-1-04	Smart Building and Materials	2	-	-	2	2	20	20	60	100	-	-	-	100
5	BSC	25-BSC-1-05	Engineering Physics Laboratory	-	-	2	2	1	-	-	-	-	25	-	-	25
6	ESC	25-ESC-1-05	Basic Electrical and Electronics Engineering Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
7	ESC	25-ESC-1-09	Smart Building and Materials Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
8	VSEC	25-VSC-1-01	TechSkill	-	-	4	4	2	-	-	-	-	50	-	-	50
9	CCC		Co-curricular Course -I	-	-	2	2	1	-	-	-	-	50	-	-	50
10	IKS	25-IKS-1-01	Indian Knowledge System	-	2	-	2	2	-	-	-	-	50	-	-	50
11	AEC	25-AEC-1-01	Professional Communicati on Skills	-	1	-	1	1	-	-	-	-	25	-	-	25
Total				11	4	12	27	21	80	80	240	400	250	-	-	650

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Course Code	Bucket of Co-curricular Course
25-CCC-1-A	Yoga
25-CCC-1-B	Sports
25-CCC-1-C	NSS (National Service Scheme)
25-CCC-1-D	Cultural

Note: Students have to select any one course from the above basket.

Induction Program (Mandatory)	3 Weeks Duration
The induction program (as per AICTE guidelines) is to be completed at the start of the first year.	• SIP Module 1: UHV 1 • SIP Module 2: Physical Health and Related Activities • SIP Module 3: Familiarization of Department/ Branch and Innovation • SIP Module 4: Visit to a Local Area • SIP Module 5: Lectures by Eminent People • SIP Module 6: Proficiency Modules • SIP Module 7: Literature / Literary Activities • SIP Module 8: Creative Practices • SIP Module 9: Extra Curricular Activities



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Semester – II

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	BSC	25-BSC-1-02	Engineering Chemistry	3	-	-	3	3	20	20	60	100	-	-	-	100
2	BSC	25-BSC-1-04	Statistics and Integral Calculus	3	-	-	3	3	20	20	60	100	-	-	-	100
3	ESC	25-ESC-1-03	Engineering Graphics	3	-	-	3	3	20	20	60	100	-	-	-	100
4	ESC	25-ESC-1-02	Programming and Problem Solving	2	-	-	2	2	20	20	60	100	-	-	-	100
5	PCC	25-PCC-ET-1-01	Digital Design	2	-	-	2	2	20		30	50	-	-	-	50
6	BSC	25-BSC-1-06	Engineering Chemistry Laboratory	-	-	2	2	1	-	-	-	-	25	-	-	25
7	ESC	25-ESC-1-08	Engineering Graphics Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
8	ESC	25-ESC-1-07	Programming and Problem Solving Lab	-	-	2	2	1	-	-	-	-	25	-	-	25
9	PCC	25-PCC-ET-1-02	Digital Design Lab	-	-	2	2	1	-	-	-	-	25	25	-	50
10	VSEC	25-VSC-1-02	TechShop	-	-	4	4	2	-	-	-	-	50	-	-	50
11	CCC	25-CCC-1-05	Co-curricular Course -II	-	-	4	4	2	-	-	-	-	25	-	-	25
Total				13	-	16	29	21	100	80	270	450	175	25	-	650

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**Level 4.5 Exit Criteria: Mandatory Courses to be completed after first year for obtaining One
Year UG Certificate in Electronics and Telecommunication Engineering**

Sr. No	Category	Course Code	Course Name	Teaching Scheme					Evaluation Scheme							
				Hours				Credits	Theory Course				Lab Course			Total Marks
				L	T	P	Total Hours		CIE	MSE	SEE	TH Marks	TW	PR	OR	
1	EXT	25-EXT-1-01	Internship / Fieldwork/OJ T	-	-	8	8	4	-	-	-	-	100	-	-	100
2	EXT	25-EXT-1-02	Mini Project	-	-	8	8	4	-	-	-	-	50	-	50	100
Total				-	-	16	16	8	-	-	-	-	150	-	50	200

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Semester-I



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25-BSC-1-01 : Engineering Physics		
Teaching Scheme: Theory:3 Hours/Week	Credit: 3	Examination Scheme: CIE : 20 Marks MSE : 20 Marks SEE : 60 Marks
Prerequisite Courses: Useful Concepts: Band theory of solids, Classification of solids, Study of Atoms, Molecules and atomic theory and Rutherford Expt, Photoelectric effect, Transducer, Origin of Quantum mechanics and its comparison with classical mechanics, Dual nature of radiation, Meaning of calibration, Piezoelectric effect, Polarisation, Properties of Matter, Electric field, Magnetic Field.		
Companion Course: 25-BSC-1-05 Engineering Physics Lab.		
Course Objectives: - To provide inclusive knowledge of fundamental physics principles encouraging engineering students to venture in applications. - To teach basic concepts and principles of physics, relate them to laboratory experiments.		
Course Outcomes: After completion of the course, learners should be able to		
CONo	CO	BL
CO1	Apply the principles of Measurement and Dimensions for concepts of Engineering Physics.	3
CO2	Discuss the principles of physics to solve engineering problems and applications.	2
CO3	Describe laser, Sensor & Fiber optics applications.	2
CO4	Explore to Gain insights into the interdisciplinary nature of engineering, bridging physics with other fields.	3
CO5	Understand the core concepts of quantum mechanics & their uses.	2
CO6	Identify the impact of nanotechnology on various fields.	2
Course Contents		
Unit I	Dimensions and Semiconductor Physics	7 Hours

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Measurements and Dimension, Need for Measurement: Units of Measurement, Systems of units; SI units, fundamental and derived units, Significant Figures, Dimensions of physical quantities, Band theory of solids, Classification of Conductor, Semiconductor & insulator on basis of band theory, Electrical Conductivity in Semiconductors, Fermi-Dirac Statistics, Hall effect, Applications of Semiconductors, P-n Junction, (Zero, forward & reverse Biasing based on band theory), Solar cell.		
Exemplar/Case Studies: 1] To measure dimensions of different equipments like wire, metal bob, sheet etc 2] To study different equipment of computers made up of semiconductor material.		
*Mapping of Course Outcomes		C01, C02, C04
Unit II	Crystallography	7 Hours
Introduction, Lattice direction, Miller indices, Lattice planes, Lattice point and space lattice, The basis and crystal structure, Unit cell and lattice parameter, Primitive cell, The seven crystal systems and Bravais space lattice. The unit cell characteristics Number of atoms per unit cell, Atomic radius, Coordination number, Packing density. Separations between lattice planes in a cubic crystal, X-ray diffraction, Bragg's law.		
Exemplar/Case Studies: 1] To study different parameters of silicon such as structure, defects etc (Solar Cell) 2] To analyze different crystals in nature like chalk, alum, NaCl, Sugar etc.		
*Mapping of Course Outcomes		C01, C02, C04
Unit III	Photonics and LASER	7 Hours
Introduction of LASER, Fundamentals of Laser: Absorption, Spontaneous emission and Stimulated emission, Metastable state, Resonant cavity, Population inversion, three & four level lasers. types of pumping, Ruby Laser, Semiconductor Laser (heterojunction laser diode), He-Ne laser, Applications (Engineering, Medical, Communication) Parameters of optical fibers: Critical angle, total internal reflection, Numerical Aperture, Acceptance angle and acceptance cone, Numericals, Types of optical fibers: step index, graded index, Advantages of optical fiber communication.		
#Exemplar/Case Studies: 1] To verify and study light through different technology like fiber optics, sensors, solar cells etc.		
*Mapping of Course Outcomes		C01, C02, C03, C04
Unit IV	Physics of Sensor and Characterization Techniques	7 Hours
Ultrasonic sensors: Concept of inverse piezoelectricity, use of piezoelectric transducer as ultrasonic generator, Applications, Light sensors (LDR): Concept of Polarisation- Double Refraction (Half Shade Polarimeter-Principle & Applications, Material Characterization Techniques and Instrumentation (e.g. XRD)		
#Exemplar/Case Studies: 1] To study different sensors like pressure, temperature, displacement etc for finding different Domestic & Societal Applications.		
*Mapping of Course Outcomes		C01, C02, C03, C04

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Unit V	Quantum Physics	7 Hours
Introduction (Interaction of matter with radiation, Matter waves,) De Broglie hypothesis, Wave Packet), De Broglie hypothesis, Wave Packet, Concept of Phase velocity and group velocity and relation with particle velocity (Introductory), Heisenberg Uncertainty Principle, Concept Of Wave function and Probability Density; Physical interpretation of wave function, Schrodinger's time independent wave equation Applications: Particles trapped in one dimensional infinite potential well, Tunneling effect and STM, Fundamentals of Quantum Computing (Difference between classical computing & quantum computing, Quantum Superposition theorem, Quantum Entanglement theorem, Quantum cryptography)- Computer and AIDS Engineering		
#Exemplar/Case Studies: Applications of STM.(Medical)		
*Mapping of Course Outcomes		C01, C02, C04, C05
Unit VI	NDT and Nanotechnology	7 Hours
Non Destructive Testing - Classification of Non-destructive testing methods, Principles of physics in Non-destructive Testing, Advantages of Non-destructive testing methods, Acoustic Emission Testing - Ultrasonic (thickness measurement, flaw detection), Radiography testing, Nanotechnology - Introduction to nanotechnology, Quantum confinement and surface to volume ratio, Properties of nanoparticles: optical, electrical, mechanical.Applications of nanoparticles: Medical (targeted drug delivery), electronics, Space and Defence, automobile, environment and energy.		
#Exemplar/Case Studies: 1] To analyze the different properties of material components. (View Nanomaterial)		
*Mapping of Course Outcomes		C01, C02, C04, C06
Learning Resources		
Text Books		
T1. Avadhanulu & Kshirsagar "A textbook of Engineering Physics"-S. Chand Publication 2023. T2. S. O. Pillai "A textbook of Engineering Physics", New Age International Publishers 2023.		
Reference Books :		
R1: David. J. Griffiths- Introduction to Quantum Mechanics- Cambridge university . R2: Arthur Beiser-Concepts of Modern Physics-Tata McGraw Hill R3:S. O. Pillai-Solid State Physics- New Age International Publishers 2023.		
Additional Resources: (Books, e-Resources)		
1.E-Book of "Engineering Physics" for FE students. Click Here 2. https://discovery1.delnet.in/Search/Results?lookfor=s+o+pillai&type=Author&location_code= 3. https://discovery1.delnet.in/Search/Results?lookfor=Avadhanulu+%26+Kshirsagar&type=Author&location_code=&limit=60 4. https://discovery1.delnet.in/Search/Results?lookfor=A.S.+Vasudeva&type=Author&location_code=&limit=60		

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| 5. https://discovery1.delnet.in/Search/Results?lookfor=David.+J.+Griffiths&type=Author&location_code=&limit=60
6. https://discovery1.delnet.in/Search/Results?look for=Arther+Beiser+&type=Author&location_code=&limit=60 |
| MOOC Courses links :
1. https://onlinecourses.nptel.ac.in/noc25_ph07/preview
2. https://onlinecourses.nptel.ac.in/noc20_bt16/preview |



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25-BSC-1-03: Linear Algebra And Differential Calculus		
Teaching Scheme: Theory: 03 Hours/Week. Tutorial: 01 Hours/ Week.	Credit: TH : 4	Evaluation Scheme: CIE : 20 Marks. MSE : 20 Marks. SEE : 60 Marks.
Prerequisites: Basics of Differentiation, Basics of Integration, Maxima and Minima, Determinants and Basics of Matrices.		
Companion Course: ----		
Course Objectives: - To make the students familiarize with concepts and techniques in differential Calculus, and linear Algebra. - The aim is to equip them with the techniques to understand advanced level mathematics and its applications that would enhance analytical thinking power, useful in the discipline		
Course Outcomes: After completion of the course, learners should be able to		
CO No	CO	BL
C01	Understand the basic Concept.	2
C02	Solve the system of linear equation by using matrix method, ODE ,Partial Diff , find the Expansion of Function	3
C03	Find the Eigenvalue and Eigenvector. N th order derivatives, series by using Taylor's and McLaren's theorem.	3
C04	Apply theorem in Expansion, Leibnitz, Euler's theorems of Homogeneous Function, Cayley -Hamilton theorem.	3
C05	Analyze the Problems and apply the appropriate concept	3
C06	Apply the concept of Linear algebra, and differential calculus for real life engineering Problems.	3
Course Contents		
Unit I	Linear Algebra- Matrices ,System of linear equations	7 Hours
Rank of a Matrix, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations, Application to problem in Engineering.		

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Exemplar/Case study: Case study on matrices.		
Assignment: Assignment on System of, Linear Equations, Linear and Orthogonal Transformations		
*Mapping of Course Outcomes		C01, C02, C06
Unit II	Linear Algebra- Eigenvalue and Eigenvector	7 Hours
Eigenvalues and EigenVectors, Cayley Hamilton theorem, Diagonalization of a matrix, Reduction of Quadratic forms to Canonical form by Linear and Orthogonal transformation		
Exemplar/Case Studies : Case study on matrices eigenvalues and eigenvector		
Assignment : Assignment on Eigenvalues and EigenVectors, Reduction of Quadratic forms to Canonical form by Linear and Orthogonal transformations		
*Mapping of Course Outcomes		C03, C04, C06
Unit III	Differential Calculus: Expansion And Indeterminate form	7 Hours
Rolle's Theorem, Mean Value Theorems, Taylor's Series and Maclaurin's Series, Expansion of functions using standard expansions, Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits and Applications.		
exemplar/Case Studies :--		
Assignment : Assignment on Mean Value Theorems, Taylor's Series ,Indeterminate Forms,		
*Mapping of Course Outcomes		C01,C03, C04, C05
Unit IV	Ordinary Differential equations and its Application	7 Hours
Exact differential equations, Equations reducible to exact form, Linear differential equations, Equations reducible to linear form, Applications of Differential Equations to Orthogonal Trajectories, Newton's Law of Cooling, Kirchhoff's Law of Electrical Circuits, One dimensional Conduction of Heat		
exemplar/Case Studies: -		
Assignment : Assignment on Differential equation and its Application		
*Mapping of Course Outcomes		C01,C02, C05, C06
Unit V	Successive Differentiation and Linear Differential Equation	7 Hours

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Successive Differentiation, Leibnitz Theorem, DE of nth order with constant coefficients, Complementary Function, Particular Integral, General method, Shot -cut methods, Method of variation of parameters.		
Example/Case Studies: –		
Assignment: Assignment on Linear Differential Equation & Successive Differentiation.		
*Mapping of Course Outcomes		C01,C02, C04, C05
Unit VI	Partial Differentiations and its Applications	7 Hours
Introduction to Partial Derivatives, Euler's Theorem on Homogeneous functions, Partial derivative of Composite Function, Total Derivative, Its applications Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.		
exemplar/Case Studies: –		
Assignment : Assignment on Partial Differential equation and its Application		
*Mapping of Course Outcomes		C01,C02, C04, C05, C06
Learning Resources		
Text Books		
T1. .B. V. Ramana ,“Higher Engineering Mathematics”, (Tata McGraw Hill) (2017, 29 th edition) T2. B. S. Grewal, “Higher Engineering Mathematics “, (Khanna Publication, Delhi(2014. 2 nd edition)		
Reference Books :		
R1. Erwin Kreyszig , “ Advanced Engineering Mathematics” , (Wiley Eastern Ltd.), (2014, 9 th edition) R2. M. D. Greenberg , “Advanced Engineering Mathematics” , (Pearson Education), (2014. 2 nd edition) R3. Peter V. O'Neil, “ Advanced Engineering Mathematics “ , (Thomson Learning) , (2013,7 th edition)		
Additional Resources: (Books, e-Resources) https://discovery1.delnet.in/Search/Results?lookfor=B.+V.+Ramana&type=Author&location_code=&limit=60 2. https://discovery1.delnet.in/Search/Results?lookfor=B.+S.+Grewal&type=Author&location_code=&limit=60 3. https://discovery1.delnet.in/Search/Results?lookfor=Erwin+Kreyszig&type=Author&location_code=&limit=60 4. https://discovery1.delnet.in/Search/Results?lookfor=M.+D.+Greenberg+&type=Author&location_code=&limit=60 5. https://discovery1.delnet.in/Search/Results?lookfor=Peter+V.+O&type=Author&location_code=&limit=60 6. https://discovery1.delnet.in/Search/Results?lookfor=George+B.+Thomas&type=Author&location_code=&limit=60 7. https://discovery1.delnet.in/Search/Results?lookfor=P.N.Wartika&type=Author&location_code=&limit=60 8. https://discovery1.delnet.in/Search/Results?lookfor=Ron+Larson%2C&type=Author&location_code=&limit=60		

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25-ESC-1-01 : Basic Electrical & Electronics Engineering		
Teaching Scheme: Theory: 03 Hours/Week	Credit: 03	Evaluation Scheme: CIE : 20 Marks MSE : 20 Marks SEE : 60 Marks
Prerequisites: Basic knowledge of Physics		
Companion Course: 25-ESC-1-05 : Basic Electrical & Electronics Engineering Lab		
Course Objectives: - To provide knowledge about electrical and electronic components and circuits. - To be aware of the electrical safety devices, electrical systems & electrical machines. - To provide knowledge about sensors. - To impart knowledge of the basic principles of communication systems.		
Course Outcomes: After completion of the course, learners should be able to		
CO No.	CO	BL
CO1	Analyze the resistive circuits.	4
CO2	Use Semiconductor devices in the rectifier, switch and amplifier applications.	3
CO3	Explain the electrical systems and safety devices.	2
CO4	Explain the construction, working principle of electrical machines.	2
CO5	Select the sensors for given applications.	3
CO6	Describe the basic principles of communication systems.	2
Course Contents		
Unit I	Basic Circuits elements	6 Hours
Basic Circuit Elements: Active & passive electronics components and their uses in the circuits. Sources:		

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Ideal & Practical Voltage & Current sources. Resistor & capacitor - Series and parallel connection, Voltage and current divider theorem. Ohm's law, Kirchoff's laws: Basic concepts of KVL & KCL.		
Exemplar/Case Studies: Applications of Active & passive electronics components.		
*Mapping of Course Outcomes :	C01	
Unit II	Semiconductor Devices & Circuits	6 Hours
Diodes: PN junction diode, Biasing, V-I characteristics. Special diodes: LED, Photodiode. Rectifier Circuits: HWR, FWR (Bridge). Introduction to regulated DC power supply. Transistors: BJT - Region of operation, CE configuration, BJT as a Switch & amplifier, E-MOSFET- Switch & amplifier.		
Exemplar/Case Studies: Applications of diodes.		
*Mapping of Course Outcomes :	C02	
Unit III	Fundamentals of Electrical Systems and safety devices	6 Hours
Electrical system: Single phase and three phase supply, Alternating voltage & current. Calculation & billing of energy consumption, How to reduce the power consumption. Safety devices: Fuse, MCB, MCCB, ELCB. Battery: Introduction, Lithium Ion Battery. Non Conventional Energy Source: Rooftop Solar Plant.		
Exemplar/Case Studies: Calculate the electric consumption of your home and suggest the ways to reduce it.		
*Mapping of Course Outcomes :	C03	
Unit IV	Electrical Machines	6 Hours
DC Machines (Shunt and series motor) : Construction, Working principle & Application. Transformer : Working principles, types, losses, emf equation of transformer, Application. Special Machines : Introduction to Stepper motor, Servo motor.		
Exemplar/Case Studies: Applications of Motors.		
*Mapping of Course Outcomes :	C04	
Unit V	Sensors	6 Hours

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Sensors: Selection criterion, Active and Passive sensors. Block diagram of instrumentation system. Working Principles and applications of sensors : Temperature (RTD, Thermocouple), Force / Weight (Strain Gauge, load Cell), Motion (LVDT), Obstacle (ultrasonic)		
Exemplar/Case Studies: Applications of Sensors.		
*Mapping of Course Outcomes :		C05
Unit VI	Basic Communication System	6 Hours
Communication System : Block Diagram of Communication System. Communication Media: Wired and Wireless. Electromagnetic spectrum (IEEE spectrum). Modulation- Need, Amplitude & Frequency Modulation. Mobile Communication System : Cellular Network, GSM, Introduction to 5G.		
Exemplar/Case Studies: Applications of different media (wired, wireless) used for communication.		
*Mapping of Course Outcomes :		C06
Learning Resources		
Text Books		
T1. B.L. Theraja, "A Textbook of Electrical Technology", S. Chand Publication T2. R.S. Sedha, "Applied Electronics", S. Chand T3. D.P. Kothari, I. J. Nagrath, "Electric Machines", McGraw Hill		
Reference Books		
R1. V. K. Mehta, Rohit Mehta, "Basic Electrical Engineering", S Chand Publications R2. Van Valkenburgh, "Solid State Electronics", Cengage Learning R3. Srinivas, "Basic Electrical Engineering", I. K. International R4. Abhijit Chakrabarti, "Electrical Machines", McGraw Hill R5. D.V.S. Murty, "Transducers and Instrumentation", PHI, 2nd Edition R6. J. Schiller, "Mobile Communication", Pearson, 2nd Edition		
Additional Resources: (Books, e-Resources) https://en.wikipedia.org/wiki/Lithium-ion_battery		

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MOOC Courses links :

https://onlinecourses.nptel.ac.in/noc24_ee53/preview

https://onlinecourses.nptel.ac.in/noc24_mm10/preview



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25-ESC-1-04 : Smart Building and Materials		
Teaching Scheme: Theory: 2 Hours/Week	Credit: 2	Examination Scheme: CIE : 20 Marks MSE : 20 Marks SEE : 60 Marks
Prerequisite Courses: Green Building.		
Companion Course: 25-ESC-1-09 : Smart Building and Materials Lab.		
Course Objectives: • To acquire the knowledge of modern tools and softwares. • To know the rules of building bylaws. • To learn the concept of intelligent buildings. • To study the different types of construction materials.		
Course Outcomes: After completion of the course, learners should be able to		
CONo	CO	BL
CO1	Draw effectively building plan using Computer Aided Drafting software.	3
CO2	Understand principles of building planning, bylaws, set back distance etc.	3
CO3	Acquire skills and its applications using GIS.	2
CO4	Describe the various modern tools of surveying.	3
CO5	Understand the concept of conventional and intelligent building.	2
CO6	Acquire the knowledge of conventional and smart materials of construction.	2
Course Contents		
Unit I	Introduction to Computer aided Drafting	6 Hours
Introduction to Computer Aided Drafting (2D), Concept of AutoCAD, Toolbars in CAD software, coordinate system, snap, grid, and ortho mode (Absolute, Relative and Polar), setting of units and layout, Drawing commands – point, line, arc, circle, ellipse, Editing commands – scale, erase, copy, stretch, lengthen and explode, Dimensioning and placing text in drawing area, Sectioning and		

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hatching, Create layers within a drawing, Specifying Geometric.		
#Exemplar/Case Studies : – Develop the line plan of the building using AutoCAD software.		
*Mapping of Course Outcomes		C01
Unit II	Building Layout and Planning	6 Hours
Principles of Building Planning, Classification of buildings, building bylaws, concept of set back distance.		
#Exemplar/Case Studies : –		
*Mapping of Course Outcomes		C02
Unit III	Introduction to GIS & GPS	6 Hours
GPS - Introduction to GPS, Overview of GPS, GPS Segments, Types of GPS, GPS Applications:- GPS for utilities industry, Forestry and natural resources, Precision Farming. GIS - Basic Concept of GIS, Definition and history of GIS, Components of GIS, Recent trends and applications of GIS, Important applications of GIS.		
#Exemplar/Case Studies : –		
*Mapping of Course Outcomes		C03
Unit IV	Introduction to modern testing tools	6 Hours
Measurement of distance and area by EDM and Digital Planimeter. Basics of modern surveying tools like theodolite, total station.		
#Exemplar/Case Studies		
*Mapping of Course Outcomes		C04
Unit V	Intelligent Building	6 Hours
Index-IBI), Difference between a conventional building and an intelligent building, Basic parameters for designing building lighting, Mechanical Transport and Safety (Elevators, lifts, local regulations on lift and elevator, new development in elevator technology), Life Value of Building, Fire detection and safety, Gas alarm, emergency evacuation systems		
#Exemplar/Case Studies : A Field Visit to study intelligent building features of a building		
*Mapping of Course Outcomes		C05
Unit VI	Introduction to Conventional Materials	6 Hours

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& Smart Materials	
Conventional materials: Stones, Lime, Bricks, Cement, Timber, Steel, Tiles, cementitious materials like fly ash, pond ash, rice husk ash, ground granulated blast furnace slag. Smart materials: Piezoelectric Materials, Shape Memory Alloys, Magnetostrictive Materials, Electrochromic materials, Fibers, Sensors.	
#Exemplar/Case Studies:	
*Mapping of Course Outcomes	C06
Learning Resources	
Text Books	
T1: T. Jeyapooran, "Engineering Drawing with AutoCAD 2000", Vikas Publishing House, Delhi, 2010 T2: Dr. B.C. Punmia Er. Ashok K. Jain Dr. Arun K. Jain, "Surveying" Laxmi Publication, 2016	
Reference Books :	
R1: Panda B C, "Principles of Remote Sensing", Viva Books Private Limited, 2005 R2: Gurucharan Singh, "Building Planning, Scheduling and Design", 2 nd Edition, Khanna Publishers, 2010. R3.: Kailas Phalak, Kisan Bidkar, "Intelligent Building" Lambert Academic Publishing, 2019	
Additional Resources: (Books, e-Resources) : -	
MOOC Courses links : NPTEL : https://nptel.ac.in/courses/105108077 NPTEL : https://nptel.ac.in/courses/112102101 NPTEL : https://archive.nptel.ac.in/courses/105/102/105102088/	

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25-BSC-1-05 : Engineering Physics Lab		
Teaching Scheme: PR: 02 Hours/week	Credit: 01	Evaluation Scheme: Termwork (TW) : 25 Marks
Prerequisites : Useful Concepts: Band theory of solids, Classification of solids, Study of Atoms, Molecules and atomic theory and Rutherford Expt, Photoelectric effect, Transducer, Meaning of calibration, Piezoelectric effect, Polarisation, Properties of Matter, Electric field, Magnetic Field.		
Companion Course: 25-BSC-1-01 Engineering Physics		
Course Objectives: - To gain practical knowledge by applying experimental methods to correlate with the theory. - To develop intellectual communication skills and discuss the basic understanding of various experimental principles involved.		
Course Outcomes: After completion of the course, learners should be able to		
CONo	CO	BL
C01	Demonstrate understanding of optoelectronic devices and their characteristics.	3
C02	Apply scientific principles to analyze and measure physical properties	3
C03	Utilize experimental techniques for characterization and analysis	3
C04	Evaluate and interpret data to determine material properties and functionalities.	3
C05	Demonstrate familiarity with basic electronic components and use them to design simple electronic circuits.	3
C06	Proficiently perform various NDT techniques including but not limited to Visual Inspection, Ultrasonic Testing and Radiography Testing.	3
Guidelines for Instructor's Manual The instructor's manual is to be developed as a reference and hands-on resource. It should include prologue (about University/program/ institute/ department/foreword/ preface), curriculum of the course, conduction and Assessment guidelines,		

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topics under consideration, concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.		
Guidelines for Student's Laboratory Journal/Manual The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, , Assessment grade/marks and assessor's sign, Theory- Concept in brief, (if applicable), conclusion/analysis.		
Guidelines for Laboratory /Term Work Assessment Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as Team work, Understanding, Lab report and interpretation of result and conclusion.		
Guidelines for Laboratory Conduction & Safety • Do not come into the lab early unless the instructor is present. • Do not set equipment too close to the edge of the table. • Do not activate any circuit or apparatus until the instructor inspects it. • Never touch a possibly live circuit and do not touch electrical equipment with wet hands. • No food or drink is to be consumed in the laboratory. • Any food or drink brought to the lab must remain in the students carrying bag until they leave.		
Virtual Laboratory: (If Any): • Study of Bragg's law. • Simulation Experiments on Sensors.		
Suggested List of Laboratory Experiments/Assignments(Any 8)		
Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Analyze the light sensitivity of solar cells: Measure the current-voltage (I-V) characteristics of a solar cell to understand its efficiency in converting light energy into electricity.	CO1, CO4

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2.	Calculate the energy gap in a semiconductor: Determine the forbidden energy gap of a semiconductor material, a crucial parameter for its applications in electronics and optoelectronics.	C02
3.	Measure the angle of polarization with a half-shade polarimeter: Utilize a half-shade polarimeter to analyze the polarization of light, a technique used in various applications like 3D glasses and glare reduction.	C01, C03
4.	Characterize a diffraction grating using a laser: Employ a laser and a diffraction grating to determine the number of lines per unit length on the grating. This knowledge is essential for designing optical instruments like spectrometers.	C02
5	Simulate sensor behavior: Through simulations, investigate the response of various sensors to different stimuli, allowing for the optimization of sensor design for specific applications.	C03
6	Determine the velocity of a liquid using an ultrasonic interferometer: Measure the velocity of a liquid with an ultrasonic interferometer, a non-invasive technique used in industrial processes and medical diagnostics.	C02
7	Measure the numerical aperture of an optical fiber: Determine the numerical aperture of an optical fiber, a parameter defining its light-gathering ability, which is critical for communication and sensing applications.	C02
8	Investigate a phenomenon related to double refraction: Conduct an experiment based on double refraction to determine the refractive indices of a material or identify the type of crystal. Double refraction has applications in optical components like waveplates and polarization filters.	C02, C03, C04
9	Analyze the impact of light on sensor response: Study the dependence of a sensor's output on the intensity or wavelength of light. This understanding is crucial for designing light-based sensors for various applications.	C01
10	Explore the switching behavior of transistors: Analyze the operation of a transistor as a switch, a fundamental building block in digital circuits.	C05
11	Evaluate Non-Destructive Testing (NDT) methods: Study various NDT techniques for material characterization without damaging the sample.	C06

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Learning Resources
Text Books
T1. Avadhanulu & Kshirsagar "A textbook of Engineering Physics"-S. Chand Publication 2023. T2. S. O. Pillai "A textbook of Engineering Physics", New Age International Publishers 2023.
Reference Books :
R1. A.K. Katiyar, C.K. Pandey. Katiyar, C.K. Pandey "Engineering Physics: Theory and Practical, 2ed-Wiley Book Series.
Additional Resources: (Books, e-Resources) 1. https://www.arvindguptatoys.com/toys.html



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25-ESC-1-05: Basic Electrical and Electronics Engineering Lab		
Teaching Scheme: Practical: 02 hrs/Week	Credit: 1	Evaluation Scheme: Termwork (TW) : 25 Marks
Prerequisite Courses: Basic knowledge of Physics		
Companion Course: 25-ESC-1-01: Basic Electrical and Electronics Engineering		
Course Objectives: - To provide practical demonstration of electrical components and basic laws. - To provide practical demonstration of semiconductor devices and their applications. - To provide practical demonstration of electrical safety devices & electrical machines. - To provide knowledge of batteries, cables & sensors.		
Course Outcomes: After completion of the course, learner should be able to		
CO No.	CO	BL
CO1	Analyze resistive circuits using KVL, KCL under DC supply	4
CO2	Build and test power supply, LED biasing, transistor application as a switch and amplifier	3
CO3	Demonstrate the electrical safety devices & electrical machines	3
CO4	Explain applications of batteries, cables & sensors	2
Guidelines for Instructor's Manual The instructor's manual is to be developed as a reference and hands-on resource. It should include rubric for the assessment and practical conduction plan. The Instructor's Manual should contain the following related to every experiment – Aim , objectives, Brief theory related to the experiment, Apparatus with their detailed specifications, Connection diagram /circuit diagram, Observation table/ simulation waveforms, Sample calculations for one/two readings, Result table, Graph and Conclusions, Few questions related to the experiment, Relevance of practical in real life /industry.		
Guidelines for Student's Laboratory Journal		

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The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and printed write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, test cases, Test Data Set (if applicable), mathematical model (if applicable), conclusion/analysis. For reference one or two journals may be maintained in the Laboratory.

Guidelines for Laboratory /Term Work Assessment

There should be continuous assessment for the TW. Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as timely completion, performance, punctuality and neatness etc. or as per the defined rubrics.

Guidelines for Laboratory Conduction

All the experiments mentioned in the syllabus are compulsory. Use of open source software and recent versions are to be encouraged.

Virtual Laboratory: (If Any):

1. <https://be-iitkgp.vlabs.ac.in/List%20of%20experiments.html>
2. <https://sl-coep.vlabs.ac.in/List%20of%20experiments.html>

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Compulsory Assignment)

Sr No	Assignment Title	Mapping of Course Outcomes
1.	Demonstration of electrical safety devices.	C03
2.	Identify & test different types of active & passive electronic components.	C01
3.	Demonstration of Ohm's, KVL, KCL.	C01
4.	Design & build LED biasing circuit.	C02
5.	Design & build transistor as a switch/amplifier.	C02
6.	Build & test regulated DC power supply.	C02



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Group B: Assignments (Any 2)		
Sr No	Assignment Title	Mapping of Course Outcomes
1.	Understanding the battery parts & its specification.	C03
2.	Determine efficiency and regulation of single phase transformer.	C04
3.	Study of different types of sensors & their applications.	C05
4	Study of different types of Cables & their applications.	C06
Group C: Assignments (optional)		
Sr No	Assignment Title	Mapping of Course Outcomes
1.	Visit to rooftop solar power plant.	C03
Learning Resources		
Text Books		
T1. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill		
Reference Books :		
R1. S. K. Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson		
Additional Resources: (Books, e-Resources):		
1. https://www.tinkercad.com		
MOOC Courses links :		
1. https://onlinecourses.swayam2.ac.in/nou24_ec02/preview		
2. https://onlinecourses.nptel.ac.in/noc24_ee12/preview		

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25-ESC-1-09 : Smart Building And Materials Lab																				
Teaching Scheme: Practical: 2 Hours/Week	Credit: 1	Examination Scheme: Termwork (TW) : 25 Marks																		
Prerequisites Courses: -----																				
Companion Course: -----																				
Course Objectives: • To understand basic principles of building planning. • To acquire the knowledge of modern tools. • Identify various building materials and their structural requirements. • To learn the fundamentals of GIS and GPS																				
Course Outcomes: After completion of the course, learners should be able to <table border="1" data-bbox="215 1089 1464 1495"> <thead> <tr> <th>COno</th><th>CO</th><th>BL</th></tr> </thead> <tbody> <tr> <td>C01</td><td>Draw the building plan using Autocad</td><td>3</td></tr> <tr> <td>C02</td><td>Understand the use of modern tools</td><td>3</td></tr> <tr> <td>C03</td><td>Understand the basics of construction materials.</td><td>2</td></tr> <tr> <td>C04</td><td>Demonstrate applications of GIS and GPS</td><td>2</td></tr> <tr> <td>C05</td><td>Get the knowledge of intelligent building.</td><td>2</td></tr> </tbody> </table>			COno	CO	BL	C01	Draw the building plan using Autocad	3	C02	Understand the use of modern tools	3	C03	Understand the basics of construction materials.	2	C04	Demonstrate applications of GIS and GPS	2	C05	Get the knowledge of intelligent building.	2
COno	CO	BL																		
C01	Draw the building plan using Autocad	3																		
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Guidelines for Instructor's Manual The instructor's manual is to be developed as a reference and hands-on resource. It should include a prologue (about University/program/ institute/ department/foreword/ preface), curriculum of the course, conduction and Assessment guidelines, topics under consideration, concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.																				
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Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work should be based on the overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grades/marks based on parameters, such as timely completion, performance, innovation, efficient codes, and punctuality.

Guidelines for Laboratory Conduction

1. All the experiments mentioned in the syllabus are compulsory.
2. Experiments should be performed in the group of 4-5 students.
3. Use of open source software and recent versions is to be encouraged.

Suggested List of Laboratory Experiments/Assignments

Group A: Assignments (Mandatory Assignment)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	2 D Drawing using Autocad	C01, C02
2.	Preparation of Line plan / center line plan using Cad.	C01, C02
3.	Distance measurement using EDM	C02
4.	Field test of materials: Bricks, Cement.	C03
5.	Area calculation by digital Planimeter	C02

Group B: Assignments (Out of List perform any 2) (Optional)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Assignment on GIS and GPS	C04
2.	Assignment on Life Value of Building	C05
3.	Assignment on Day light system	C05

Group C: Assignments (if Any) <<Mini Project/Field Visit Etc>>

Sr No	Assignment Title	*Mapping of Course Outcomes
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1.	Site visit on construction site	C03
Learning Resources (If applicable)		
Text Books		
T1.:P. NageswaraRao "AutoCAD for Engineering Drawing Made Easy", Tata McGraw Hill, New Delhi. T2: M. Anji Reddy, "Remote Sensing & Geographical Information System", BS Publications, Hyderabad.		
Reference Books :		
R1: John R. Jensen, "Remote Sensing & Digital Image Processing", Department of Geography University of South Carolina Columbia, Pearson Prentice Hall,2007		
Additional Resources: (Books, e-Resources) https://www.youtube.com/watch?v=cmR9cfWJRUU		



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25-VSC-1-01 : Techskill		
Teaching Scheme: Practical: 04 Hours/Week	Credit: 2	Evaluation Scheme: Termwork (TW) : 50 Marks
Prerequisite Courses: Basic understanding of terms : computer, mobile device components and electrical devices.		
Course Objectives: Module I - To understand mobile phone and surveillance system components, their functions, and how they work together. - To Develop skills to repair Mobile and troubleshoot CCTV System Module II - To familiarize learners with the computer hardware and software components, their functionality. - To introduce the computer network, internet and its configuration. Module III - To enable students to operate basic electronic instruments and perform accurate soldering on PCBs. - To develop skills for analyzing wiring and troubleshooting household electrical appliances safely.		
Course Outcomes: After completion of the course, learners should be able to		
CO No.	CO	BL
	Module - I (AIDS)	
CO1	Understand and troubleshoot hardware and software issues in mobile devices	2

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CO2	Apply fundamental concepts, components, and working principles of CCTV systems and evaluate their application in surveillance and security environments.	3
Module - II (Computer)		
CO3	Understand the basic concept and structure of computer hardware and networking.	2
CO4	Integrated PC's into LAN & reinstall operating system and Study various application programs.	3
Module - III (E&Tc)		
CO5	Demonstrate the use of basic electronic instruments and perform precise soldering of electronic components on a PCB.	3
CO6	Analyze wiring connections and troubleshoot basic faults in electrical home appliances by following standard safety practices.	4
Guidelines for Instructor's Manual		
The instructor's manual is to be developed as a reference and hands-on resource. It should include prologue (about institute/department), curriculum of the course, conduction and Assessment guidelines, topics under consideration, concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.		
Guidelines for Laboratory /Term Work Assessment		
Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as Write-up, Viva, Timely Completion.		
Guidelines for Practical Examination		
Problem statements must be decided jointly by the internal examiner and external examiner. During practical assessment, maximum weightage should be given to satisfactory implementation of the problem statement. Relevant questions may be asked at the time of evaluation to test the student's understanding of the fundamentals, effective and efficient implementation. This will encourage, transparent evaluation and fair approach, and hence will not create any uncertainty or doubt in the minds of the students. So, adhering to these principles will consummate our team efforts to the promising start of student's academics.		
Guidelines for Laboratory Conduction		
List of laboratory assignments is provided below . The instructor is expected to conduct the assignments by understanding the		

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prerequisites, technological aspects, utility and recent trends related to the topic. Use of open source software and recent versions are to be encouraged.		
Suggested List of Laboratory Experiments/Assignments		
Module I	MobiTech	12 Hours
Sr No	Assignment Title	Mapping of COs
1.	Disassemble and reassemble the mobile device using mobile repairing tools.	CO1
2.	Disassemble a water-damaged phone , clean the components using appropriate methods, and replace any damaged parts.	CO1
3.	Troubleshooting of mobile screen display .	CO1
4.	Demonstrate procedures for backing up and restoring data on mobile devices.	CO1
5.	Study of different types of CCTV cameras, their functions, types of cables used in CCTV surveillance systems .	CO2
6.	Demonstrate CCTV Camera Installation and configuration .	CO2
Module II	Crafting Your Digital World	12 Hours
Sr No	Assignment Title	Mapping of COs
1.	Study of hardware peripherals of Desktop and Laptop Computer, Assembly of Computer system.	CO3
2.	Installation and configuration of internal or external peripherals, basic fault finding and troubleshooting of hardware peripherals.	CO3
3.	Study of operating systems. Types of operating system, Installation and configuration of Operating Systems like Windows and Linux.	CO3

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4.	Installation and configuration of System Software and Application Software, basic fault finding and troubleshooting of software.	CO3
5.	Introduction to computer networks. Study of various topologies. Understanding the working of networking devices, Preparing the network cable using crimping tools and connectors.	CO4
6.	Study various internet based services and understand basic networking commands. Case study: Installation and configuration of computer network in Lab using network switch.	CO4
Module III	Electronics Repair Hub	12 Hours
Sr No	Assignment Title	Mapping of COs
1.	Handling of electronic instruments: Voltmeter, Ammeter, Multimeter, CRO etc.	CO5
2.	Soldering & desoldering practice of electronic components.	CO5
3.	Study of different types of electrical wires, their applications & wiring standards like fire safety etc.	CO6
4.	Hands on practice of residential wiring & wiring board.	CO6
5.	Troubleshooting of clothes Iron.	CO6
6.	Troubleshooting of mixer grinder.	CO6
Learning Resources		
Text Books		
T1. Chukky Oparandu, "Mobile Phones and Tablets Repairs: A Complete Guide for Beginners and Professionals", ISBN 9789534116 T2. Scott Mueller, "Upgrading and Repairing PCs", 16th Edition, BPB Publication, ISBN 81-7635-737-5 T3. Manahar Lotia, Pradeep Nair, Payal Lotia, "Modern Computer Hardware Course", BPB Publication, ISBN: 9788183331678		



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T4. J. A. Sam Wilson, "Electronic Troubleshooting & Servicing Techniques", Thomson Delmar Learning

Reference Books :

R1. Lotia M, "Modern Mobile Phone Service Diagram & Troubleshooting", Vol. I, BPB Publication, ISBN 8176563366

R2. Mark Edward Soper, "PC REPAIR AND TROUBLESHOOTING GUIDE", BPB Publication, ISBN: 9788183335096

R3. S. P. Bali, "Consumer Electronics", Pearson Education, 2nd Edition

Additional Resources: (Books, e-Resources)

Module I

- https://www.nsdcindia.org/scmp/assets/image/1179656187-CCTV_Installation_Technician__English.pdf

Module II

- <https://github.com/com-puter-tips/Technical-eBooks/blob/master/The%20Ultimate%20Computer%20Repair%20Guide-slicer.pdf>

Module III

- <https://www.electrorecycle.ca/blog/repair-resources-for-small-appliances/>
- <https://home.howstuffworks.com/how-to-repair-small-appliances.htm>

MOOC Courses links :

Module II

- <https://cursa.app/free-courses-maintenance-of-computers-and-notebooks-online>
- <https://nptel.ac.in/courses/106105084>



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25-CCC-1-A: Yoga			
Teaching Scheme: Practical: 2 Hours / Week.		Credit: 01	Evaluation Scheme: Term work (TW) : 50 Marks
Prerequisite Courses: Warm up, stretches before asanas.			
Companion Course: 25-CCC-1-02: Sports			
Course Objectives: • To motivate the students for higher education in Yogasana • To improve physical and mental fitness, remove stress and ethical knowledge about Yoga • To get acquainted with Warm up, Surya Namaskar, Yogasana, Pranayama, meditation practices • To understand the importance of healthy diet and hygienic practices for maintaining good health			
Course Outcomes: After completion of the course, learners should be able to			
CO No	CO	BL	
C01	Explain the Yoga ethics as an Indian culture	2	
C02	Apply basic Yoga and Pranayama in daily life to maintain physical and Mental fitness	3	
C03	Explain and Practice of meditation for improving concentration and better handling of stress	3	
C04	Explain and adopt healthy diet and hygienic practices for maintaining good health	3	
Course Contents			
Unit I	Introduction of Yoga	4 Hours	C01,C04

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Introduction: Presentations on Introduction to Yoga and its History, Meaning, History & Development of Yoga, General Guidelines for Yoga ethics & Practice. Perform warming up exercises to prepare the body from head to toe for Yoga			
Unit II	Surya Namaskar	4 Hours	C01,C02
Perform all the postures of Surya Namaskar one by one in a very slow pace, after warming up. Perform multiple Surya Namaskar (Starting with three and gradually increasing it to twelve) Shavasana is essential for self-relaxation			
Unit III	Basic Asanas	8 Hours	C01,C02,C03
Perform Yogasana to develop body strength and flexibility, Supine Posture - Sarvangasana, Halasana, Setubandhasana Prone Posture - Bhujangasana, Shalabhasana, Makarasana Sitting Posture Paschimottanasana. Bhadrasana, Vakrasana Standing Posture - Veer Bhadrasana Vrikshasana, Trikonasana Shavasana is essential for self-relaxation.			
Unit IV	Basic Pranayama, Kapalbhati & Meditation	8 Hours	C01,C02,C03
Perform Pranayama, Meditation in daily life to maintain physical and Mental fitness, Pranayama:- Perform Bhastrika Pranayam, Anulom-Vilom Pranayam Kriya, Practice Kapalbhati Pranayam Kriya Practice Bhramari Pranayam, Meditation:- Perform sitting in Dhyana Mudra and Meditating. Start with five minutes and slowly increase to higher durations, Guideline for diet and hygienic Practices.			
Learning Resources			
Text Books			
T1. Swami Vivekananda, "Patanjali's Yoga Sutras", Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13?: ? 978-9354407017 T2. Luisa Ray, Angus Sutherland, "Yoga for Every Body: A beginner's guide to the practice of yoga Postures, Breathing exercises and me", Vital Life Books (2022) ISBN-13?: ? 978-1739737009.			
Reference Books :			
R1. Swami Saradananda, Mudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen your, Watkins Publishing (2019) ISBN-13?: ? 978-1786782786 R2. Martha Davis, Elizabeth Robbins, Matthew McKay, Eshelman MSW, The Relaxation and Stress Reduction Workbook, A New Harbinger Self-Help Workbook (2019)			

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R3. Ann Swanson, Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice, ISBN-13: 978-1465479358.

Additional Resources: (Books, e-Resources)

- [https://onlinecourses.swayam2.ac.in/aic19_ed28/preview-introduction to Yoga and Applications of Yog](https://onlinecourses.swayam2.ac.in/aic19_ed28/preview-introduction%20to%20Yoga%20and%20Applications%20of%20Yog)
- https://onlinecourses.swayam2.ac.in/aic23_ge09/preview
- https://onlinecourses.swayam2.ac.in/aic23_ge05/preview
- https://onlinecourses.swayam2.ac.in/aic23_ge06/preview
- https://onlinecourses.nptel.ac.in/noc21_hs29/preview
- https://onlinecourses.swayam2.ac.in/nce19_sc04/preview
- <https://www.classcentral.com/course/swayam-fitness-management->



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25-CCC-1-B : Sports			
Teaching Scheme: Practical: 2 Hours/Week		Credit: 01	Examination Scheme: Termwork (TW) : 50 Marks
Prerequisites Courses: Basic knowledge of sports			
Companion Course: 25-CCC-1-01 Yoga			
Course Objectives: - To maintain their mental and physical wellness upright and develop ability in them to cope up with the stress arising in life. - To create space in the curriculum to nurture the potential of the students in sports/games/ etc. - To introduce a practice oriented introductory course on the subject. More involved / advanced course may come up in subsequent years of study - Develop techniques and tactics involved in organized physical activities, games and sports - Develop positive health related fitness habits which can be practiced lifelong so as to prevent degenerative diseases.			
Course Outcomes: After completion of the course, learners should be able to			
CO No	CO	BL	
C01	Design basic training plans considering energy systems and physiological adaptations.	2	
C02	Explain wellness and its importance and define the components of wellness & Classify physical fitness and recognize its importance in life.	3	
C03	Apply psychological strategies to improve athletes & motivation, goal- setting, and mental resilience	3	
C04	Enhanced physical fitness leads to improved athletic performance and overall well-being	3	
Course Contents			
Unit I	Introduction of Physical Education & Sports	4 Hours	C01,C02,C03,C04
Concept of Physical Education, its Definition and Scope,Concept of Physical Fitness,Components of Health Related Physical Fitness (Cardio-vascular Endurance, Muscular Strength Endurance, Flexibility, and Body Composition) and Activities to improve these components,Physical Activity Guidelines (Physical activity for health benefits)			
Unit II	Physical Fitness, Wellness, and Lifestyle	6 Hours	C01,C02,C03,C04

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Meaning & importance of Wellness, Health, and Physical Fitness, Traditional Sports & Regional Games for promoting wellness, Leadership through Physical Activity and Sports			
Unit III	Practice of different sport Activity	10 Hours	C01,C02,C03,C04
Every student should participate in game/sports selected by him/her			
Unit IV	Fitness Assessment	4 Hours	C01,C02,C03,C04
Cardiovascular Endurance, Flexibility, Muscular Strength Endurance and,Body Composition			
Learning Resources			
Text Books			
T1. Foundation of Physical Education, Exercise Science and Sports,Bucher, C. A., & Wuest, D. A. (2010).. Tata McGraw Hill Education Private Limited. New Delhi. T2. First Aid Handbook.keeck, P. (2010), Hermes House. London. T3. Physical Activity and Health Guidelines,Rahl, R. V. (2010). Human Kinetics. USA T4. Principle and History of Physical Education and Sports,Singh, D. K. (2010),Friends Publication. New Delhi. T5. Textbook of Applied Measurement Evaluation & Sports Selection,Kansal, D. K. (2008). Sports and Spiritual Science			
Reference Books :			
R1. NSCA's Guide to Test and Assessment,Miller, T. (2012), Human Kinetics, USA. R2. Test Measurement and Evaluation in Physical Education and Sports,Yobu, A. (2010). Friends Publication. New Delhi. R3. Measurement and Evaluation in Physical Education, Lipman, H. A. (2009). Friends Publication, New Delhi. R4. Measurement and Evaluation in Human Performance,Morrow, J. Jackson, A., Disch, J., & Mood, D. (2005). Human Kinetics, JSA.			
Additional Resources:-			
MOOC Courses links :-			



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25-CCC-1-C : NSS			
Teaching Scheme: Practical: 2 Hours / Week		Credit: 1	Examination Scheme: Termwork (TW) : 50 Marks
Prerequisites Courses:			
Companion Course:			
Course Objectives: - To understand the NSS Scheme in Nation Building - To understand the importance of Shramdan to youth - To understand the importance of Awareness Activities to youth - To provide a technical solution to the different issues of society			
Course Outcomes: After completion of the course, learners should be able to			
CO No	CO	BL	
1	Describe the concept of Youth and compare the international definitions of the term Youth.	2	
2	Students will be able to appreciate our demographic advantage and its role in nation-building.	3	
3	Know the growth and evolution of NSS and its role in nation-building through community service.	2	
4	Visualize the signs, symbols, and logo of NSS and understand their broader meaning.	4	
Course Contents			
Unit I	Introduction to NSS	4 Hours	CO1
Origin of NSS, Aims and Objectives of NSS, Motto of NSS, NSS Symbol, NSS Song, NSS Day, Basic Concepts and Components, NSS Program and Activities			
Unit II	Shramdan	4 Hours	CO2
Campus Cleaning, Tree Plantation, Weeding, Watering, any other activities, Registration of all students on MyBharat Portal			

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Unit III	Awareness Programs	4 Hours	C03
Awareness Programs: awareness rallies, blood donation, voter awareness, Fit India, Celebration of National and International Days, Personality Development Programs, Waste management awareness, Health awareness, Awareness for self-Employment in adapted villages, constructive activities, any other activities			
Unit IV	Community Engagement and Problem Solving	4 Hours	C04
Visit to the adapted Village, identification of problems, propose a solution for the same, drafting and development of a procedure, model, or design			
Learning Resources			
Text Books			
T1. NATIONAL SERVICE SCHEME MANUAL (REVISED) 2006 Government of India, Ministry of Youth Affairs & Sports, New Delhi T2. Prof. B.K. Shivanna, "National Service Scheme" Printing Press, KSOU, Mysore, 2011 T3. MadhuAhuja, Students Leaders in the National Service Scheme (NSSS) in Delhi: A case study 1986 (New Delhi: Dept. of Management and Extension, Lady Irwin College, University of Delhi, 1986) T4. Chattarjee, B., Social service opportunities for students in Slum Areas (reprint: Delhi: Delhi School of Social Work, University of Delhi, 1973)			
Reference Books :			
R1. Jones Gill, (2009), Youth, Polity Press, UK. i) Kehily Jane Mary (Etd.) (2007), Understanding Youth: Perspectives, Identities and Practices, Sage Publications, London. R2. Landis H. Paul, (2011), Adolescence and Youth: The Process of Maturing, Sarup Book Publishers Pvt. Ltd., New Delhi			
MOOC Courses links :			
Community Engagement and Social Responsibility - https://onlinecourses.swayam2.ac.in/ugc24_ge05			

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24-CCC-1-D: Cultural			
Teaching Scheme : Practical: 02 Hrs / Week		Credit: 01	Evaluation Scheme: Term work (TW) : 50 Marks
Prerequisites Courses: - -----			
Companion Course: .. -----			
Course Objectives: - Students develop their ability to communicate ideas, emotions, and narratives effectively to an audience. - Students learn to work together, cooperate, and compromise, establishing key collaboration skills, through group rehearsals and performances. - Through painting, drawing, writing, and other artistic activities, students can explore their thoughts, emotions, and ideas in meaningful ways.			
Course Outcomes: After completion of the course, learners should be able to:			
CO No	CO	BL	
C01	Understand the improvement of cultural perspective in daily life.	2	
C02	Experience physical benefits such as improved lung capacity, posture, relaxation, and stress relief through singing & to identify, evaluate, and enjoy many melodic aspects, including tone, pitch, rhythm, and intensity of sound	5	
C03	Develop proficiency in various artistic techniques and mediums, such as drawing, painting, sculpture, printmaking, or digital art.	3	
C04	Develop debating -Communal conversation.	3	
Course Contents			
Unit I	Performing Arts- Dance & Drama	6 Hours	C01,C02

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Dance-Performance Practices :(conventions of performance etiquette, audience engagement, and stage presence in different cultural contexts.), Cultural Exchange: The interchange of cultural aspects between various communities and areas, including movements, rhythms, music, costumes, and themes, has an impact on dance practices. Drama-Performance Skills: Developing performance skills, including acting, voice, movement, and improvisation, through practical exercises and rehearsals, Theatrical Production: Learning about the process of theatrical production, including stagecraft, set design, costume design, lighting, sound, and directing.			
Unit II	Music-Melody	6 Hours	C01,C02
Song:Vocal Technique: Breathing exercises and techniques to develop proper breath support and control. Listening skills, enabling you to recognize, assess, and appreciate various elements of melody, such as tone, pitch, rhythm, and sound intensity. Instrumental: Fundamentals of music theory, including notation, scales, intervals, chords, and key signatures.			
Unit III	Visual Arts & Literary Arts	6 Hours	C01,C03
Visual Arts: painting, drawing, poster making sculpture(assembling materials such as clay, wood, metal, stone, or plaster), printmaking, photography. Literary Arts: Creative writing, Letters, Written arts, Verbal arts, Poetry Making			
Unit IV	Debating-communal conversation	4 Hours	C01,C04
Extempore, Forum debates, Express you! Panel discussions, JAM's (in the Just a Minute public speaking exercise, participants are asked to talk without hesitation for one minute on a particular topic.)			
Learning Resources			
Text Books:			
T1. Ganendra Dutt Bajpai, "Text Book of dance" , Publisher-Kanishka, ISBN-13 978-8184576177. T2. Dr.Shilpa Bahulekar,"KalaShasra Visharad", Publisher-Sanskar Prakashan,Third Edition.			
Reference Books :			
R1."Sangeet Ratnavali" by Ashok Kumar Yaman R2."fundamentals of visual art by Dr. Anuj Choudhary"			
Additional Resources: (Books, e-Resources) https://smp.gymkhana.iitb.ac.in/extra_culture.php			
● MOOC Courses links :-----			

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25-IKS-1-01 : Indian Knowledge System																	
Teaching Scheme: TU: 2 Hours/Week	Credit: 2	Evaluation Scheme: Term work (TW) : 50 Marks															
Prerequisites Courses: – Nil																	
Companion Course: – Nil																	
Course Objectives: - To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of Indian Knowledge System - To make students acquainted with the facets of traditional knowledge & their relevance and help them be able to apply it to their day-to-day life.																	
Course Outcomes: After completion of the course, learners should be able to <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>CO No</th><th>CO</th><th>BL</th></tr> </thead> <tbody> <tr> <td>CO1</td><td>Explain the foundation and significance of the Indian Knowledge System.</td><td>2</td></tr> <tr> <td>CO2</td><td>Advocate for the preservation of traditional knowledge.</td><td>3</td></tr> <tr> <td>CO3</td><td>Apply traditional knowledge principles to various fields.</td><td>3</td></tr> <tr> <td>CO4</td><td>Analyze the ongoing influence of Indian Knowledge Systems in the modern world.</td><td>4</td></tr> </tbody> </table>			CO No	CO	BL	CO1	Explain the foundation and significance of the Indian Knowledge System.	2	CO2	Advocate for the preservation of traditional knowledge.	3	CO3	Apply traditional knowledge principles to various fields.	3	CO4	Analyze the ongoing influence of Indian Knowledge Systems in the modern world.	4
CO No	CO	BL															
CO1	Explain the foundation and significance of the Indian Knowledge System.	2															
CO2	Advocate for the preservation of traditional knowledge.	3															
CO3	Apply traditional knowledge principles to various fields.	3															
CO4	Analyze the ongoing influence of Indian Knowledge Systems in the modern world.	4															
Course Contents																	
Unit I	Introduction of Indian Education System	6 Hours															
Indian Education System Gurukul system, Ancient Universities (Nalanda, Takshashila, Vikramshila etc.) Indian Ancient Scientists and Their Inventions Patanjali, Aryabhatta, Charaka, Varahmitra, Vardhanmaan Mahaveer, Bhaskaracharya, Brahmagupta, Aadibramha Adinath. Etc.																	

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Indian Art and Architecture Tanjore Paintings, Madhubani Paintings, Warli Paintings, etc. ,Harappa and Mohenjo-Daro Civilization, Temples and other Religious Places, Forts and monuments.		
Exemplar/Case Studies: A case study on integrating Ancient wisdom into modern Education.		
Mapping of Course Outcomes		C01
Unit II	Indian Mathematics & Astronomy	6 Hours
Introduction to Indian Mathematics, Binary mathematics and combinatorial problems in ChandaḥŚāstra . Algebra, Geometry, Trigonometry (Sine & Cosine), Magic squares in India. Introduction to Indian astronomy,Indian contributions in astronomy ,The celestial coordinate system ,Elements of the Indian calendar , Notion of years and months.		
Exemplar/Case Studies: Aryabhata's astronomical observations and calculations laid the foundation for modern trigonometry and spherical geometry.		
Mapping of Course Outcomes		C03
Unit III	Indian Polity and Economy (I)	4 Hours
Indian Polity and Economy Indian conception of well-organized Polity and flourishing Economy of handcrafts, textile etc. as introduction, Foundational texts, and The notion of Bharatavarsha as a Chakravarti-Kshetra and important attributes of Chakravartin, King as the protector of Dharma. King as the strength and support of the weak, King as the protector of Varta, King as the protector of the times, Meaning of Varta: Krishi, Gopalana and Vanijya forming the basis of Varta and the core of economic, Activity in society. The importance of sharing, The Grams as the center of the polity.		
Exemplar/Case Studies: The Mauryan and Gupta empires exemplified administrative prowess and economic prosperity, with advancements in trade routes, currency systems, and taxation policies.		
Mapping of Course Outcomes		C02
Unit III	Trade In Ancient India (II)	3 Hours
Trade In Ancient India (II): Types of Trade, Kautilya on Trade, Trade Routes, Port & Sailors, The Famous Silk Route, By product of Trade cultural Exchange.		
Exemplar/Case Studies: The case of the Silk Route and the maritime trade routes highlights India's pivotal role in		

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facilitating exchanges of goods, ideas, and cultures.		
Mapping of Course Outcomes		C02
Unit IV	Achievements of India in Engineering & Technology	6 Hours
Engineering and Technology in Ancient India, Engineering and Technology in Medieval India, Engineering and Technology in Modern India, Engineering and Technology: Metals and Metalworking, Water Management System.		
Exemplar/Case Studies: The Construction of Monumental Structure of Rangmahal , Renuka Devi Temple Chandwad		
Mapping of Course Outcomes		C04
Learning Resources		
Text Books		
T1. B. Mahadevan, V. R. Bhat, NagendraPavana, "Introduction to Indian Knowledge Systems Concepts and Applications", PHI Learning Publications, Delhi, 2022.		
Reference Books :		
R1. SatishchandraChaterjee, DheerendramohanDatta, "An Introduction to Indian Philosophy",MotilalBanarsidass Publishing House, New Delhi, 2016 R2. V.Sivaramakrishnan (Ed.), "Cultural Heritage of India-course material", BharatiyaVidyaBhavan, Mumbai. 5th Edition,2014 R3., KapilKapoor, Avadesh Kumar Singh,"Knowledge Traditions and Practices of India", Vol. 1, 2005, DK Print World (P) Ltd., ISBN 81-246-0334		
Additional Resources: (Books, e-Resources)		
MOOC Courses links : SWAYAM/NPTEL Indian Knowledge System (IKS) : Concepts and Applications in Engineering By Prof. B. Mahadevan, Dr. VinayakRajatBhat, Dr. R VenkataRaghavan Indian Institute of Management Bangalore (IIMB), Chanakya University, Bangalore (https://onlinecourses.swayam2.ac.in/imb23_mg53/preview) Indian Knowledge System (IKS) : Concepts and Applications in Science		

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By Prof. B. Mahadevan, Dr. VinayakRajatBhat, Dr. R VenkataRaghavan | Indian Institute of Management Bangalore
(IIMB), Chanakya University, Bangalore

(https://onlinecourses.swayam2.ac.in/imb23_mg53/preview)

- <http://www.iitkgp.ac.in/departement/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63>.
(Centre of Excellence for Indian Knowledge System, IIT Kharagpur)

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25-AEC-1-01: Professional Communication Skills			
Teaching Scheme: Tutorial: 1Hours/Week.		Credit: 1	Examination Scheme: Termwork (TW) : 25 Marks
Prerequisites Courses: Basic Proficiency in English Language			
Companion Course: NA			
Course Objectives: - To know the basic principles of communication skills - To improve the verbal communication skills through participation - To learn different visual tools of presentation - To learn the importance of writing technical document			
Course Outcomes: After completion of the course, learners should be able to			
CO No	CO	BL	
CO1	Understand the communication ethics and apply the principles and practices of Communication in daily life.	2	
CO2	Illustrate the verbal communication skills by effectively participating in a group discussion.	3	
CO3	Use various visual aids for enhancing the presentation skills.	4	
CO4	Write a technical document with correctness of language, appropriate vocabulary and style.	5	
Course Contents			
Unit I	Introduction to Communication & Speaking Skills	4 Hours	CO1 , CO3
Introduction to Theory of Communication, Types of Communication, Barriers to Communication, Communication Ethics, Job Interviews			
Exemplar/Case Studies: Write and narrate an article of your choice			

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Unit II	Group Discussion	4 Hours	CO1 ,CO2,CO3
Basics of a Group Discussion, Understanding the different types of Group Discussions, Practical tips and suggestions for a GD.			
Exemplar/Case Studies: Having Group Discussion of any given Topics.			
Unit III	Presentation Skills & Public Speaking for Engineers	4 Hours	CO2 , CO3
Structuring a compelling presentation, Engaging an audience using visual aids effectively, Techniques to manage and reduce public speaking anxiety, making a clear and concise speech outline.			
Exemplar/Case Studies: Having presentation of any given Topics.			
Unit IV	Professional Writing	4 Hours	CO4
Job Application with Resume, Office Drafting: Notice, Email, Technical Articles, Report Writing. Business Correspondence: Enquiry letter, Order letter, Complaint Letter and Adjustment letters			
Exemplar/Case Studies: Write down any one professional writing on following: ● Resume writing ● Leave Application to HOD/Principal ● Blog Writing/Content Writing ● Cover letter for internship application ● Request letter for a Bonafide Certificate/ Enquiry letter			
Learning Resources			
Text Books			
T1. Meenakshi Raman, Sangeeta Sharma, "Technical Communication, Principles and Practice", Oxford University Press- ISBN 978-13-16640-08-1 T2. Rajendra Pal, J.S. Korlahalli, "Essential of Business Communication", Sultan Chand & Sons, New Delhi ISBN 9788180547294i			
Reference Books :			
R1. E. H. Mcgrath, "Basic Managerial Skills for All", Prentice Hall India Learning Private Limited; 9 edition (2011), ISBN: 9788120343146 R2. R. Subramanian, "Professional Ethics", Oxford University Press; Second edition 17 April 2017, ISBN: 019947			
Additional Resources: (Books, e-Resources) ● https://www.britishcouncil.in			

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- <https://www.chrmp.com/correct-english-usage-for-effective-technical-writing/#:-:text=Write%20in%20plain%20English,voice%20instead%20of%20passive%20voice/>
- Technical Writing Blogs - <https://draft.dev/learn/the-best-technical-writing-blogs>.

MOOC Courses links :

- Technical Writing for Engineers [The Ultimate Guide & Course] - <https://www.instructionalsolutions.com/blog/technical-writing-engineers>
- SWAYAM NPTEL Course - Technical English for Engineers, By Prof. Aysha Iqbal- https://onlinecourses.nptel.ac.in/noc20_hs56/preview
- SWAYAM NPTEL Course - English Language for Competitive Exams, By Prof. Aysha Iqbal
- Google for Developers - Technical Writing Courses - <https://developers.google.com/tech-writing>



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Semester-II



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25-BSC-1-02 : Engineering Chemistry		
Teaching Scheme: Theory: 03 Hours/Week	Credit: 03	Evaluation Scheme: CIE: 20 Marks MSE: 20 Marks SEE : 60 Marks
Prerequisites: Basic Knowledge of water and pollution, Environment, periodic table, Titrations-volumetric analysis, types of reaction, classification and properties of polymers, knowledge of fuels, Oxidation, reduction reactions, strong and weak electrolytes, electromagnetic radiations, electrochemical series and corrosion, Semiconductor		
Companion Course: 25-BSC-1-06: Engineering Chemistry Lab		
Course Objectives: • To understand technology involved in the analysis of water for improving its quality as a commodity by purification. • To build consciousness about the advancement in batteries and acquire the knowledge and importance of electro-analytical techniques for qualitative and quantitative analysis of materials. • To understand chemistry of various engineering materials with composition-structure, properties and applications of speciality polymers, nanomaterial, Solders. • To enlighten the students with the basic concepts of Environmental Chemistry and the use of Green chemistry for pollution control . • To Illustrate the corrosion of metals and its control by using different methods. • To study conventional and green fuels with respect to their composition, properties and applications.		



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Course Outcomes:

After completion of the course, learners should be able to

COno	Course outcomes	BL
CO1	Apply appropriate technology for determining the purity and qualities of substances.	3
CO2	Employ diverse methods to analyze the molecular composition of liquids, fuels, and Polymers.	3
CO3	Evaluate the challenges posed by hard water and corrosion and explain strategies for mitigation.	4
CO4	Compare fuel composition, water quality, and corrosion prevention techniques.	4
CO5	Analyze fluids and fuels and find suitable purifying methods.	4
CO6	Understand the fundamental concepts of environmental chemistry, and it's real world applications.	3

Course Contents

Unit I	Water Technology	7 Hours
Water: Introduction, Hardness of water- Types, Analysis of water hardness (EDTA method) and Numericals, Alkalinity of Water and numericals. Ill effects of hard water-Scale, sludge, priming and foaming, External Treatment of water - Zeolite method, numericals, Purification of water: Reverse osmosis.		
Exemplar/Case Studies- 1) Wastewater treatment 2) Different types of membranes used in water softening		
Mapping of Course Outcomes		CO1,CO2,CO3,CO4,CO5,CO6
Unit II	Battery Technology and Electroanalytical techniques	7 Hours

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Batteries: Introduction, Ni-Cd battery, Construction, Uses , recent technologies in Lithium based batteries, Li-cells – LiMnO₂. Electroanalytical techniques: pH metry: Introduction, standardization of pH meter, pH metric titration of strong acid versus strong base with titration curve, UV-Visible Spectroscopy: Introduction, interaction of electromagnetic radiation with matter, statement of Beer's law and Lambert's law , Instrumentation and basic principle of single beam spectrophotometer, Recent applications of UV-visible spectroscopy.		
Exemplar/Case Studies- 1) Battery waste recycling 2) Current research and advances in fuel cells		
Mapping of Course Outcomes		CO2,CO5
Unit III	Chemistry of Engineering Materials	7 Hours
Polymers: Introduction, Glass transition temperature and Melting Temperature, Speciality Polymers: Structure, properties and applications of the following polymers-Conducting Polymer: Polyacetylene Doping of conducting polymer and its type, Biodegradable Polymers: PolyhydroxyButyrate Valerate-PHBV, Electroluminescent polymer Nanomaterials: Introduction, definition, properties and general applications of Graphene Solders : Eutectic mixtures and soft solders, Advanced Ceramic materials and cermets, applications		
Exemplar/Case Studies- 1) Polymer composites: Fiber reinforced plastic (FRP) and Carbon reinforced polymer composite 2) Composition and Applications of woods metal, brass, Bronze, Ti-alloys		
Mapping of Course Outcomes		CO1,CO2
Unit IV	Environmental Chemistry	7 Hours
Green Chemistry: Definition, Goals of Green Chemistry, 12 principles of Green Chemistry, Industrial applications of Green Chemistry, Major Uses, Traditional and Green pathways of synthesis of Polycarbonate. Chemicals in Agriculture: Pesticides, Insecticides, herbicides, fungicides Examples and uses. Bio Fertilizers Definition, examples and uses, E-Waste Management 6R's.		
Exemplar/Case Studies-		

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1) Bhopal gas Tragedy 2) Hazardous Waste		
Mapping of Course Outcomes		CO3,CO6
Unit V	Corrosion and its Protection	7 Hours
Corrosion: Introduction, Types of corrosion – Dry and Wet corrosion, mechanism, nature of oxide films, Pilling-Bedworth's rule, hydrogen evolution and oxygen absorption corrosion, Factors influencing rate of corrosion related to nature of metal and nature of Environment (4 to 5) Methods of corrosion control: 1. cathodic protection: Sacrificial Anodic Protection Method 2. Metallic coatings: Types-Anodic Coating & Cathodic Coating 3. Methods to apply metallic coating Galvanizing and Tinning, Electroplating.		
Exemplar/Case Studies: 1) Organic coatings: Paints applications in industry for corrosion protection (AI&DS, Computer, E&TC) 2) Lubricants: Properties- Viscosity index, Flash point, oiliness, cloud point, and applications of lubricants (Mechanical) 3) Cement: Definition, Classification and properties, Chemical constituent of Portland cement (Civil).		
Mapping of Course Outcomes		CO2,CO4,CO5
Unit VI	Energy Science	7 Hours
Fuel: Introduction, Conventional and Non-conventional Energy Resources, Calorific value (CV), Gross calorific value (GCV) and Net calorific value (NCV), Determination of Calorific value: Bomb calorimeter, Numericals. Solid fuel: Coal its Types, Proximate analysis of Coal, Disadvantages of fossil fuels, Hydrogen gas as a future fuel, Alternative fuels: Power alcohol, biodiesel. Solar Cell: Introduction, Importance, Construction & working of Solar PV cell.		
Exemplar/Case Studies: 1) Applications of fuel cells in automobile industry (Mechanical) 2) The Role of Civil Engineering in Energy Infrastructure Development (Civil). 3) Different soldering techniques for Printed Circuit Boards (EnTC) 4) Electrostatic and Hybrid capacitors (AIDS, Computer)		
Mapping of Course Outcomes		CO1,CO2,CO4,CO5
Learning Resources		

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Text Books:
T1. O. G. Palanna“Engineering Chemistry”, Tata McGraw Hill Education Pvt. Ltd,2014. T2. S. S. Dara, Dr. S. S. Umare“Textbook of Engineering Chemistry” ,S. Chand & Company Ltd,2016
Reference Books :
R1. S.Ramesh et al“Engineering Chemistry”, Wiley India Pvt. Ltd,2012 R2. Shriver and Atkins“Inorganic Chemistry”, Oxford University Press, 5ed, 2010 R3. S. M. Khopkar,Basic“Concept of Analytical Chemistry”, New Age-International Publisher, 2ed, 2008 R4. A. K. De“Environmental Chemistry”, New Age International Publications, 8ed,2018
Additional Resources: (Book, e-Resources) 1. G.Vijaya Pratap, Dr. Manasi Ghamande, Dr Prashant Pangrikar, De. Balaji Rupnar “A Text Book of Environmental Pollution and Management” ,R .K Publication. e-Resources- 1. https://discovery1.delnet.in/Search/Results?lookfor=Sunita+Rattan&type=AllFields&location_code=&limit=60 2. https://discovery1.delnet.in/Search/Results?lookfor=O.+G.+Palanna%E2%80%9C&type=AllFields&location_code=&limit=60 3. https://discovery1.delnet.in/Search/Results?lookfor=S.+S.+Dara%2C+Dr.+S.+S.+Umare&type=AllFields&location_code=&limit=60
MOOC Courses links : 1. https://archive.nptel.ac.in/courses/105/106/105106119/ 2. https://onlinecourses.nptel.ac.in/noc22_ce55/preview 3. https://archive.nptel.ac.in/courses/113/105/113105102/



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25-BSC-1-04: Statistics and Integral Calculus		
Teaching Scheme: Theory: 03 Hours/Week.	Credit : 03	Evaluation Scheme: CIE : 20 Marks. MSE :20 Marks. SEE : 60 Marks.
Prerequisites Courses: Basics of Integration, Basics of Statistics , General probability		
Companion Course: -----		
Course Objectives: - To make the students familiarize with Mathematical Modeling of advanced techniques of Fourier series integration, tracing of curve, multiple integrals and their applications. - The aim is to equip them with the basic concepts of statistics, probability functions & hypothesis tests.		
Course Outcomes: After completion of the course, learners should be able to		
CO No	CO	BL
CO1	Understand the basic Concept.	2
CO2	Find the Mean, Median, Mode, Standard deviation, Correlation, regression, probability of given data , area of double integration and rectification of curve.	3
CO3	Apply the Proper and improper integrals by some special functions.	3
CO4	Apply advanced integration techniques such as Reduction formulae, Beta functions, and Gamma functions needed in evaluating multiple integrals and their applications	3
CO5	Analyse the Problems and apply the appropriate concept	3
CO6	Apply the concept of Statistics, Probability and Integral Calculus for real life Engineering Problems.	3
Course Contents		
Unit I	Statistics- Correlation and Regression line	7 Hours

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Measures of central tendency, Standard deviation, coefficient of variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates, Curve fitting: fitting of straight line, parabola and related curves		
Exemplar/Case Studies: Case study on Correlation .		
*Mapping of Course Outcomes		C01,C02, C05, C06
Unit II	Basic Probability & Probability Distribution.	7 Hours
Theorems on Probability, Bayes Theorem, Random variables, Mathematical Expectation, Probability density function, Probability distributions: Binomial, Poisson, Normal and Hypergeometric, Test of Hypothesis: Chi-Square test, t-distribution		
Exemplar/Case Studies: Case study on Probability Distribution		
*Mapping of Course Outcomes		C01,C02, C05, C06
Unit III	Fourier series	7 Hours
Definition ,Dirichlet's Condition, Full Range Fourier Series, Half Range Fourier Series, Harmonic Analysis Parseval's Identity And Application to Engineering problem.		
Exemplar/Case Studies: –		
*Mapping of Course Outcomes		C01,C05, C06
Unit IV	Integral Calculus	7 Hours
Reduction Formulae, Beta and Gamma functions, Differentiation Under Integral Sign, Error Function.		
Exemplar/Case Studies: –		
*Mapping of Course Outcomes		C01,C03, C04, C05
Unit V	Curve Tracing	7 Hours
Tracing of Curves – Cartesian, Polar curves, Parametric curves, Rectification of curves.		
Exemplar/Case Studies: –		
*Mapping of Course Outcomes		C01,C02, C05, C06
Unit VI	Multiple Integral and Its Applications	7 Hours
Double and Triple integrations, Change of order of integration, Applications to find Area, Volume, Mass, Centre of Gravity and		

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Moment of Inertia.	
Exemplar/Case Studies: –	
*Mapping of Course Outcomes	C01,C02, C04, C05, C06
Learning Resources	
Text Books	
T1. .B. V. Ramana ,“Higher Engineering Mathematics”, (Tata McGraw Hill) (2017, 29- edition) T2. B. S. Grewal, “Higher Engineering Mathematics “, (Khanna Publication, Delhi(2014. 2- edition)	
Reference Books :	
R1. Erwin Kreyszig , “ Advanced Engineering Mathematics” , (Wiley Eastern Ltd.), (2014, 9- edition) R2. M. D. Greenberg , “Advanced Engineering Mathematics” , (Pearson Education), (2014. 2- edition) R3. Peter V. O'Neil, “ Advanced Engineering Mathematics “ , (Thomson Learning) , (2013,7- edition)	
Additional Resources: (Books, e-Resources) 1. https://discovery1.delnet.in/Search/Results?lookfor=B.+V.+Ramana&type=Author&location_code=&limit=60 2. https://discovery1.delnet.in/Search/Results?lookfor=B.+S.+Grewal&type=Author&location_code=&limit=60 3. https://discovery1.delnet.in/Search/Results?lookfor=Erwin+Kreyszig&type=Author&location_code=&limit=60 4. https://discovery1.delnet.in/Search/Results?lookfor=M.+D.+Greenberg+&type=Author&location_code=&limit=60 5. https://discovery1.delnet.in/Search/Results?lookfor=Peter+V.+O&type=Author&location_code=&limit=60 6. https://discovery1.delnet.in/Search/Results?lookfor=George+B.+Thomas&type=Author&location_code=&limit=60 7. https://discovery1.delnet.in/Search/Results?lookfor=P.N.Wartika&type=Author&location_code=&limit=60 8. https://discovery1.delnet.in/Search/Results?lookfor=Ron+Larson%2C&type=Author&location_code=&limit=60	

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25-ESC-1-03: Engineering Graphics																				
Teaching Scheme: Theory: 03 Hours/Week	Credit: 03	Examination Scheme: CIE : 20 Marks MSE : 20 Marks SEE : 60 Marks																		
Prerequisites Courses: Basic Knowledge of geometrical shapes and its construction.																				
Companion Course: 25-ESC-1-08: Engineering Graphics Lab																				
Course Objectives: • Introduce fundamental principles of Engineering Drawing. • Teach different projection methods such as orthographic, isometric. • Familiarize students with technical drawing techniques. • Educate on dimensioning standards and specifications in engineering drawings. • Enhance communication skills through graphical representation of design concepts.																				
Course Outcomes: After completion of the course, learners should be able to <table border="1" data-bbox="203 1207 1502 1690"> <thead> <tr> <th>CO No</th><th>CO</th><th>BL</th></tr> </thead> <tbody> <tr> <td>C01</td><td>Visualize and effectively communicate engineering ideas through graphical representation.</td><td>3</td></tr> <tr> <td>C02</td><td>Utilize drawing instruments and effectively produce drawings with appropriate dimensioning styles.</td><td>3</td></tr> <tr> <td>C03</td><td>Understand basic principles of engineering graphics to solve simple design and drafting of engineering application Problems.</td><td>3</td></tr> <tr> <td>C04</td><td>Apply the theory of projection for line, curves, planes and solids.</td><td>3</td></tr> <tr> <td>C05</td><td>Draw orthographic projections and isometric views using theory of projection.</td><td>3</td></tr> </tbody> </table>			CO No	CO	BL	C01	Visualize and effectively communicate engineering ideas through graphical representation.	3	C02	Utilize drawing instruments and effectively produce drawings with appropriate dimensioning styles.	3	C03	Understand basic principles of engineering graphics to solve simple design and drafting of engineering application Problems.	3	C04	Apply the theory of projection for line, curves, planes and solids.	3	C05	Draw orthographic projections and isometric views using theory of projection.	3
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C05	Draw orthographic projections and isometric views using theory of projection.	3																		
Course Contents																				
Unit I	Projection of Point and line	6 Hours																		

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Fundamentals of Engineering Drawing: Need of Engineering Drawing and design, introduction of drawing instruments and their uses, Sheet layout, Line types and dimensioning and simple geometrical constructions Projection of points and lines: Theory of projection, Projection of a Point in first quadrant, Projection of line inclined to both Principle planes (First angle of method of projection only).		
#Exemplar/Case Studies: Redraw the given drawing and identify different types of lines, and dimension style used		
*Mapping of Course Outcomes		CO1, CO2,CO3, CO4, CO5
Unit II	Projection of planes	6 Hours
Projection of regular planes on auxiliary and reference planes by first angle method only, projection of planes- Triangular plane, Quadrilateral Planes, Pentagonal plane, Hexagonal plane and Circular plane etc., Plane inclined to both principle planes.		
#Exemplar/Case Studies: Draw F.V, T.V. & S.V. of a given 2D planes like Triangle, Rectangle, Pentagon, Hexagon, Circle		
*Mapping of Course Outcomes		CO1, CO2,CO3, CO4, CO5
Unit III	Development of Lateral Surfaces	6 Hours
Introduction to development of lateral surfaces and its industrial applications. Draw the development of lateral surfaces for cut sections of cone, pyramid, prism, Cylinder etc. resting on H.P.		
#Exemplar/Case Studies: Draw lateral development of any real life product and to make 3D models using card sheet or sheet metal.		
*Mapping of Course Outcomes		CO1, CO2,CO3, CO4, CO5
Unit IV	Engineering Curves	6 Hours
Introduction to conic sections and its real world applications, various methods to construct the conic sections, Helix for Cone and Cylinder, Rolling Curves (Involute, Cycloid) and Spiral		
#Exemplar/Case Studies: Identify different conic sections used in a real life product or phenomena and to draw it using applicable method.		
*Mapping of Course Outcomes		CO1, CO2,CO3, CO4, CO5
Unit V	Orthographic Projection	6 Hours

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Introduction to First and Third angle Projection methods, Orthographic projection of machine elements/parts along with sectional view by first angle method.		
#Exemplar/Case Studies: Measure the dimension of any real life product and draw its orthographic views with dimensions using suitable scale.		
*Mapping of Course Outcomes		C01, C02,C03, C04, C05
Unit VI	Isometric Projection	6 Hours
Introduction to isometric projection, oblique projection and perspective projection. Draw the isometric projection from the given orthographic views.		
#Exemplar/Case Studies: Read and measure the dimension of any real life product and draw its Isometric views with dimensions using suitable scale.		
*Mapping of Course Outcomes		C01, C02,C03, C04, C05
Learning Resources		
Text Books		
T1: K. Venugopal, K, , "Engineering and Graphics", New Age International, New Delhi,2015 T2: Jolhe, D. A., (2015), "Engineering Drawing with introduction to AutoCAD", Tata McGraw Hill, New Delhi,2015. T3:Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charotar Publication, Anand, India,2016.		
Reference Books :		
R1. B. Bhattacharyya, S.C. Bera "Engineering graphics" I.K. International Publishing House Pvt.Ltd. New Delhi..		

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25-ESC-1-02: Programming and Problem Solving																							
Teaching Scheme: Theory: 02 Hours/Week	Credit: 02	Evaluation Scheme: CIE : 20 Marks MSE : 20 Marks SEE : 60 Marks																					
Prerequisites Knowledge: Basic Computer Skills, Logical Thinking and Problem-Solving Skills.																							
Companion Course: 25-ESC-1-07: Programming and Problem Solving Lab																							
Course Objectives: • To develop the ability to analyze a problem and design an algorithm to solve it. • To understand and use the basic programming constructs of C/C++. • To acquaint with various C/C++ data types, such as arrays, strings, and pointers. • To introduce Object Oriented Programming concepts using the C++ language. • To introduce code reusability, flexibility, extensibility, and scalability in programming using C++																							
Course Outcomes: After completion of the course, learners should be able to <table border="1" data-bbox="207 1207 1507 1795"> <thead> <tr> <th>CONo</th><th>CO</th><th>BL</th></tr> </thead> <tbody> <tr> <td>CO1</td><td>Write efficient algorithms to solve various problems.</td><td>3</td></tr> <tr> <td>CO2</td><td>Understand and use various constructs of the C/C++ programming language to develop modular applications.</td><td>2</td></tr> <tr> <td>CO3</td><td>Demonstrate the ability to write C programs using pointers, structures, unions and arrays.</td><td>3</td></tr> <tr> <td>CO4</td><td>Understand memory allocation and deallocation concepts for organizing data.</td><td>2</td></tr> <tr> <td>CO5</td><td>Apply object-oriented approaches to software problems in C++.</td><td>3</td></tr> <tr> <td>CO6</td><td>Understand and apply the concepts of inheritance and polymorphism to analyze object-oriented program design.</td><td>2,3</td></tr> </tbody> </table>			CONo	CO	BL	CO1	Write efficient algorithms to solve various problems.	3	CO2	Understand and use various constructs of the C/C++ programming language to develop modular applications.	2	CO3	Demonstrate the ability to write C programs using pointers, structures, unions and arrays.	3	CO4	Understand memory allocation and deallocation concepts for organizing data.	2	CO5	Apply object-oriented approaches to software problems in C++.	3	CO6	Understand and apply the concepts of inheritance and polymorphism to analyze object-oriented program design.	2,3
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Course Contents		
Unit I	Introduction of programming design tools and Basics on C programming	05 Hours
Program Design Tools : Algorithms, Flowchart and Pseudo code , Programming Language Introduction and Paradigms. Introduction to C Programming : C Program Structure, Identifiers, Data Types, Constants, Local and Global variable, Reserved words, Type conversions, Input and output functions, Indentations and comments, Operators and Expressions.		
#Exemplar/Case Studies : Cooking Adventures" is a creative case study designed to teach the basics of C programming in an engaging and interactive way, using cooking as a metaphor. • Program Structure: The main() function serving as the cooking instructions and header files as the list of required ingredients. • Identifiers: Ingredients, utensils, and cooking techniques are used as identifiers to illustrate variables. • Data Types: Various cooking ingredients represent different data types in C programming.		
*Mapping of Course Outcomes		C01,C02
Unit II	Control Statements in C Programming	05 Hours
Selection Control Statements : if, if-else, nested if-else, switch case statement.. Iterative Control Statements : 'while, do while and for loops, nested loops, break, continue and goto statement.		
#Exemplar/Case Studies : Design and develop a C program to simulate a simple vending machine functionalities. The program should allow users to: • Data Structures: View available items and their prices. • Data Types: Select an item for purchase. • Loop: Enter the exact amount (using a loop to check for sufficient change). Input Output Function : Display a message if the selected item is out of stock or insufficient funds are provided.		
*Mapping of Course Outcomes		C02
Unit III	Pointers, Arrays and Strings	05 Hours
Pointers and Memory Management : Definition of Pointers, Pointer variable – declaration and initialization, Dynamic memory allocation, Pointer arithmetics. Arrays : Declaration of Array, Initialization of array, Type of array. Strings : Strings Basics, Strings Declaration, Strings Initialization, String Operation.		
#Exemplar/Case Studies : To develop a simple Employee Management System in C using pointers to manage employee records efficiently.		
*Mapping of Course Outcomes		C03
Unit IV	Functions, Structures and Union	05 Hours

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Introduction to functions: Function component: declaration, definition and calling, return type, Actual and Formal parameters, Passing parameters to functions: call by value, call by reference. Introduction to structures and Unions.		
#Exemplar/Case Studies: Organizing and storing Student record information such as student IDs, names, grades, and contact details. Using Structures and Unions in C Programming.		
*Mapping of Course Outcomes		C04
Unit V	Introduction of Object oriented programming and C++	05 Hours
Introduction of Object oriented programming: Basic Concept of object-oriented programming (OOP), Objects, classes , access specifiers (private, public, protected). Classes and objects : Specifying a class: class declaration , class function definition , Simple Class example , Creating objects, accessing class members,Constructor, Destructors.		
#Exemplar/Case Studies: Design and develop a program to manage books, members, and borrowing activities in a library using OOP concepts. ● Class Definitions: The system defines classes for books, members, and borrowings, encapsulating relevant attributes and behaviors for each entity. ● Data Encapsulation: Each class encapsulates its data members within private or protected access specifiers, ensuring data integrity and promoting information hiding. ● Functionality Implementation: Functionalities such as adding new books to the library inventory, registering new members, borrowing books, returning books, and displaying information about books, members, and borrowings. User Interaction: The system provides a user-friendly interface that allows library staff to perform various tasks such as adding books, registering members, and managing borrowing activities through menus and prompts.		
*Mapping of Course Outcomes		C05
Unit VI	Inheritance and Polymorphism	05 Hours
Concept of Inheritance: Parent class, derived class. Types of inheritance: Single, Multiple, Multilevel, Hierarchical & Hybrid. Compile Time Polymorphism: Method overloading, Operator overloading Runtime Polymorphism: Method overriding.		
#Exemplar/Case Studies: Develop a program to manage animals in a shelter using inheritance to represent different animal types. ● Class Hierarchy and Inheritance: The defines a class hierarchy with a base class named 'Animal' and subclasses representing different types of animals, subclass inherits attributes and behaviors from the base class. ● Polymorphism: Polymorphism to treat objects of derived classes uniformly through pointers or references to the base class. ●Functionality Implementation: Implements functionalities such as adding new animals to the shelter, displaying information about all animals, and performing operations specific to each animal type.		
*Mapping of Course Outcomes		C06

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Learning Resources
Text Books:
T1. Yashwant Kanetkar, "Let Us C", BPB Publication, BPB Publications, 15th edition ISBN 13 978-8183331630 T2. E. Balagurusamy, "Object Oriented Programming With C++", McGraw-Hill Education, ISBN 9780070669079 T3. Yashwant Kanetkar, "Let us C++", BPB Publication, 15th edition, ISBN-13: 978-8183331630
Reference Books :
R1. Harbison and Steele, "C: A Reference Manual", Atlantic Publishers, 5th Edition, ISBN-13: 978-0130895929 R2. Harry. H. Chaudhary, "C Programming :The Definitive Beginner Reference", Createspace Independent Pub, ISBN-13 : 978-1500481001 R3. Ulla Kirch-Prinz, "A Complete Guide to Programming in C++ – 1st Edition", ISBN 978-0763718176 R4. Bjarne Stroustrup, "The Design and Evolution of C++" Addison-Wesley; 1st edition, ISBN-13 : 978-0201543308 R5. Balagurusamy, E, Object-oriented programming with C++, McGraw Hill; Eighth edition, ISBN-13 : 978-9389949186
Additional Resources: (Books, e-Resources) • https://ia801404.us.archive.org/2/items/cprogbooks/k%26r.pdf • https://www.javatpoint.com/c-programming-language-tutorial • https://www.youtube.com/watch?v=zl203Xj26AI
MOOC Courses links : • Introduction To Programming In C https://onlinecourses.nptel.ac.in/noc22_cs40/preview • Programming in C++ https://onlinecourses.nptel.ac.in/noc21_cs02/preview • Programming in Modern C++ https://onlinecourses.nptel.ac.in/noc24_cs44/preview



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25-PCC-ET-1-01: Digital Design		
Teaching Scheme: Theory: 02 Hours/Week	Credit: 2	Examination Scheme: CIE : 20 Marks SEE : 30 Marks
Prerequisites Courses: Basic knowledge of Logic Gates & Number System.		
Companion Course: 25-PCC-ET-1-02: Digital Design Lab		
Course Objectives: - To provide the basic knowledge of classification & characteristics of digital logic families. - To introduce Numbering Systems, Boolean algebra & Karnaugh maps for the design of digital circuits. - To prepare to perform the design of combinational circuits and sequential circuits.		
Course Outcomes: After completion of the course, learners should be able to		
CO No	CO	BL
C01	Classify the Digital Logic Families.	2
C02	Use the basic logic gates and various reduction techniques to design combinational circuits.	3
C03	Design and implement combinational logic circuits.	3
C04	Design and implement sequential circuits.	3
Course Contents		
Unit I	Digital Logic Families	6 Hours
Classification & Characteristics of TTL, CMOS Logic family, Comparison, Active pull up, open collector output, Tri-State logic, open drain output, Interfacing CMOS and TTL, Data sheet specifications.		
#Exemplar/Case Studies: Read Data sheets of CMOS logic family.		
*Mapping of Course Outcomes		C01
Unit II	Boolean Algebra & Logic Gates	6 Hours

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Introduction to number systems, conversion, 1's & 2's Complement, Logic Gates, Boolean algebra and logic simplification using Boolean rules and laws. K-map and minimization of POS and SOP expressions. Don't care about conditions. Static 1 & 0 Hazards & dynamic hazards.		
#Exemplar/Case Studies: Application of ASCII code.		
*Mapping of Course Outcomes		C02
Unit III	Combinational Logic Design	8 Hours
Basics of Combinational logic design, Adder and Subtractor, Parallel adders, BCD adder, Code converters, Comparators, Parity generator, BCD to 7 Segment Decoder, multiplexer, demultiplex, application, concept of PAL, PLA.		
#Exemplar/Case Studies: Application of Mux & Demux.		
*Mapping of Course Outcomes		C03
Unit IV	Sequential Logic Design	8 Hours
Introduction to sequential circuits, S-R Flip-flop, D Flip-flop and JK Flip-flop, T Flip-flop and Race around conditions,, Master-slave Flip-flop. Design of Synchronous and Asynchronous Counters, Shift Registers.		
#Exemplar/Case Studies : Use of counters in microcontrollers.		
*Mapping of Course Outcomes		C04
Learning Resources		
Text Books :		
T1. R. P. Jain, "Modern Digital Electronics", 4th Edition, TMH Publication. T2. Morris Mano, "Digital Design", 5th edition, Pearson Prentice Hall. T3. Anil K.Maini, "Digital Electronics Principles & Integrated Circuits", 1st Edition, Wiley India Edition.		
Reference Books :		
R1. John F. Wakerly, "Digital Design: Principles and Practices," 4th Edition, Pearson. R2. Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson.		
Additional Resources: (Books, e-Resources)		
YouTube: 1) Gate Smashers – Digital Electronics Playlist 2) Neso Academy – Digital Electronics		

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MOOC Courses links :

- NPTEL Course "Digital Circuits & Systems"
<https://nptel.ac.in/courses/117/106/117106086/>
- NPTEL Course "Digital Electronic Circuits"
<https://nptel.ac.in/courses/108/105/108105132/>



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25-BSC-1-06: Engineering Chemistry Lab		
Teaching Scheme: Practical: 02 Hours/Week	Credit: 01	Evaluation Scheme: Termwork (TW) : 25 Marks
Prerequisites: 11 th and 12 th Science Chemistry Basic knowledge		
Companion Course: 25-BSC-1-02 : Engineering Chemistry		
Course Objectives: - To familiarize students with titration, spectroscopic analysis, and other typical laboratory procedures utilized in engineering. - Introducing students to standard laboratory tools and apparatus utilized in chemical analysis and experimentation. - To enhance students' ability to communicate scientific results in writing and oral forms through laboratory reports. - To promote professional and ethical behavior in laboratory work, including honesty, cooperation, and time management.		
Course Outcomes: After completion of the course, learners should be able to		
CONo	Course outcomes	BL
CO1	Apply analytical techniques to determine water hardness, alkalinity, demonstrating an understanding of water quality parameters.	4
CO2	Utilize a colorimeter to measure the maximum absorption wavelength and determine the unknown concentration of a sample, showcasing competence in spectrophotometric methods.	4
CO3	Synthesize polymers, biodiesel from oil, semiconductor quantum dots, acquiring practical expertise in material synthesis and renewable energy sources.	3
CO4	Employ Mohr's Method to estimate chloride content and determine the strength of a strong acid using a conductometer, pH meter expanding their analytical toolkit.	4

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CO5	Utilize a Bomb calorimeter and Proximate Analysis to determine the calorific value and composition of a solid fuel, understanding the energy content of fuels.	3
CO6	Apply electroplating to coat copper on iron, demonstrating knowledge of electrodeposition techniques (ECE).	3

Guidelines for Instructor's Manual

The instructor's manual is to be developed as a reference and hands-on resource. It should include prologue (about University/program/ institute/ department/foreword/ preface), curriculum of the course, conduction and Assessment guidelines, topics under consideration, concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.

Guidelines for Student's Laboratory Journal

The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment. Write-up should include Title, Date of Completion, Objectives, diagram, working principle, procedure, observations, graphs, calculations, conclusion and questions, Assessment grade/marks and assessor's sign, Theory- Concept in brief). For reference one or two journals may be maintained in the Laboratory.

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as timely completion, performance, understanding, and presentation/journal writing.

Guidelines for Laboratory Conduction

1. The teacher will brief the given experiment to students, its procedure, observations calculation, and outcome of this experiment.
2. Apparatus, chemicals, solutions and equipment required for given experiment will be provided by the lab assistants
3. Students will perform the same experiment in a group under the supervision of faculty and lab assistants. After performing the experiment students will check their readings, and calculations from their respective teacher.
4. Students follow lab guideline as given below
 - Follow lab timings strictly.
 - Keep your belongings and bags in the rack.
 - Use instruments of the lab properly.



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- Use fans and tubes of the lab only if required.
- Do not disturb an arranged set of practicals.
- Never work alone in the laboratory.
- Never begin working, until your instructor arrives.
- Never bring smoking materials, food or drink into the chemistry lab.
- Many laboratory chemicals are poisonous. Never taste a chemical or a solution.
- Do not use broken or cracked glass equipment.
- Read the label carefully before removing a chemical from a container.
- Do not pipette out any concentrated acids, alkalis and buffer solutions.
- While diluting H₂SO₄, pour the acid very slowly into water with constant stirring. Do not add water to the acid.
- Use tongs wherever necessary especially when you have to pick up hot objects.
- Arrange the stools properly after use.
- Handle apparatus with care and wash them thoroughly before and after use.
- At once report all accidents to your teacher.
- Get your write up checked regularly and in time.

Virtual Laboratory: (If Any):-

1. <https://vlab.amrita.edu/?sub=2>
2. <https://chemistryvl.pict.edu/#/>
3. <https://www.olabs.edu.in/?pg=topMenu&id=41>

Suggested List of Laboratory Experiments/Assignments(Any Eight)

Sr No	Assignment Title	Mapping of Course Outcomes
1.	Water Analysis: Determination of total hardness of water by the EDTA method for its quality analysis	CO1
2.	Water Analysis: Determination of Alkalinity of water	CO1
3.	Acid-Base Titration: Determination of the strength of a strong acid using a pH meter	CO4
4.	Spectrophotometry: Measurement of the maximum absorption wavelength of a sample and determination of its unknown concentration using a colorimeter.	CO2



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5.	Electrochemical Techniques (ECE): To coat copper on an iron plate using electroplating.	CO6
6.	Fuel Analysis: Proximate analysis of coal to understand its composition.	CO5
7.	Polymer Synthesis: Preparation of Phenol Formaldehyde / Urea Formaldehyde resin.	CO3
8.	Biodiesel Production: Preparation of biodiesel from oil.	CO3
9.	Fuel Analysis: Determine the calorific value of given solid fuel by using Bomb calorimeter.	CO5
10.	Nanomaterial Synthesis: Colloidal synthesis of 2-6 or 3-5 semiconductor quantum dots nanoparticles	CO3
11.	Quantitative Analysis: Estimation of Chloride content by Mohr's Method	CO4
12.	Acid -Base Titration: Determination of strength of strong acid using a Conductometer.	CO4

Learning Resources

Text Books :

- T1.** O.P. Varmani and A.K.Narula, "Applied Chemistry 'Theory and Practice", 2ed, New Age International Publishers, New Delhi 2012.
- T2.** S.K.Bhasin and Sudha Rani, "Laboratory manuals on Engg.Chemistry", 3 ed, Dhanpat Rai publishing company (Pvt) Ltd, New Delhi-2012.
- T3.** Archana Thakur, "Practical Engineering Chemistry", Alpha Science International Limited, 2019

Reference Book :

- R1.** G. R. Chatwal & S. K. Anand, "Instrumental Methods of Chemical Analysis", Himalaya Publishing House. 2019

Additional Resources: (Books, e-Resources)

[G. H. Jeffery J. Bassett J. Mendham R C. Denney, "Textbook of Quantitative Chemical Analysis", 5 th Edition](#)

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25-ESC-1-08: Engineering Graphics Lab		
Teaching Scheme: Practical: 2 Hours/Week	Credit: 01	Examination Scheme: Term work (TW) : 25 Marks
Prerequisites Courses: Basic Knowledge of geometrical shapes, its construction and knowledge of computer handling.		
Companion Course: 25-ESC-1-03: Engineering Graphics		
Course Objectives: • Introduce fundamental principles of Engineering Drawing. • Educate on dimensioning standards and specifications in engineering drawings. • Teach different projection methods such as orthographic, isometric. • Provide hands-on training in CAD software for graphical communication. • Enhance communication skills through graphical representation of design concepts.		
Course Outcomes: After completion of the course, learners should be able to		
CO No	CO	BL
C01	Apply theory of projection accurately for point and line for graphical representation.	3
C02	Apply theory of projection accurately for 2D planes for graphical representation.	3
C03	Draw the development of lateral surfaces for cut sections of geometrical solids.	3
C04	Construct the various engineering curves using the drawing instruments.	3
C05	Apply the concept of orthographic projection to create sectional views from isometric views and to generate isometric views from given orthographic views.	3
C06	Apply learnt skills effectively with practical competence to create detailed product/object drawings using CAD software.	3
Guidelines for Student's Laboratory Journal		

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The laboratory assignments are to be submitted by students in the form of a bunch of sheets. Bunch consists of Certificate, table of contents, and hand drawn sheets along with CAD Printout of each assignment (Title of assignment, Date of Completion, date of submission, Scale used, name of students, roll number, branch and division etc.) in a prescribed template provided on printed A2 size (594mm X 420mm) sheet.

Guidelines for Laboratory /Term Work Assessment

Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign marks based on the rubrics of evaluation prepared by course instructor, such as Proper Line Types, Graphically Accurate, Dimensions and Timely Submission for manual assessment and for CAD sheet assessment will be based on accuracy of dimension, level of detailing, use of CAD features and timely submission.

Guidelines for Laboratory Conduction

Group-A: Draw minimum one problem on each assignment on A2 size drawing sheet and same problem using CAD software. During the practical sessions the practice of drawing and familiarization with CAD software can be initially done for 2 to 3 practical sessions. After having hands-on experience with drawing instruments and CAD Software students have to draw the simple as well as some complex problems.

Group-B: Students have to solve a minimum of one assignment from group B by using CAD Software.

Suggested List of Laboratory Assignments

Group A: Assignments (Mandatory Assignment)

Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Draw projection of lines inclined to both principal planes.	C01, C06
2.	Draw Projection of different 2D planes inclined to both principal planes.	C01, C02, C06
3.	Draw the development of the lateral surface of a solids/ truncated solids.	C01, C02, C03, C06
4.	Construct Engineering curves	C01, C02, C03, C04, C06
5.	Draw orthographic and Isometric views of a given object.	C01, C02, C03, C04, C05, C06



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6.	Draw projection of lines inclined to both principal planes.	C01, C06
Group B: Assignments (Out of List perform minimum 1)		
Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Draw the Orthographic and isometric views of a Workshop Job prepared during the workshop practice using CAD software.	C01, C02, C03, C04, C05, C06
2.	Draw Orthographic and isometric projection of desktop monitor / CPU Box / Mouse using CAD software.	C01, C02, C03, C04, C05, C06
3.	Draw Simple elevation and plan of Floor of own house using CAD software.	C01, C02, C03, C04, C05, C06
Learning Resources		
Text Books		
T1: K. Venugopal, K, (2015), "Engineering and Graphics", New Age International, New Delhi. T2: Jolhe, D. A., (2015), "Engineering Drawing with introduction to AutoCAD", Tata McGraw Hill, New Delhi. T3: Bhatt, N. D. and Panchal, V. M., (2016), "Engineering Drawing", Charotar Publication, Anand, India.		
Reference Books :		
R1. B. Bhattacharyya, S.C. Bera 'Engineering graphics' I.K. International Publishing House Pvt.Ltd. New Delhi. R2. Sham Tickoo, Vivek Kumar Singh, Swapna D 'Auto CAD for Engineers and Designers (2023)' dreamTech Press.		

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25-ESC-1-07: Programming and Problem Solving Lab																							
Teaching Scheme: Practical: 02 Hours/Week	Credit: 01	Evaluation Scheme: Termwork (TW) : 25 Marks																					
Prerequisites Courses: Basic Computer Skills, Logical Thinking and Problem-Solving Skills.																							
Companion Course: 25-ESC-1-02: Programming and Problem Solving.																							
Course Objectives: - To introduce students with programming fundamentals of C and C++ language. - To impart writing skills of programming to the students and solving problems in C. - To impart the concepts like looping, array, functions, pointers, structures. - To make the student learn an object oriented way of solving problems																							
Course Outcomes: After completion of the course, learners should be able to <table border="1" data-bbox="203 1087 1498 1644"> <thead> <tr> <th>CONo</th><th>CO</th><th>BL</th></tr> </thead> <tbody> <tr> <td>CO1</td><td>Apply problem-solving skills and effectively develop, compile and debug C and C++ programs.</td><td>3,4</td></tr> <tr> <td>CO2</td><td>Construct a solution for a given problem utilizing control structures.</td><td>3,6</td></tr> <tr> <td>CO3</td><td>Develop programs using functions.</td><td>3,6</td></tr> <tr> <td>CO4</td><td>Utilize arrays, pointers when developing programs.</td><td>3</td></tr> <tr> <td>CO5</td><td>Demonstrate the application of Object-Oriented Programming principles to solve diverse computing problems with C++.</td><td>3,4</td></tr> <tr> <td>CO6</td><td>Apply the concept of Inheritance for reusability of a class.</td><td>3</td></tr> </tbody> </table>			CONo	CO	BL	CO1	Apply problem-solving skills and effectively develop, compile and debug C and C++ programs.	3,4	CO2	Construct a solution for a given problem utilizing control structures.	3,6	CO3	Develop programs using functions.	3,6	CO4	Utilize arrays, pointers when developing programs.	3	CO5	Demonstrate the application of Object-Oriented Programming principles to solve diverse computing problems with C++.	3,4	CO6	Apply the concept of Inheritance for reusability of a class.	3
CONo	CO	BL																					
CO1	Apply problem-solving skills and effectively develop, compile and debug C and C++ programs.	3,4																					
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CO6	Apply the concept of Inheritance for reusability of a class.	3																					
Guidelines for Instructor's Manual The instructor's manual is to be developed as a reference and hands-on resource. It should include prologue (about institute/ department), curriculum of the course, conduction and Assessment guidelines, topics under consideration, concept, objectives, outcomes, set of typical																							



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applications/assignments/ guidelines, and references.		
Guidelines for Student's Laboratory Journal The laboratory assignments are to be submitted by students in the form of a journal. Journal consists of Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Software and Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm, flowchart), conclusion/analysis. Program codes with sample output of all performed assignments are to be submitted as softcopy. As a conscious effort and little contribution towards Green IT and environment awareness, attaching printed papers as part of write-ups and program listing to journals must be avoided. Use of CD containing student programs maintained by Laboratory In-charge is highly encouraged. For reference one or two journals may be maintained with program prints in the Laboratory.		
Guidelines for Laboratory /Term Work Assessment Continuous assessment of laboratory work should be based on overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grade/marks based on parameters, such as Write-up, Correctness and Documentation of Program, Viva, Timely Completion.		
Guidelines for Laboratory Conduction List of laboratory assignments is provided below . The instructor is expected to conduct the assignments by understanding the prerequisites, technological aspects, utility and recent trends related to the topic. Encourage students for appropriate use of coding style, proper indentation and comments. Use of open source software and recent versions is to be encouraged.		
Suggested List of Laboratory Experiments/Assignments		
Assignments (Compulsory)		
Sr No	Assignment Title	Mapping of Course Outcomes
1.	Write a C program to calculate parking charges based on vehicle type and parking duration. • The charges as below • Truck/ Bus : Rs. 120/- hour • Car : Rs. 80/- hour • Motorcycle/Scooter : Rs. 30/- hour • Bicycle : Rs. 10/- hour	CO1,CO2

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2	Create a Program in C for a Simple Ticket Booking System for a Movie Theater. The Program Should allow users to select a Movie, Choose the number of Tickets they want to Purchase and Calculate the total cost. Use Loops to display the available movie options and to validate the user's input for the number of Tickets.	CO1, CO2
3.	Develop a Program in 'C' for a small Grocery Store that tracks Inventory using Arrays, the program should allow the Store Manager to add new Items to the Inventory, Update Quantities and display the current inventory Status.	CO1, CO2, CO3,
4.	Develop a program in C that reads a string input from the user, counts the number of vowels in the string, and displays the result	CO1, CO2, CO4
5.	Write a program in C that simulates a bank account management system. The program should allow users to deposit money, withdraw money, and check their account balance. Use pointers to update and access account balances.	CO1, CO2, CO3, CO4
6.	Write a program to print the area and perimeter of a triangle having sides of 3, 4 and 5 units by creating a class named 'Triangle' with a function to print the area and perimeter. ● Triangle Class Declaration: Create a class named 'Triangle'. The class includes private member variables to store the side lengths of the triangle and public member functions to calculate and display its area and perimeter. ● Constructor and Destructor: The Triangle class includes a constructor to initialize the side lengths of the triangle and a destructor to clean up resources when the object is destroyed. ● Area Calculation Function: The Triangle class provides a member function to calculate the area of the triangle using the given side lengths. ● Perimeter Calculation Function: The Triangle class includes a member function to calculate the perimeter of the triangle by summing the lengths of its sides.	CO1, CO3, CO5
7.	Write a program to find the area and volume of a respective figure using Function Overloading. ● Function Overloading: The system utilizes function overloading to define multiple versions of functions for calculating the area and volume of different geometric figures.	CO1, CO2, CO3, CO5

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	● Area Calculation Functions: The system defines overloaded functions for calculating the area of geometric figures such as rectangles, triangles, and circles. ● Volume Calculation Functions: Defines overloaded functions for calculating the volume of geometric figures such as cubes, spheres, and cylinders.	
8.	Develop a C++ program to define a base class Shape with two subclasses Rectangle and Triangle. Each subclass calculates its area based on given width and height. The program should demonstrate polymorphic behavior by storing the addresses of Rectangle and Triangle objects in a base class pointer and invoking the area() function for each object to calculate and display the area. ● Shape Class Declaration: The system declares a base class named 'Shape' to represent geometric shapes. ● Subclass Inheritance and Polymorphic Behavior: The Rectangle and Triangle subclasses inherit from the Shape base class, allowing them to override the 'area()' function. ● Area Calculation Functions: Each subclass (Rectangle and Triangle) provides an overridden 'area()' function to calculate the area.	CO1, CO3, CO5, CO6
Text Books		
T1. Yashwant Kanetkar, "Let Us C", BPB Publication, BPB Publications, 15th edition ISBN 13 978-8183331630 T2. E. Balagurusamy, "Object Oriented Programming With C++", McGraw-Hill Education, ISBN 9780070669079 T3. Yashwant Kanetkar, "Let us C++", BPB Publication, 15th edition, ISBN-13: 978-8183331630		
Reference Books :		
R1. Harbison and Steele, "C: A Reference Manual", Atlantic Publishers, 5th Edition, ISBN-13: 978-0130895929 R2. Harry. H. Chaudhary, "C Programming :The Definitive Beginner Reference", Createspace Independent Pub, ISBN-13 : 978-1500481001 R3. Ulla Kirch-Prinz, "A Complete Guide to Programming in C++ – 1st Edition", ISBN 978-0763718176 R4. Bjarne Stroustrup, "The Design and Evolution of C++" Addison-Wesley; 1st edition, ISBN-13 : 978-0201543308 R5. Balagurusamy, E, Object-oriented programming with C++, McGraw Hill; Eighth edition, ISBN-13 : 978-9389949186		
Virtual Lab : ● C Programming https://cse02-iiith.vlabs.ac.in/ ● Object Oriented Programming with C++:		

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<http://vlabs.iitb.ac.in/vlabs-dev/labs/oops/index.php>

- **Problem Solving Lab:**

<http://ps-iiith.vlabs.ac.in/>

M00C Courses links :

- **Introduction To Programming In C**

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

- **Programming in C++**

https://onlinecourses.nptel.ac.in/noc21_cs02/preview

- **Programming in Modern C++**

https://onlinecourses.nptel.ac.in/noc24_cs44/preview



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25-PCC-ET-1-02: Digital Design Lab		
Teaching Scheme: Practical: 2 Hours/Week	Credit: 1	Examination Scheme: Termwork (TW) : 25 Marks Practical (PR) : 25 Marks
Prerequisites Courses: Basic knowledge of Logic Gates & Number System.		
Companion Course: 25-PCC-ET-1-01: Digital Design		
Course Objectives: - To design & implement logic gates. - To design different combinational logic and sequential logic circuits.		
Course Outcomes: After completion of the course, learners should be able to		
CO No	CO	BL
CO1	Apply boolean algebra to simplify digital circuits.	3
CO2	Design & Implement different combinational logic circuits.	3,6
CO3	Design & Implement different sequential logic circuits.	3,6
Guidelines for Instructor's Manual The instructor's manual is to be developed as a reference and hands-on resource. It should include a prologue (about University/program/ institute/ department/foreword/ preface), curriculum of the course, conduction and Assessment guidelines, topics under consideration, concept, objectives, outcomes, set of typical applications/assignments/ guidelines, and references.		
Guidelines for Student's Laboratory Journal The laboratory assignments are to be submitted by students as a journal. The journal consists of a Certificate, table of contents, and handwritten write-up of each assignment (Title, Date of Completion, Objectives, Problem Statement, Software and Hardware requirements, Assessment grade/marks and assessor's sign, Theory- Concept in brief, algorithm, flowchart, test cases, Test Data Set(if applicable), mathematical model (if applicable), conclusion/analysis. Program codes with sample output of all performed assignments will be submitted as softcopy. As a conscious effort and little contribution towards Green IT and environmental awareness, attaching printed papers as part of write-ups and program listing to journals must be avoided. DVD containing		

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student programs maintained by the Laboratory in charge is highly encouraged. For reference one or two journals may be maintained with program prints in the Laboratory.		
Guidelines for Laboratory /Term Work Assessment		
Continuous assessment of laboratory work should be based on the overall performance of Laboratory assignments by a student. Each Laboratory assignment assessment will assign grades/marks based on parameters, such as timely completion, performance, innovation, efficient codes, and punctuality.		
Guidelines for Practical Examination		
Problem statements must be decided jointly by the internal examiner and external examiner. During the practical assessment, maximum weightage should be given to satisfactory implementation of the problem statement. Relevant questions may be asked at the time of evaluation to test the student's understanding of the fundamentals and effective and efficient implementation. This will encourage transparent evaluation and a fair approach, and hence will not create any uncertainty or doubt in the minds of the students. So, adhering to these principles will consummate our team efforts to the promising start of student's academics.		
Guidelines for Laboratory Conduction		
1) Connect the circuit as per the diagram with neat and labeled wiring. 2) Double-check connections before powering the circuit. 3) Ensure correct Vcc and GND connections to avoid IC damage. 4) Use logic probes or LEDs to test outputs properly. 5) Work in teams of 2–3 students for better collaboration. 6) Keep your workspace clean and organized. 7) Do not remove components or equipment from the lab. 8) If any component is damaged, report it immediately to the lab assistant. 9) Switch off the power supply when not in use or before modifying connections. 10) Record all observations accurately in the lab journal.		
Virtual Laboratory: (If Any):		
• Digital Logic Design https://dld-iitb.vlabs.ac.in/List%20of%20experiments.html • Hybrid Electronics: http://he-coep.vlabs.ac.in/		
Suggested List of Laboratory Experiments/Assignments		
Group A: Assignments (Mandatory Assignment)		
Sr No	Assignment Title	*Mapping of Course Outcomes

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1.	Simplify the given Boolean expression and realize it using logic gates.	C01
2.	Design and Implement the given Boolean function using multiplexer IC 74153	C02
3.	Design and Implement full adder using decoder IC 74138	C02
4.	Design and Implement 1 digit BCD adder using IC 7483 (4 bit Adder)	C02
5.	Design and Implement 4-bit Comparator using IC 74LS85.	C02
6.	Design and Implement MOD-N counter using IC-74LS90 (Decade Counter)	C03
Group B: Assignments (Out of List perform any 2)		
Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Design and implement a 3-bit Gray to Binary code converter using IC-74LS138.	C02
2.	Design and Implement 4-bit shift register using IC-74HC194/IC74LS95 (Use right shift/left shift).	C03
3.	Design & Implementation of JK Flip Flop.	C03
Group C: Assignments (Mini Project)(Any one)		
Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Water level control using basic AND and NOT gates.	C01
2.	Seat belt warning system using basic AND & NOT gates.	C01
Learning Resources (If applicable)		
Text Books		
T1. R. P. Jain, "Modern Digital Electronics," 4th Edition, TMH Publication. T2. Morris Mano, "Digital Design", 4th Edition, Pearson Prentice Hall.		
Reference Books :		
R1. John F. Wakerly, "Digital Design: Principles and Practices", 4th Edition, Pearson. R2. Thomas L. Floyd, "Digital Fundamentals", 11th Edition, Pearson.		

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Additional Resources: (Books, e-Resources)
MOOC Courses links : • Digital logic design Lab https://dld-iitb.vlabs.ac.in/ • Digital Application Lab https://da-iitb.vlabs.ac.in/



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25-VSC-1-02: TechShop		
Teaching Scheme: Practical: 4 Hours/Week	Credit: 2	Examination Scheme: Termwork (TW) : 50 Marks
Prerequisites Courses: Basic safety rules, basic knowledge of geometrical drawing		
Course Objectives: ● To develop students' skill sets in various construction activities in Civil Engineering. ● To impart the basic knowledge and understanding related to building construction. ● To provide exposure to the students with hands-on experience in various basic engineering practices in automobiles. ● To know the function of engine and gear oil used in vehicles. ● To understand workshop practices and safety Norms. ● To know the various manufacturing shops in the workshop.		
Course Outcomes: After completion of the course, learners should be able to		
CO No	CO	BL
C01	Illustrate the importance of various construction materials and activities.	3
C02	Perform on site construction activities (Lineout, masonry, Casting etc.)	3
C03	Use different tools and equipment for removal of wheel, puncture of tyre cleaning of spark Plug and battery terminals of vehicles	3
C04	Select appropriate engine and gear oil for a particular vehicle	3
C05	Apply the safety precautions/practices in the workshop	3
C06	Illustrate the various manufacturing processes used in the workshop.	3

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Guidelines for Instructor's Manual		
The instructor's manual shall contain: • The production drawing of a job with all linear and geometric dimensions, • Raw material, size and shape, and allowances provided. • List of drawings and tools required. • Process plan to complete the job. • General safety instructions.		
Guidelines for Student's Laboratory Journal		
• The student has to maintain a file consisting of drawings/sketches of the jobs and a brief description of tools, equipment, and procedures used for doing the job and schedule. • The student has to maintain one file for write-ups based on the demonstration of Techshop		
Guidelines for Laboratory /Term Work Assessment		
Term work assessment shall be based on the timely completion of jobs, quality of job, skill acquired, and maintaining the journal, as well as brief write-ups on illustrations/sketches of demonstrated parts/mechanisms/machine tools, etc.		
Guidelines for Laboratory Conduction		
All assignment of each module are compulsory		
Suggested List of Laboratory Experiments/Assignments		
Module I	Civil Engineering Workshop	
Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Civil Engineering Activities At Construction Site Perform lineout of a building using Nylon twine, Measuring Tape, Marking Pegs, Lime Powder.	C01, C02
2.	Masonry: Practical Study of Common Brick Bonds in Masonry.	C01, C02
3.	Precast Element Casting : Flower Pot Making Using Concrete and Mould.	C01, C02
4.	Finishing Works:	C02

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	Prepare the surface for whitewashing and painting using brush, roller, spray then apply it to the walls.	
5.	Visit to construction site: Visit to the construction site to study the construction material and construction activities.	C02
Module II	Mechanical	
Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Demonstration of Hand tools and Cleaning tools and applications in the Automobile and Mechanical field.	C03
2.	Use of various tools and equipment like screw jack, spanners for removal of wheels and puncture of tyres of vehicle.	C03
3.	Inspect and clean the Spark plug of the motorcycle/scooter.	C03
4.	Assignment on importance of engine oils and understanding of various engine oil grading system in two/four wheeler vehicles	C04
5.	Assignment on importance of gear oils and understanding of gear oil grading system in two/four wheeler vehicles.	C04
6.	Study of maintenance of batteries used in two/four wheeler vehicles.	C03
Module III	Workshop	
Sr No	Assignment Title	*Mapping of Course Outcomes
1.	Safety in Workshop: Fire hazards, electric short circuit-causes and remedies, machine protection, human protection, accident prevention methods, and the ability to observe safe working habits	C05
2.	Demonstration of lathe Machine: Demonstration on various functions of lathe parts: Headstock, Tailstock, Carriage, Lead screw, All geared Mechanism, Apron mechanism etc.	C05, C06
3.	Demonstration of Carpentry Processes:	C05, C06

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	Introduction to woodworking, kinds of woods, hand tools & machines, Types of joints, wood turning. Pattern making, types of patterns, contraction, draft and machining allowances	
4.	Demonstration of Joining Processes: Includes making temporary and permanent joints between similar and dissimilar material by processes of chemical bonding, mechanical fasteners and fusion technologies	C05, C06
5.	Demonstration of Fitting Processes: Types of Fits, concepts of interchangeability, datum selection, location layout, marking, cutting, shearing, chipping, sizing of metals, drilling and tapping	C05, C06
6.	Demonstration of Sheet metal work: Introduction to sheet metal operations: punching, blanking, bending, drawing, with riveting/brazing/soldering (at least one temporary and one Permanent joint either using resistance welding/Arc welding)	C05, C06
Learning Resources		
Text Books		
T1. A Text Book of Automobile Engineering - R. K. Rajput T2. A Textbook of Internal Combustion Engines : R.K. Rajput T3. Elements of workshop technology/vol 1 manufacturing processes S. K. Hajra Choudhury, A. K. Hajra Choudhury and Nirjhar Roy T4. Workshop Technology II, S. K. Hajra Choudhury		
Reference Books :		
R1. Massey Howard C, Basic Plumbing With Illustrations, Craftsman Book Co: California, ISBN 9780934041997 R2. PWD- Standard Data Book for Building Work, PWD Government of Maharashtra , Mumbai R3. CPWD work manual, CPWD Government of India, New Delhi.		

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25-CCC-1-05: Co-curricular Course -II		
Teaching Scheme: Practical: 04 Hours/Week.	Credit: 02	Evaluation Scheme: Term work (TW) : 25 Marks
Prerequisites Courses: 25-BSC-1-01: Engineering Physics, 25-BSC-1-03: Linear Algebra And Differential Calculus, 25-ESC-1-01: Basic Electrical and Electronics Engineering, 25-ESC-1-02: Programming and Problem Solving, 25-VSC-1-01: TechSkill.		
Companion Course: 25-BSC-1-02: Engineering Chemistry, 25-BSC-1-04: Statistics Probability and Integral Calculus, 25-ESC-1-03: Engineering Graphics , 25-ESC-1-04: Smart Building and Materials, 25-PCC-CS-1-01: Object Oriented Programming using Java, 25-VSC-1-02: TechShop		
Course Objectives: - To emphasize learning activities that are long-term, interdisciplinary and student-centric. - To inculcate independent learning by problem solving with social context. - To provide the new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products which are useful for a student in preparing for an engineering career. - To provide every student the opportunity to get involved either individually or as a group to develop team skills and learn professionalism.		
Course Outcomes: After completion of the course, learners should be able to		
CO No.	CO	BL
1	Develop creative thinking and learn the innovation cycle of design thinking process for Developing innovative products/models.	6
2	Work effectively in teams, communicate well with others, and collaborate on group projects.	3
3	Apply theoretical knowledge to practical settings and develop proficient technical skills Relevant to their chosen hobby or interest.	3

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Group Structure:

- Students will work in monitored groups under the guidance of assigned mentors to plan, manage, and complete a task, project, or activity based on a specific problem.
- Each group will consist of 5 to 6 students.
- A mentor is assigned to oversee each individual group.

Guidelines for Mentor:

1. Initiate Design Thinking Mindset

- Encourage creative problem-solving with a strong emphasis on societal needs.
- Help students understand that innovation starts with empathy and real-world relevance.

2. Defining Objectives – Innovation for Social Impact

- Guide students to frame clear, focused problem statements.
- Ensure the projects are oriented toward solving relevant social issues or local community problems.

3. Brainstorming and Idea Generation

- Let students share ideas freely in groups.
- Encourage creative thinking and respect all ideas – big or small.
- Help them select the best and most useful ideas.

4. Think Creatively to Solve the Problem

- Teach students to think in new and different ways.
- Help them explore multiple solutions, not just one.

5. Build Prototypes and Test Ideas

- Guide students to make simple models or prototypes.
- Let them test the ideas, get feedback, and improve their work.
- Teach them that failure is part of learning.



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Selection of Project/Problem/Theme :

- Begin by selecting a problem or topic based on interest or curiosity.
- The problem may relate to daily life, science, society, or technology.
- It should align with a subject area and support learning or knowledge application.
- Problems that connect two or more subjects (multidisciplinary) are encouraged.
- The problem should be examined from different perspectives.
- Projects may range from simple to complex but must support specific learning goals.
- Hands-on activities such as building models, creating designs, or conducting experiments are recommended.
- Ideas and skills from various subjects should be integrated wherever possible.
- Technology, such as internet resources, software, and digital tools, should be used for research, collaboration, and presentations.
- Real-life problems may be addressed, or real situations explored through fieldwork or surveys.
- Reports or summaries should be prepared based on the work completed and the knowledge gained.
- Participation in hobby club contests provides an opportunity to showcase work and gain insights from peers.
- Competitions help foster innovation, teamwork, and confidence.

Assessment:

- The college, department, and mentors regularly check student progress and how well the program is working.
- The Co-curricular Course-II is reviewed from time to time to ensure quality work.
- Both individual and group performance are observed during the course.
- Mentors and college authorities keep an eye on all activities and do regular assessments.
- Students should show teamwork, self-motivation, and take responsibility for their learning.
- The department supports students by giving proper guidance, orientation, and required resources.
- Mentors and students both take part in the assessment process.
- Students can show their learning through presentations, reports, or models.
- Assessment looks at each student's role, involvement, and performance in the group.
- Group work is also assessed based on teamwork, communication, task sharing, and cooperation.
- Proper documentation and clear presentations are an important part of the evaluation.



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Evaluation and Continuous Assessment:

It's suggested that all activities are recorded, and regular assessments are conducted, with proper documentation maintained by both students and mentors in a "Co-curricular Course -II Work Book." Each mentor should maintain a Continuous Assessment Sheet. The recommended assessment parameters and weightage are as follows:

- Idea Inception (10%)
- Awareness / Consideration of Environment / Social / Ethical / Safety Measures / Legal Aspects (10%)
- Provided Solutions / Final Product Outcomes (20%) - assessed individually and as a team.
- Documentation (20%) - Project report and Co-curricular Course -II workbook.
- Demonstration (40%) - assessed based on presentation, user interface, usability etc.
- The Co-curricular Course -II workbook will serve to facilitate students, mentors, and project coordinators, reflecting accountability, punctuality, technical writing ability, and the workflow of undertaken tasks

