SCHEME AND SYLLABI FOR
BACHELOR OF TECHNOLOGY PROGRAMMES

IN

1. COMPUTER SCIENCE AND ENGINEERING
2. INFORMATION TECHNOLOGY
3. COMPUTER SCIENCE AND ENGINEERING – ARTIFICIAL INTELLIGENCE
4. COMPUTER SCIENCE AND ENGINEERING – DATA SCIENCE
5. ELECTRONICS AND COMMUNICATION ENGINEERING

OFFERED BY

UNIVERSITY SCHOOL OF INFORMATION, COMMUNICATION AND TECHNOLOGY
AT THE DWARKA CAMPUS OF UNIVERSITY AND ITS AFFILIATED INSTITUTIONS
(WITH EFFECT FROM ACADEMIC SESSION 2026-27)

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY
AN UNIVERSITY ESTABLISHED BY THE GOVERNMENT OF NCT OF DELHI

Approval History

1. 1st year scheme and syllabus (1st to 2ndsemester) and Framework for higher semesters (3rdto 8th semesters or 2ndto 4th year) implemented from 2026-27 batch approved by Board of Studies of USICT on 08.08.2026.
2. 1st year scheme and syllabus (1st to 2nd semester) and Framework for higher semesters (3rd to 8th semesters or 2nd to 4th year) implemented from 2026-27 batch approved by Academic Council Sub-committee on 19.08.2026.

Vision of the School

Create high-quality engineering and computer application professionals

Mission of the School

To serve humanity by creating professionally competent, socially sensitive engineers with high ethical values who can work as individuals or in groups in multicultural global environments.

Introduction

This document describes the curriculum of the Bachelor of Technology part of the Dual Degree (Bachelor Technology / Master of Technology) Programmes that are offered at the University School of Information ,Communication and Technology in its own campus (not at the affiliated institution of the University).In the event of any difficulty of implementation, and / or interpretation of any clause of the document, the same maybe brought to the notice of Dean of the University School of Information Communication and Technology. The decision of the Dean, University School of Information Communication and Technology shall be final and implemented to resolve the issue. The same shall be put up in the subsequent meeting of the Board of Studies of the University School of Information Communication and Technology for its approval. If the decision of the Board of Studies of the University School of Information Communication and Technology is at variance with the decision taken earlier by the Dean of the School, the decision of the Board shall be effective from the date of the approval by the Board of Studies. In the interim period (between the approval of the Dean, of the School and the Board of Studies approval), the decision already taken by the Dean of the school shall stand.

The marking scheme for all non-NUES papers (theory/practical) to be as:

1. **Teachers Continuous Evaluation: 40 marks**
2. **Term-end Theory Examinations: 60 marks**

The marking scheme for all NUES papers (theory/practical) to be as:

1. **Teachers Continuous Evaluation: 100 marks**

The University School of Information, Communication and Technology (USICT) offers Bachelor of Technology / Master of Technology (Dual Degree) programme(s) of study in the following five disciplines of 4+2 years duration,namely:

1. Computer Science and Engineering
2. Information Technology
3. Electronics and Communications Engineering
4. Computer Science and Engineering – Artificial Intelligence
5. Computer Science and Engineering – Data Science

In addition, the School offers four regular programmes at Master of Technology Level and a programme at the level of Master of Computer Applications.

This document describes the Bachelor of Technology part of the dual degree programmes for the following programmes (major discipline):

1. Computer Science and Engineering
2. Information Technology
3. Electronics and Communications Engineering
4. Computer Science and Engineering – Artificial Intelligence
5. Computer Science and Engineering – Data Science

Note: This document describes the Scheme and Syllabus of the 1st year only. 2nd Year to 4th Year scheme and syllabus for these programmes is in a separate document.

The dual degree programme is to be offered only at the University School of Information Technology, only the Bachelor of Technology programme is to be offered at approved affiliated institutions of the University.

The document is prepared after extensive discussion among the stakeholders. The following has been guiding principles for the design of this document:

1. AICTE Handbook
2. The eligibility conditions for the admissions to these programmes. The eligibility conditions for these programmes of studies do not require chemistry to be studied at the 10+2 level.
3. The multiple entry and multiple exit principle of NEP requires a major overhaul of the structure of the scheme and syllabi. This requires that a minimum knowledge of the specific discipline be taught in the first year itself so that a Certificate may be awarded.
4. Minor specializations shall be offered. This allows the students to study not only the core foundational papers / subjects in the discipline but also subjects in the focus areas and emerging areas of technology that are relevant to the discipline and of related disciplines.

5. Subject of Graduate Aptitude Test in Engineering (GATE), for these disciplines shall be studied by the students, as core subjects.
6. Multiple Exit and re-entry after completion of every academic year of study.
7. Multiple routes for the award of the degree. This leads to a major revision of the scheme of examinations, as it implies that engineering papers have to be offered in the 1st year.
8. Value Added Course on "Environment Studies"
9. Value Added Course on "Human Values and Ethics"
10. Value Added Course on "Science and Practice of Happiness"
11. Inter-diciplinary Courses of 9 Credits to be studied by students from other discipline than their own.
12. Maximum Credits: 178
13. Minimum Credits 160

Note:

A. The document currently specifies the following:
   1. The scheme and syllabus of the first year.
   2. The regulation for exit and re-entry into the programme after completion of every academic year.
   3. The regulation for the award of the degree.
B. The document only provides for the framework for the following (the detailed and finalization of these shall occur in subsequent meeting of the Board of Studies of the School):
   1. The final scheme and syllabus of the second to fourth year of study.
   2. The minor specializations that may be offered to the students.
C. The faculty deputed for teaching a course/paper shall be of appropriate expertise in consonance with the syllabus of the course/paper.

Acronyms:

APC:	Academic programme committee comprising of all faculty of the school and as defined in the implementation rules.
BoS:	Board of Study of the school, USICT.
USICT:	University School of Information, Communication and Technology.
L:	Number of Lecture hours per week
T/P:	Number of Tutorial / Practical Hours per week
C:	Number of credits assigned to a course / paper
COE:	Controller of Examinations of the Examinations Division of the University.
SGPA/CGPA:	Semester/Cumulative Grade Point Average.
NUES:	No term end examination shall be held. The evaluation shall be conducted as per the scheme of examinations as described in the scheme of study.
PC:	Programme Core, that is course/paper offered in the discipline of the programme as a compulsory paper.
PCE:	Programme Core Elective, that is, elective course/paper offered in the discipline of the programme.
EAE:	Emerging Area Elective offered by school.
OAE:	Open area elective offered by other school or open/emerging area elective offered by the school / offered through SWAYAM / NPTEL MOOCs platform.
ES:	Engineering Science Course.
SEC:	Skill enhancement course. As these are engineering disciplines, most of the courses are skill oriented.
AEC:	Ability enhancement course. As these are engineering disciplines, most of the courses are ability enhancing for employability.
VAC:	Value added courses

Definitions:

Batch: The batch of the student shall mean the year of the first time enrolment of the students in the programme of study in the first semester. Lateral entry students admitted in the 3rd semester / 2nd year shall be designated as students admitted in the previous batch as they are admitted one year later. A student re-admitted in a programme of study in a lower / later batch shall be considered as the student of the original batch for the purpose calculation of duration of study.

Programme of study: shall mean Bachelor of Technology part of the Dual Degree programme.

Major specialization: shall mean the discipline in which the student is admitted / upgraded or transferred.

Minor specialization shall mean the specializations earned through the PCE, EAE or OAE route subject to fulfilment of requirements specified in the scheme of study.

Paper / Course shall be treated as synonyms. A paper is one unit of curriculum taught, in general, in one particular semester.

NOTE:

1. ***THE CURRENT DOCUMENT DEFINES THE FRAMEWORK FOR THE SCHEME OF THE 4 YEARS (8 SEMESTER) CORRESPONDING TO THE BACHELOR OF TECHNOLOGY DISCIPLINE SPECIFIED, WHICH IS THE PART OF THE BACHELOR OF TECHNOLOGY. THE DETAILED SCHEME AND SYLLABUS FOR THE FIRST YEAR (SEMSESTER 1 AND 2) IS APPROVED.***
2. ***The affiliated institutions shall only offer the 4 year Bachelor of Technology Programme as specified. Dual degree B.Tech./M.Tech. shall only be offered at the USIC.***

Programme Outcomes

1. ***Engineering Knowledge*** (**PO01**): Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. ***Problem Analysis*** (**PO02**): Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. ***Design/Development of Solutions*** (**PO03**): Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. ***Conduct Investigations of Complex Problems*** (**PO04**): Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems:
    a. that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline as against problems given at the end of chapters in a typical text book that can be solved using simple engineering theories and techniques;
    b. that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions;
    c. that require consideration of appropriate constraints / requirements not explicitly given in the problem statement such as cost, power requirement, durability, product life, etc.;
    d. which need to be defined (modelled) within appropriate mathematical framework; and
    e. that often require use of modern computational concepts and tools, for example, in the design of an antenna or a DSP filter.
5. ***Modern Tool Usage*** (**PO05**): Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. ***The Engineer and Society*** (**PO06**): Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. ***Environment and Sustainability*** (**PO07**): Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. ***Ethics*** (**PO08**): Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. ***Individual and Team Work*** (**PO09**): Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. ***Communication*** (**PO10**): Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. ***Project Management and Finance*** (**PO11**): Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. ***Life-long Learning*** (**PO12**): Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Programme Education Objectives (PEO)

PEO 1: Our students will apply their knowledge and skills to succeed in their careers and/or obtain advanced degrees.

PEO 2: Our students will behave ethically and responsibly, and will remain informed and involved as full participants in their profession and society.

PEO 3: Our students will creatively solve problems, communicate effectively, and successfully function in diverse and inclusive multi-disciplinary teams.

PEO4 4: Our students will apply principles and practices of computing grounded in mathematics and science to successfully complete hardware and/or software-related engineering projects to meet customer business objectives and/or productively engage in research.

Programme Specific Outcomes (PSO)

On completion of the programme of study, the students will have the ability to:

PSO 1: Identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.

PSO 2: Apply engineering analysis & design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.

PSO 3: Communicate effectively with a range of audiences.

PSO 4: Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

PSO 5: Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

PSO 6: Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

PSO 7: Acquire and apply new knowledge as needed, using appropriate learning strategies.

PEO to PO Mapping

PEO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
PEO 1	3	1	1	1	1	1	1	1	1	1	1	3
PEO 2	1	-	-	-	-	3	3	3	-	-	-	3
PEO 3	3	3	3	3	3	2	2	1	1	3	3	-
PEO 4	3	3	3	3	3	-	-	-	1	1	3	-

(scale 1: low, 2: Medium, 3: High)

PSO to PO Mapping

PSO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
PSO 1	3	-	-	-	-	-	-	-	-	-	-	3
PSO 2	-	3	3	3	3	3	3	-	-	-	-	-
PSO 3	-	-	-	-	-	3	-	-	3	3		-
PSO 4	-	-	-	-	-	3	3	3	1	-	-	-
PSO 5	-	-	-	-	-	-	-	1	3	1	3	-
PSO 6	1	2	2	3	3	1	1	1	-	-	-	3
PSO 7	-	-	-	-	-	-	-	-	-	-	-	3

(scale 1: low, 2: Medium, 3: High)

First Year Common Scheme of Examinations for

BACHELOR OF TECHNOLOGY PROGRAMMES

IN

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5. ELECTRONICS AND COMMUNICATION ENGINEERING

First Semester						L: Lectures, P: Practical, C: Credits
Group	**Code**	**Paper**	**L**	**P**	**C**	**Remarks**
Theory Papers						
SEC	ICT-101T ICT-101P	Programming for Problem Solving Programming for Problem Solving Laboratory	3 -	- 2	3 1	Compulsory / Mandatory
		(School/ Institute to offer any ONE. Both papers have to be studied by students, one shall be offered in the 1st semester and the second in the 2nd semester)				
SEC	ICT-103T ICT-103P	Basics of Electrical Engineering[2] Basics of Electrical Engineering Laboratory	3 -	- 2	3 1	Compulsory / Mandatory
		OR				
	ICT- 105T ICT- 105P	Digital Electronics and Computer Organization[2] Digital Electronics and Computer Organization Laboratory[2]	3 -	- 2	3 1	
ES	ICT-107	System Modeling Techniques – I	3	-	3	Compulsory / Mandatory
		(School/ Institute to offer any ONE. Only one of the following shall be offered.)				Compulsory / Mandatory
ES	ICT-109	Electricity and Magnetism	4	-	4	
		OR				
	ICT-111T ICT-111P	Engineering Physics-I Engineering Physics-I Laboratory	3 -	- 2	3 1	
		(School/ Institute to offer any ONE. Both papers have to be studied by students, one shall be offered in the 1st semester and the second in the 2nd semester)				
AEC	ICT-113	Communication Skills	3	-	3	Compulsory / Droppable
		OR				
VAC	HVEE-115	Human Values & Ethics*	2	-	2	
VAC	EM-117T	**Environmental** Studies*	2	-	2	Compulsory / Mandatory
MDC	ICT- 119	Engineering Mechanics	3	-	3	Compulsory / Droppable
		(School/ Institute to offer any ONE group only)				Compulsory / Droppable
		Group A:				
ES	ICT-123	Engineering Graphics-I	-	2	1	
VAC	ICT-117P	**Environmental** Studies Laboratory[1]	-	3	1	
		Group B:				
AEC	ICT-125	Term Paper-I**	-	-	2	

*This is an NUES paper. Comprehensive evaluation of the students by the concerned teacher, out of 100. All assessment shall be conducted by the concerned teacher. There shall not be any term end / semester end examinations

[1]This may include field visits and reports.

[2]The SEC paper is a Engineering Science paper also.

**This is a NUES paper. Comprehensive evaluation of the students a committee of teachers formed by the APC of the School/Institute, out of 100. All assessment shall be conducted by the committee. There shall not be any term end / semester end examinations. The evaluation shall be done as Teachers' Continuous Evaluation. The list of books is attached in the Annexure 1 of this document.

Group	Code	Paper	L	P	Credits	
VAC	ICT-352	***NSS/NCC/Cultural Clubs/Technical Society/ Technical Club/Institution's Innovation Council	-	-	2	Mandatory Pass marks is required

***This is an NUES paper. Comprehensive evaluation of the students by the concerned coordinator of NCC / NSS / Cultural Clubs / Technical Society / Technical Clubs, out of 100 as per the evaluation schemes worked out by these activity societies, organizations; the Coordinators shall be responsible for the evaluation of the same. These activities shall start from the 1st semester and the evaluation shall be conducted at the end of the 6th semester for students admitted in the first semester. Students admitted in the 2nd year (3rd semester) as lateral entry shall undergo training or participate in the activities for the period of 3rd semester to 6thsemester only. Also if a student is admitted in the third year (due to multiple entry scheme), the student must earn the 2 credits by participating in the 3rd year. Students admitted in the 4th year shall be exempt from this requirement

Note: Orientation/ Student Induction program will be offered to the students, right at the start of the first semester.

Second Semester						L: Lectures, P: Practical, C: Credits
Group	**Code**	**Paper**	**L**	**P**	**C**	**Remarks**
Theory Papers						
		(School/ Institute to offer any ONE. Only one of the following shall be offered.)				
ES	ICT-102T	Engineering Chemistry	3	-	3	Compulsory / Droppable
	ICT-102P	Engineering Chemistry Laboratory	-	2	1	
		OR				
	ICT-104	Probability and Stochastic Processes for Engineers	4	-	4	
		(School/ Institute to offer any ONE. Both papers have to be studied by students, one shall be offered in the 1st semester and the second in the 2nd semester)				
SEC	ICT-106T	Basics of Electrical Engineering[1]	3	-	3	Compulsory / Mandatory
	ICT-106P	Basics of Electrical Engineering Laboratory[1]	-	2	1	
		OR				
	ICT- 108T	Digital Electronics and Computer Organization[1]	3	-	3	
	ICT- 108P	Digital Electronics and Computer Organization Laboratory[1]	-	2	1	
ES	ICT-110	System Modeling Techniques – II	3	-	3	Compulsory / Mandatory
		(School/ Institute to offer any ONE. Only one of the following shall be offered.)				Compulsory / Droppable
SEC	ICT-112T	Cyber Sensitization and Digital Hygiene	3	-	3	
	ICT-112P	Cyber Sensitization and Digital Hygiene Lab	-	2	1	
		OR				
ES	ICT-114T	Engineering Physics-II	3	-	3	
	ICT-114P	Engineering Physics-II Laboratory	-	2	1	
SEC	ICT-116T	Programming in Python[1]	3	-	3	Compulsory / Droppable
	ICT-116P	Programming in Python Laboratory[1]	-	2	1	
		(School/ Institute to offer any ONE. Both papers have to be studied by students, one shall be offered in the 1st semester and the second in the 2nd semester)				
AEC	ICT-118	Communication Skills	3	-	3	Compulsory / Droppable
		OR				
VAC	HVEE-120	Human Values & Ethics*	2	-	2	
MDC	ICT-122	Introduction to Manufacturing Process	3	-	3	Compulsory / Droppable
		(School/ Institute to offer any ONE group only)				Compulsory / Droppable
		Group A:				
AEC	ICT-124	Engineering Graphics-II	-	2	1	
	ICT-126	Workshop Technology	-	3	1	
		Group B:				
	ICT-128	Term Paper-II*	-	-	2	

*This is an NUES paper. Comprehensive evaluation of the students by the concerned teacher, out of 100. All assessment shall be conducted by the concerned teacher. There shall not be any term end / semester end examinations

**This is a NUES paper. Comprehensive evaluation of the students a committee of teachers formed by the APC of the School/Institute, out of 100. All assessment shall be conducted by the committee. There shall not be any term end / semester end examinations. The evaluation shall be done as Teachers' Continuous Evaluation. The list of books is attached in the Annexure 1 of this document.

[1]The SEC paper is a Engineering Science paper also.

Note:

1. Students admitted through lateral entry[1] as per provision of the university in the 2nd year of the respective programme shall be exempt from the 1st year credits. The lateral entry students shall not study the subjects/courses being offered in the 1st year.

BRIDGE COURSE FOR LATERAL ENTRY STUDENTS

Provision for Lateral Entry of Students

Lateral entry of students shall be allowed as per University rules, regulations and policy. These students shall be admitted in the second year of the degree programme. Such students shall study the papers / courses offered from the second year onwards only. Only the credits earned for the papers of second to fourth year of the programme of study shall be considered for the award of the degree to the lateral entry students. In addition to these papers/course of second to fourth year of study, these students have two study two papers / courses, namely (first time offered in the 3rd semester):

Paper Code	Paper Name	L/P
BC-001	Bridge Course in Mathematics	4
BC-002	Bridge Course in Programming in C	4

Implementation Rules for Bridge Courses:

1. The Class incharges for the third semester of the batch (appointed by the Dean, USICT or the Head of Department of the Disciple in an affiliated institution) shall act as the mentor of the lateral entry students for these courses.
2. These papers have to be qualified by the students. The students shall study the bridge course in self-study mode under the mentorship of the mentors.
3. For these papers examination shall be conducted by the concerned subject teacher / mentor as NUES, the same shall be transferred to Examination Division of the University.
4. The degree to be awarded to the student only subject to the acquiring qualifying grade/marks in the bridge courses (passmarks are 40 out of 100) and the minimum credits in the regular courses of the scheme of study as prescribed.
5. These Courses shall be qualifying in nature; they shall not be included for calculation of CGPA. The qualifying marks shall be 40 marks in each paper.
6. A separate marksheet will be issued by the Examination Division of the University for the Bridge Course.
7. Students shall study the paper in the self study mode. A Mentor shall be allocated by the academic programme committee of the School/Department of the Institute, to groups of lateral entry students. Mentors shall interact with the students to clarify, guide, assignments (given by the mentor) and evaluation of the course.

Framework for the 2nd-year to 4th year

An academic year shall be apportioned into semesters.

An academic year shall have maximum 40 to 44 credits offered to students for the award of the Bachelor of Technology Degree in the Major Discipline.

For the Minor Specializations, the students shall be offered 20 credits across the 2nd year (3rd semester onwards) till 4th year (7th Semester). These credits shall not be counted for CGPA

Maximum credits for B.Tech. in major discipline: 176

Minimum Credits for B.Tech. in major discipline: 160

Note: Medium of instructions and examinations shall be English.

First Year Combined Syllabus of B.Tech (CSE/IT/ECE/CSE-AI/CSE-DS) under the aegis of University School of Information, Communication and Technology Applicable from Academic Session 2026-27

Paper Code(s): ICT-101T	L : 3
Paper: Programming for Problem Solving	C :3
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Develop structured C programs using fundamental programming constructs, data types, operators, expressions, control structures, and standard input/output techniques to solve computational problems.
CO2	Design modular C programs using functions, arrays, strings, storage classes, header files, recursion, and standard library functions for implementing searching, sorting, and numerical algorithms.
CO3	Develop efficient C programs employing structures, unions, enumerations, pointers, dynamic memory allocation, file handling, and command-line arguments for solving engineering applications involving complex data.
CO4	Design and implement Abstract Data Types (ADTs) and fundamental data structures using C, including linked lists, stacks, queues, and trees, while applying function pointers, generic programming concepts, and modern C programming practices for robust software development.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	3	3	2	1	1	-	-	-	2	1	1	3
CO2	3	3	3	1	1	-	-	-	2	1	1	3
CO3	3	3	3	1	1	-	-	-	2	1	1	3
CO4	3	3	3	1	1	-	-	-	2	1	1	3

Unit I
Structure of a C program, Basic data types (int, char, float, double, bool, fixed-width integers), Declarations and initializations, Constants using const and #define, Operators and expressions (arithmetic, relational, logical, bitwise, assignment, conditional, increment/decrement), Type conversions (implicit, explicit casting), Input/output (printf, scanf, format specifiers), Compound statements (blocks), Conditional statements (if, if-else, else-if, switch), Loops (while, do-while, for, infinite loops, early exit), break, continue, goto, return, Algorithm development including flowcharts, pseudocode representation, Tracing and dry run, structured programming. C89, C99, C11 and C23 extensions and usage

Unit II
Function declaration, definition, and invocation, Argument passing (by value, recursion), Inline functions and macro functions, Storage classes (auto, static, extern, register, thread_local), Scope and lifetime of variables, Header files and modular program design, One- and two-dimensional arrays (declaration, access, memory layout), Bubble sort, selection sort, insertion sort, linear and binary search, String input/output (gets, puts, fgets, fputs), Standard string manipulation (strlen, strcpy, strcat, strcmp, etc.), Arrays of strings, Command-line arguments. Root finding of a positive floating point number.

Unit III
Structures (struct definition, nested structures, array of structures, pointer to structures), Unions (union, use-cases, memory layout), Enumerated types (enum, typedef enum), Bit fields, Memory layout and alignment, Pointers (declaration, dereferencing, pointer arithmetic, arrays vs pointers, pointer to pointer), Dynamic memory allocation (malloc, calloc, realloc, free), Memory leak prevention, NULL and null pointer checks, Compound literals, Representation and Arithmetic on polynomials with floating point coefficients. Matrices and arithmetic operations on them (addition, subtraction and multiplication). File I/O (opening, closing, reading, writing text and binary files, fopen, fclose, fprintf, fscanf, fread, fwrite, fgets, fputs), Error handling using errno, Command-line parameters

Unit IV
Abstract Data Types (ADTs), Singly and doubly linked lists , Stack (array and linked list implementation), Infix-to-postfix conversion, Parenthesis balancing, Queue (linear, circular, priority) (array and linked list implementation), Traversal, insertion, deletion in lists, Binary tree basics (creation, inorder, preorder, postorder traversal), Function pointers, Pointers to arrays and functions, Idea of Generic code using macros, _Generic for type-generic programming, Assertions and diagnostics (assert, _Static_assert), Safer macros and expressions, Forward declaration, Program segmentation, Header hygiene, recursion.

Textbooks:
1. B. W. Kernighan and D. M. Ritchie, The C Programming Language, 2nd Edition, Pearson Education, 1988.
2. Jens Gustedt, Modern C, 2nd Edition, Manning Publications, 2025.
3. ISO/IEC 9899:2024, Information Technology — Programming Languages — C, 5th Edition, International Organization for Standardization (ISO), 2024.

References:

1. *21st Century C*, Ben Klemens, O'Reilly Media, 2014
2. *C: How to Program*, Paul Deitel and Harvey Deitel, 8th Edition, Pearson, Latest Edition
3. *Engineering Problem Solving With C*, Delores M. Etter, Pearson, Latest Edition
4. *Problem Solving and Program Design in C*, Jeri R. Hanly and Elliot B. Koffman, Pearson, 2016.
5. *C Programming: A Modern Approach*, K. N. King, W. W. Norton, 2008
6. MIT 6.087 Course Notes, Practical C Programming

Paper Code(s): ICT-101P	**P : 2**
Paper: Programming for Problem Solving Lab	**C : 1**
Prerequisites: None	
Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term-End Semester Examinations: 60 Marks	
Instructions: **1.** The course objectives and course outcomes are identical to that of ICT-101T as this is the practical component of the corresponding theory paper. **2.** The practical list shall be notified by the teacher in the first week of the class commencement. **3.** There should be at least 4 practicals from each Unit (Minimum 16 practicals)	

Paper Code(s): ICT-103T/ICT-106T	L : 3
Paper: Basics of Electrical Engineering	C :3
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Ability to understand and use Kirchpff's Laws to solve resistive circuit problems.
CO2	Ability to analyse resistive, inductive and capacitive circuits for transient and steady state sinusoidal solutions.
CO3	Understand the first order filters and magnetic circuits.
CO4	Understand the design of electrical machines.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	1	1	1	2
CO2	3	3	3	3	3	-	-	-	1	1	1	2
CO3	3	3	3	3	3	-	-	-	1	1	1	2
CO4	3	3	3	3	3	-	-	-	1	1	1	2

Unit I
Electric charge, current, voltage, energy, power, independent and dependent sources, Ohm's law, series and parallel resistors, voltage and current division, ideal and real circuit elements, source transformations, Kirchhoff's current law, Kirchhoff's voltage law, basic circuit modeling, practical resistor behavior, power calculations in resistive circuits.

Unit II
Nodal analysis, mesh analysis, linearity and superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, circuit simplification strategies, controlled sources in analysis, transient analysis of first-order circuits, natural and step response of RL circuits, natural and step response of RC circuits.

Unit III
Sinusoidal signals and phasors, impedance and admittance in frequency domain, node and mesh analysis in phasor domain, power in AC circuits, average and reactive power, complex power, power factor and correction, resonance in series and parallel RLC circuits, balanced three-phase circuits, phase sequence, line and phase quantities, power in three-phase loads.

Unit IV
Magnetic circuits, Faraday's and Lenz's laws, inductance and mutual inductance, ideal transformer model, introduction to real transformer behavior, energy conversion principles, operating principles of DC machines, types and characteristics of DC motors and generators, basic concepts of three-phase induction motors, concept of torque and slip, circuit protection devices, electrical safety and grounding, power systems overview for digital infrastructure, energy auditing and efficiency principles.

Textbooks:
1. *Fundamentals of Electric Circuits*, Charles K. Alexander and Matthew N. O. Sadiku, McGraw-Hill Education, 7thEdition, 2022)

References:
1. *Basic Electrical Engineering*,D. P. Kothari and I. J. Nagrath, McGraw-Hill Education, 4thEdition, 2019.
2. *Electrical Engineering Fundamentals*,Vincent Del Toro, Prentice Hall, 2ND Edition
3. *Electric Machinery*, A. E. Fitzgerald, Charles Kingsley Jr., Stephen D. Umans, McGraw-Hill Education, 7th Edition.
4. MIT OpenCourseWare – "Circuits and Electronics" (6.002X)

Paper Code(s): ICT-103P/ICT-106P	P : 2
Paper: Basics of Electrical Engineering Lab	C : 1
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions:
1. The course objectives and course outcomes are identical to that of ICT-103T/ICT-106T as this is the practical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement.
3. There should be at least 10 practical exercises.

Paper Code(s): ICT-105T/ICT-108T	L : 3

Paper: Digital Electronics and Computer Organization	C :3

Prerequisites: None

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Ability to understand codes and minimize Boolean expression
CO2	Design and Implement Combinational and Sequential Circuits
CO3	Ability to Design Finite state machines of the Moore and Mealy types
CO4	Understand functioning of a digital computer

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	-	-	-	1
CO2	3	3	3	3	3	-	-	-	-	-	-	1
CO3	3	3	3	3	3	-	-	-	-	-	-	1
CO4	3	3	3	3	3	-	-	-	-	-	-	1

Unit I

Number systems: binary, octal, decimal, hexadecimal, base conversions, complements (1's, 2's, 9's, 10's), binary arithmetic, signed number representations (sign-magnitude, 1's and 2's complement), overflow conditions. Binary codes: BCD, Gray code, ASCII, parity bits, Hamming codes. Boolean algebra: axioms and theorems, switching algebra, logic gates and their realization, truth tables, canonical forms, minterms and maxterms. Logic simplification using Boolean algebra and Karnaugh maps (up to 5 variables), don't care conditions, NAND-NAND and NOR-NOR networks. Quine-McClusky's Algorithm. Combinational hazards, static-1 and static-0 hazards, hazard-free realization.

Unit II

Design and implementation of: adders (half, full, carry lookahead), subtractors, comparators, encoders, decoders, priority encoders, multiplexers, demultiplexers. Function realization using MUX, DEMUX, and ROM. Design of arithmetic circuits: 4-bit adders/subtractors, BCD adders. Magnitude comparator, code converters , parity generator/checker. Use of standard ICs and programmable logic devices (PLA, PAL — basic introduction). Binary multipliers: combinational array multiplier. Introduction to Verilog-based truth-table and logic-level modeling.

Unit III

Bistable elements: latches (SR, D), flip-flops (SR, D, JK, T — level and edge-triggered), characteristic equations, excitation tables, timing diagrams. Flip-flop timing: setup, hold, propagation delay, metastability. Counters: asynchronous, synchronous, up-down, modulus-n, Johnson, ring counters. Shift registers and bidirectional shift registers. Sequential design methodology using state diagrams, Moore and Mealy machines, state reduction. Design of synchronous sequential circuits , up/down and modulus counters , shift registers, Ring counter , Johnson counter , timing diagram , serial adder , sequence detector, Design of sequence detectors, control logic with FSMs. Classification of memories: ROM, RAM, static and dynamic RAM, memory cell design concepts, memory timing, address decoding logic.

Unit IV

Functional components of a digital computer: control unit, ALU, registers, memory, and interconnect. Instruction cycle: fetch, decode, execute. Register transfer language (RTL), micro-operations, and control signals. Control unit design: hardwired control logic (detailed), microprogramming (basic concepts only). Introduction to bus structures, memory read/write sequences. Addressing modes: immediate, direct, indirect, register, indexed. I/O mechanisms: program-controlled, interrupt-driven, DMA overview. Basic instruction format and design: 1-address, 2-address, 3-address machine. Conceptual design of a simple accumulator-based computer..

Textbooks:

1. *Digital Logic and Computer Design*, M. Morris Mano, Pearson Education, Latest Edition.

References:

1. *Digital Design and Computer Architecture, David Harris & Sarah Harris, Morgan Kaufmann, 4th Edition.*
2. *Computer System Architecture, M. Morris Mano, Rajib Mall Pearson Education, 2017*
3. *Computer Organization and Embedded Systems*, Carl Hamacher, Z. Vranesic, S. Zaky, McGraw-Hill, 6thEdition.
4. *Fundamentals of Digital Logic with Verilog Design*, Stephen Brown and Zvonko Vranesic, McGraw-Hill, 3rdEdition.
5. *Digital Systems: Principles and Applications*, Ronald J. Tocci, Neal S. Widmer, Pearson, 3rdEdition.
6. *Computer System Architecture*, M. Morris Mano, Pearson Education, 12thEdition.
7. *Fundamentals of Logic Design*, Charles H. Roth, Jr., Larry L. Kinney, Cengage, 7thEdition.
8. *Computer Organization and Embedded Systems*, Hamacher, Vranesic, Zaky, McGraw Hill, 6thEdition.
9. *Computer Architecture: A Quantitative Approach*, John L. Hennessy and David A. Patterson, Morgan Kaufmann, 7th Edition.

Paper Code(s): ICT105P/ICT108T	P : 2
Paper: Digital Electronics and Computer Organization Lab	C : 1
Prerequisites: None	
Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term-End Semester Examinations: 60 Marks	
Instructions: **1.** The course objectives and course outcomes are identical to that of ICT-105P/ICT-108P as this is the practical component of the corresponding theory paper. **2.** The practical list shall be notified by the teacher in the first week of the class commencement. **3.** There should be at least 10 practical exercises.	

Paper Code(s): ICT-107	L : 3
Paper: System Modeling Techniques - I	C :3
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Apply multivariable differential calculus to analyze optimization problems and engineering models involving functions of several variables.
CO2	Solve ordinary differential equations using analytical and power series methods, and interpret their applications in engineering systems.
CO3	Analyze systems of linear equations and apply matrix methods, eigenvalue techniques, and matrix factorizations in engineering computations.
CO4	Apply vector differential and integral calculus, including Green's, Gauss', and Stokes' theorems, to model and analyze engineering and physical phenomena.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	2	3	3	3	1	-	-	-	-	-	1	2
CO2	2	3	3	3	1	-	-	-	-	-	2	2
CO3	2	3	3	3	1	-	-	-	-	-	2	2
CO4	2	3	3	3	1	-	-	-	-	-	2	2

Unit I

Functions of several variables, Partial derivatives, Chain rule, Differentiation of implicit functions, Exact differentials, Jacobians and transformation of coordinates, Taylor's and Maclaurin's series, Maxima, minima and saddle points, Method of Lagrange multipliers, Differentiation under the integral sign.

Ordinary differential equations: Basic concepts, Geometrical interpretation of first-order differential equations, Direction fields, Euler's method, Separable differential equations, Exact differential equations, Integrating factors, Linear differential equations, Bernoulli equation, Orthogonal trajectories, Applications.

Unit II

Higher-order linear differential equations with constant coefficients, Differential operator method, Euler–Cauchy equations, Wronskian, Method of variation of parameters, Free oscillations of mass–spring systems.

Power series solution of ordinary differential equations, Bessel's equation and Bessel functions of the first kind, Legendre's equation and Legendre polynomials, Recurrence relations and important properties, Gamma and Beta functions and their properties.

Unit III

Matrices and determinants, Gauss elimination, Gauss–Jordan elimination, Rank of a matrix, Linear independence, Vector spaces, Systems of linear equations, Existence and uniqueness of solutions, Cramer's rule, Eigenvalues and eigenvectors, Symmetric, skew-symmetric and orthogonal matrices, Eigenbases, Matrix diagonalization, Quadratic forms, Gram–Schmidt orthogonalization, Cayley–Hamilton theorem (without proof), LU decomposition and Cholesky decomposition with engineering applications..

Unit IV

Vector and scalar point functions, Space curves, Arc length, Curvature, Gradient, Directional derivative, Divergence, Curl, Line integrals, Path independence, Double and triple integrals, Surface integrals, Green's theorem, Gauss divergence theorem, Stokes' theorem, Engineering applications..

Textbooks:

[1] E. Kreyszig, Advanced Engineering Mathematics, 10th ed. Hoboken, NJ, USA: John Wiley & Sons, 2011.

References:

1. K. F. Riley, M. P. Hobson, and S. J. Bence, Mathematical Methods for Physics and Engineering, 3rd ed. Cambridge, U.K.: Cambridge University Press, 2013.
2. K. A. Stroud and D. J. Booth, Engineering Mathematics, 8th ed. London, U.K.: Macmillan International Higher Education, 2020.
3. L. C. Andrews, Special Functions of Mathematics for Engineers, 2nd ed. New York, NY, USA: Oxford University Press, 1998.
4. L. Turyn, Advanced Engineering Mathematics. Boca Raton, FL, USA: CRC Press (Taylor & Francis Group), 2014.
5. D. G. Zill, Advanced Engineering Mathematics, 7th ed. Burlington, MA, USA: Jones & Bartlett Learning, 2020.
6. D. G. Duffy, Advanced Engineering Mathematics with MATLAB, 4th ed. Boca Raton, FL, USA: CRC Press (Taylor & Francis Group), 2017.
7. M. C. Potter, J. L. Lessing, and E. F. Aboufadel, Advanced Engineering Mathematics, 4th ed. Cham, Switzerland: Springer, 2019

Paper Code(s): ICT 109	L : 4
Paper: Electricity and Magnetism	C :4
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Explain electric fields, potentials, and electrostatic phenomena using fundamental laws and principles
CO2	Analyze magnetic fields, magnetic materials, and magnetostatic systems using appropriate physical models.
CO3	Apply electromagnetic induction principles and explain the physical significance of Maxwell's equations.
CO4	Describe fundamental electromagnetic phenomena and relate electromagnetic concepts to engineering applications.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	3	2	-	-	1	-	-	-	-	-	-	1
CO2	3	3	-	2	2	-	-	-	-	-	-	1
CO3	3	3	-	2	2	-	-	-	-	1	-	2
CO4	3	2	-	2	2	-	1	-	-	1	-	2

Unit I
Electric charge and Coulomb's law, Electric field and electric flux, Superposition principle, Electric field due to continuous charge distributions, Gauss's law and its applications, Electrostatic potential and potential energy, Relation between electric field and potential, Conductors in electrostatic equilibrium, Capacitance and capacitors, Energy stored in electric fields.

Electrostatics in dielectric media: Polarization, Bound charges, Electric displacement vector, Dielectric constant and susceptibility, Boundary conditions at dielectric interfaces, Energy in dielectric systems.

Unit II
Magnetic fields and magnetic forces, Lorentz force, Motion of charged particles in magnetic fields, Biot–Savart law, Ampere's law and applications, Magnetic vector potential (introductory concept), Magnetic dipole and magnetic moment.

Magnetization, Bound currents, Auxiliary magnetic field (H), Magnetic susceptibility and permeability, Magnetic materials: diamagnetic, paramagnetic, and ferromagnetic materials, Magnetic circuits and engineering applications.

Unit III
Faraday's law of electromagnetic induction, Lenz's law, Motional electromotive force, Self and mutual inductance, Energy stored in magnetic fields, Electromagnetic braking and practical applications.

Displacement current and its physical significance, Continuity equation, Introduction to Maxwell's equations, Integral forms of Maxwell's equations, Physical interpretation and applications.

Unit IV
Electric and magnetic fields in engineering systems, Energy transfer in electromagnetic systems, Electromagnetic forces, Introduction to electromagnetic waves, Qualitative discussion of wave propagation, Polarization concepts, Electromagnetic spectrum, Applications in communication and electronic systems.

Introduction to boundary concepts and field continuity (qualitative treatment).

Textbooks:
[1] D. J. Griffiths, *Introduction to Electrodynamics*, Cambridge, U.K.: Cambridge University Press, Latest Edition.

References:
[1] E. M. Purcell and D. J. Morin, Electricity and Magnetism, 3rd ed. Cambridge, U.K.: Cambridge University Press, 2013.
[2] D. K. Cheng, Field and Wave Electromagnetics, 2nd ed. New Delhi, India: Pearson Education, 2014.
[3] W. H. Hayt and J. A. Buck, Engineering Electromagnetics, 9th ed. New York, NY, USA: McGraw-Hill Education, 2019.
[4] M. N. O. Sadiku, Elements of Electromagnetics, 7th ed. Oxford, U.K.: Oxford University Press, 2018.
[5] J. D. Kraus and D. A. Fleisch, Electromagnetics with Applications, 5th ed. New York, NY, USA: McGraw-Hill, 1999.

Paper Code(s): ICT 111T	L : 3
Paper: Engineering Physics-I	C :3
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Apply Newtonian mechanics principles to analyze motion and forces in engineering systems.
CO2	Apply conservation laws of energy, momentum, and angular momentum to mechanical systems.
CO3	Analyze oscillatory systems and explain damping, resonance, and their engineering applications.
CO4	Explain rotational motion and rigid body dynamics using appropriate physical models.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	3	3	-	2	2	-	-	-	-	-	-	1
CO2	3	3	-	2	2	-	-	-	-	-	-	2
CO3	3	3	-	2	2	-	-	-	-	-	-	2
CO4	3	3	1	2	2	-	-	-	-	-	-	2

Unit I
Physical quantities, Scalars and vectors, Vector algebra, Coordinate systems, Reference frames, Newton's laws of motion, Equations of motion, Motion in one and two dimensions, Projectile motion, Circular motion, Applications of Newton's laws. Forces in nature, Frictional forces, Constraints and constraint forces, Motion in polar coordinates, Introduction to cylindrical and spherical coordinate systems.

Unit II
Work done by a force, Kinetic and potential energy, Conservative and non-conservative forces, Potential energy functions, Relation between force and potential energy, Equipotential surfaces, Conservation of mechanical energy.
Linear momentum and impulse, Conservation of momentum, Angular momentum and torque, Conservation of angular momentum.
Central forces, Planetary motion, Kepler's laws, Satellite motion and basic orbital applications..

Unit III
Simple harmonic motion, Differential equation of harmonic oscillator, Energy of harmonic oscillator, Mechanical oscillators, Examples of oscillatory systems.
Damped oscillations, Over-damped, critically damped and under-damped systems, Forced oscillations, Resonance, Quality factor, Engineering applications of vibration and resonance.
Non-inertial reference frames, Rotating frames, Centripetal and Coriolis forces, Applications of Coriolis effect.

Unit IV
Centre of mass, Motion of rigid bodies, Translational and rotational motion, Moment of inertia, Radius of gyration, Parallel and perpendicular axis theorems.
Torque, Angular momentum, Rotational kinetic energy, Rolling motion, Gyroscopic effects, Introduction to three-dimensional rigid body motion and engineering applications.

Textbooks:
[1] D. Kleppner and R. Kolenkow, An Introduction to Mechanics, 2nd ed. Cambridge, U.K.: Cambridge University Press, Latest Edition.

References:
[2] J. R. Taylor, Classical Mechanics. Sausalito, CA, USA: University Science Books, 2005.
[3] R. P. Feynman, R. B. Leighton, and M. Sands, The Feynman Lectures on Physics, Vol. I. New York, NY, USA: Basic Books, Latest Edition.
[4] H. C. Ohanian and J. A. Markert, Physics for Engineers and Scientists, 3rd ed. New York, NY, USA: W. W. Norton & Company, 2007.
[5] R. A. Serway and J. W. Jewett, Physics for Scientists and Engineers with Modern Physics, 10th ed. Boston, MA, USA: Cengage Learning, Latest Edition.

Paper Code(s): ICT-111P	P : 2
Paper:Engineering Physics-I Lab	C : 1
Prerequisites: None	
Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term-End Semester Examinations: 60 Marks	
Instructions: **1.** The course objectives and course outcomes are identical to that of ICT-111T as this is the practical component of the corresponding theory paper. **2.** The practical list shall be notified by the teacher in the first week of the class commencement. **3.** There should be at least 10 practical exercises.	

Paper Code(s): ICT-113/ICT118	L : 3
Paper: Communication Skills	C :3
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1:	Apply fundamental principles of English grammar, vocabulary, and sentence construction in academic communication.
CO2:	Develop effective writing skills through paragraph writing, summarization, paraphrasing, and précis writing.
CO3:	Prepare formal written communication such as letters, notices, memoranda, meeting documents, and e-mails.
CO4:	Demonstrate reading comprehension and critical appreciation of written and spoken texts

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	-	-	-	-	-	-	-	-	3	3	-	3
CO2	-	-	-	-	-	-	-	-	3	3	-	3
CO3	-	-	-	-	-	-	-	-	3	3	-	3
CO4	-	-	-	-	-	-	-	-	3	3	-	3

Unit I
Parts of speech and their usage, Sentence structure, Types of sentences, Transformation of sentences, Subject–verb agreement, Articles and determiners, Prepositions, Tenses and their applications, Active and passive voice, Direct and indirect speech.

Vocabulary development: Word formation, Synonyms and antonyms, Prefixes and suffixes, Commonly confused words, Technical vocabulary, Common errors in English usage.,

Unit II
Principles of effective writing, Types of writing, Paragraph structure and development, Topic sentences and supporting ideas, Coherence and cohesion.

Paraphrasing techniques, Summarizing skills, Précis writing, Editing and proofreading, Avoiding ambiguity and redundancy, Developing clarity and precision in writing.

Unit III
Principles of formal communication, Professional writing conventions.
Meetings: Agenda preparation, Minutes of meetings.
Business and professional correspondence:

- Formal letters
- Applications
- Notices
- Memoranda
- Press releases
- E-mails

Introduction to technical communication, Writing for academic and professional contexts.

Unit IV
Reading strategies: Skimming, scanning, intensive and extensive reading, Identifying main ideas and supporting details, Inference and interpretation. Comprehension and critical appreciation of selected speeches and talks:

1. Steven Spielberg's Speech at Harvard Commencement (2016) (https://www.youtube.com/watch?v=TYtoDunfu00)
2. Johan Rockström: Let the Environment Guide our Development(http://www.ted.com/talks/johan_rockstrom_let_the_environment_guide_our_development)

Analysis of:

- Theme and central ideas
- Structure and organization
- Style and rhetorical techniques
- Vocabulary and expressions
- Critical response and discussion

Textbooks:
1. *High English Grammar and Composition* by Wren, P.C. & Martin H., S.Chand& Company Ltd, New Delhi.
2. *Technical Communication: Principles & Practice* by Meenakshi Raman, 4th Edition, New Delhi: Oxford University Press, 2022

References:

1. *Be Grammar Ready: The Ultimate Guide to English Grammar* by John Eastwood, New Delhi, Oxford University Press, 2020.
2. *Communication Skills: A Workbook* by Sanjay Kumar & Pushp Lata, New Delhi, Oxford University Press, 2018.
3. *Basic Technical Communication* by Kavita Tyagi & Padma Mishra, New Delhi, PHI Learning, 2012.
4. *Advanced Technical Communication* by Kavita Tyagi & Padma Mishra, New Delhi, PHI Learning, 2011.

Paper Code(s): HVEE-115/ HVEE-120	L :2
Paper: Human Values and Ethics	C :2
Prerequisites: None	

Marking Scheme:

1. Teachers Continuous Evaluation: 100 marks
2. This is NUES, non-credit and qualifying Paper. All evaluations to be conducted by the concerned teacher.

Instructions for paper setter:

1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Understand value of education and self- development
CO2	Imbibe good values in students
CO3	Learn the importance of good character and human values
CO4	Overall Personality Development

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	-	-	-	-	-	3	-	3	-	-	-	-
CO2	-	-	-	-	-	3	-	3	-	-	-	-
CO3	-	-	-	-	-	3	-	3	-	-	-	-
CO4	-	-	-	-	-	3	-	3	-	-	-	-

Unit I

Introduction to Value Education, What are Values?, Importance of Values in life, Distinction between Human Values and Skills, Value Spectrum, Types of Values (Universal Values, Personal Values, Social Values, Moral Values, Spiritual Values), Sources of Values (Family, Society, Culture, Education), Self-exploration as a process for Value Education, Harmony in the Individual (Understanding the self, Body and Self, Needs of Self and Body, Realization of Co-existence), Harmony in Family (Relationships, Trust, Respect, Care, Affection, Guidance, Reverence, Glory), Harmony in Society (Justice, Social Order, Role of Society in Value Inculcation).

Unit II

Introduction to Ethics, Definition of Ethics, Distinction between Ethics and Morality, Importance of Ethics in human conduct, Ethical Relativism vs. Universal Ethics, Sources of Ethical Principles (Law, Religion, Philosophy, Conscience, Culture), Ethical Theories (brief introduction to Utilitarianism, Deontology/Duty-based ethics, Virtue Ethics), Ethical Decision-Making Process (Identifying the ethical problem, Gathering information, Evaluating alternatives, Making a decision, Reflecting on the outcome), Conscience and its role in ethical judgment.

Unit III

Concept of Profession and Professional Ethics, Ethics in the Engineering Profession, Importance of Professional Ethics for Engineers, Codes of Ethics (overview of general principles), Core Values of Professional Ethics (Integrity, Honesty, Objectivity, Impartiality, Confidentiality, Diligence, Fairness), Professional Responsibility, Accountability, Conflict of Interest, Gifts and Kickbacks, Whistleblowing (meaning, importance, ethical considerations), Data Privacy and Confidentiality (general awareness), Social and Environmental Responsibility of Professionals.

Unit IV

Ethics in a Globalized World, Cross-Cultural Ethical Understanding, Challenges of Cultural Relativism, Social Justice and Equity, Human Rights (Universal Declaration of Human Rights - overview), Environmental Ethics (brief overview, moral responsibility towards nature), Sustainable Development Goals (SDGs) as a framework for ethical action, Ethical Leadership, Ethics in Governance, Role of Values and Ethics in Nation Building, Concept of a "Value-based Society", Individual's role in promoting ethical behavior and contributing to a harmonious society.

Textbooks:

1. A Foundation Course in Human Values and Professional Ethics, R.R. Gaur, R. Sangal, G.P. Bagaria, Excel Books, Latest Edition

References:

1. *An Introduction to Ethics, William Lillie, Routeledge 2020.*
2. *Ethics in Engineering, Mike W. Martin and Roland Schinzinger, McGraw-Hill Education, 4th edition, 2017.*
3. *Practical Ethics, Peter Singer, Cambridge University Press, 3rd edition, 2011.*
4. *Business Ethics: Concepts and Cases, Manuel G. Velasquez, Pearson, 8th edition, 2017.*

Paper Code(s): EM117T	L : 2
Paper: Environmental Studies	C : 2
Prerequisites: None	
Marking Scheme: 1. Teachers Continuous Evaluation: 100 marks 2. This is NUES, non-credit and qualifying Paper. All evaluations to be conducted by the concerned teacher.	

Course Outcomes (CO):

CO1	Understand Environment as a System of interconnected components
CO2	Understand environmental resources, renewable and non-renewable
CO3	Understand causes of different types of pollutions of the Environment and its effect on climate change
CO4	Understand regulations and policies related to environment

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	-	-	-	-	-	3	3	3	-	-	-	-
CO2	-	-	-	-	-	3	3	3	-	-	-	-
CO3	-	-	-	-	-	3	3	3	-	-	-	-
CO4	-	-	-	-	-	3	3	3	-	-	-	-

Unit I

Introduction to Environmental Studies, Scope and importance, Key environmental, Historical perspectives on human-environment interactions, Basic ecological principles and concepts, Levels of organization in ecology, Ecosystem components (biotic and abiotic), Energy flow in ecosystems, Biogeochemical cycles, Biodiversity and its conservation, Importance of biodiversity, Threats to biodiversity, Ecosystem services and their value.

Unit II

Renewable and non-renewable resources, Principles of sustainable resource use, Water resources and management, Global water distribution and availability, Water pollution , Challenges in water management, Land resources and degradation, Soil formation and types, Soil degradation processes, Land use patterns and their environmental impacts, Mineral resources and environmental consequences of extraction, Energy resources, Environmental impacts associated with different energy sources, Forests and wildlife resources, Importance of forests, Causes and effects of deforestation, Principles of wildlife conservation, Role of protected areas.

Unit III

Air pollution, Water pollution, Soil pollution, Noise pollution, Marine pollution, Thermal pollution, Hazardous waste management(sources, effects, mitigation for different pollution type). Electronic Waste (E-Waste) Management, Environmental toxicology, Public health and environment, Climate change (greenhouse effect, greenhouse gases, evidence of global warming and its impacts), Ozone layer depletion, Acid rain, Smog, Environmental disasters (overview of major natural and man-made disasters).

Unit IV

Overview of environmental legislation and policies, Role of government agencies in environmental protection, Concept and purpose of Environmental Impact Assessment (EIA), Sustainable development, Environmental ethics and philosophy (anthropocentrism, biocentrism, ecocentrism, deep ecology), Population and environment Urbanization and its environmental challenges, Role of environmental movements and Non-Governmental Organizations (NGOs), Importance of public participation in environmental decision-making, Case studies of environmental challenges and solutions, Individual actions for environmental protection and sustainability.

Textbooks:

1. *Environmental Studies*, Erach Bharucha, Orient Blackswan, 3rd edition, 2020.

References:

1. Environmental Science: Earth as a Living Planet, Daniel B. Botkin and Edward A. Keller, John Wiley & Sons, 11th edition, 2022.
2. Silent Spring, Rachel Carson, Grapewine India 2022.
3. Fundamentals of Ecology, Eugene P. Odum and Gary W. Barrett, Brooks Cole, 5th edition, 2005.
4. Living in the Environment, G. Tyler Miller and Scott Spoolman, Cengage Learning, 21st edition, 2021.
5. Environmental Science: Toward a Sustainable Future, Richard T. Wright and Dorothy F. Boorse, Pearson, 14th edition, 2021.
6. Environment, Peter H. Raven, David M. Hassenzahl, and Linda R. Berg, John Wiley & Sons, 11th edition, 2023.
7. The Human Impact on the Natural Environment, Andrew Goudie, Wiley Blackwell, 8th edition, 2018.
8. Energy and Civilization: A History, Vaclav Smil, MIT Press, 1st edition, 2017.
9. Environmental Chemistry, Colin Baird and Michael Cann, W. H. Freeman, 5th edition, 2012.
10. Environmental Chemistry, Stanley E. Manahan, CRC Press, 10th edition, 2017.
11. Environmental and Occupational Medicine, William N. Rom and Steven B. Markowitz (Eds.), Lippincott Williams & Wilkins, 5th edition, 2017.
12. The Limits to Growth, Donella H. Meadows, Dennis L. Meadows, Jørgen Randers, and William W. Behrens III, Universe Books, 1st edition, 1972.
13. Environmental Ethics, Kristin S. Shrader-Frechette, Rowman & Littlefield Publishers, 3rd edition, 2002.
14. Environmental Geography, H. M. Saxena, Rawat Publications, 2nd edition, 2006.
15. Ecology, Environmental Science and Conservation, J. S. Singh, S. P. Singh, and S. R. Gupta, S. Chand & Company, 1st edition, 2014.
16. Environmental and Natural Resource Economics, Tom Tietenberg and Lynne Lewis, Pearson, 12th edition, 2022.
17. Principles of Ecosystem Stewardship: Resilience, Self-Organization, and Adaptation in Social-Ecological Systems, F. Stuart Chapin III, Margaret A. Palmer, and Osvaldo E. Sala (Eds.), Springer, 1st edition, 2010.

18. Studies and articles on the informal e-waste recycling sector in India.
19. United Nations Environment Programme (UNEP) publications on various environmental issues.
20. United Nations Sustainable Development Goals (SDGs) reports and official website.
21. United States Environmental Protection Agency (EPA) publications on pollution control.
22. World Health Organization (WHO) reports on environmental health.
23. World Wildlife Fund (WWF) reports on forest and wildlife conservation.

Paper Code(s): ICT-117P	**P : 3**
Paper: Environment Studies Lab	**C : 1**
Prerequisites: None	
Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term-End Semester Examinations: 60 Marks	
Instructions: **1.** The course objectives and course outcomes are identical to that of ICT-117T as this is the practical component of the corresponding theory paper. **2.** The practical list shall be notified by the teacher in the first week of the class commencement. **3.** There should be at least 10 practical exercises. Field visits and their reports shall also be a part of the practicals	

Paper Code(s): ICT-119	L : 3
Paper: Engineering Mechanics	C :3
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Ability to solve problems pertaining to force systems, equilibrium and distributed systems.
CO2	Ability to solve problems of friction and engineering trusses.
CO3	Ability to deal with the problems of kinematics and kinetics of particle
CO4	Ability to deal with the problems of kinematics and kinetics of rigid bodies.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	2	3	3	2	-	-	-	1	1	1	2
CO2	3	3	3	3	2	-	-	-	1	1	1	2
CO3	3	3	3	3	2	-	-	-	1	1	1	2
CO4	3	2	3	3	2	-	-	-	1	1	1	2

Unit I
Force System: Introduction, force, principle of transmissibility of force, resultant of a force system, resolution of a force, moment of force about a line, Varignon's theorem, couple, resolution of force into force and a couple, properties of couple and their application to engineering problems.
Equilibrium: Force body diagram, equations of equilibrium and their applications to engineering problems, equilibrium of two force and three force members.

Unit II
Structure: Plane truss, perfect and imperfect truss, assumption in the truss analysis, analysis of perfect plane trusses by the method of joints, method of section and graphical method.
Friction: Static and Kinetic friction, laws of dry friction, co-efficient of friction, angle of friction, angle of repose, cone of friction, frictional lock, friction in flat pivot and collar bearing, friction in flat belts.

Unit III
Kinematics of Particles: Rectilinear motion, plane curvilinear motion, rectangular coordinates, normal and tangential coordinates.
Kinetics of Particles: Equation of motion, rectilinear motion and curvilinear motion, work-energy equation, conservation of energy, concept of impulse and momentum, conservation of momentum, impact of bodies, co-efficient of restitution, loss of energy during impact.

Unit IV
Kinematics of Rigid Bodies: Concept of rigid body, types of rigid body motion, absolute motion, introduction to relative velocity, relative acceleration (Corioli's component excluded) and instantaneous center of zero velocity, Velocity and acceleration.
Kinetics of Rigid Bodies: Equation of motion, translatory motion and fixed axis rotation, application of work energy principles to rigid bodies conservation of energy.

Textbooks:
1. *Engineering Mechanics* by A.K.Tayal, Umesh Publications.

References:
1. *Engineering Mechanics' by K. L. Kumar, Tata Mc-Graw Hill*
2. *Engineering Mechanics' by S. Timoshenko, D. H. Young, J. V. Rao, Tata Mc-Graw Hill*
3. *Engineering Mechanics-Statics and Dynamics' by Irwing H. Shames, PHI.*
4. *Engineering Mechanics' by Basudev Bhattacharya, Oxford Higher Education.*

Paper Code(s): ICT-123	P : 2
Paper: Engineering Graphics-I	C : 1
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	To understand the theory of projections and projection of points
CO2	Ability to do line projections
CO3	Ability to do plane projections
CO4	Ability to do solid projections and development of surfaces

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	3	3	3	3	2	-	-	-	1	2	1	2
CO2	3	3	3	3	2	-	-	-	1	2	1	2
CO3	3	3	3	3	2	-	-	-	1	2	1	2
CO4	3	3	3	3	2	-	-	-	1	2	1	2

Unit I

Introduction: Engineering Graphics/Technical Drawing, Introduction to drawing equipments and useof instruments, Conventions in drawing practice. Types of lines and their uses, BIS codes for lines,technical lettering as per BIS codes, Introduction to dimensioning, Types, Concepts of scale drawing,
Types of scales
Theory of Projections: Theory of projections, Perspective, Orthographic, System of orthographicprojection: in reference to quadrants, Projection of Points, Projection in different quadrants,Projection of point on auxiliary planes. Distance between two points, Illustration through simpleproblems.

Unit II

Projection of Lines: Line Parallel to both H.P. and V.P., Parallel to one and inclined to other, Othertypical cases: three view projection of straight lines, true length and angle orientation of straightline: rotation method, Trapezoidal method and auxiliary plane method, traces of line.

Unit III

Projection of Planes: Projection of Planes Parallel to one and perpendicular to other, Perpendicularto one and inclined to other, Inclined to both reference planes, Plane oblique to reference planes,traces of planes.
Planes Other than the Reference Planes: Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., projections of points and lines lying in the planes, conversion of obliqueplane into auxiliary plane and solution of related problems.

Unit IV

Projection of Solids: Projection of solids in first or third quadrant, Axis parallel to one andperpendicular to other, Axis parallel to one inclined to other, Axis inclined to both the principal plane,Axis perpendicular to profile plane and parallel to both H.P. and V.P., Visible and invisible details inthe projection, Use of rotation and auxiliary plane method.
Development of Surface: Purpose of development, Parallel line, radial line and triangulation method,Development of prism, cylinder, cone and pyramid surface for both right angled and oblique solids,Development of surface

Note: The sheets to be created shall be notified by the concerned teacher.

Textbooks:

1. Engineering Drawing by N.D. Bhatt, 53rd Ed., Charotar Publishing House Pvt. Ltd., Gujarat,2017.

References:

1. Engineering Drawing by P.S. Gill, S.K Kataria & Sons, New Delhi, 2013.
2. Technical Drawing with Engineering Graphics by Frederick E. Giesecke, Shawna Lockhart, Marla Goodman, and Cindy M. Johnson, 15th Ed., Prentice Hall, USA, 2016
3. Engineering Drawing by M.B. Shah and B.C. Rana, 3rd Ed., Pearson Education, New Delhi, 2009

Paper Code(s): ICT102T	L : 3
Paper: Engineering Chemistry	C :3
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Explain atomic structure, chemical bonding, and material properties using fundamental chemical principles.
CO2	Apply principles of spectroscopy and molecular interactions for understanding chemical characterization techniques.
CO3	Analyze thermodynamic and electrochemical processes relevant to energy, corrosion, and industrial applications.
CO4	Explain organic structures, reactions, and stereochemical principles relevant to engineering materials and applications.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	3	2	-	1	2	-	-	-	-	-	-	1
CO2	3	3	-	2	2	-	-	-	-	1	-	2
CO3	3	3	-	2	2	1	1	-	-	1	-	2
CO4	3	2	1	1	1	-	-	-	-	1	-	2

Unit I

Green chemistry and biofuels: Twelve Principles of Green Chemistry, Zero Waste Technology, Atom economy, Use of alternative feedstock, innocuous reagents, alternative solvents, designing alternative reaction methodology, minimising energy consumption. Bioethanol and bio diesel.

Nano Chemistry: Nanomaterials: Properties, carbon nanotubes (CNTs); graphene; quantum dots; smart coatings; self-cleaning and hydrophobic surfaces; photochromic and thermos-chromic materials; shape-memory polymers.

Unit II

Analytical aspects of water: Introduction, water quality standards, physical, chemical and biological characteristics; hardness of water, disadvantages of hardness, determination of hardness (EDTA method) and related numerical problems. Alkalinity and its determination related numerical problems, Boiler related problems due to use of hard water and their prevention: Scale and sludge formation, boiler corrosion, caustic embrittlement, priming and foaming, boiler water treatment –internal or in-situ: carbonate and phosphate conditioning, Colloidal and Calgon Conditioning; external treatment: (a) Lime soda process and related numericals (b) Zeolite process (c) Ion-exchange process. Desalination of brackish water-Reverse Osmosis and Electro dialysis of water.Industrial applications of water

Unit III

Corrosion chemistry nd its Control: Definition, effects, theory (mechanisms): dry/chemical, wet/electrochemical corrosion, Pilling-Bedworth ratio; Types of corrosion: Galvanic corrosion, Soil corrosion, Pittng corrosion, Concentration cell or Differential Aeration corrosion, Stress corrosion; Mechanism of rusting of iron, Passivity. Factors influencing corrosion; protective measures: galvanization, tinning, cathodic protection, sacrificial anodic protection; electroplating and prevention of corrosion through material selection and design.

Polymers for computers and electronics: Classification, functionality and polymerization; Speciality Polymers: Conducting Polymers, Liquid crystalline polymers (LCD applications, Electroluminescent Polymers, (LED and O-LED applications) and biodegradable polymers. Polymer composites for sensors and microchips based applications

Unit IV

Energy Storage and Power Chemistry:

Fundamentals of electrochemistry; nernst equation and it's numericals; primary and secondary batteries; lithium –ion batteries, sodium ion batteries and their applications in laptops, mobiles and EVs; battery safety and charging principles; super capacitors; fuel cells; introduction to energy harvesting materials and wireless charging technologies

Textbooks

[1] S. Agarwal, Engineering Chemistry: Fundamentals and Applications, 2nd ed. Cambridge, U.K.: Cambridge University Press, 2019.
[2] P. C. Jain and M. Jain, Engineering Chemistry, 17th ed. New Delhi, India: Dhanpat Rai Publishing Company, 2024.

Reference Books

[1] S. Chawla, A Textbook of Engineering Chemistry, 3rd ed. New Delhi, India: Dhanpat Rai & Co. (P) Ltd., 2017.
[2] O. V. Roussak and H. D. Gesser, Applied Chemistry: A Textbook for Engineers and Technologists, 2nd ed. New York, NY, USA: Springer, 2012.
[3] O. G. Palanna, Engineering Chemistry, 2nd ed. New Delhi, India: McGraw Hill Education, 2017.
[4] J. Anireddy, Textbook of Engineering Chemistry, 1st ed. New Delhi, India: Wiley India, 2018.
[5] P. T. Anastas and J. C. Warner, Green Chemistry: Theory and Practice. Oxford, U.K.: Oxford University Press, 2000.

Paper Code(s): ICT-102P	P : 2
Paper:Engineering Chemistry Lab	C : 1
Prerequisites: None	
Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term-End Semester Examinations: 60 Marks	
Instructions: **1.** The course objectives and course outcomes are identical to that of ICT-102T as this is the practical component of the corresponding theory paper. **2.** The practical list shall be notified by the teacher in the first week of the class commencement. **3.** There should be at least 10 practical exercises.	

Paper Code(s): ICT-104	L : 4
Paper: Probability and Stochastic Processes for Engineers	C : 4
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1:	Analyze multivariate random variables and probability models for engineering applications.
CO2:	Characterize random processes using statistical measures such as correlation functions, stationarity, and spectral density.
CO3:	Apply Markov chains, Poisson processes, and queueing models for performance analysis of stochastic engineering systems.
CO4:	Develop stochastic and reliability models for analyzing uncertain engineering systems and real-world applications.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	-	3	1	1	1	-	-	-	-	-	1	2
CO2	-	3	1	1	1	-	-	-	-	-	1	2
CO3	-	3	2	2	1	-	-	-	-	-	2	2
CO4	-	3	3	3	1	-	-	-	-	-	2	2

Unit I
Review of random variables and probability distributions, Joint probability distributions, Marginal and conditional probability distributions, Independence of random variables, Functions of two or more random variables, Transformation of random variables, Distribution of functions of random variables, Mathematical expectation of functions of random variables, Joint moments, Covariance and correlation coefficients, Moment generating functions, Characteristic functions, Applications of random variable models in engineering systems.

Unit II
Introduction to random processes, Classification of random processes, Discrete-time and continuous-time random processes, Ensemble averages, Mean function, Autocorrelation function, Cross-correlation function, Covariance function, Stationary random processes, Wide-sense stationary processes, Ergodic processes, Gaussian random processes, White noise processes, Power spectral density, Relationship between autocorrelation and power spectral density, Linear systems with random inputs.

Unit III
Markov chains, Discrete-time Markov chains, Transition probability matrix, Chapman–Kolmogorov equations, Classification of states, Periodicity and recurrence, Steady-state probabilities, Continuous-time Markov chains (basic concepts), Poisson processes, Birth-death processes, Introduction to queueing theory, Queueing models and Kendall notation, M/M/1 and M/M/c queueing systems, Little's theorem, Applications of queueing models in computer and communication networks.

Unit IV
Reliability concepts, Reliability function, Failure rate and hazard function, Mean time to failure, Series and parallel reliability models, Standby systems, Availability and maintainability, Renewal process (basic concepts), Monte Carlo simulation methods for stochastic systems, Applications of stochastic processes in communication systems, signal processing, computer networks, manufacturing systems, and machine learning.

Textbook

1. A. Leon-Garcia, Probability, Statistics, and Random Processes for Electrical Engineering, 3rd ed. Boston, MA, USA: Pearson, 2008.

References

2. A. Papoulis and S. U. Pillai, Probability, Random Variables, and Stochastic Processes, 5th ed. New York, NY, USA: McGraw-Hill Education, 2002.
3. S. M. Ross, Introduction to Probability Models, 12th ed. Amsterdam, The Netherlands: Academic Press, 2019.
4. R. D. Yates and D. J. Goodman, Probability and Stochastic Processes: A Friendly Introduction for Electrical and Computer Engineers, 3rd ed. Hoboken, NJ, USA: John Wiley & Sons, 2014.
5. H. Stark and J. W. Woods, Probability, Random Processes, and Estimation Theory for Engineers, 4th ed. Upper Saddle River, NJ, USA: Prentice Hall, 2011.
6. D. P. Bertsekas and J. N. Tsitsiklis, Introduction to Probability, 2nd ed. Nashua, NH, USA: Athena Scientific, 2008.

Paper Code(s): ICT-110	L : 3
Paper: System Modelling Techniques - II	C : 3
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Apply elementary probability and statistical methods to analyze engineering data, quantify uncertainty, and support engineering decision-making.
CO2	Apply the principles of complex analysis to solve engineering problems involving analytic functions and contour integration.
CO3	Employ Laplace and Fourier analytical techniques for solving ordinary differential equations and engineering models.
CO4	Formulate and solve classical partial differential equations arising in heat transfer, wave propagation, and related engineering applications.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	3	3	3	3	3	-	-	-	-	-	-	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2
CO3	3	3	3	3	3	-	-	-	-	-	-	2
CO4	3	3	3	3	3	-	-	-	-	-	-	2

Unit I
Probability concepts, Conditional probability, Bayes' theorem, Random variables, Discrete and continuous probability distributions, Binomial, Poisson and Normal distributions, Mathematical expectation and variance, Correlation and regression, Sampling distributions, Confidence intervals, Tests of hypotheses for means and proportions, Engineering applications.

Unit II
Complex functions, Analytic functions, Cauchy-Riemann equations, Harmonic functions and Laplace equation, Exponential, trigonometric, hyperbolic and logarithmic functions, Euler's formula, De Moivre's theorem (without proof), General power and principal value, Singularities and zeros, Line integrals in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Taylor and Laurent series, Residue theorem, Evaluation of definite real integrals using residues..

Unit III
Laplace transforms: Definition, properties, transforms of derivatives and integrals, Shifting theorems, Unit step function, Dirac delta function, Inverse Laplace transforms, Convolution theorem, Solution of ordinary differential equations.

Fourier analysis: Fourier series, Functions of arbitrary period, Half-range expansions, Sturm-Liouville problems, Introduction to Fourier transforms and engineering applications.

Unit IV
Basic concepts of partial differential equations, Wave equation, Heat equation, Method of separation of variables, D'Alembert's solution, Laplace equation in two dimensions, Boundary value problems, Fourier series solutions, Engineering applications.

Textbooks:
1 E. Kreyszig, Advanced Engineering Mathematics, 10th ed. Hoboken, NJ, USA: John Wiley & Sons, 2011.

References:
1. K. F. Riley, M. P. Hobson, and S. J. Bence, Mathematical Methods for Physics and Engineering, 3rd ed. Cambridge, U.K.: Cambridge University Press, 2013.
2. K. A. Stroud and D. J. Booth, Engineering Mathematics, 8th ed. London, U.K.: Macmillan International Higher Education, 2020.
3. L. C. Andrews, Special Functions of Mathematics for Engineers, 2nd ed. New York, NY, USA: Oxford University Press, 1998.
4. L. Turyn, Advanced Engineering Mathematics. Boca Raton, FL, USA: CRC Press (Taylor & Francis Group), 2014.
5. D. G. Zill, Advanced Engineering Mathematics, 5th ed. Burlington, MA, USA: Jones & Bartlett Learning, 2018.
6. D. G. Duffy, Advanced Engineering Mathematics with MATLAB, 4th ed. Boca Raton, FL, USA: CRC Press (Taylor & Francis Group), 2017.
7. M. C. Potter, J. L. Lessing, and E. F. Aboufadel, Advanced Engineering Mathematics, 4th ed. Cham, Switzerland: Springer, 2019

Paper Code(s): ICT-112T	L :3
Paper: Cyber Sensitization and Digital Hygiene	C :3
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Identify and mitigate common cyber threats, social engineering tactics, and malicious software variations encountered in daily digital interactions
CO2	Configure and maintain optimal privacy, credential safety, and wireless connection settings across personal communication accounts and devices
CO3	Execute safe digital banking, UPI, and e-commerce transactions while systematically identifying online financial traps and fraudulent gateways
CO4	Interpret fundamental statutory cyber laws, intellectual property rights, and execute the exact compliance procedures required to report digital offenses

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	2	3	-	2	2	2	1	1	1	-	-	2
CO2	2	2	-	1	3	2	1	1	1	-	-	2
CO3	2	3	-	2	2	3	1	1	-	1	-	2
CO4	2	2	-	1	1	3	1	3	-	2	-	2

Unit 1:
Introduction to the digital landscape and personal digital footprints. Overview of software vulnerabilities including malware, spyware, ransomware, trojans, and adware. Core principles of credential security covering strong password generation, password managers, and multi-factor authentication (MFA/2FA). Comprehensive study of social engineering tactics such as phishing, smishing, vishing, spear-phishing, and baiting.

Unit 2:
Social Media Privacy and Network Safety: Analysis of privacy architectures on modern social platforms like Facebook, Instagram, LinkedIn, and X. Risks of oversharing information, identity theft, and profile cloning. Examining platform reporting for cyberbullying, online stalking, deepfakes, and photo morphing. Technical review of network threats including public Wi-Fi risks, man-in-the-middle (MitM) attacks, rogue hotspots, and unsecured Bluetooth. Best practices for secure browsing using HTTPS, Virtual Private Networks (VPNs), and understanding incognito mode limitations.

Unit 3:
Financial Cyber Safety and E-Commerce Security: Overview of the digital payment ecosystem, including Unified Payments Interface (UPI) workflows, mobile wallets, and internet banking channels. Deconstruction of financial frauds such as SIM swapping, OTP scams, fake QR codes, lottery traps, remote access scams, and card skimming. Best practices for secure e-commerce, spotting fake shopping portals, verifying SSL certificates, and using safe payment gateways. Introduction to cryptocurrency risks, peer-to-peer transaction threats, and investment scams.

Unit 4:
Introduction to cyber jurisprudence, netiquette, and digital ethics. Study of India's Information Technology (IT) Act, 2000, focusing on punitive clauses including Sections 66, 66C, 66D, 66E, and 67. Awareness of data privacy legislation including India's Digital Personal Data Protection (DPDP) Act and GDPR basics. Understanding Intellectual Property Rights (IPR) in cyberspace, software piracy, copyright infringement, and plagiarism. Standard procedures for emergency incident response, compiling digital evidence, and reporting offenses on national portals like cybercrime.gov.in.

Textbooks
1. N. Godbole and S. Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley India, 2011.
2. J. Pande, Introduction to Cyber Security, Uttarakhand Open University, 2017.

Reference Books
1. H. Chander, Cyber Laws and IT Protection. New Delhi, India: PHI Learning Pvt. Ltd., 2012.
2. C. J. Brooks et al, Cyber Security: The Essential Guide to Digital Hygiene and Privacy. Hoboken, NJ, USA: Sybex, 2018.
3. The Information Technology Act, 2000 (with Amendments), Government of India, New Delhi, India, 2000.
4. Digital Personal Data Protection Act, 2023, Ministry of Law and Justice, Government of India, New Delhi, India, 2023.

Paper Code(s): ICT-112P	P : 2
Paper: Cyber Sensitization and Digital Hygiene Lab	C : 1
Prerequisites: None	
Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term-End Semester Examinations: 60 Marks	
Instructions: **1.** The course objectives and course outcomes are identical to that of ICT-112T as this is the practical component of the corresponding theory paper. **2.** The practical list shall be notified by the teacher in the first week of the class commencement. **3.** There should be at least 10 practical exercises.	

Paper Code(s): ICT 114T	**L : 3**
Paper: Engineering Physics II	**C :3**
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Explain the principles of simple harmonic motion, wave propagation, and oscillatory systems, and analyze their engineering applications.
CO2	Apply the principles of geometrical optics to analyze reflection, refraction, optical instruments, and image formation.
CO3	Analyze interference and diffraction phenomena and evaluate the resolving power of optical systems using wave optics.
CO4	Explain the principles of laser operation, distinguish between different laser systems, and evaluate their applications in science, engineering, and medicine.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-

Unit I

Review of harmonic oscillations, Mechanical and electrical oscillators, Complex representation of harmonic motion and phasors, Damped and forced oscillations, Resonance, Quality factor, Mechanical and electrical impedance.

Wave motion, Transverse and longitudinal waves, Wave equation, Harmonic waves, Superposition principle, Reflection and transmission of waves at boundaries, Standing waves, Normal modes and eigenfrequencies, Acoustic waves, Speed of sound, Applications of standing waves.

Dispersion of waves, Phase velocity and group velocity, Wave packets, Introduction to Fourier representation of waves.

Unit II

Nature and propagation of light, Ray optics, Fermat's principle, Laws of reflection and refraction, Electromagnetic nature of light (qualitative introduction), Fresnel equations, Reflectance and transmittance, Brewster's angle, Total internal reflection, Evanescent waves and applications.

Mirrors and lenses, Image formation, Lens formula, Optical instruments, Magnifying power, Resolution, Introduction to optical matrix methods.

Unit III

Huygens' principle, Wavefronts, Interference of light, Coherence and conditions for interference, Young's double-slit experiment, Interference by division of amplitude, Thin film interference, Newton's rings.

Interferometers: Michelson interferometer and Mach–Zehnder interferometer, Applications of interferometry.

Diffraction of light, Fraunhofer diffraction, Single slit diffraction, Diffraction due to circular apertures, Rayleigh criterion, Resolving power, Diffraction gratings and applications.

Diffraction of light, Fraunhofer diffraction, Single slit diffraction, Diffraction due to circular apertures, Rayleigh criterion, Resolving power, Diffraction gratings and applications.

Unit IV

Interaction of radiation with matter, Absorption, Spontaneous emission and stimulated emission, Einstein's A and B coefficients, Population inversion, Laser action and optical amplification.

Characteristics of laser radiation: Monochromaticity, Coherence, Directionality, Brightness and speckle formation.

Types of lasers: Gas lasers (He–Ne and CO_2), Solid-state lasers (Ruby and Nd:YAG), Semiconductor lasers (introductory concepts), Dye lasers.

Applications of lasers in engineering, communication, manufacturing, medicine, and scientific instrumentation.

Textbooks:

[1] A. Ghatak, Optics, 7th ed. New Delhi, India: McGraw Hill Education, 2020.
[2] N. Subrahmanyam, B. Lal, and M. N. Avadhanulu, A Textbook of Optics, 23rd ed. New Delhi, India: S. Chand & Company Ltd., 2012.

References:

[1] F. A. Jenkins and H. E. White, Fundamentals of Optics, 4th ed. New York, NY, USA: McGraw-Hill, 2011.
[2] E. Hecht, Optics, 5th ed. Boston, MA, USA: Pearson Education, 2017.
[3] D. Halliday, R. Resnick, and J. Walker, Fundamentals of Physics, 12th ed. Hoboken, NJ, USA: John Wiley & Sons, 2021.
[4] O. Svelto, Principles of Lasers, 5th ed. New York, NY, USA: Springer, 2010.
[5] B. B. Laud, Lasers and Non-Linear Optics, 3rd ed. New Delhi, India: New Age International Publishers, 2011.

Paper Code(s): ICT-114P	P : 2
Paper: Engineering Physics- II Lab	C : 1
Prerequisites: None	
Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term-End Semester Examinations: 60 Marks	
Instructions: **1.** The course objectives and course outcomes are identical to that of ICT-114T as this is the practical component of thetheory paper. **2.** The practical list shall be notified by the teacher in the first week of the class commencement. **3.** There should be at least 10 practical exercises.	

Paper Code(s): ICT-116T	**L : 3**
Paper: Programming in Python	**C : 3**
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Ability to write procedural programmes in Python.
CO2	Ability to write programs using standard data structures.
CO3	Ability to use object oriented paradigm to write program in Python.
CO4	Ability to write modular program in Python

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	-	1	2	1	3	-	-	-	1	1	1	1
CO2	-	1	2	1	3	-	-	-	1	1	1	1
CO3	-	1	2	1	3	-	-	-	1	1	1	1
CO4	-	1	2	1	3	-	-	-	1	1	1	1

Unit I

Comparison of C (compiled, statically typed) and Python (interpreted, dynamically typed) execution models. Python shell, script execution, virtual environments, and PEP 8 code layout conventions. Primitive data types, mutable vs. immutable objects, object identities (id()), and dynamic memory assignment. Arithmetic, bitwise, relational, and logical operators; operator precedence. Control flow mechanisms: conditional branching (if-elif-else), match-case constructs, while loops, for loops, break, continue, and else with loops. Functions: parameters, positional, keyword, *args, kwargs, local/global scoping (LEGB rule), lambda functions, and recursive paradigms. Introduction to built-in collections: lists, tuples, dictionaries, sets, list/dictionary comprehensions, and sequence slicing operations.

Unit II

Paradigm shift from procedural structured programming to object-oriented programming (OOP). Anatomy of a Python class: state and behavior. Instance creation, references, and constructor init. Attributes: instance attributes versus class attributes. Access modifiers and data hiding using naming conventions (public, protected _, private __). Methods: instance methods (self), class methods (@classmethod), static methods (@staticmethod), and properties (@property getter/setter). Object representation and special magic methods (str, repr, len, eq). Memory allocation, garbage collection, and object lifecycle (del). Designing modular classes and module organization across multiple files.

Unit III

Inheritance fundamentals: single, multiple, multilevel, and hierarchical inheritance models. Method overriding, accessing parent features using super(), and resolution order under Multiple Inheritance (Method Resolution Order - MRO / C3 Linearization algorithm). Composition versus Inheritance ("has-a" vs "is-a" relationships). Abstract Base Classes (ABCs) using the abc module and enforcing interfaces. Polymorphism: duck typing, operator overloading (add, sub, mul), and method interface implementation. Error handling architecture: standard exception hierarchy, handling exceptions (try-except-else-finally), raising exceptions, and custom user-defined exception classes. Resource management using Context Managers and the with statement.

Unit IV

File handling: reading, writing, appending text, and binary streams; structural file formats (CSV, JSON processing). Object serialization and deserialization using the pickle module. Implementation of classic data structures using OOP principles: Stacks, Queues, Singly Linked Lists, and Binary Search Tree nodes. Introduction to built-in advanced structures (collections.deque, defaultdict, Counter). Time and space complexity benchmarking using timeit and basic algorithmic analysis. Unit testing frameworks using unittest / pytest for class testing and basic test-driven development (TDD) workflow. Capstone miniproject design using modular class architectures

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Textbooks:

1. *E. Matthes, "Python Crash Course: A Hands-On, Project-Based Introduction to Programming," 3rd ed. San Francisco, CA, USA: No Starch Press, 2023.*
2. *R. Hettinger and D. Beazley, "Python Cookbook," 3rd ed. Sebastopol, CA, USA: O'Reilly Media, 2013..*

References:

[1] L. Ramalho, "Fluent Python: Clear, Concise, and Effective Programming," 2nd ed. Sebastopol, CA, USA: O'Reilly Media, 2022.
[2] A. Sweigart, "Automate the Boring Stuff with Python: Practical Programming for Total Beginners," 2nd ed. San Francisco, CA, USA: No Starch Press, 2019.
[3] D. M. Beazley, "Python Essential Reference," 4th ed. Upper Saddle River, NJ, USA: Addison-Wesley Professional, 2009.

Paper Code(s): ICT-116P	**P : 2**
Paper: Programming in Python Lab	**C : 1**
Prerequisites: None	
Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term-End Semester Examinations: 60 Marks	
Instructions: **1.** The course objectives and course outcomes are identical to that of ICT-116T as this is the practical component of the corresponding theory paper. **2.** The practical list shall be notified by the teacher in the first week of the class commencement.	

Paper Code(s): ICT-122	L : 3
Paper: Introduction to Manufacturing Process	C : 3

Prerequisites: None

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Understand casting process.
CO2	Understand joining process.
CO3	Understand forging and sheet metal work.
CO4	Basic understanding of new technology for manufacturing

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	1	-	-	-	-	-	-	1

Unit I
Definition of manufacturing, Importance of manufacturing towards technological and social economic development, Classification of manufacturing processes, Properties of materials.
Metal Casting Processes: Sand casting, Sand moulds, Type of patterns, Pattern materials, Pattern allowances, Types of Moulding sand and their Properties, Core making, Elements of gating system. Description and operation of cupola.
Working principle of Special casting processes: Shell casting, Pressure die casting, Centrifugal casting. Casting defects.

Unit II
Joining Processes: Welding principles, classification of welding processes, Fusion welding, Gas welding, Equipments used, Filler and Flux materials. Electric arc welding, Gas metal arc welding, Submerged arc welding, Electro slag welding, TIG and MIG welding process, resistance welding, welding defects.

Unit III
Deformation Processes: Hot working and cold working of metals, Forging processes, Open and closed die forging process. Typical forging operations, Rolling of metals, Principle of rod and wire drawing, Tube drawing. Principle of Extrusion, Types of Extrusion, Hot and Cold extrusion.
Sheet metal characteristics: Typical shearing operations, bending and drawing operations, Stretch forming operations, Metal spinning.

Unit IV
Ideation: Introduction, Steps of Ideation, Introduction of Product Design, Development and Prototyping.
3D Printing: Definition, Types, History, Feasibility of Rapid Prototyping Technology (RPT), Role of CAD in RPT, 3D Modeling software and its role in RPT, Creation of STL file from CAD model and FDM.
Laser Cutting and engraving: Definition, Types, History, 3D Modeling software, and Creation of compatible file format for Laser Cutting and engraving.
Wood Routing: Definition, Types, History, 3D Modeling software, and Creation of compatible file format for Wood Routing.
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Textbooks:
1. *Manufacturing Technology: Foundry, Forming and WeldingVolume 1*, P. N Rao, McGrawHill, 5e, 2018.
2. S. K. Hajra Choudhury, A. K. Hajra Choudhury, and Nirjhar Roy, Elements of Workshop Technology, Volumes 1 & 2, 16th Revised Edition, Media Promoters & Publishers Pvt. Ltd., 2015.

References:
1. R. K. Jain and S. C. Gupta, Production Technology, 19th Edition, Khanna Publishers.
2. SeropeKalpakjian and Steven R. Schmid, Manufacturing Processes for Engineering Materials (SI Units), 6th Edition, Pearson, 2018.
3. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems, 7th Edition, John Wiley & Sons, 2019.

Paper Code(s): ICT-124	P :2
Paper: Engineering Graphics- II	C :1

Prerequisites: None

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Ability to draw sectional diagrams of solids.
CO2	Ability to draw 3S projections (isometric and oblique)
CO3	Ability to draw perspective projections
CO4	Understand and use a CAD tool (AutoCAD).

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	3	3	3	3	2	-	-	-	1	2	1	2
CO2	3	3	3	3	2	-	-	-	1	2	1	2
CO3	3	3	3	3	2	-	-	-	1	2	1	2
CO4	3	3	3	3	2	-	-	-	1	2	1	2

Unit I
Section of Solids: Definition of Sectioning and its purpose, Procedure of Sectioning, Illustration through examples, Types ofsectional planes-application to few examples.

Unit II
Isometric Projection: Classification of pictorial views, Basic Principle of Isometric projection, Difference between isometric projection and drawing, Isometric projection of solids such as cube, prism, pyramid and cylinder. Oblique Projection: Principle of oblique projection, difference between oblique projection and isometric projection, receding lines and receding angles, oblique drawing of circle, cylinder, prism and pyramid.

Unit III
Perspective Projection: Principle of perspective projection, definitions of perspective elements, visual ray method, vanishing point method.
Conversion of 3D to 2D figures

Unit IV
Introduction to CADD: Interfacing and Introduction to CAD Software, Coordinate System, 2D drafting: lines, circles, arc, polygon, etc., Dimensioning, 2-D Modelling, Use of CAD Software for engineering drawing practices.

Note: The sheets to be created shall be notified by the concerned teacher in the first week of teaching.

Textbooks:
1. Engineering Drawing by N.D. Bhatt, 53rd Ed., Charotar Publishing House Pvt. Ltd., Gujarat,2017

References:
1. Engineering Drawing by P.S. Gill, S.K Kataria & Sons, New Delhi, 2013.
2. Technical Drawing with Engineering Graphics by Frederick E. Giesecke, Shawna Lockhart, Marla Goodman, and Cindy M.Johnson, 15th Ed., Prentice Hall, USA, 2016
3. Engineering Drawing by M.B. Shah and B.C. Rana, 3rd Ed., Pearson Education, New Delhi, 2009.
4. AutoCAD 2017 for Engineers & Designers by Sham Tickoo, Dreamtech Press 2016

Paper Code(s): ICT-126	P :3
Paper: Workshop Technology	C :1
Prerequisites: None	

Marking Scheme:
1. Teachers Continuous Evaluation: 40 marks
2. Term-End Semester Examinations: 60 Marks

Instructions for paper setter:
1. There should be 9 questions in the term end examinations question paper.
2. The first (1st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 12 marks.
3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 12.
4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook.
5. The requirement of (scientific) calculators / log-tables / data – tables may be specified if required.

Course Outcomes (CO):

CO1	Ability to safely work in a Lab./workshop.
CO2	Ability to use machines (lathe, mill, shaper, planer, grinder, drill).
CO3	Ability to weld.
CO4	Ability to use sheet metal tools and fitting shop tools

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High)

CO/PO	*PO01*	*PO02*	*PO03*	*PO04*	*PO05*	*PO06*	*PO07*	*PO08*	*PO09*	*PO10*	*PO11*	*PO12*
CO1	2	1	2	2	3	-	-	-	-	-	-	2
CO2	2	1	2	2	1	-	-	-	-	-	-	2
CO3	2	1	2	2	1	-	-	-	-	-	-	2
CO4	2	1	2	2	1	-	-	-	-	-	-	2

Unit I

Safety, precautions and maintenance: Safety in shop, safety devices, safety and precautions - moving machine and equipment parts, electrical parts and connections, fire, various driving systems like chain, belt and ropes, electrical accidents, an overview of predictive, preventive and scheduled maintenance, standard guidelines to be followed in shop..

Unit II

Introduction to machine shop: Introduction to Lathe, Milling, shaper, Planer, grinder, drilling and overview of operations performed on these machines by making some jobs.

Unit III

Introduction to welding shop: Welding, types of welding, tools and applications, gas welding and arc welding, edge preparation, various joints formation by gas welding and electric arc welding.

Unit IV

Introduction to sheet metal shop: Sheet metal tools and operations, formation of a box using sheet.
Introduction to fitting shop: Introduction to fitting, tools and applications, some jobs in fitting shop.

Textbooks:

1. Workshop Technology Vol. 1 and Vol. 2, Hajra Choudhary and Roy, Media Promoters and Publishers, 2018.

References:

1. A course in Workshop Technology Vol.1 and Vol. 2, B. S. Raghuvanshi, Dhanpat Rai and Compnay, 2015.
2. Workshop Technology (Manufacturing Processes), Khurmi and Gupta, S. Chand Publication, 2010.