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SCHEME OF EXAMINATION

&

SYLLABI

for

Bachelor of Technology / Master of Technology (Dual Degree Programmes)

Scheme and Syllabus

for

a. Computer Science and Engineering – Major Discipline
b. Information Technology– Major Discipline
c. Electronics and Communication Engineering– Major Discipline
d. Computer Science and Engineering - Artificial Intelligence
e. Computer Science and Engineering - Data Science

1st Year Common Scheme and Syllabus, 2nd year Scheme, and Framework of Scheme for higher semesters (3rd year and 4th year) (w.e.f. AS 2024-25)

Offered by

University School of Information, Communication & Technology

At

GGSIP University, Dwarka Campus

GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY

Guru Gobind Singh Indraprastha University
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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.

Approval History:

1. Scheme and Syllabi of 1st year, Scheme of 2nd year, and framework of scheme of 3rd year and 4th year approved by BoS on 06/08/2024.

2. Scheme and Syllabi of 1st year, Scheme of 2nd year, and framework of scheme of 3rd year and 4th year approved by AC Sub-committee on 13/08/2024.

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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 may be 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**

w.e.f from the batch of A.S.: 2023-24 onwards (for lateral entry this provision shall be applicable from admissions through lateral entry from admissions in the academic session 2024-25). For earlier batch (regular) admitted in the year 2021-22, 2022-23 (and corresponding lateral entry admissions), the marking scheme for all non-NUES papers (theory/practical) Theory to have 25 marks for Teachers Continuous Evaluation and 75 marks for term end examinations while the corresponding bifurcation for practicals/projects/dissertation to be 40:60 and NUES papers out of 100.

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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.

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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.

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Course / Paper Group Codes:

BS: Basic Sciences
ES: Engineering Sciences
VAC: Value Added Course
AEC: Ability Enhancement Course
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.
Note: The details of the papers offered by USIC&T as open elective/emerging area electives shall be notified later on.

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.

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

Minor Specialization: It is possible to use the electives to provide a limited specialization in some sub-areas of CSE/IT/ECE, which is called Minor specializations. It shall mean the specializations earned through the EAE or OAE route subject to fulfilment of requirements as shall be specified in the scheme of study for the concerned minor specialization. The details about the minor specialization offered by USIC&T will be notified later on.

Paper / Course shall be treated as synonyms. A paper is one unit of curriculum taught, in general, in one particular semester, having up to 4 credits.

Acronyms:

CSE: Computer Science and Engineering
IT: Information Technology
ECE: Electronics and Communications Engineering
CSE-AI: Computer Science and Engineering - Artificial Intelligence
CSE-DS: Computer Science and Engineering - Data Science
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.
USIC&T: University School of Information, Communication &Technology.
L: Number of Lecture hours per week
P: Number of 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.

NOTE: THE CURRENT DOCUMENT DEFINES THE SCHEME AND SYLLABUS FOR THE FIRST YEAR, SCHEME FOR THE SECOND YEAR, AND FRAMEWORK OF SCHEME OF THIRD YEAR AND FOURTH YEAR. THE SCHEME OF 2nd YEAR AND FRAMEWORK OF 3rd YEAR AND 4th YEAR MAY CHANGE ON FINALIZATION OF THE SCHEME AND SYLLABUS OF 2nd YEAR ONWARDS (INCLUDING IMPLEMENTATION GUIDELINES).

FIRST YEAR

Common Scheme and Syllabus for

Bachelor of Technology / Master of Technology (Dual Degree Programmes) In

a. Computer Science and Engineering – Major Discipline
b. Information Technology– Major Discipline
c. Electronics and Communication Engineering– Major Discipline
d. Computer Science and Engineering - Artificial Intelligence
e. Computer Science and Engineering - Data Science

B.Tech/M.Tech Dual Degree

First Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
ES	ES-101	Programming for Problem Solving	4	-	4
ES	ES-103/ ES-105	*Any one of the following: Basics of Electrical Engineering/ Basics of Electronics Engineering	3	-	3
BS	BS-107	Engineering Mathematics – I	4	-	4
BS	BS-109/ BS-111	*Any one of the following: Engineering Chemistry/ Engineering Physics	3	-	3
ES/ AEC	ES-113/ AEC-115	*Any one of the following: Engineering Mechanics/ Communication Skills	3	-	3
VAC	VAC-117	+Indian Constitution	2	-	2
VAC	VAC-119	++Human Values & Ethics	2	-	2
Practical/ Viva Voce					
ES	ES-151	Programming for Problem Solving Lab	-	2	1
EC	ES-153/ ES-155	*Any one of the following corresponding to the theory paper offered: Basics of Electrical Engineering Lab/ Basics of Electronics Engineering Lab	-	2	1
BS	BS-157/ BS-159	*Any one of the following corresponding to the theory paper offered: Engineering Chemistry Lab/Engineering Physics Lab	-	2	1
Total			**21**	**6**	**24**

Group	**Code**	**Paper**	**L**	**P**	**Credits**
VAC		**NSS/NCC/Cultural Clubs/Technical Society/ Technical Club/Institution's Innovation Council	-	-	2
VAC	VAC-161	***Environment Studies	-	-	0

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

* For a particular batch of a programme of study one out of these two papers shall be taught in the first semester while the other shall be taught in the 2nd semester. Students who have to re-appear can only

reappear in the odd semester if originally offered to the student in the 1st semester and similarly for the students who study the paper in the second semester. The school shall decide which paper to offer in which semester.

+This is an NUES paper.

++This is an NUES paper. Every student is required to complete this paper of at least 2 credits through SWAYAM / NPTEL MOOCs platform, with the approval of the Dean, USIC&T. If the student completes a course with the higher number of credits from SWAYAM / NPTEL MOOCs platform, the credits reflected in the university marksheet shall be only 2 credits. The marksheet of successfully completing the paper/course with at least 40% marks has to be submitted to the school by the end of the 6th semester (3rd year) of studies. The cost of the paper/course including its examination fee is to be borne by the student. The clearance of the paper/course is mandatory for the award of the degree. The result of this subject shall be incorporated in the 6th semester marksheet.

**NUES: 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 co-ordinators shall be responsible for the evaluation of the same. These activities shall start from the 1stsemester and the evaluation shall be conducted at the end of the 6thsemester for students admitted in the first semester. Students admitted in the 2nd year (3rdsemester) as lateral entry shall undergo training or participate in the activities for the period of 3rdsemester to 6thsemester only.

***Non-credit: Every student is required to complete an Environmental Studies paper of at least 2 credits through SWAYAM / NPTEL MOOCs platform with the approval of Dean, USIC&T. This shall be considered as a non-credit paper/course. The marksheet of successfully completing the paper/course with at least 40% marks has to be submitted to the school by the end of the 6th semester (3rd year) of studies. The cost of the paper/course including its examination fee is to be borne by the student. The clearance of the paper/course is mandatory for the award of the degree.

B.Tech/M.Tech Dual Degree

Second Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
ES	ES-102	Data Structures	4	-	4
SEC	SEC-104	Python Programming	4	-	4
ES	ES-106/ ES-108	*Any one of the following: Basics of Electrical Engineering/ Basics of Electronics Engineering	3	-	3
BS	BS-110	Engineering Mathematics – II	4	-	4
BS	BS-112/ BS-114	*Any one of the following: Engineering Physics/ Engineering Chemistry	3	-	3
ES/ AEC	ES-116/ AEC-118	*Any one of the following: Engineering Mechanics/ Communication Skills	3	-	3
Practical/ Viva Voce					
ES	ES-152	Data Structures Lab	-	2	1
SEC	SEC-154	Python Programming Lab	-	2	1
ES	ES-156/ ES-158	*Any one of the following corresponding to the theory paper offered: Basics of Electrical Engineering Lab/ Basics of Electronics Engineering Lab	-	2	1
BS	BS-160/ BS-162	*Any one of the following corresponding to the theory paper offered: Engineering Physics Lab/ Engineering Chemistry Lab	-	2	1
Total			**21**	**8**	**25**

*For a particular batch of a programme of study one out of these two papers shall be taught in the first semester while the other shall be taught in the 2nd semester. Students who have to re-appear can only reappear in the odd semester if originally offered to the student in the 1st semester and similarly for the students who study the paper in the second semester. The school shall decide which paper to offer in which semester.

SYLLABUS OF FIRST YEAR

for

a. **Computer Science and Engineering – Major Discipline**
b. **Information Technology – Major Discipline**
c. **Electronics and Communication Engineering – Major Discipline**
d. **Computer Science and Engineering - Artificial Intelligence**
e. **Computer Science and Engineering - Data Science**

Offered by

University School of Information, Communication & Technology at the GGSIPU University Campus, Dwarka

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Paper Code: ES-101	Paper: Programming for Problem Solving	L	P	C
		4	-	4

Marking Scheme:

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

Instruction 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 15 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 15.
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 Objectives :

1:	To impart basic knowledge about simple algorithms for arithmetic and logical problems so that students can understand how to write a program, syntax and logical errors in 'C'.
2:	To impart knowledge about how to implement conditional branching, iteration and recursion in 'C'.
3:	To impart knowledge about using arrays, pointers, files, union and structures to develop algorithms and programs in 'C'.
4:	To impart knowledge about how to approach for dividing a problem into sub-problems and solve the problem in 'C'.

Course Outcomes (CO):

CO1:	Ability to develop simple algorithms for arithmetic and logical problems and implement them in 'C'.
CO2:	Ability to implement conditional branching, iteration and recursion and functions in 'C'
CO3:	Ability to use arrays, pointers, union and structures to develop algorithms and programs in 'C'.
CO4:	Ability to decompose a problem into functions and synthesize a complete program using divide and conquer approach in 'C'.

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	2	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

Introduction to Programming: Computer system, components of a computer system, computing environments, computer languages, creating and running programs, Preprocessor, Compilation process, role of linker, idea of invocation andexecution of a programme. Algorithms: Representation using flowcharts, pseudocode.

Introduction to C language: History of C, basic structure of C programs, process of compiling and running a C program, C tokens, keywords, identifiers, constants, strings, special symbols, variables, data types, I/O statements. Interconversion of variables.

Operators and expressions: Operators, arithmetic, relational and logical, assignment operators, increment and decrement operators, bitwise and conditional operators, special operators, operator precedence and associativity, evaluation of expressions, type conversions in expressions.

Unit II

Control structures: Decision statements; if and switch statement; Loop control statements: while, for and do while loops, jump statements, break, continue, goto statements.

Arrays: Concepts, One dimensional array, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi dimensional arrays.

Functions: User defined and built-in Functions, storage classes, Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference, Recursion.

Strings: Arrays of characters, variable length character strings, inputting character strings, character library functions, string handling functions.

Unit III

Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, functions returning pointers, Dynamic memory allocation. Pointers to functions. Pointers and Strings

Structures and unions: Structure definition, initialization, accessing structures, nested structures, arrays of structures, structures and functions, self referential structures, unions, typedef, enumerations.File handling: command line arguments, File modes, basic file operations read, write and append.Scope and life of variables, multi-file programming.

C99 extensions. 'C' Standard Libraries: stdio.h, stdlib.h, assert.h, math.h, time.h, ctype.h, setjmp.h, string.h, stdarg.h, unistd.h

Unit IV

Basic Algorithms: Finding Factorial, Fibonacci series, Searching, Basic Sorting Algorithms- Bubble sort, Insertion sort and Selection sort. Find the square root of a number, array order reversal, reversal of a string, two-way merge sort, stacks, queues, single –link linked list, Binary search tree.

Textbooks:

1. *How to solve it by Computer* by R. G. Dromey, Prentice-Hall India EEE Series, 1982.
2. *The C programming language* by B W Kernighan and D M Ritchie, Pearson Education, 1988.

References:

1. *Programming Logic & Design* by Tony Gaddis, Pearson, 2nd Ed. 2016.
2. *Programming Logic and Design* by Joyce Farrell, Cengage Learning, 2015.
3. *Engineering Problem Solving With C* by Delores M. Etter, Pearson, 2013.
4. *Problem Solving and Program Design in C* by Jeri R. Hanly and Elliot B. Koffman, Pearson, 2016.
5. *Structure and Interpretation of Computer Programs* by Harold Abelson and Gerald Sussman with Julie Sussman, MIT Press, 1985.
6. *How to Design Programs* by Matthias Felleisen, Robert Bruce Findler, Matthew Flatt, and Shriram Krishnamurthi, MITPress, 2018.
7. *ANSI/ISO 9899-1990, American National Standard for Programming Languages 'C'* by American National Standards Institute, Information Technology Industry Council, 1990 (C89).
8. *ISO/IEC 9899:1999. International Standard for Programming Languages – C (ISO/IEC 9899)* by American NationalStandards Institute, Information Technology Industry Council, 2000 (C99).
9. *INCITS/ISO/IEC 9899-2011.American National Standard for Programming Languages 'C'*by American National StandardsInstitute, Information Technology Industry Council, 2012 (C11).

Paper Code: ES-103(odd)/ ES-106(even)	Paper: Basics of Electrical Engineering	L	P	C
		3	-	3

Marking Scheme:

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

Instruction 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 15 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 up to 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15.
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 Objectives:

1:	To impart knowledge of the basics electrical engineering.
2:	To impart knowledge of the working of RLC circuits.
3:	To impart basic knowledge about filters and magnetic circuits.
4:	To impart basic knowledge about electrical machines.

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

DC Circuits: Passive circuit components, Basic laws of Electrical Engineering, Temperature Resistance Coefficients. voltage and current sources, Series and parallel circuits, power and energy, Kirchhoff's Laws, Nodal & Mesh Analysis, delta-star transformation, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem. Time domain analysis of first Order RC & LC circuits.

Unit – II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

Unit - III

D. C. Generators & Motors: Principle of operation of Generators & Motors, Speed Control of shunt motors, Flux control, Rheostatic control, voltage control, Speed control of series motors.

A. C. Generators & Motors: Principle of operation, Revolving Magnetic field, Squirrel cage and phase wound rotor, Starting of Induction motors, Direct on line and Star Delta starters, Synchronous machines.

Unit - IV

Transformers: Construction and principle of operation, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Measuring Instruments: Electromagnetism, Different Torques in Indicating instruments, Moving Iron Instruments: Construction & Principle, Attraction and Repulsion type; Moving Coil instruments: Permanent Magnet type; Dynamometer type Instruments.

Textbooks:

1. *Electrical Engineering Fundamentals* by Vincent Del Toro, PHI (India), 1989

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References:

1. *An Introduction to Electrical Science* by Adrian Waygood, Routledge, 2nd Ed. 2019.
2. *Electrical Circuit Theory and Technology* by John Bird, Elsevier, 2007.
3. *Principles and Applications of Electrical Engineering* by Giorgio Rizzoni, MacGraw-Hill, 2007.
4. *Electrical Engineering* by Allan R. Hambley, Prentice-Hall, 2011.
5. *Hughes Electrical & Electronic Technology* by Edward Hughes revised by Hohn Wiley, Keith Brown and Ian McKenzie Smith, Pearson, 2016.
6. *Electrical and Electronics Technology* by E. Hughes, Pearson, 2010.
7. Basic Electrical Engineering by D.C. Kulshrestha, McGraw-Hill, 2009.
8. Basic Electrical Engineering by D. P. Kothai and I.J. Nagrath, McGraw-Hill, 2010.

Paper Code: ES-105(odd)/ ES-108(even)	Paper: Basics of Electronics Engineering	L	P	C
		3	-	3

Marking Scheme:

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

Instruction for paper setter:

1. There should be 9 questions in the term end examination 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 15 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 attemptonlyoneofthetwoquestionsintheunit.Individualquestionsmaycontainupto5sub-parts/sub-questions.Each Unit shall have a marks weightage of 15.
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 Objectives:

1:	To impart the basic knowledge about semiconductor Physics
2:	To impart the knowledge about pn junction and special diodes
3:	To impart the knowledge about transistors and MOSFET
4:	To impart the knowledge about digital system

Course Outcomes(CO):

CO1:	Ability to understand the fundamentals of semiconductor Physics.
CO2:	Ability to understand pn junction and special diodes .
CO3:	Ability to understand transistors and MOSFET.
CO4:	Ability to understand the digital systems.

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale1: low,2: Medium, 3:High)

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

UNIT I

Review of semiconductor Physics: Energy levels and Energy bands, Electrons and holes in an intrinsic semiconductor, conductivity of a semiconductor, direct and indirect band-gap semiconductors, carrier concentration in an intrinsic semiconductor, donor and acceptor impurities, charge densities in a semiconductor, fermi level in a semiconductor having impurities, Carrier transport: diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson and continuity equations.

Unit II

Diodes: Open circuit pn Junction, energy band diagram, contact potential, Space charge at the junction, pn junction diode under external bias,I-Vcharacteristics,DiodeEquation, Temperature dependence of diode. Breakdown phenomena, diode resistances & capacitances, Diode equivalent circuit. Zener Diode, LED, Photodiode, Solar cell: structure, principle, characteristics.

UNIT - III

Transistors: Bipolar Junction transistor (BJT)-Physical Structure, modes of operation, BJT current components, BJT Configurations and I-V characteristics, large signal current gains, early effect, BJT as switch, BJT as an Amplifier, Eber's moll model of BJT

MOSFET: Structure, operation, current voltage characteristics, enhancement and depletion type MOSFETs, CMOS structure, MOSFET as resistor and inverter.

UNIT–IV

Fundamentals of Digital Systems: Logic gates; Boolean Algebra; Number Systems: decimal, binary, octal hexadecimal numbers and their conversion, signed binary numbers, Binary arithmetic, Binary codes. Minimization of logic functions usingK-map & Quine-McCluskey's algorithm.

Digital Circuits: Half adder, full adder, subtractors, Multiplexer,De-Multiplexer,Decoders,Encoder, decoders/drivers for display devices, S-R Flip-Flop, J-K Flip-Flop, sequential circuits.

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TextBooks:

1. Millman's Electronic Devices and Circuits, Third Edition, McGraw Hill Education(India) Pvt. Ltd.
2. M. Morris Mano, Digital Logic and Computer Design. Prentice Hall, 2016

Reference Books:

1. D. P. Leach and Albert Paul Malvino, Digital Principles and Applications. McGraw-Hill Science, Engineering & Mathematics, 2011.
2. Microelectronic Circuits, 7thEdition, Adel S Sedra and Kenneth C Smith, Oxford University Press.
3. B. Streetman and S. Banerjee, Solid State Electronic Devices. Pearson, 2015.

Anjana

Paper Code: BS-107	Paper: Engineering Mathematics – I	L	P	C
		4	-	4

Marking Scheme:

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

Instruction 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 15 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 15.
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 Objectives:

1:	To understand use series, differential and integral methods to solve formulated engineering problems.
2:	To understand use Ordinary Differential Equations to solve formulated engineering problems.
3:	To understand use linear algebra to solve formulated engineering problems.
4:	To understand use vector calculus to solve formulated engineering problems.

Course Outcomes (CO):

CO1:	Ability to use series, differential and integral methods to solve formulated engineering problems.
CO2:	Ability to use Ordinary Differential Equations to solve formulated engineering problems.
CO3:	Ability to use linear algebra to solve formulated engineering problems.
CO4:	Ability to use vector calculus to solve formulated engineering problems.

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

Partial derivatives, Chain rule, Differentiation of Implicit functions, Exact differentials.Maxima, Minima and saddle points, Method of Lagrange multipliers. Differentiation underIntegral sign, Jacobians and transformations of coordinates.

Unit II

Ordinary Differential Equations (ODEs): Basic Concepts. Geometric Meaning of $y' = f(x, y)$. Direction Fields, Euler's Method, Separable ODEs. Exact ODEs. Integrating Factors, Linear ODEs. Bernoulli Equation. Population Dynamics, Orthogonal Trajectories. Homogeneous Linear ODEs with Constant Coefficients. Differential Operators. Modeling of Free Oscillations ofa Mass–Spring System, Euler–Cauchy Equations. Wronskian, Nonhomogeneous ODEs, Solution by Variation of Parameters. Power Series Method for solution of ODEs: Legendre's Equation. Legendre Polynomials, Bessel's Equation, Bessels's functions Jn(x) and Yn(x). Gamma Function

Unit III

Linear Algebra: Matrices and Determinants, Gauss Elimination, Linear Independence. Rank of a Matrix. Vector Space. Solutions of Linear Systems and concept of Existence, Uniqueness, Determinants. Cramer's Rule, Gauss–Jordan Elimination.The Matrix Eigenvalue Problem.
Determining Eigenvalues and Eigenvectors, Symmetric, Skew-Symmetric, and Orthogonal Matrices.Eigenbases. Diagonalization. Quadratic Forms.Cayley – Hamilton Theorem (without proof)

Unit IV

Vector Calculus: Vector and Scalar Functions and Their Fields. Derivatives, Curves. Arc Length. Curvature. Torsion, Gradient of a Scalar Field. Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field, Line Integrals, Path Independence of Line Integrals, Double Integrals, Green's Theorem in the Plane, Surfaces for Surface Integrals, Surface Integrals, Triple Integrals, Stokes Theorem. Divergence Theorem of Gauss.

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Textbooks:

1. *Advanced Engineering Mathematics* by Erwin Kreyszig, John Wiley, 10th Ed., 2011.
2. *Mathematical Methods for Physics and Engineering*, by K. F. Riley, M. P. Hobson and S. J. Bence, CUP, 2013. (for Unit I)

References:

1. *Engineering Mathematics* by K.A. Stroud withDexter J. Booth, Macmillan, 2020.
2. *Advanced Engineering Mathematics* by Larry Turyn, Taylor and Francis, 2014.
3. *Advanced Engineering Mathematics* by Dennis G. Zill, Jones & Bartlett Learning, 2018.
4. *Advanced Engineering Mathematics with MATLAB* by Dean G. Duffy, Taylor and Francis, 2017.
5. *Advanced Engineering Mathematics* by Merle C. Potter, Jack L. Lessing, and Edward F. Aboufadel, Springer (Switzerland),

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Paper Code: BS-109 (odd)/ BS-114 (even)	Paper: Engineering Chemistry	L	P	C
		3	-	3

Marking Scheme:

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

Instruction for paper setter:

1. There should be 9 questions in the term-end examinations question paper.
2. The first unit will be compulsory and cover the entire syllabus. This question will have Five sub-parts, and the students will be required to answer any THREE parts of 5 marks each. This unit will have a total weightage of 15 marks.
3. Apart from unit 1 which is compulsory, the 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 up to 5 sub-parts / sub-questions.Each Unit shall have a marks weightage of 15.
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 Objectives:

1:	To impart knowledge about understanding and modeling atomic structure and chemical bonding.
2:	To impart knowledge about understanding and modeling Thermochemistry and Reaction Kinetics.
3:	To impart knowledge about understanding and modeling organic compound structure and reactions.
4:	To impart knowledge about understanding and modeling Stereochemistry.

Course Outcomes (CO):

CO1:	Ability to understand and model atomic structure and chemical bonding.
CO2:	Ability to understand and model Thermochemistry and Reaction Kinetics.
CO3:	Ability to understand and model organic compound structure and reactions.
CO4:	Ability to understand and model Stereochemistry.

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	2	3	3	2	-	-	-	1	1	-	1
CO2	2	2	3	3	2	-	-	-	1	1	-	1
CO3	2	2	3	3	2	-	-	-	1	1	-	1
CO4	2	2	3	3	2	-	-	-	1	1	-	1

Unit I

Atomic Structure: Introduction to wave mechanics, the Schrödinger equation as applied to hydrogen atom, origin of quantum numbers, Long form of periodic table on the basis of Electronic configuration s, p, d, f block elements periodic trends, Ionization potential, atomic and ionic radii electron affinity & electro-negativity.

Chemical Bonding: Ionic bond, energy changes, lattice energy Born Haber Cycle, Covalent bond-energy changes, Potential energy curve for H2 molecule, characteristics of covalent compound, co-ordinate bond-Werner's Theory, effective atomic numbers, A hybridization and resonance, Valence Shell Electron Repulsion theory (VSEPR), Discussion of structures of H2O, NH3, BrF3, SiF4, Molecular orbital theory, Linear combination of atomic orbitals (LCAO) method. Structure of simple homo nuclear diatomic molecule like H2, N2, O2, F2.

Unit II

Thermochemistry: Hess's Law, heat of reaction, effect of temperature on heat of reaction at constant pressure (Kirchhoff's Equation) heat to dilution, heat of hydration, heat of neutralization and heat of combustion, Flame temperature. Reaction Kinetics: Significance of rate law and rate equations, order and molecularity, Determinations of order of simple reactions-experimental method, Equilibrium constant and reaction rates -Lindermann, collision and activated complex theories, complex reactions of 1st order characteristics of consecutive, reversible and parallel reactions-Steady state and non-steady state approach.

Unit III

Basic concepts of Organics: Inductive, electromeric, mesomeric and hyperconjugative effects. Stability of reaction intermediates. Electrophiles and nucleophiles, concepts of acids and bases. Arrhenius, Lowry-Bronsted and Lewis theory of acids and bases (HSAB), Carbon acids (active methylene groups), super acids. Bonds weaker than covalent bond: Hydrogen bonding - nature, types, stability and effects. IUPAC Nomenclature.

Unit IV

Stereochemistry: Classification of stereoisomers, diastereomers, Separation of enantiomers. Absolute configuration (R and

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S), Projection formulae. Stereochemistry of compounds containing two asymmetric C-atoms. Elements of symmetry - center, plane and axis of symmetry, Conformations: Conformations around a C-C bond in acyclic and cyclic compounds.

Textbooks / References:

1. Engineering Chemistry (16th Edition) Jain, Jain, Dhanpat Rai Publishing Company, 2013.
2.Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley, 2017
3.Engineering Chemistry by E.R. Nagarajan and S. Ramalingam, Wiley, 2017.

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Paper Code: BS-111 (odd)/ BS-112 (even)	Paper: Engineering Physics	L	P	C
		3	-	3

Marking Scheme:

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

Instruction 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 orshort answer type question of total 15 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 15.
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 Objectives:

1:	To understand and model oscillations and waves.
2:	To understand and model interference, diffraction and polarization phenomenon.
3:	To understand and appreciate relativistic systems and Lasers.
4:	To learn about the band theory of solids and properties and characteristics of diodes.

Course Outcomes (CO):

CO1:	Ability to understand and model oscillations and waves.
CO2:	Ability to understand and model interference, diffraction and polarization phenomenon.
CO3:	Ability to understand and appreciate relativistic systems and Lasers.
CO4:	Understand the band theory of solids and properties and characteristics of diodes.

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	2	3	3	2	-	-	-	1	1	-	2
CO2	2	2	3	3	2	-	-	-	1	1	-	2
CO3	2	2	3	3	2	-	-	-	1	1	-	2
CO4	2	2	3	3	2	-	-	-	1	1	-	2

Unit I

Waves and Oscillations: Wave motion, simple harmonic motion, wave equation, superposition principle. Introduction to Electromagnetic Theory: Maxwell's equations. work done by the electromagnetic field, Poynting's theorem, Momentum, Angular momentum in electromagnetic fields, Electromagnetic waves: the wave equation, plane electromagnetic waves, energy carried by electromagnetic waves

Unit II

Interference: Interference by division of wave front (Young's double slit experiment, Fresnel's biprism), interference by division of amplitude (thin films, Newton's rings, Michelson's interferometer), Coherence and coherent sources

Diffraction: Fraunhofer and Fresnel diffraction; Fraunhofer diffraction for Single slit, double slit, and N-slit (diffraction grating), Fraunhofer diffraction from a circular aperture, resolving power and dispersive power of a grating, Rayleigh criterion, resolving power of optical instruments

Polarization: Introduction to polarization, Brewster's law, Malu's law, Nicol prism, double refraction, quarter-wave and half-wave plates, optical activity, specific rotation, Laurent half shade polarimeter.

Unit III

Theory of relativity: The Michelson-Morley Experiment and the speed of light; Absolute and Inertial frames of reference, Galilean transformations, the postulates of the special theory of relativity, Lorentz transformations, time dilation, length contraction, velocity addition, mass energy equivalence. Invariance of Maxwell's equations under Lorentz Transformation. Introduction to Laser Physics: Introduction, coherence, Einstein A and B coefficients, population inversion, basic principle and operation of a laser, the He-Ne laser and the Ruby laser

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Unit IV

Band Theory of Solids: Origin of energy bands in solids, motion of electrons in a periodic potential – the Kronig–Penny model (Qualitative). Brillouin zones, effective mass, metals, semi-conductors and insulators and their energy band structures. Extrinsic and Intrinsic semiconductors, doping – Fermi energy for doped and undoped semiconductors, the p-n junction (energy band diagrams with Fermi energy), the unbiased diode, forward and reverse biased diodes – tunnel diodes, zener diode, photo diode its characteristics, LED

Textbooks:

1. *Concepts of Modern Physics (SIE)*by Arthur Beiser, Shobhit Mahajan, and S. Rai Choudhury,McGraw-Hill, 2017.
2. *Physics for Scientists and Engineers* by Raymond A. Serway and John W. Jewett, 9th Edition , Cengage, 2017

References:

1. *Modern Physics* by Kenneth S. Krane, Wiley, 2020.
2. *Principles of Physics* by Robert Resnick, Jearl Walker and David Halliday, Wiley, 2015.
3. *Optics* by Ajoy Ghatak, McGraw Hill, 2020.
4. *Solid State Electronic Devices ,by* Streetman and Ben G Prentice Hall India Learning Private Limited; 2006

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Paper Code: ES-113 (odd)/ ES-116 (even)	Paper: Engineering Mechanics	L	P	C
		3	-	3

Marking Scheme:

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

Instruction 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 15 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 15.
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 Objectives:

1:	To impart knowledge to solve problems pertaining to force systems, equilibrium and distributed systems.
2:	To impart knowledge to solve problems of friction and engineering trusses.
3:	To impart knowledge to deal with the problems of kinematics and kinetics of particle
4:	To impart knowledge to deal with the problems of kinematics and kinetics of rigid bodies.

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	3	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	3	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, Varigon'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.

Distributed Forces: Determination of center of gravity, center of mass and centroid by direct integration and by the method of composite bodies, mass moment of inertia and area moment of inertia by direct integration and composite bodies method, radius of gyration, parallel axis theorem, polar moment of inertial.

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.

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Kinetics of Rigid Bodies: Equation of motion, translatory motion and fixed axis rotation, application of work energy principles to rigid bodies conservation of energy.

Beam: Introduction, types of loading, methods for the reactions of a beam, space diagram, types of end supports, beams subjected to couple.

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: AEC-115 (odd)/ AEC-118(even)	Paper: Communication Skills	L	P	C
		3	-	3

Marking Scheme:

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

Instruction for paper setter:

1. There should be 9 questions in the term-end examinations question paper.
2. The first unit will be compulsory and cover the entire syllabus. This question will have Five sub-parts, and the students will be required to answer any THREE parts of 5 marks each. This unit will have a total weightage of 15 marks.
3. Apart from unit 1 which is compulsory, the 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 up to 5 sub-parts / sub-questions.Each Unit shall have a marks weightage of 15.
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.

Course Objectives:

1:	To help them understand the structures of language, and build up the vocabulary.
2:	To enhance language proficiency and communication competence.
3:	To understand basic principles of written communication.
4:	To develop the efficiency of using language for Specific Purposes with clarity.
5:	To be able to critically appreciate the written texts and audio-visual inputs effectively.
6:	To develop the theoretical understanding of interpersonal communication effectively.

Course Outcomes (CO):

CO1:	Ability to understand the basic structure of language.
CO2:	Ability to communicate effectively in writing.
CO3:	Ability to present their ideas effectively in professional and demanding situations.
CO4:	Ability to interpret texts and comprehend the extended discourse.

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

Basic Language Efficiency 1: Parts of Speech, Sentence Structure, Subject-Verb Agreement, Vocabulary, Common Errors

Unit II

Basic Language Efficiency 2: Writing Skills: Types of Writing, Paragraph writing, Paraphrasing, Summarizing, Précis Writing

Unit III

Formal Written Communication: Meetings – Agenda and Minutes ,Press release, Letter writing, Notice, Memorandum, E-mails

Unit IV

Appreciating written Texts for comprehension ability:

Steven Spielberg's Speech at Harvard Commencement 2016 (https://www.youtube.com/watch?v=TYtoDunfu00)

Lecture by Johan Rockstrom:

Let the Environment Guide our Development

http://www.ted.com/talks/johan_rockstrom_let_the_environment_guide_our_development

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, New Delhi: Oxford University Press

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.

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Paper Code: VAC-117	Paper: Indian Constitution	L	P	C
		2	-	2

Marking Scheme:

1. This is an NUES paper of 100 marks, hence all examinations to be conducted by the concerned teacher.

Course Objectives:

1:	To create awareness among students about the Indian Constitution
2:	To create consciousness among students about democratic principles and enshrined in the Constitution of India

Course Outcomes (CO):

CO1:	To understand institutional mechanism and fundamental values enshrined in the Constitution of India
CO2:	To understand the inter-relation between Centre and State Government
CO3:	To understand Fundamental Rights and Duties
CO4:	To understand the structure and functions of judicial systems in the country.

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
CO2	-	-	-	-	-	3	-	2	-	-	-	1
CO3	-	-	-	-	-	3	-	2	-	-	-	1
CO4	-	-	-	-	-	3	-	2	-	-	-	1

Unit I

Introduction to Constitution of India: Definition, Source and Framing of the Constitution of India. Salient Features of the Indian Constitution. Preamble of the Constitution.

Unit II

Fundamental Rights and Duties: Rights To Equality (Article 14-18).Rights to Freedom (Article 19-22).Right against Exploitation (Article 23-24).Rights to Religion and Cultural and Educational Rights of Minorities(Article 25- 30). The Directive Principles of State Policy – Its significance and application. Fundamental Duties – Necessary obligations and its nature, legal status and significance

Unit III

Executives and Judiciary: Office of President, Vice President and Governor: Power and Functions, Parliament, Emergency Provisions-, President Rule; Union Judiciary: Appointment of Judges, Jurisdiction of the Supreme Court, State Judiciary: Power and functions, Writ Jurisdiction

Unit IV

Centre- States Relation: Is Indian Constitution Federal in Nature, Legislative relations between Union and States, Administrative Relations between Union and States, Financial Relations between Union and States

Textbooks:

1. *Constitutional Law of India* by J.N Pandey, Central Law Publication, 2018.
2. *Introduction to the Indian Constitution of India*by D.D. Basu, PHI, New Delhi, 2021
3. *The Constitution of India* by P.M. Bakshi, Universal Law Publishing Co., 2020.

References:

1. *Indian Constitutional Law* by M.P. Jain, Lexis Nexis, 2013
2.*Constitution of India* byV.N. Shukla, Eastern Book Agency, 2014

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43/C

PaperCode: ES-151	Paper: Programming for Problem Solving Lab.		L	P	C
			-	2	1
Teachers Continuous Evaluation:	40 marks	Term End Examinations:	60 Marks		

Instructions:

1. The course objectives and course outcomes are identical to that of ES-101 (Programming for Problem Solving) 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.

PaperCode: ES-153(odd)/ ES-156(even)	Paper: Basics of Electrical Engineering Lab.		L	P	C
			-	2	1
Teachers Continuous Evaluation:	40 marks	Term End Examinations:	60 Marks		

Instructions:

1. The course objectives and course outcomes are identical to that of ES-103(odd)/ES-106(even) (Basics of Electrical Engineering) as this is the practicalcomponent of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement.

PaperCode: ES-155(odd)/ ES-158(even)	Paper: Basics of Electronics Engineering Lab.		L	P	C
			-	2	1
Teachers Continuous Evaluation:	40 marks	Term End Examinations:	60 Marks		

Instructions:

1. The course objectives and course outcomes are identical to that of ES-105(odd)/ ES-108(even) (Basics of Electronics Engineering) 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.

PaperCode: BS-157(odd)/ BS-162(even)	Paper: Engineering Chemistry Lab.		L	P	C
			-	2	1
Teachers Continuous Evaluation:	40 marks	Term End Examinations:	60 Marks		

Instructions:

1. The course objectives and course outcomes are identical to that of BS-109(odd)/BS-114(even) (Engineering Chemistry) as this is thepractical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the school in which the paper is being offered.

PaperCode: BS-159(odd)/ BS-160(even)	Paper: Engineering Physics Lab.		L	P	C
			-	2	1
Teachers Continuous Evaluation:	40 marks	Term End Examinations:	60 Marks		

Instructions:

1. The course objectives and course outcomes are identical to that of BS-111(odd)/BS-112(even) (Engineering Physics) as this is thepractical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the school in which the paper is being offered.

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Paper Code: ES-102	Paper: Data Structures	L	P	C
		4	-	4

Prerequisite Paper: ES-101

Marking Scheme :

1. Teacher's Continuous Evaluation : 40 marks
2. Term and Theory 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 questions of total 15 marks.
3. Apart from question one which is compulsory, rest of the paper shall consists of four 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 maycontain up to 5 sub-parts/sub-questions. Each unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning objectives of course/paper. The standard /level of the questions to be asked should be at the level of the prescribed text book.

Course Objectives :

1.	To introduce basics of Data structures (Arrays, strings, linked list etc.)
2.	To understand the concepts of Stacks, Queues and Trees, related operations and theirimplementation
3.	To understand sets, heaps and graphs
4.	To introduce various Sorting and searching Algorithms

Course Outcomes (CO)

CO 1	To be able to understand difference between structured data and data structure
CO 2	To be able to create common basic data structures and trees
CO 3	To have a knowledge of sets, heaps and graphs
CO 4	To have basic knowledge of sorting and searching algorithms

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

	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO 1	3	2	2	2	3	-	-	-	2	2	2	3
CO 2	3	2	2	2	3	-	-	-	2	2	2	3
CO 3	3	2	2	2	3	-	-	-	2	2	2	3
CO 4	3	2	2	2	3	-	-	-	2	2	2	3

UNIT – I

Overview of data structure, Basics of Algorithm Analysis including Running Time Calculations, Abstract Data Types, Arrays, Arrays and Pointers, Multidimensional Array, String processing, General Lists and List ADT, Listmanipulations, Single, double and circular lists. Stacks and Stack ADT, Stack Manipulation, Prefix, infix and postfix expressions, recursion. Queues and Queue ADT, Queue manipulation.

UNIT - II

Sparse Matrix Representation (Array and Link List representation) and arithmetic (addition, subtraction and multiplication), polynomials and polynomial arithmetic.

Trees, Properties of Trees, Binary trees, Binary Tree traversal, Tree manipulation algorithms, Expression treesand their usage, binary search trees, AVL Trees, Heaps and their implementation, Priority Queues, B-Trees, B* Tree, B+ Tree

UNIT - III

Sorting concept, order, stability, Selection sorts (straight, heap), insertion sort (Straight Insertion, Shell sort),Exchange Sort (Bubble, quicksort), Merge sort (External Sorting) (Natural merge, balanced merge andpolyphase merge). Searching – List search, sequential search, binary search, hashing methods, collision resolution in hashing.

UNIT - IV

Disjoint sets representation, union find algorithm, Graphs, Graph representation, Graph Traversals and theirimplementations (BFS and DFS). Minimum Spanning Tree algorithms, Shortest Path Algorithms

Textbook(s):

1. Richard Gilberg , Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C, 2nd Edition,Cengage Learning, Oct 2004
2. E. Horowitz, S. Sahni, S. Anderson-Freed, "Fundamentals of Data Structures in C", 2nd Edition, Silicon Press(US), 2007.

41/C

References:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson, September, 1996
2. Robert Kruse, "Data Structures and Program Design in C", 2nd Edition, Pearson, November, 1990
3. Seymour Lipschutz, "Data Structures with C (Schaum's Outline Series)", McGrawhill, 2017
4. A. M. Tenenbaum, "Data structures using C". Pearson Education, India, 1st Edition 2003.
5. Weiss M.A., "Data structures and algorithm analysis in C++", Pearson Education, 2014.

Anjana

Paper Code: SEC-104	Paper: Python Programming	L	P	C
		4	-	4

Marking Scheme:

1. Teachers Continuous Evaluation: 40 marks
2. Term end Theory 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 questions of total 15 marks.
3. Apart from question one which is compulsory, rest of the paper shall consists of four 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 maycontain up to 5 sub-parts/sub-questions. Each unit shall have a marks weightage of 15.
4. The questions are to be framed keeping in view the learning objectives of course/paper. The standard /level of the questions to be asked should be at the level of the prescribed text book.

Course Objectives:

1:	The students will learn the Programming in the Python Language
2:	The students will learn usage of language implemented data structures.
3:	The students shall learn usage of simple graphics & image processing, and the object oriented features of the Python Language.
4:	The students will learn about graphical user interfaces in Python.

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 do graphical programming 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

The concept of data types:

Variables, Assignments; Immutable Variables; Numerical Types; Arithmetic Operators And Expressions; comments in the program; understanding error messages; Conditions, boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while); short-circuit (lazy) evaluation; Strings and text files; manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated); String manipulations: subscript operator, indexing, slicing a string.

Unit II

Lists, tuples, and dictionaries:

Basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries; Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments.

Unit III

Simple Graphics and Image Processing:

"turtle" module; simple 2d drawing - colors, shapes; digital images, image file formats, image processing: Simple image manipulations with 'image' module (convert to bw, greyscale, blur, etc).

Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects; inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; exception handling, try block

Unit IV: Graphical user interfaces:

Event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames.

Textbooks:

1. T.R. Padmanabhan, Programming with Python, Springer, 1st Ed., 2016.
2. Kenneth Lambert, Fundamentals of Python: First Programs, Cengage Learning, 1st Ed., 2012.

PaperCode: BS-110	Paper: Engineering Mathematics – II	L	P	C
		4	-	4

Marking Scheme:

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

Instruction 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 15 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 15.
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 Objectives:

1:	To understand Complex series methods.
2:	To understand Complex analysis
3:	To understand Fourier and Laplace methods
4:	To understand how to solve specific formulated engineering problems using PDE methods.

Course Outcomes (CO):

CO1:	Ability to use Complex series methods.
CO2:	Ability to use Complex analysis to solve formulated engineering problems
CO3:	Ability to use Fourier and Laplace methods to solve formulated engineering problems
CO4:	Ability to solve specific formulated engineering problems using PDE methods.

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

Complex Analysis – I : Complex Numbers and Their Geometric Representation, Polar Form of Complex Numbers. Powers and Roots, Derivative. Analytic Function, Cauchy–Riemann Equations. Laplace's Equation, Exponential Function, Trigonometric and Hyperbolic Functions. Euler's Formula, de'Moivre's theorem (without proof), Logarithm. General Power. Principal Value.Singularities and Zeros. Infinity,

Line Integral in the Complex Plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Functions, Taylor and Maclaurin Series.

Unit II

Complex Analysis – II: Laurent Series, Residue Integration Method. Residue Integration of Real Integrals,

Geometry of Analytic Functions: Conformal Mapping, Linear Fractional Transformations (Möbius Transformations), Special Linear Fractional Transformations, Conformal Mapping by Other Functions, Applications: Electrostatic Fields, Use of Conformal Mapping. Modeling, Heat Problems, Fluid Flow. Poisson's Integral Formula for Potentials

Unit III

Laplace Transforms: Definitions and existence (without proof), properties, First Shifting Theorem (s-Shifting), Transforms of Derivatives and Integrals and ODEs, Unit Step Function (Heaviside Function).Second Shifting Theorem (t-Shifting), Short Impulses. Dirac's Delta Function. Partial Fractions, Convolution. Integral Equations, Differentiation and Integration of Transforms. Solution of ODEs with Variable Coefficients, Solution of Systems of ODEs. Inverse Laplace transform and its properties.

Fourier Analysis: Fourier Series, Arbitrary Period. Even and Odd Functions. Half-Range Expansions, Sturm–Liouville Problems. Fourier Integral, Fourier Cosine and Sine Transforms, Fourier Transform. Usage of fourier analysis for solution of ODEs. Inverse Fourier transform and its properties.

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Unit IV

Partial Differential Equations (PDEs): Basic Concepts of PDEs. Modeling: Vibrating String, Wave Equation. Solution by Separating Variables. Use of Fourier Series. D'Alembert's Solution of the Wave Equation. Characteristics. Modeling: Heat Flow from a Body in Space. Heat Equation:Solution by Fourier Series.Steady Two-Dimensional Heat Problems. Dirichlet Problem.

Heat Equation: Modeling Very Long Bars.Solution by Fourier Integrals and Transforms. Modeling: Membrane, Two-Dimensional Wave Equation. Rectangular Membrane. Laplacian in Polar Coordinates. Circular Membrane. Laplace's Equation in Cylindrical and Spherical Coordinates. Potential. Solution of PDEs by Laplace Transforms.

Textbooks:

1. *Advanced Engineering Mathematics* by Erwin Kreyszig, John Wiley, 10th Ed., 2011.

References:

1. *Engineering Mathematics* by K.A. Stroud withDexter J. Booth, Macmillan, 2020.
2. *Advanced Engineering Mathematics* by Larry Turyn, Taylor and Francis, 2014.
3. *Advanced Engineering Mathematics* by Dennis G. Zill, Jones & Bartlett Learning, 2018.
4. *Advanced Engineering Mathematics with MATLAB* by Dean G. Duffy, Taylor and Francis, 2017.
5. *Advanced Engineering Mathematics* by Merle C. Potter, Jack L. Lessing, and Edward F. Aboufadel, Springer (Switzerland), 2019.

Mathematical Methods for Physics and Engineering, by K. F. Riley, M. P. Hobson and S. J. Bence, CUP, 2013.

PaperCode: ES-152	Paper: Data Structures Lab.		L	P	C
			-	2	1
Teachers Continuous Evaluation:	40 marks	Term End Examinations:	60 Marks		

Instructions:

1. The course objectives and course outcomes are identical to that of ES-102 (Data Structures) as this is thepractical component of the corresponding theory paper.
2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the school in which the paper is being offered.

PaperCode: SEC-154	Paper: Python Programming Lab.		L	P	C
			-	2	1
Teachers Continuous Evaluation:	40 marks	Term End Examinations:	60 Marks		

Instructions:

1. The course objectives and course outcomes are identical to that of SEC-104 (Python Programming) 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 under intimation to the office of the school in which the paper is being offered.

SECOND YEAR

Scheme for

Bachelor of Technology / Master of Technology
(Dual Degree Programmes)
In

a. **Computer Science and Engineering – Major Discipline**
b. **Information Technology – Major Discipline**
c. **Computer Science and Engineering - Artificial Intelligence**
d. **Computer Science and Engineering - Data Science**

B.Tech/M.Tech Dual Degree

Third Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
PC	PC-201	Computer Organization and Architecture	4	-	4
PC	PC-203	Database Management Systems	4	-	4
PC	PC-205	Object Oriented Programming using Java	4	-	4
PC	PC-207	Design and Analysis of Algorithms	4	-	4
PC	PC-209	Operating Systems	4	-	4
AEC	AEC-211/ AEC-213	*Any one of the following: Principles of Management/ Engineering Economics	2	-	2
Practical/ Viva Voce					
PC	PC-251	Database Management Systems Lab	-	2	1
PC	PC-253	Object Oriented Programming using Java Lab	-	2	1
PC	PC-255	Design and Analysis of Algorithms Lab	-	2	1
PC	PC-257	Operating Systems Lab	-	2	1
Total			**22**	**8**	**26**

B.Tech/M.Tech Dual Degree

Fourth Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
PC	PC-202	Theory of Computation	4	-	4
PC	PC-204	Software Engineering	4	-	4
PC	PC-206	Computer Networks	4	-	4
PC	PC-208	Artificial Intelligence & Machine Learning	4	-	4
PC	PC-210	Web Technologies	4	-	4
AEC	AEC-212/ AEC-214	*Any one of the following: Engineering Economics/ Principles of Management	2	-	2
Practical/ Viva Voce					
PC	PC-252	Software Engineering Lab	-	2	1
PC	PC-254	Computer Networks Lab	-	2	1
PC	PC-256	Artificial Intelligence & Machine Learning Lab	-	2	1
PC	PC-258	Web Technologies Lab	-	2	1
Total			**22**	**8**	**26**

*For a particular batch of a programme of study one out of these two papers shall be taught in the third semester while the other shall be taught in the 4thsemester. Students who have to re-appear can only reappear in the odd semester if originally offered to the student in the 3rdsemester and similarly for the students who study the paper in the fourth semester. The school shall decide which paper to offer in which semester.

SECOND YEAR

Scheme for

Bachelor of Technology / Master of Technology

(Dual Degree Programmes)

In

Electronics and Communication Engineering – Major Discipline

Offered by

University School of Information, Communication & Technology at the GGSIPU University Campus, Dwarka

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B.Tech/M.Tech Dual Degree

Third Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
PC	PC-201	Signals and Systems	4	-	4
PC	PC-203	Network Analysis & Synthesis	4	-	4
PC	PC-205	Computer Organization & Architecture	4	-	4
PC	PC-207	Analog Devices & Circuits	4	-	4
PC	PC-209	Analog Communications	4	-	4
AEC	AEC-211	Engineering Economics	2	-	2
Practical/ Viva Voce					
PC	PC-251	Signals and Systems Lab	-	2	1
PC	PC-253	Network Analysis & Synthesis Lab	-	2	1
PC	PC-255	Analog Devices & Circuits Lab	-	2	1
PC	PC-257	Analog Communications Lab	-	2	1
Total			**22**	**8**	**26**

B.Tech/M.Tech Dual Degree

Fourth Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
PC	PC-202	Engineering Electromagnetics	4	-	4
PC	PC-204	Digital Communication	4	-	4
PC	PC-206	Linear Integrated Circuits	4	-	4
PC	PC-208	Digital Systems Design	4	-	4
PC	PC-210	Computer Networks	4	-	4
AEC	AEC-212	Principles of Management	2	-	2
Practical/ Viva Voce					
PC	PC-252	Digital Communication Lab	-	2	1
PC	PC-254	Linear Integrated Circuits Lab	-	2	1
PC	PC-256	Digital Systems Design Lab	-	2	1
PC	PC-258	Computer Networks Lab	-	2	1
Total			**22**	**6**	**26**

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Framework of the Scheme

(3rd Year and 4th Year)

for

Bachelor of Technology / Master of Technology

(Dual Degree Programmes)

In

a. **Computer Science and Engineering – Major Discipline**
b. **Information Technology – Major Discipline**
c. **Electronics and Communication Engineering – Major Discipline**

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B.Tech/M.Tech Dual Degree

Fifth Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
PC	PC-301	PC1	4	-	4
PC	PC-303	PC2	4	-	4
PCE	PCE-305	Core area Elective – 1	4	-	4
EAE	EAE-307	Elective in Emerging Areas 1 (students to choose one group)	4	-	4
OAE	OAE-309	Elective from other school or emerging area/ open elective offered by the school - 1	4	-	4
VAC	VAC-311	Any one VAC	2	-	2
Practical/ Viva Voce					
PC	PC-351	PC1 Lab	-	2	1
PC	PC-353	PC2 Lab	-	2	1
PC	PC-355	Summer Training (after 4th semester) Report	-	-	2
Total			**22**	**4**	**26**

B.Tech/M.Tech Dual Degree

Sixth Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
PCE	PCE-302	Core area Elective – 2	4	-	4
PCE	PCE-304	Core area Elective – 3	4	-	4
EAE	EAE-306	Elective in Emerging Areas - 2 (students to choose one group)	4	-	4
EAE	EAE-308	Elective in Emerging Areas – 3 (students to choose one group)	4	-	4
OAE	OAE-310	Elective from other school or emerging area/ open elective offered by the school - 2	4	-	4
OAE	OAE-312	Elective from other school or emerging area/ open elective offered by the school - 3	4	-	4
Practical/ Viva Voce					
VAC	VAC-314	** NSS/NCC/Cultural Clubs/Technical Society/ Technical Club/Institution's Innovation Council	-	-	2
Total			**22**	**4**	**26**

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B.Tech/M.Tech Dual Degree

Seventh Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
PCE	PCE-401	Core area Elective – 4	4	-	4
EAE	EAE-403	Elective in Emerging Areas - 4 (students to choose one group)	4	-	4
EAE	EAE-405	Elective in Emerging Areas – 5 (students to choose one group)	4	-	4
OAE	OAE-407	Elective from other school or emerging area/ open elective offered by the school –4	3	-	3
OAE	OAE-409	Elective from other school or emerging area/ open elective offered by the school – 5	3	-	3
Practical/ Viva Voce					
PC	PC-411	Minor Project	-	-	6
PC	PC-413	Summer Training (after 6th Semester) Report	-	-	2
Total			**18**		**26**

B.Tech/M.Tech Dual Degree

Eight Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Practical/ Viva Voce/ Internship%					
PC/ Project	PC-402	Major Project – Dissertation & Viva-Voce	-	-	24
	PC-404	Major Project Progress Evaluation	-	-	2
PC/ Internship	PC-402	Internship Report & Viva-Voce	-	-	24
	PC-404	Internship Progress Evaluation	-	-	2
Total			**-**	**-**	**26**

% A student shall either be allowed to do a project work or an internship.

Framework of the Scheme

(3rd Year and 4th Year)

for

Bachelor of Technology / Master of Technology

(Dual Degree Programmes)

In

a. **Computer Science and Engineering - Artificial Intelligence**
b. **Computer Science and Engineering - Data Science**

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B.Tech/M.Tech Dual Degree

Fifth Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
PC	PC-301	PC1	4	-	4
PC	PC-303	PC2	4	-	4
PCE	PCE-305	Core area Elective – 1	4	-	4
PCE	PCE-307	Core area Elective – 2	4	-	4
OAE	OAE-309	Elective from other school or emerging area/ open elective offered by the school – 1	4	-	4
VAC	VAC-311	Any one VAC	2	-	2
Practical/ Viva Voce					
PC	PC-351	PC1 Lab	-	2	1
PC	PC-353	PC2 Lab	-	2	1
PC	PC-355	Summer Training (after 4th semester) Report	-	-	2
Total			**22**	**4**	**26**

B.Tech/M.Tech Dual Degree

Sixth Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
PCE	PCE-302	Core area Elective – 3	4	-	4
PCE	PCE-304	Core area Elective – 4	4	-	4
PCE	PCE-306	Core area Elective – 5	4	-	4
PCE	PCE-308	Core area Elective – 6	4	-	4
OAE	OAE-310	Elective from other school or emerging area/ open elective offered by the school – 2	4	-	4
OAE	OAE-312	Elective from other school or emerging area/ open elective offered by the school – 3	4	-	4
Practical/ Viva Voce					
VAC	VAC-314	** NSS/NCC/Cultural Clubs/Technical Society/ Technical Club/Institution's Innovation Council	-	-	2
Total			**22**	**4**	**26**

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B.Tech/M.Tech Dual Degree

Seventh Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Theory Papers					
PCE	PCE-401	Core area Elective – 7	4	-	4
PCE	PCE-403	Core area Elective – 8	4	-	4
PCE	PCE-405	Core area Elective – 9	4	-	4
OAE	OAE-407	Elective from other school or emerging area/ open elective offered by the school –4	3	-	3
OAE	OAE-409	Elective from other school or emerging area/ open elective offered by the school – 5	3	-	3
Practical/ Viva Voce					
PC	PC-411	Minor Project	-	-	6
PC	PC-413	Summer Training (after 6th Semester) Report	-	-	2
Total			**18**		**26**

B.Tech/M.Tech Dual Degree

Eight Semester					
Group	**Code**	**Paper**	**L**	**P**	**Credits**
Practical/ Viva Voce/ Internship%					
PC/ Project	PC-402	Major Project – Dissertation & Viva-Voce	-	-	24
	PC-404	Major Project Progress Evaluation	-	-	2
PC/ Internship	PC-402	Internship Report & Viva-Voce	-	-	24
	PC-404	Internship Progress Evaluation	-	-	2
Total			**-**	**-**	**26**

% A student shall either be allowed to do a project work or an internship.

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Implementation Rules:

1. The examinations, attendance criteria to appear in examinations, promotion and award of the degree shall be governed by the Ordinance 11 of the University. The term "major discipline" / "primary discipline" in this document refers to the discipline in which student is admitted / studies from 3rd semester onwards. However, credits of courses / paper for OAE groups shall not be considered for the purpose of promotion from one year of study to the subsequent year of study.

2. Minimum duration of the Bachelor of Technology part of the Bachelor / Master of Technology (Dual Degree) programme shall be 4 years (N=4 years) (8 semesters).

3. Maximum duration of the Bachelor of Technology part of the Bachelor / Master of Technology (Dual Degree) programme shall be 6 years (N+2 years). After completion of N+2 years of study, if the student has appeared in the papers of all the semesters upto 8th semester, then a maximum extension of 1 year may be given to the student for completing the requirements of the degree (details about the criteria for extension of 1 year shall be notified later on). After the period of allowed study, the admission of the student shall be cancelled.

4. Only after qualifying for the award of the degree of Bachelor of Technology, the student may be allowed to proceed for the Master in Technology part of the Bachelor / Master of Technology (Dual Degree).

5. The scheme and syllabi of the Master of Technology part of the Bachelor / Master of Technology (Dual Degree) shall be notified separately. This document pertains to the Bachelor of Technology part of the Bachelor / Master of Technology (Dual Degree) programme only.

6.The students of CSE/IT/ECE shall undergo the following group of Courses / Papers as enumerated in the scheme.

Group	1st Year	2nd Year	3rd Year	4th Year	Group Credit Total
ES	21				21
BS	16				16
PC		48	12	34	94
PCE			12	4	16
EAE			12	8	20
OAE			12	6	18
SEC	5				5
AEC	3	4			7
VAC	4		4		8
Semester Credit Total	**49**	**52**	**52**	**52**	**205**

TABLE 1: Distribution of Credits for CSE/IT/ECE. (Project / internship credits are 32 (Major Project – 26; Minor Project – 6) out of the 94 credits for Programme Core (PC) credits, while extra-curricular activities credits are 2 out of 15 credits for Ability Enhancement Course (AEC)/ Value Added Course (VAC) credits.

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7.The students of CSE-AI/CSE-DS shall undergo the following group of Courses / Papers as enumerated in the scheme.

Group	1st Year	2nd Year	3rd Year	4th Year	Group Credit Total
ES	21				21
BS	16				16
PC		48	12	34	94
PCE			24	12	36
OAE			12	6	18
SEC	5				5
AEC	3	4			7
VAC	4		4		8
Semester Credit Total	**49**	**52**	**52**	**52**	**205**

TABLE 2: Distribution of Credits for CSE-AI/ CSE-DE. (Project / internship credits are 32 (Major Project – 26; Minor Project – 6) out of the 94 credits for Programme Core (PC) credits, while extra-curricular activities credits are 2 out of 15 credits for Ability Enhancement Course (AEC)/ Value Added Course (VAC) credits.

8. Maximum Credits: 205 (refer Table 1 and Table 2), these are the credits for which the student shall have to study and has to appear in the examinations for these credits.

9. Minimum Credits: 200 (out of 205 credits).

10. The scheme of examinations for the B.Tech. Programmes at the affiliated institutions shall be notified separately.

11. Pass marks in every paper shall be 40%.

12. Grading System shall be as per Ordinance 11 of the University.

13. Teachers of other Schools, as and when deputed by their school, for teaching the students enrolled in programmes offered by the University School of Information, Communication and Technology (USIC&T) shall be a part of the Academic Programme Committee (APC) of the School. Such teachers, for all academic matters, including teaching, teachers' continuous evaluation, term end examinations etc. shall be governed by the decisions of the APC of USIC&T. Similarly, the guest faculty, the visiting faculty and the contract / Ad Hoc faculty as and when deputed to teach students of USIC&T shall form a part of APC of USIC&T.

14.The medium of instructions shall be English.

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