SHRI GURU RAM RAI UNIVERSITY

[Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized byUGC u/s (2f) of UGC Act 1956]

SYLLABUS FOR

B.Tech. Computer Science and Engineering (Artificial Intelligence & Machine Learning) (FIRST YEAR)

With Exit option
(after One year with Undergraduate Certificate in Computer Science and Engineering/Two years with Undergraduate Diploma in Computer Science and Engineering / Three years with Undergraduate Advanced Diploma in Computer Science and Engineering / Four years B.Tech. Computer Science and Engineering (AI & ML)

CURRICULUM

As per NEP 2020
(Effective from Session 2024-25)

School of Engineering & Technology

22/7/24

SHRI GURU RAM RAI UNIVERSITY

[Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized byUGC u/s (2f) of UGC Act 1956]

SYLLABUS AND ORDNANCE OF BACHELOR OF TECHNOLOGY (FIRST YEAR) IN COMPUTER SCIENCE & ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

With Exit option (after One year with Undergraduate Certificate in Computer Science and Engineering/Two years with Undergraduate Diploma in Computer Science and Engineering / Three years with Undergraduate Advanced Diploma in Computer Science and Engineering / Four years B.Tech. Computer Science and Engineering (AI & ML)

CURRICULUM

As per NEP 2020 (Effective from Session 2024-25)

School of Engineering & Technology

Dr Swetank Arya	Dr Sanjay Sharma	Mr Pradeep Semwal	Mrs Archana Kero
(External Expert)	(Dean SE&T)	(Asstt Dean SE&T) Asso Prof, SE&T	(Asstt Dean SE&T) Associate Prof., SET

Date: 22 July 2024 **Venue:- SGRR University Dehradun**

(Dr. Pankaj Chamoli) HOD, Physics

Dr Suman Rani (Co-ordinator SET)

Dr. A.S. Bhadauri

Ordnance of
Bachelor of Technology
in
Computer Science & Engineering (Artificial Intelligence and Machine Learning)

Bachelor of Technology in Computer Science & Engineering is an undergraduate degree programme of either 3 or 4-year duration, with multiple entry and exit points and re-entry options, with appropriate certifications such as:

S.No.	Name of Program	Duration of the program	Remarks
1	**Certificate in Computer Science and Engineering** (after completing 1 year with 44 credits)	1 Year	Students who opt to exit after completion of the first year and have secured **44 credits** will be awarded a UG certificate if, in addition, they complete one vocational course/Internship of **4 credits** during the summer vacation of the first year. These students are allowed to re-enter the degree programme within three years and complete the degree programme within the stipulated maximum period of seven years
2	**Diploma in Computer Science and Engineering** (after completing 2-years with 88 credits)	2 Years	Students who opt to exit after completion of the second year and have secured **88 credits** will be awarded the UG diploma if, in addition, they complete one vocational course/Internship of **4 credits** during the summer vacation of the second year. These students are allowed to re-enter within a period of three years and complete the degree programme within the maximum period of seven years.
3	**Undergraduate Advanced Diploma in Computer Science and Engineering** (after completing 3-years with 132 credits)	3 Years	Students who opt to exit after completion of the second year and have secured 132 **credits** will be awarded UG Advanced Diploma, if, in addition, they complete one vocational course/Internship of **4 credits** during the summer vacation of the third year. These students are allowed to re-enter degree programme within a period of three years and complete the degree programme within the maximum period of seven years.
4	**Bachelor of Technology in Computer Science and Engineering (AI & ML)** (after completing 4-years with 176 credits)	4 Years	A four-year UG degree **Bachelor of Technology in Computer Science & Engineering (Artificial Intelligence and Machine Learning)** will be awarded to those who complete a four-year degree programme with **176 credits**.

Eligibility for admission to B. Tech CSE (AI & ML) :

Sr. No.	Eligibility	Mandatory Courses at 10+2 Level
1.	Passed 10+2 examination with Physics/ Mathematics/ Chemistry/ Computer Science/ Electronics/ Information Technology/ Biology/ Informatics Practices/ Biotechnology/ Technical Vocational subject/ Agriculture/ Engineering Graphics/ Business Studies/ Entrepreneurship Obtained at least 45% marks (40% marks in case of candidates belonging to reserved category) in the above subjects taken together. OR Passed D.Voc. Stream in the same or allied sector.	Physics, Mathematics

Duration of the Programme: 4 years

Examination Scheme:

	Internal Assessment		External Assessment (ESE)
Components	Internal Exam	Assignment & Teacher Assessment	
Weightage (%)	15	15	70

Progression Policy

sem	1	2	3	4	5	6	7	8
Promotion	50%	50%	Y	-	-	-	-	-
With	100%	100%	50%	50%	Y	-	-	-
credit	100%	100%	100%	100%	50%	50%	Y	

Programme Outcomes (POs)

S. No.	Program Outcome	Description
PO1	Advanced Computational Knowledge	Apply advanced knowledge of mathematics, science, and engineering to solve complex computational problems
PO2	Innovative Problem Solving	Identify, formulate, and solve engineering problems through innovative methods and creative thinking
PO3	Design and Development	Design, implement, and evaluate computer-based systems, processes, components, or programs to meet desired needs with a focus on innovation and sustainability
PO4	Research and Development	Conduct research and experiments to develop new knowledge and technologies in computing and its applications
PO5	Modern Tool Usage	Utilize modern computing tools and techniques to address and solve real-world problems efficiently
PO6	Interdisciplinary Collaboration	Work effectively in multidisciplinary teams, applying engineering principles to a variety of domains
PO7	Entrepreneurial Skills	Develop entrepreneurial skills to create and manage startups and innovative projects in the tech industry
PO8	Ethical Responsibility	Apply ethical principles and commit to professional responsibilities and norms of engineering practice
PO9	Effective Communication	Communicate effectively in both written and oral forms, including the ability to present complex technical information to a variety of audiences
PO10	Project Management	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO11	Global and Societal Impact	Understand the global, economic, environmental, and societal impacts of computing and demonstrate an ability to develop sustainable solutions
PO12	Life-long Learning	Recognize the need for and engage in independent and life-long learning to keep up with technological changes and advancements in the field

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Basic Structure of B.Tech. Computer Science and Engineering (AI & ML) with Exit option (after One year with Undergraduate Certificate in Computer Science and Engineering/Two years with Undergraduate Diploma in Computer Science and Engineering / Three years with Undergraduate Advanced Diploma in Computer Science and Engineering / Four years B.Tech. Computer Science and Engineering (AI & ML)

Basic Structure of UG Single Core Discipline Program –

Type of Course

Discipline Specific Core (DSC) Discipline
Specific Elective (DSE)General Elective (GE)
Ability Enhancement Courses (AEC)Skill
Enhancement Course (SEC)
Internship/Apprenticeship / Project/ Community
Outreach (IAPC)Value Addition course (VAC)

Sem	Core - Discipline Specific Core (DSC)	Elective- Discipline Specific Elective (DSE)	Elective- Generic Elective (GE)	Ability Enhancement Course (AEC)	Skill Enhancement Course (SEC)	(Internship/ Apprenticeship / Project/ Community Outreach) (IAPC)	Value Addition Course (VAC)	Total Credits
	Course/credit distribution (Credits 4) Theory or Theory + Practicum (3T+1L)	**Course/ credit distribution** (Credits 4) Theory or Theory + Practicum/ Lab (3T+1L or 2T+2L)	**Course/ credit distribution** (Credits 4) Theory or Theory + Practicum/ Lab (Credits 4T or 3T+1L or 2T+2L)	**Course/ credit distribution** (Credits 2)	**Course/credit distribution** (Credits 2)	**Course/ credit distribution** (Credits 2)	**Course/ credit distribution** (Credits 2)	
I	**DSC 1- (4)** **DSC 2- (4)** **DSC 3- (4)** (3T+1L)		Choose one from a pool of courses **GE – 1 (4)**	**AEC – 1 (2)**	Choose one from a pool of courses **SEC – 1 (2)**		Choose one from a pool of courses **VAC – 1 (2)**	22
II	**DSC 4- (4)** **DSC 5- (4)** **DSC 6- (4)** (3T+1L)		Choose one from a pool of courses **GE – 2 (4)**	**AEC – 2 (2)**	Choose one from a pool of courses **SEC – 2 (2)**		Choose one from a pool of courses **VAC – 2 (2)**	22
	Students on exit shall be awarded Undergraduate Certificate (in the field of study/Discipline) after securing requisite 44 credits in semester I & II							***Total credits = 44***

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STUDY & EVALUATION SCHEME
Choice Based Credit System

B.Tech. in Computer Science and Engineering (Artificial Intelligence & Machine Learning)

1st Semester

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (Internal)	External (ESE)	
Theory										
1	Discipline Specific core	BTDSC101	Programmingin 'C'	3	-	-	3	30	70	100
2	Discipline Specific core	BTDSC102	Digital Electronics	4	-	-	4	30	70	100
3	Discipline Specific core	BTDSC103	Engineering Mathematics	4	-	-	4	30	70	100
4	GenericElective (Choose any one)	BTGE101	Engineering Physics	3	-	-	3	30	70	100
		BTGE102	Engineering Mechanics	3	1	-	4			
5	Skill enhancement		Select from the list of Skill enhancement subjects	2	-	-	2	30	70	100
6	Ability enhancement		Select from the list of Ability enhancement subjects	2	-	-	2	30	70	100
7	Value Addition course		Select from the list of Value Addition subjects	2	-	-	2	30	70	100
Practical										
8	Major/Core	BTDSC11P	Lab- Programming in 'C'	-	-	2	1	30	70	100
9	Minor/ Generic Elective	BTGE11P	Lab-Engineering Physics	-	-	2	1	30	70	100
			Total	**20**	**-**	**4**	22	**270**	**630**	**900**

Note: Between the generic electives, Engineering Physics includes practical sessions, whereas Engineering Mechanics does not. In both cases, the total credits amount to 22.

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2nd Semester

S. No	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	C	Sessional (INT)	External (ESE)	
Theory										
1	Discipline Specific core	BTDSC201	Data Structures	3	-	-	3	30	70	100
2	Discipline Specific core	BTDSC202	Computer System Architecture	4	-	-	4	30	70	100
3	Discipline Specific core	BTDSC203	Discrete Mathematics	4	-	-	4	30	70	100
4	Generic Elective (Choose any one)	BTGE201	Engineering Chemistry	3	-	-	3	30	70	100
		BTGE202	Introduction to Electromagnetic Theory	3	1	-	4			
5	Skill enhancement		Select from the list of Skill enhancement subjects	2	-		2	30	70	100
6	Ability enhancement		Select from the list of Ability enhancement subjects	2	-	-	2	30	70	100
7	Value Addition course		Select from the list of Value Addition subjects	2	-	-	2	30	70	100
Practical										
8	Major/Core	BTDSC21P	Lab- Data Structures	-	-	2	1	30	70	100
9	Minor/ Generic Elective	BTGE21P	Lab- Engineering Chemistry	-	-	2	1	30	70	100
			Total	**19**	**1**	**4**	**22**	**270**	**630**	**900**
Exit option after one year with 44 credits to get **Undergraduate Certificate** in **Computer Science and Engineering**				**Total Credits (I & II Sem)**			**44**	**Total Marks (I st & II nd Sem)**		**1800**

Note: Between the generic electives, Engineering Chemistry includes practical sessions, whereas Introduction to Electromagnetic Theory does not. In both cases, the total credits amount to 22.

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Discipline Specific Core

Course code	BTDSC101			
Course Name	Programming in 'C'			
Semester /Year	1st Semester / 1st Year			
	L	T	P	C
	3	0	0	3

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Understand the basics of Programming Paradigms,
2. To learn the basic concepts and syntax of C programming.
3. To be able to develop logics which help them to create programs and applications using C language.
4. To learn the use of C libraries functions in C language.
5. To learn the file handling and basic memory allocation concepts in C language.
6. After learning the C programming, they can easily switch over to any other language

COURSE CONTENTS

UNIT I - Introduction To 'C' Language

History of 'C' language, Programming paradigms: Top-down and Bottom-up, Structure of a C program, Character sets, Constants and variables, Identifiers and keywords. Data types. operators and expressions, Precedence and associativity of operators in 'C'. Type conversion and type casting. Symbolic constants. Input-output library functions -getchar(), putchar(), scanf(), printf(), gets(), puts() etc. C Library- commonly used header files. Conditional control statements- if, if-else, nested if-else, else-if ladder, multiple branching control statements, switch-case. Loop control statements- while, do-while, for, nested loops. Jump control statements- break and continue. goto, exit and return statements.

UNIT II - Arrays and Functions

Arrays: defining an array, passing array to a function, two-dim and multi-dim array, matrix addition and multiplication, multi-dimensional arrays. Strings in 'C'- operations and functions of strings. Storage classes. Functions: Syntax, return value; parameter passing - call by value, call by reference; return statement, calling a function, recursion basics,library functions.

UNIT III - Pointers and preprocessor directives

Pointers- address-off operator, value-at operator, pointer declaration and its use. Passing pointer to a function. Various operations on pointers. pointers and arrays, array of pointers. C-pre-processor- basics, #include, #define, #undef, conditional compilation directive- #if, #else, #elif, #ifdef and #ifndef, #error. Command line arguments in C.

UNIT IV – Structure & Union

Defining a structure, pointer to structures, structure within structure. Array of structures, structure variable and structure pointer. Union- similarity and difference between structure and unions. Dynamic memory management functions- malloc(),calloc(), free(), realloc() etc.

UNIT V - File Handling and Related Functions

FILE data structure. File opening modes- read, write, append and others. Operations on file-open, read, write and close. Appending contents in a binary and text file, unformatted data files. Various library functions- fopen(), read() ,write(), fprintf() and fscanf(), fseek(), ftell() etc.

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Text Books:

TB1. Pointers in C, Kanetkar Y.P., BPB Publications
TB2. Kanetkar Y.P., Let us C, BPB Publications

Reference Books:

RB1. The C programming language, Kernighan and Ritchie, PHI
RB2. The Spirit of C, Cooper Mullish, Jaico Publishing House, Delhi

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Able to understand the basic concepts of C programming language & improve the understanding, remembering of using data types, variables and arithmetic operations in C programming.
CO2	Able to understand Array String, Functions concepts and implement array and string using functions.
CO3	Able to understand the concept of pointer & preprocessor directives. In addition, resolve real world problems and able to design and develop various programming problems using C programming concepts.
CO4	Able to Implement advance C programming concepts like structure and union & dynamic memory allocation by using malloc and calloc function etc.
CO5	Able to analyze, understand the file handling using C Programming language.
CO6	Create & design file handling using C Programming language.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	1	1	1					
CO2	2	2	1	1	1	1	1					
CO3	1	2	2	2	1	1	1	1				
CO4	1	2	2	2	1	1	1					
CO5	2	1	1		1	1	1	2				
CO6	1	1	1		1	1	1					
AVG	**1.5**	**1.5**	**1.5**	**1.1**	**1**	**1**	**1**	**0.5**	**0**	**0**	**0**	**0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

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Course code	BTDSC11P			
Course Name	Lab- Programming In 'C'			
Semester /Year	1st Semester / 1st Year			
	L	T	P	C
	0	0	2	1

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To understand basic concepts of C programming, operators and expressions.
2. To learn the Concept of Various Decision Control statements and loops.
3. To understand the Concept of Arrays and String Operations.
4. To understand Concept of Functions, Pointers, Structure, Union and Enumeration.
5. To understand Concept of File Handling

COURSE CONTENTS

- Simple Program based on operators
- Simple Program based on Loops
- Program based on arrays
- Program based on strings
- Program based on function
- Program based on pointers
- Program based on structure & union
- Program based on File handling

Text Books:

TB3. Pointers in C, Kanetkar Y.P., BPB Publications
TB4. Kanetkar Y.P., Let us C, BPB Publications

Reference Books:

RB3. The C programming language, Kernighan and Ritchie, PHI
RB4. The Spirit of C, Cooper Mullish, Jaico Publishing House, Delhi

CO1	Simple programs to understand & create the concepts of data types, operations and expressions.
CO2	By analyze and applying conditional and control statements.
CO3	Implementing Concept of array and String to solve problem.
CO4	Analyze and Implementation of functions, pointers, operation on pointers and dynamic storage allocation.
CO5	Defining, applying and handling structures, array of structures, union and processing data
CO6	Create & design file handling using C Programming language.

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CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	2	3	2	1					
CO2	2	2	3	2	3	1	2	1				
CO3	1	3	3	2	2	1	1	1			1	
CO4	1	2	3	2	2	1	2	1			1	
CO5	3	1	2	2	2	1	2	1				
CO6	2	1	2	2	2	1	2	1				
AVG	1.8	1.6	2.6	2	2.3	1.1	1.5	0.8	0	0	0.4	0

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	BTDSC102			
Course Name	DIGITAL ELECTRONICS			
Semester /Year	1st Semester / 1st Year			
	L	T	P	C
	4	0	0	4

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To learn basic techniques for the design of digital circuits and fundamental concepts used inthe design of digital systems.
2. To understand common forms of number representation in digital electronic circuits and to beable to convert between different representations.
3. To implement simple logical operations using combinational logic circuits.
4. To design combinational logic circuits, sequential logic circuits.

COURSE CONTENTS

UNIT I: Number Systems: Digital Computer, Number Systems– Number Representation, Binary, Octal, Hexadecimal, Unsigned and Signed Numbers, Arithmetic Operations, Fixed point and Floating-Point representations, Use of different number systems in digital design, Binary Codes– BCD, EBCDIC, ASCII, Unicode, Gray codes, Excess-3, Error Detection and Correction codes.

UNIT II: Boolean Algebra and Digital Logic: Boolean Algebra, Truth Tables, Logic Gates– AND, OR, NOT, NAND, NOR, XOR, Digital Circuit Characterization– Fan-in/Fan-out, Switching Functions, Boolean Functions– Sum of Product and Product of Sum, Karnaugh Maps, Minimization of Boolean Functions, K-Maps with Don't Care, Multiple Output Functions.

UNIT III: Combinational Logic & Circuit Design: Combinational Circuits– Analysis and Design Procedures, Circuits for Arithmetic Operations– Code Conversion, Binary Adder, Binary Subtractor, Decimal Adder, Magnitude Comparator, Decoders and Encoders, Multiplexers and Demultiplexers, Introduction to HDL– HDL Models of Combinational circuits, Introduction to VHDL and Basic VHDL Modelling.

UNIT IV: Sequential Logic & Circuit Design: Sequential Elements– Latches and Flip Flops– Analysis and Design Procedures, Application of Flip Flops– Clock Generation, Counters, Registers, Shift Registers, State Machine Concepts– State Diagram, State Table, State Assignment and State Reduction/Minimization, HDL for Sequential Logic Circuits. Asynchronous Sequential Logic– Analysis and Design of Asynchronous Sequential Circuits, Reduction of State and Flow Tables, Race-free State Assignment, Hazards.

UNIT V: Memory & Programmable Logic Devices: Memory hierarchy, Memory technologies– Cache memory, Virtual memory, TLBs, Design of memory– ROM and RAM, Programmable Logic Array (PLA), Programmable Array Logic (PAL). Different Logic families– TTL, ECL, MOS, CMOS– operation, design and specification.

Textbooks:

1. M. Morris Mano, Digital Logic and Computer Design, Pearson Education, 1sted., 2004.
2. M. Morris Mano, Michael D. Ciletti, Digital Design: With an Introduction to the Verilog HDL, Pearson Education, 5thed., 2014

References:

1. David A. Patterson, John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Morgan Kaufmann, 5thed., 2016.
2. M. Morris Mano, Computer System Architecture, Pearson Education, 3rded., 2008.
3. John F. Wakerly, Digital Design Principles and Practices, Pearson Education, 4thed., 2007.
4. Charles H. Roth Jr, Fundamentals of Logic Design, Jaico Publishing House, 5thed., 2003.
5. Donald D. Givone, Digital Principles and Design, Tata McGraw Hill, 2003.

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Recall the advantages of binary systems and understand different number systems(binary, octal, decimal, hexadecimal). Recall the properties of logic gates and different logic family terminologies. Recall binary arithmetic operations, such as addition, subtraction, multiplication,and division. Recall the representations of signed and unsigned numbers, including signed magnitude, signed 1's complement, and signed 2's complement.
CO2	Explain the significance of binary systems in digital systems. Demonstrate understanding of Boolean algebra and its application in logic circuits.Understand and interpret minterms, maxterms, and Boolean expressions. Explain the concepts and applications of encoders, decoders, multiplexers, and demultiplexers.
CO3	Apply the conversion techniques between different number systems. Apply binary arithmetic operations and perform conversions between differentnumber representations.

	Apply Boolean algebra theorems and Karnaugh's map for logic function simplification. Design and implement combinational circuits using logic gates and multiplexers.
CO4	Analyze complex logic functions and simplify them using Boolean algebra theoremsand Karnaugh's map. Analyze the behavior and functionality of different types of flip-flops and registers.Analyze the operation of synchronous and asynchronous counters.
CO5	Evaluate the correctness and efficiency of logic circuit designs. Evaluate the suitability of different logic gates and components for specificapplications. Evaluate the performance and limitations of sequential circuits. Critically evaluate the design choices made for combinational and sequential circuits.
CO6	Design and create combinational logic circuits to solve specific problems. Design and implement sequential circuits using flip-flops, registers, and counters.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	2	3	2	1					
CO2	2	2	3	2	3	1	2	1				
CO3	1	3	3	2	2	1	1	1			1	
CO4	1	2	3	2	2	1	2	1			1	
CO5	3	1	2	2	2	1	2	1				
CO6	2	1	2	2	2	1	2	1				
AVG	**1.8**	**1.6**	**2.6**	**2**	**2.3**	**1.1**	**1.5**	**0.8**	**0**	**0**	**0.4**	**0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**BTDSC103**			
Course Name	**ENGINEERING MATHEMATICS**			
Semester /Year	**1st Semester / 1st Year**			
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

To provide the students with sufficient knowledge in calculus and matrix algebra, this can be used in theirrespective fields.

COURSE CONTENTS

Unit - I: Linear Equations

Rank of matrix, normal form of a matrix, PAQ form, Gauss Jordan Method of finding the inverse, consistencyof linear system of equations.

Unit - II: Linear transformations and Quadratic forms

Linear transformations, orthogonal transformations, vectors (linearly independent & dependent), eigen values, eigen vectors, properties of eigen values, Cayley - Hamilton theorem (without proof), reduction to diagonal form, reduction of Quadratic form to Canonical form, nature of the Quadratic form.

Unit - III: Single and Multivariable Calculus

Rolle"s theorem, Lagrange"s mean value theorem, Cauchy"s mean value theorem (All theorems without proof). Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, Taylor"s series expansion of two variable function, maxima and minima of functions of two variables, method of Lagrange"s multipliers.

Unit - IV: Multiple Integrals

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves, evaluation of triple integrals, volumes of solids, change of variables between cartesia cylindrical and spherical polar coordinates, calculation of mass, center of gravity.

Unit - V: Special functions

Beta and Gamma functions and their properties, relation between Beta and Gamma functions, evaluation ofdouble and triple integrals by using Beta and Gamma functions, error

Textbooks:

1. B. S. Grewal, "*Higher Engineering Mathematics*", 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, "*Advanced Engineering Mathematics*", 10/e, John Wiley& Sons, 2011.

References:

1. N. P. Bali, "*Engineering Mathematics*", Lakshmi Publications.
2. George B. Thomas, Maurice D. Weir and Joel Hass, "*Thomas Calculus*", 13/e, Pearson Publishers,2013.
3. H. K. Dass, "Advanced Engineering Mathematics", S. Chand and company Pvt. Ltd.
4. Michael Greenberg, "*Advanced Engineering Mathematics*", Pearson, Second Edition.

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Apply elementary transformations to reduce the matrix into the echelon form and normalform to determine its rank and interpret the various solutions of system of linear equations
CO2	Identify the special properties of a matrix such as the eigen value, eigen vector, employorthogonal transformations to express the matrix into diagonal form, quadratic form and canonical form
CO3	Equip themselves familiar with the functions of several variables and mean valuetheorems
CO4	Evaluate double and triple integrals techniques over are going in two dimensional and three dimensional geometry

CO5	Evaluate some proper and improper integrals using beta and gamma functions
CO6	Able to understand the use of special functions

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	1	2	2	1	2	1	1	1
CO2	2	1	1	2	1	1	2	1	2	2	1	1
CO3	1	2	2	2	2	1	2	1	2	2	2	1
CO4	2	1	1	2	2	2	2	1	2	2	2	2
CO5	1	2	2	2	2	2	1	2	2	2	1	1
CO6	2	3	3	1	2	2	2	1	2	2	1	1
AVG	**1.6**	**1.6**	**1.6**	**1.8**	**1.6**	**1.6**	**1.8**	**1.1**	**2**	**1.8**	**1.3**	**1.1**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**BTDSC201**			
Course Name	**DATA STRUCTURES**			
Semester /Year	**2nd Semester / 1st Year**			
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To learn basic knowledge about data structure and arrays.
2. To learn how to create and use linked list and its applications.
3. To learn the importance of static and dynamic use of stack and queues.
4. To learn the basic terminology of trees.
5. To learn basics of sorting and searching techniques

COURSE CONTENTS

Unit –I

Introduction: Basic Terminology, Elementary Data Organization, Structure operations, algorithm Complexity and time-Space trade-off, **Arrays& Linked list**: Array Definition, Representation and Analysis, Single and Multidimensional, Sparse Matrices, Recursive definition and processes, recursion in C, example of recursion, Tower of Hanoi, Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array

Unit – II

Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation

of postfix expression using stack. **Queues:** Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, D-queues and Priority Queues.

Unit – III

Trees: Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, path length algorithm. Huffman Algorithm. Binary Search Tree (BST), Insertion and Deletion in BST.

Unit – IV

Sorting: Selection sort, Bubble sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort.
Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies.

Unit – V] **Introduction to Graphs:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, **File Structures**: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing.

Text Books:

1. Lipschutz, "Data Structure", TMH

Reference Books:

1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia
2. R. Kruse etal, "Data Structures and Program Design in C" Pearson Education

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Able to understand and remember basics of C programming language and arrays & able to apply basic concepts of linked list & its types
CO2	Able to understand and apply basic concepts of stack and queues through array and linked list
CO3	To understand and apply the basic knowledge of Binary trees & its representation, traversing in BST, Threaded binary tree, Huffman algorithm etc.
CO4	Able to understand the concepts of sorting.
CO5	To understand &apply searching & Hashing techniques
CO6	Create the structure of different types of graphs

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2					1		1
CO2	2	2	2	2	2					1		1
CO3	2	2	2	2	2					1		1
CO4	2	2	2	2	2					1		1
CO5	2	2	2	2	2					1		1
CO6	2	2	2	2	2					1		1
AVG	**2**	**2**	**2**	**2**	**2**					**1**		**1**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**BTDSC21P**			
Course Name	**Lab- DATA STRUCTURES**			
Semester /Year	**2nd Semester / 1st Year**			
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To learn how to design the algorithms to solve the programming problems.
2. To learn how to discriminate the usage of various structures in approaching the problem solution.
3. To learn how to use effective and efficient data structures in solving various Computer Engineering domain problems
4. To learn how to analyse the problems to apply suitable algorithm and data structure.
5. To learn how to use appropriate algorithmic strategy for better efficiency

COURSE CONTENTS

- Program based on arrays
- Program based on strings
- Program based on Link List & types of Link List
- Program based on stack
- Program based on Queues
- Program based on Trees
- Program based on different types of sortings
- Program based on Graphs

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Analyze & understand the difference between linear and non linear DS & implement array & link list and its types

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CO2	Understand and implement stack and queues using array and link list
CO3	Understand and implement BST, addition and deletion of nodes, Huffman algorithm etc.
CO4	To implement different sorting techniques like selection Bubble, insertion, merge quick sort etc.
CO5	To understand and implement linear and binary search
CO6	To create and implement of graphs like directed and undirected graphs etc

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2					1		1
CO2	2	2	2	2	2					1		1
CO3	2	2	2	2	2					1		1
CO4	2	2	2	2	2					1		1
CO5	2	2	2	2	2					1		1
CO6	2	2	2	2	2					1		1
AVG	**2**	**2**	**2**	**2**	**2**					**1**		**1**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**BTDSC202**			
Course Name	**COMPUTER ORGANIZATION & ARCHITECTURE**			
Semester /Year	**2nd Semester / 1st Year**			
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To understand the structure, function and characteristics of computer systems.
2. To understand the design of the various functional units and components of computers.
3. To identify the elements of modern instructions sets and their impact on processordesign.
4. To explain the function of each element of a memory hierarchy.
5. To identify and compare different methods for computer I/O

COURSE CONTENTS

Unit 1: Introduction to Computers

Basics of Computer, Von Neumann Architecture, Generation of Computer, Classification of Computers, Instruction Execution, Register Transfer and Micro operations- Register Transfer, Bus and Memory Transfers, Tree-State Bus Buffers, Memory Transfer, Micro-Operations, Register Transfer Micro-Operations, Arithmetic Micro-Operations, Logic Micro-Operations,

Shift Micro-Operations.

Unit 2: Computer Arithmetic
Addition and Subtraction with Signed-Magnitude, Multiplication Algorithm, Booth Multiplication Algorithm, Fixed Point and IEEE floating-point number representation.

Unit 3: Control Unit Organization
Hardwired and Microprogrammed Control Unit, CPU Organization- Types, Instruction Formats, Three - Address Instructions, Two – Address Instructions, One-Address Instructions, Zero Address Instructions, Addressing modes, CISC Characteristics vs. RISC Characteristics, Pipelining - Arithmetic Pipeline & Instruction Pipeline.

Unit 4: Memory Organization
Memory Hierarchy, Main Memory, Auxiliary Memory, Cache Memory, Virtual Memory. Address Space and Memory Space, Associative Memory, Page Table, Page Replacement.

Unit 5: Input-Output Organization
- Modes of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPU-IOP Communication.

Text Books:
1. M. M. Mano, Computer System Architecture Digital Design, 3rd ed., PearsonEducation, Delhi, 2007.
2. T. Radhakrishnan and V. Rajaraman – Computer Organization & Architecture,PHI, 2004

Reference Books:
1. D.P. Leach, A. P. Malvino, Goutam Guha, Digital Principles and Applications,Tata Mc-Graw Hill, New Delhi, 2011.
2. R.J. Tocci and N.S. Widner, Digital Systems - Principles & Applications,PHI, 10th Ed., 2007

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Outline the principles of computer design and understand the basicorganization of computer and BUS architecture of the system.
CO2	Understand the digital representation of data in a computer system and performing arithmetic calculations on data.
CO3	Demonstrate the different types of control logic designs in processors, instruction set principles and instruction format.
CO4	Illustrate the effect of addressing modes on the execution time of aprogram.
CO5	Summarize the concepts of memory system, memory mapping. Evaluatethe computer memory types based on performance and cost and interpret replacement algorithms.

CO6	Integrate the concepts of input/output organization, differentcommunication schemes and data transfer modes.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	2	-	-	-	2	-	-
CO2	3	2	2	2	-	2	-	-	-	1	-	-
CO3	3	2	2	2	-	1	-	-	-	1	-	-
CO4	2	1	1	1	-	1	-	-	-	1	-	-
CO5	2	1	1	1	-	1	-	-	-	1	-	-
CO6	3	2	2	2	-	1	-	-	-	1	-	-
AVG	**2.7**	**1.7**	**1.7**	**1.7**	**0.0**	**1.3**	**0.0**	**0.0**	**0.0**	**1.2**	**0.0**	**0.0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**BTDSC203**			
Course Name	**DISCRETE MATHEMATICS**			
Semester /Year	**2nd Semester / 1st Year**			
	L	**T**	**P**	**C**
	4	**0**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Familiarize the students with the basic mathematical concepts and numerical methods.
2. To understand the concepts and results in Mathematical logic, Number theory, Group theory and Numerical methods.

COURSE CONTENTS

Unit I: Proposition and Logic

Propositions and Compound Propositions, Logical Operations, Truth tables, Tautologies and Contradictions, Logical Equivalence, Algebra of propositions, Conditional and Bi-conditional Statements Arguments, Logical Implications. Quantifiers, Negation of Quantified Statements, Basic Counting Principles, Factorial, Binomial Coefficient, Permutations, Combinations Pigeonhole Principle

Unit-2 Mathematical Induction

Order and inequalities, Mathematical Induction, Division Algorithm, Divisibility, Euclidean Algorithm Fundamental theorem of Arithmetic, Congruence relation, Congruence Equations, Semigroups, Groups, Subgroups, Normal subgroups, Homomorphisms, Rings

Unit-3 Recurrence Relations

Towers of Hanoi, Iterations, Homogeneous linear equations with constant coefficients, particular solution, difference table, finite order differences, Line in a plane in general position

Unit-4 Graph Theory

Paths, connectivity, subgraphs, isomorphism, trees, complete graphs, bipartite graphs, matching colourability, planarity, digraphs;

Unit-5 Classification of Languages
Overview of Formal Languages: Representation of regular languages and grammars, finite state Machines, Push Down Automata

Text Books:

1. Seymour Lipschutz and Marc Lipson– Discrete Mathematics– Second Edition – Tata McGraw Hill Edition– 2002.
2. Schaums Series – Discrete Mathematics – 2nd Edition.

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Solve an argument using logical notation like prepositional logic and determine if the argument is or is not valid. Learn about permutation and combination and also Pigeonhole Principle.
CO2	Illustrate the basic principle of mathematical induction and also understand the algebraic structure related to the groups, and elementary properties of Rings and Fields.
CO3	Evaluate the problem using recurrence relations and Homogenous and Non homogenous equation, Line in a plane in general position and tower of Hanoi problem.
CO4	Design and learn about basic concepts of graph, connectivity, subgraphs, isomorphism, trees, complete graphs, bipartite graphs, matching colourability, planarity, digraphs.
CO5	To understand algorithm Fundamental theorem of Arithmetic, Congruence relation, Congruence Equations.
CO6	To understand the overview of Formal Languages: Representation of regular languages and grammars, finite state Machines

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	1	2	2	1	2	1	1	1
CO2	2	1	1	2	1	1	2	1	2	2	1	1
CO3	1	2	2	2	2	1	2	1	2	2	2	1
CO4	2	1	1	2	2	2	2	1	2	2	2	2
CO5	1	2	2	2	2	2	1	2	2	2	1	1
CO6	2	3	3	1	2	2	2	1	2	2	1	1
AVG	**1.6**	**1.6**	**1.6**	**1.8**	**1.6**	**1.6**	**1.8**	**1.1**	**2**	**1.8**	**1.3**	**1.1**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

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Generic Electives

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Generic Electives

Couse Code	Course Name	L	T	P	C
BTGE101	Engineering Physics	3	-	-	3
BTGE11P	Lab-Engineering Physics	-	-	2	1
BTGE102	Engineering Mechanics	3	1	-	4
BTGE201	Engineering Chemistry	3	-	-	3
BTGE21P	Lab- Engineering Chemistry	-	-	2	1
BTGE202	Introduction to Electromagnetic Theory	3	1	-	4

Course code	**BTGE101**			
Course Name	**ENGINEERING PHYSICS**			
Semester /Year	**2nd Semester / 1st Year**			
	L	**T**	**P**	**C**
	3	**0**	**0**	**3**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

COURSE CONTENTS

1. To introduce the student to the basic of wave optics, lasers, and demonstrate their applications in technology.
2. To make students aware about quantum physics phenomena.
3. Give the beginning student an appreciation of recent developments in materials science & engineering within the framework of this class.
4. To review physics in the context of materials science & engineering.
5. Give an introduction to the relation between processing, structure, and physical properties.
6. To make the students aware about Electromagnetic wave fundamentals

COURSE CONTENTS

Unit 1: Interference: Coherent Sources, Conditions of Interference, Fresnel's Biprism Experiment, Interference in Thin Films, Newton's Rings; Single and n-Slit Diffraction, Diffraction Grating, Raleigh's Criterion of Resolution, Resolving Power of Telescope, Phenomenon of Double Refraction, Ordinary and Extra-ordinary Rays, Nicol Prism, Circularly and Elliptically Polarized Light, Fresnel Theory, Optical Activity, Specific Rotation; Laser: Principle of Laser Action, Einstein's Coefficients, Construction and Working of He-Ne and Ruby Laser, Applications of Laser.

Unit 2: Black body radiation, Planck's Radiation Law, Wave Particle Duality, de-Broglie

hypothesis, Photoelectric effect, Wave Function and its Normalization, Born Interpretation, Schrodinger equation, Particle in a Box, Potential Step (E < Vo), Tunneling effect (Qualitative idea).

Unit 3: Introduction to crystal structure of materials, Miller indices for crystallographic planes and directions. Diffraction of X-Rays, Bragg's Law, Determination of crystal structure using X-rays Diffraction and its applications. Defects in solids: point, line and planar defects and their effect on properties of materials. Band theory of solids, conductors, semi-conductors and insulators, metals. Fermi Level. Magnetism: dipole moments, paramagnetism, Curie's law, magnetization and hysteresis, Ferromagnetism and Anti- Ferromagnetism. Ferro electricity and Piezoelectricity. Superconductivity in materials.

Unit 4: Ampere's Law and Displacement Current, Maxwell's Equations in Integral and Differential Forms, Electromagnetic Wave Propagation in Free Space and Conducting Media, Poynting Theorem.

Textbooks:

1. Gaur, Gupta, "Engineering Physics"
2. Callister W.D., "Materials Science and Engineering: An introduction", 6th Edition, John Wiley & Sons Inc., New York 2002.

References:

1. J. R. Taylor, C.D. Zafiratos and M. A. Dubson, Modern Physics for Scientists and Engineers,2nd Pearson
2. Arthur Beiser, Concepts of Modern Physics, 6th Ed., TMH, (2009)
3. D.J. Griffith : Electrodynamics
4. Charles Kittel, Introduction to Solid State Physics,
5. S.O. Pillai, Solid State Physics,
6. Ajoy Ghatak- Optics

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Demonstrate interference, diffraction and polarization of light and explain the working principle of Lasers.
CO2	Student will understand quantum mechanical aspects of physics.
CO3	Enable to explain the phenomenon of crystal structure and crystallographic, qualitatively description of X-ray diffraction and its general physical properties, as well as possible applications.
CO4	Students will understand the phenomenon of defects in solids and their physical properties, band theory of solids and classification of energy bands, electric and magnetic properties of solids and able to explain qualitative idea of superconductivity in materials.

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CO5	This will enable the students to learn physical concepts associated with electromagnetic radiation and devices.
CO6	Use Maxwell's equations to describe propagation of EM waves in a medium.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	1	2	2	1	2	1	1	1
CO2	2	1	1	2	1	1	2	1	2	2	1	1
CO3	1	2	2	2	2	1	2	1	2	2	2	1
CO4	2	1	1	2	2	2	2	1	2	2	2	2
CO5	1	2	2	2	2	2	1	2	2	2	1	1
CO6	2	3	3	1	2	2	2	1	2	2	1	1
AVG	**1.6**	**1.6**	**1.6**	**1.8**	**1.6**	**1.6**	**1.8**	**1.1**	**2**	**1.8**	**1.3**	**1.1**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**BTGE11P**			
Course Name	**LAB- ENGINEERING PHYSICS**			
Semester /Year	**2nd Semester / 1st Year**			
	L	**T**	**P**	**C**
	0	**0**	**2**	**1**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

To make students aware about experimental verification behind the theory, familiarize the student to the basic of spectroscopy, lasers, and semiconductor lab experiment and demonstrate their applications. Give the brief introduction about the Planck's constant, Hall Effect, Ohm's law, Thomson's experiment, conversion of Galvanometer to Voltmeter and Ammeter and unknown resistance using post office box

COURSE CONTENTS

1. To determine refractive index of glass and liquid using spectrometer.
2. To determine the wavelength of spectral lines using plane diffraction grating (Use Hg source).
3. To determine the wavelength of sodium light by Newton's Ring method.
4. To measure an accessible (Horizontal and vertical) height using sextant.
5. Determination of wavelength of He-Ne laser using single slit /N slit diffraction pattern.
6. To study the photoelectric effect and determine the value of Planck's constant.
7. To determine the heating efficiency of an electric kettle with varying voltage.
8. To Determine the wavelength of the semiconductor diode laser.
9. Measurement of forward/reverse saturation current in p-n-junction diode at various temperatures and to find the approximate value of energy gap.
10. To study the Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material.
11. To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility
12. Measurement of e/m of electron e/m- Thomson's Experiment

13. To verify Ohm's law.
14. Conversion of Galvanometer into Voltmeter and Ammeter.
15. To determine the unknown resistance by a post office box.

References:

1. Practical Physics, C.L. Arora, S. Chand & Co.
2. Engineering Practical Physics, S.Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
3. Advanced Practical Physics for students, B.L. Flint & H.T. Worsnop, 1971, Asia Publishing House.
4. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
5. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	After Demonstration the student will able to perform the experiment and learn about the practical knowledge of various theory part. Enable to find the efficiency of electric kettle, band gap of materials, behaviour of semiconductor, charge density and hysteresis curve in ferromagnetic materials
CO2	Student will enable to find the refractive index of material, wavelength of monochromatic source of light.
CO3	Enable to find the efficiency of electric kettle, band gap of materials, behaviour of semiconductor, charge density and hysteresis curve in ferromagnetic materials
CO4	Students will understand the phenomenon of defects in solids and their physical properties, band theory of solids and classification of energy bands, electric and magnetic properties of solids and able to explain qualitative idea of superconductivity in materials.
CO5	This will enable the students to learn physical concepts associated with electromagnetic radiation and devices.
CO6	Use Maxwell's equations to describe propagation of EM waves in a medium.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	1	2	2	1	2	1	1	1
CO2	2	1	1	2	1	1	2	1	2	2	1	1
CO3	1	2	2	2	2	1	2	1	2	2	2	1
CO4	2	1	1	2	2	2	2	1	2	2	2	2

CO5	1	2	2	2	2	2	1	2	2	2	1	1
CO6	2	3	3	1	2	2	2	1	2	2	1	1
AVG	**1.6**	**1.6**	**1.6**	**1.8**	**1.6**	**1.6**	**1.8**	**1.1**	**2**	**1.8**	**1.3**	**1.1**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**BTGE102**			
Course Name	**Engineering Mechanics**			
Semester /Year	**2nd Semester / 1st Year**			
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

COURSE CONTENTS

1. To understand distributed force systems, centroid/ center of gravity and method of finding centroids of composite figures and bodies.
2. To understand the moment of inertia and method of finding moment of inertia of areas and bodies.
3. To understand types of frames and analyze for the forces in the members of the truss by method of joints and method of sections.
4. To understand dynamics of a particle.
5. To interpret the simple given dynamic problems and solve them for positions, velocities and accelerations, etc.,
6. To understand the kinetics of the rigid bodies and solve simple problems using work-energy method.
7. To understand virtual work method and solve simple problems

COURSE CONTENTS

Unit 1: Force System

Introduction: Force system, dimensions and units in mechanics, laws of mechanics, vector algebra, addition and subtraction of forces, cross and dot products of vectors, moment of a force about a point and axis, couple and couple moment, transfer of a force to a parallel position, resultant of a force system using vector method, Problems involving vector application Equilibrium: Static and dynamic equilibrium, static in determinacy, general equations of equilibrium, Varingnon's theorem, Lami's theorem, equilibrium of bodies under a force system, Problems.

Unit 2: Truss and Frames: Truss, classification of truss, assumptions in truss analysis, perfect truss, analysis of perfect plane truss using method of joints and method of sections, Problems.

Unit 3: Centre Of Gravity and Moment of Inertia

Centroid, Centre of mass and Centre of gravity, Determination of centroid, centre of mass and centre of gravity by integration method of regular and composite figures and solid objects,

Problems, Moment of Inertia: Area moment of inertia, mass moment of inertia, parallel axis and perpendicular axis theorems, radius of gyration, polar moment of inertia, product of inertia, pr87xinciple axis, problem based on composite figures and solid objects.

Unit 4: Friction and Virtual Work

Friction-characteristics of dry friction, problems involving friction of ladder, wedges and connected bodies. Definition of virtual work, principle of virtual work for a system of connected bodies

Unit 5: Kinematics And Dynamics

Kinematics: Concept of rigid body, velocity and acceleration, relative velocity, translation and rotation of rigid bodies, equations of motion for translation and rotation, problems. Particle Dynamics: Energy methods and momentum methods, Newton's laws, work energy equation for a system of particles, linear and angular momentum equations, projectile motion, problem.

Textbooks:

1. R S Khurmi, "Engineering Mechanics".
2. P K Nag "Engineering Thermodynamics".

References:

1. Van Wylen G.J. & Sonnlog R.E.: Fundamentals of classical thermodynamics, John Wiley & Sons,Inc. NY.
2. Wark Kenneth: Thermodynamics (2nd edition), Mc Graw Hill book Co. NY.
3. Holman, J.P.: Thermodynamics, MC Graw Hill book Co. NY.
4. Yadav R.: Thermodynamics and Heat Engines, Vol I & II (Sl Edition) Central Publishing House Allahabad.

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Identify the significance of centroid/ center of gravity and find centroids of composite figures and bodies.
CO2	Understand the moment of inertia and method of finding moment of inertia of areas and bodies.
CO3	Identify the type of frame and analyze for the forces in the members of the truss (frame) by method of joints and method of sections.
CO4	Understand dynamics of a particle.
CO5	Interpret the simple given dynamic problems and solve them for positions, velocities and accelerations, etc.,
CO6	Understand the kinetics of the rigid bodies and solve simple problems using work-energy method. Understand virtual work method and solve simple problems.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	1	2	2	1	2	1	1	1
CO2	2	1	1	2	1	1	2	1	2	2	1	1
CO3	1	2	2	2	2	1	2	1	2	2	2	1
CO4	2	1	1	2	2	2	2	1	2	2	2	2
CO5	1	2	2	2	2	2	1	2	2	2	1	1
CO6	2	3	3	1	2	2	2	1	2	2	1	1
AVG	1.6	1.6	1.6	1.8	1.6	1.6	1.8	1.1	2	1.8	1.3	1.1

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	BTGE201			
Course Name	ENGINEERING CHEMISTRY			
Semester /Year	2nd Semester / 1st Year			
	L	T	P	C
	3	0	0	3

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Chemical bonding, which deals with different types of chemical bonds present in vari chemical compounds and biological molecules, will cover bonding, structure, geometry, hybridization of various molecules.
2. Studying this topic the students will learn about the extraction and production of oil and to meet energy needs, as well as refining of crude oil into several value-added products.
3. To get knowledge about water quality parameters and find ways to make water suita for domestic and industrial uses.
4. Pollution, different types of polluting agent is incorporated to make the student aware waysto keep atmosphere pollution free.
5. Electrochemistry deals with conductance in electrolytic solutions and its applications.
6. The objective of introducing polymer is to provide an overview of the fundamentals polymer science and engineering, including the chemical structure of polymers, tl methods of preparation, and a variety of properties exhibited by polymers.

COURSE CONTENTS

Unit-1: Chemical Bonding

Ionic and covalent bonds; valence bond theory (VBT) of covalency-atomic orbitals and tl overlap, hybridization of orbitals-definition, types, associated geometries, VSEPR theory, shape simple molecules like H_2O, CO_2, NH_3, CH_4, C_2H_6, C_2H_2 BF_3, PCl_5, SF_6, inter-halogen and noble compounds in the light of the hybridization state of the central atom and VSEPR effects; molecı

orbital theory (MOT) - concept of molecular orbitals, molecular orbital energy level diagra homonuclear diatomic molecules (like He_2, O_2, N_2) and their molecular ions; bond order, b length and magnetic properties; non-covalent interactions: van der Waals and hydrogen bond and their effect over physical properties.

Unit-2: Fuels

Definition and classification of fuels; characteristics of good fuel; comparison among solid, liq and gaseous fuels; calorific value of fuels-definition, units, higher and lower calorific valu determination of the calorific value of a solid fuel by bomb calorimeter; solid fuel: coal- ori types; proximate and ultimate analysis; liquid fuel: petroleum- origin, refining of crude cracking; isomerization; catalytic hydrogenation; desulfurization; synthetic petrol; synthesis gasoline: octane number; cetane number. Numerical problems.

Unit-3: Water

Introduction; hardness of water: causes, types, units, disadvantages of using hard water for dome and industrial purposes (e.g., scale and sludge formation in boilers, caustic embrittlement, bo corrosion, etc.); softening of hard water (lime Fischer-Tropsch and Bergius methods knockin soda, permutit and ion- exchange processes); chemical analysis of water- estimation of chlorine, total alkalinity, hardness and dissolved oxygen. Numerical on hardness.

Unit-4: Pollution and its Control

Pollution-introduction, air pollutants, particulates, smog, photochemical smog, acid rain, gr house effects; ozone layer depletion; analysis of gaseous effluents-oxides of nitrogen, oxides Sulphur and H_2S; chemical analysis of effluent liquid streams; BOD, COD; control of air polluti particulate emission, gaseous pollutants.

Unit-5: Electrochemistry

Arrhenius theory of electrolytic dissociation; electrolytes, classification; degree of dissociati dissociation constant of weak acids; conductance of solutions-specific, molar and equiva conductance, variation of molar conductance with dilution for strong and weak electroly Kohlrausch's law of independent migration of ions; Ostwald's dilution law; Nernst equation single electrode and electrochemical cells; concept of pH and pOH; buffer solutions; solubi product; common ion effect; indicators and theory of acid-base indicators; Photoelectric effect solar cells. Numericals.

Unit-6: Polymer Chemistry

Introduction; types of polymerization; classification of polymers based on chain characterist source, method of synthesis and molecular forces involved; mechanism of polymerizat reaction; glass transition and crystalline melting point temperatures; factors influencing g transition and crystalline melting point temperatures; preparation, properties and uses of following-polyethylene, PVC, polystyrene, PAN, Teflon, nylon-6:6, polyester, rubber-monon structure, compounding of rubber, vulcanization, synthetic rubbers-Buna-S, Buna-N, neopre butyl rubber and polyurethanes, weight average and number average molecular weight (express and numerical problems), PDI.

Reference Books:

1. Shashi Chawla, A Text Book of Engineering Chemistry, 3rd Edition, Dhanpat Rai & Co., New Delhi, 2007.
2. Jain and Jain, Engineering Chemistry, 15th Edition, Dhanpat Rai Publishers.

3. Dr S. Vairam and Dr. Suba Ramesh, Engineering Chemistry, 1st Edition, Wiley-India, Ne Delhi.
4. S. S. Dhara, A Text book of Engineering Chemistry,11th Edition, S Chand & Co. Ltd., Ne Delhi

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	To predict the structure and properties of different materials using the knowledg of chemical bonding.
CO2	Knowledge on conventional and non-conventional energy sources and future energy resources in sustainable development.
CO3	Develop novel systems to analyze water for domestic and industrial use at very lo cost.
CO4	Knowledge of contemporary environmental issues and adverse effects of pollutionto living forms and ways to keep problems arising from pollution at bay.
CO5	Acquire the knowledge of electrochemistry and its principles and apply the same to various disciplines.
CO6	Comprehend idea about the synthesis and applications of polymers.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2		-	-	-	-	-	-	-	-	-
CO2	-	2		-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5		2	2									
CO6												3
AVG	0.5	1	0.3									0.5

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

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Course code	BTGE21P			
Course Name	LAB- ENGINEERING CHEMISTRY			
Semester /Year	2nd Semester/ 1st Year			
	L	T	P	C
	0	0	2	1

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Students will learn laboratory techniques in chemistry, carrying out practical's and todetermine the quality of water sample.
2. Analytical estimation of metal ions in supplied chemical compound.
3. By applying their practical knowledge student will get exposure to the Chemical Industry.

COURSE CONTENTS

1. Preparation of primary standard solution (oxalic acid, $K_2Cr_2O_7$).
2. Preparation and standardization of solution (NaOH, HCl, $KMnO_4$).
3. Determination of total hardness of water sample by complexometric titration method.
4. Estimation of total amount of chloride present in a water sample through argentometrictitration method.
5. Estimation of carbonate and bicarbonate alkalinity of a water sample by acid base titrationmethod.
6. Determination of iron present in Mohr's salt solution by redox titration.
7. Estimation of acetic acid present in commercial vinegar sample.
8. Determination of alkali content in a given antacid tablet through acid base titration method.
9. Synthesis of aspirin.
10. Separation of caffeine from tea powder.

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Develop expertise in preparing and standardizing primary standard and titrant solutions.
CO2	Acquire analytical skills for preparation of chemicals and estimation of material constituents.
CO3	Gain proficiency in estimating metal ions such as iron using redox titration techniques.
CO4	Apply analytical techniques to estimate the content of acetic acid in vinegar and alkali in antacid tablets

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CO5	Demonstrate practical knowledge in synthesizing aspirin and extracting caffeine from tea.
CO6	Prepare for chemical industry roles through hands-on experience in laboratory techniques and analytical methods.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	3	1	1	3	1	-	-	3
CO2	3	3	1	1	3	1	1	3	-	1	2	3
CO3	3	3	1	1	3	1	1	3	-	1	2	3
CO4	3	3	1	-	3	1	1	3	1	1	2	3
CO5	3	3	3	-	3	1	-	3	-	2	2	3
CO6	3	3	3	3	3	3	3	3	3	3	3	3
AVG	**3**	**2.8**	**1.7**	**1**	**3**	**1.3**	**1.2**	**3**	**0.8**	**1.3**	**1.8**	**3**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**BTGE202**			
Course Name	**INTRODUCTION TO ELECTROMAGNETIC THEORY**			
Semester /Year	**2nd Semester/ 1st Year**			
	L	**T**	**P**	**C**
	3	**1**	**0**	**4**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

COURSE CONTENTS

1. Understand and apply the principles of electrostatics, magnetostatics, Faraday's law, displacement current, and Maxwell's equations.
2. Analyze the behavior of electric and magnetic fields in vacuum and in dielectric media.
3. Apply mathematical tools such as vector calculus (divergence, curl, Stokes' theorem) to analyze electromagnetic fields.
4. Solve practical problems involving electrostatics, magnetostatics, Faraday's law, and electromagnetic waves.
5. Interpret and apply boundary conditions for electric and magnetic fields in various scenarios.
6. Explore the physical implications of electromagnetic theory, including energy and momentum aspects of electromagnetic waves.

COURSE CONTENTS

Unit 1: Electrostatics in vacuum

Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction;

Practical examples like Faraday's cage and coffee-ring effect; Boundary conditions of electric field and electrostatic potential; method of images; energy of a charge distribution and its expression in terms of electric field. Electrostatics in a linear dielectric medium Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; Solving simple electrostatics problems in presence of dielectrics - Point charge at the centre of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field.

Unit 2: Magnetostatics

Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.

Unit 3 : Faraday's law

Faraday's law in terms of EMF produced by changing magnetic flux; equivalence of Faraday's law and motional EMF; Lenz's law; Electromagnetic breaking and its applications; Differential form of Faraday's law expressing curl of electric field in terms of time-derivative of magnetic field and calculating electric field due to changing magnetic fields in quasi-static approximation; energy stored in a magnetic field.

Unit 4: Displacement current, Magnetic field due to time-dependent electric field and Maxwell's equations

Continuity equation for current densities; Modifying equation for the curl of magnetic field to satisfy continuity equation; displace current and magnetic field arising from time dependent electric field; calculating magnetic field due to changing electric fields in quasistatic approximation. Maxwell's equation in vacuum and non-conducting medium; Energy in an electromagnetic field; Flow of energy and Pointing vector with examples. Qualitative discussion of momentum in electromagnetic fields.

Unit 5: Electromagnetic waves

The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples. Momentum carried by electromagnetic waves and resultant pressure. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

Laboratory - Introduction to Electromagnetic Theory

Choice of experiments from the following:

- Experiments on electromagnetic induction and electromagnetic breaking; LC circuit and LCR circuit;
- Resonance phenomena in LCR circuits;
- Magnetic field from Helmholtz coil;
- Measurement of Lorentz force in a vacuum tube.

TEXTBOOKS

1. David Griffiths, Introduction to Electrodynamics
2. Halliday and Resnick, Physics

REFERENCES:

1. W. Saslow, Electricity, magnetism and light
2. A.B. Bhattacharya, Engineering Physics

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Understand and apply the principles of electrostatics, magnetostatics, Faraday's law, displacement current, and Maxwell's equations. Analyze the behavior of electric and magnetic fields in vacuum and in dielectric media. Develop proficiency in solving problems related to static and dynamic electromagnetic phenomena.
CO2	Solve complex problems involving time-varying electric and magnetic fields using Maxwell's equations and the continuity equation. Calculate the electric and magnetic fields in different scenarios, such as wave propagation and reflection/transmission at interfaces.
CO3	Evaluate the connection between electrostatics and thermal conduction/diffusion, as well as practical examples like the Faraday's cage and the coffee-ring effect. Analyze the energy aspects of electromagnetic fields and relate them to practical applications such as electromagnetic braking and energy transmission.
CO4	Apply advanced mathematical techniques including vector calculus (divergence, curl, Stokes' theorem) to analyze and solve electromagnetic problems. Demonstrate proficiency in handling boundary value problems and applying appropriate boundary conditions for electric and magnetic fields.
CO5	Lay the groundwork for understanding electromagnetic wave propagation, including wave equations, polarization, energy, and momentum carried by electromagnetic waves. Discuss qualitative aspects of momentum in electromagnetic fields and its implications
CO6	Integrate theoretical concepts with practical examples and applications in electromagnetism, enhancing understanding and problem-solving skills. Apply electromagnetic theory to interpret experimental results and predict behaviors in various electromagnetic phenomena.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2					1		1
CO2	2	1.5	2	1.5	2					1		1
CO3	2	2	2	2	2					1		1
CO4	2	2	2	2	2					1		1
CO5	2	2	2	1.5	2					1		1
CO6	2	2	2	2	2					1		1
AVG	**2**	**2**	**2**	**2**	**2**	**0**	**0**	**0**	**0**	**1**		**1**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

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Skill EnhancementCourses

Skill Enhancement courses

Couse Code	Course Name	L	T	P	C
BTSC101	Personality Development and Soft Skills	2	-	-	2
BTSC12P	Internet Technology-I	1	-	2	2
BTSC201	Leadership Skills	2	-		2
BTSC22P	Internet Technology-II	1	-	2	2
	Total	**2**	**-**	**2**	**4**

Course code	BTSC101			
Course Name	PERSONALITY DEVELOPMENT AND SOFT SKILLS			
Semester /Year	1st Semester / 1st Year			
	L	T	P	C
	2	0	0	2

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1 Develop effective communication skills, both verbal and non-verbal.
2 Enhance interpersonal skills for building and maintaining positive relationships.
3 Cultivate self-awareness and personal development to enhance professional growth.
4 Acquire problem-solving and decision-making abilities in various contexts.
5 Develop ethical and professional behavior in personal and team settings.
6 Adapt to new technologies and embrace lifelong learning for continuous growth.

COURSE CONTENTS

Unit 1: Introduction to Personality Development

Understanding the concept of personality, Factors influencing personality development, Self-awareness and self-assessment, Personality traits and characteristics,

Unit 2: Communication Skills

Verbal and non-verbal communication, Effective listening skills, Public speaking and presentationskills, Interpersonal communication and conflict resolution

Unit 3: Interpersonal Skills

Building and maintaining relationships, Teamwork and collaboration, Emotional intelligence andempathy, Assertiveness and negotiation skills

Unit 4: Time Management and Organization
Setting goals and priorities, Managing time effectively, Prioritizing tasks and resources. Organizational skills and productivity enhancement

Unit 5: Professionalism and Etiquette
Business etiquette and professional behavior, Dressing and grooming standards, Workplace ethicsand professionalism, Networking and building professional relationships

Unit 6: Leadership and Management Skills
Leadership styles and qualities, Decision-making and problem-solving skills, Team management and delegation, Conflict management and resolution

Unit 7: Stress Management and Emotional Well-being
Understanding stress and its impact, Coping mechanisms and stress reduction techniques. Work- life balance, Building resilience and managing emotions

Text Books:

1. "The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change" by Stephen R. Covey
2. "Emotional Intelligence: Why It Can Matter More Than IQ" by Daniel Goleman
3. "Crucial Conversations: Tools for Talking When Stakes Are High" by Kerry Patterson,Joseph Grenny, Ron McMillan, and Al Switzler
4 "The Power of Now: A Guide to Spiritual Enlightenment" by Eckhart Tolle
5. "How to Stop Worrying and Start Living" by Dale Carnegie
6. "Influence: The Psychology of Persuasion" by Robert Cialdini

Reference Books:

1. "How to Win Friends and Influence People" by Dale Carnegie
2. "The Art of Public Speaking" by Stephen E. Lucas
3 "Soft Skills: The Software Developer's Life Manual" by John Sonmez
4. "Mindset: The New Psychology of Success" by Carol S. Dweck

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Recall and describe the key concepts and theories related to personality developmentand soft skills and identify the components of effective communication and interpersonal skills.
CO2	Explain the importance of personality development and soft skills in personal and professional contexts and summarize the principles and strategies behind effective communication and interpersonal relationships.
CO3	Apply effective communication techniques to convey ideas clearly and assertively indifferent settings and utilize active listening skills to understand and respond effectively to others.

CO4	Analyze the impact of different communication styles on interpersonal relationships and conflict resolution and evaluate the effectiveness of various techniques forbuilding and maintaining positive relationships.
CO5	Critically evaluate personal strengths and weaknesses in areas such as time management, leadership, and emotional intelligence and assess the ethical implications of different professional behaviors and decision-making processes.
CO6	Develop a personal development plan integrating various strategies for enhancing communication, leadership, and self-awareness and design and implement a comprehensive presentation or project demonstrating effective communication and soft skills.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		1								2	
CO2	2	1								3		
CO3			1			2					3	
CO4						3				2		
CO5				2			1				3	
CO6							3		1	2		
AVG	**0.83**	**0.17**	**0.33**	**0.33**	**0**	**0.83**	**0.67**	**0**	**0.17**	**1.17**	**1.33**	**0**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**BTSC201**			
Course Name	**LEADERSHIP SKILLS**			
Semester /Year	**2nd Semester / 1st Year**			
	L	**T**	**P**	**C**
	2	**0**	**0**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1 Understand the principles and theories of effective leadership.
2 Develop essential communication and interpersonal skills for leading teams.
3 Apply decision-making and problem-solving techniques in leadership scenarios.
4 Analyze different leadership styles and their suitability in various contexts.
5 Evaluate personal leadership strengths and areas for improvement.
6 Create a comprehensive leadership plan for project management and team leadership.

COURSE CONTENTS

Unit 1: Introduction to Leadership

Definition of leadership, Importance of leadership in the technology industry, Key qualities andcharacteristics of effective leaders

Unit 2: Leadership Theories and Styles

Trait theory of leadership, Behavioral theories of leadership (e.g., autocratic, democratic, laissez-faire), Situational and contingency theories, Transformational and transactional leadership

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Unit 3: Communication Skills for Leaders
Effective verbal and non-verbal communication, Active listening and feedback, Emotional intelligence in leadership, Presentation skills for leaders

Unit 4: Decision-Making and Problem-Solving
Decision-making models and techniques, Problem-solving processes, Critical thinking and creativity in decision-making, handling conflicts and making tough decisions

Unit 5: Team Building and Team Management
Forming, storming, norming, and performing stages of team development, Building and motivating high-performing teams, Delegation and empowerment, Conflict resolution and teamdynamics

Unit 6: Leadership in Project Management
Leadership roles and responsibilities in project management, setting project goals and objectivesTime and resource management, managing risks and overcoming challenges

Unit 7: Ethical Leadership and Personal Growth
Ethical considerations in leadership, Values-based leadership, Personal growth and self-awareness as a leader, Continuous learning and professional development

Text Books:

1. "Leadership: Theory and Practice" by Peter G. Northouse
2. "The Leadership Challenge" by James M. Kouzes and Barry Z. Posner
3. "Leading Teams: Setting the Stage for Great Performances" by Richard Hackman
4. "The 21 Irrefutable Laws of Leadership: Follow Them and People Will Follow You" byJohn C. Maxwell

Reference Books:

1. "Good to Great: Why Some Companies Make the Leap... and Others Don't" by Jim Collins

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Recall and define fundamental leadership theories and styles discussed in the course.
CO2	Understanding of the importance of effective communication in leadership and itsimpact on team dynamics.
CO3	Apply various decision-making models to real-world leadership scenarios and demonstrate their problem-solving skills.

CO4	Analyze the strengths and weaknesses of different leadership styles and theirapplicability in different organizational contexts.
CO5	Assess and critique their own leadership skills and behaviors, identifying areas forimprovement.
CO6	Design and present a comprehensive leadership plan for managing a project team,incorporating the principles learned in the course.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1	3	2	1	1	2	3	3	2
CO2	2	3	3	2	3	3	2	2	3	3	3	3
CO3	2	3	3	2	3	3	2	2	3	3	3	3
CO4	1	2	2	1	3	2	1	1	2	3	3	2
CO5	1	2	2	1	3	2	1	1	2	3	3	2
CO6	2	3	3	2	3	3	2	2	3	3	3	3
AVG	1.67	2.67	2.67	1.67	3	2.67	1.67	1.67	2.67	3	3	2.67

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Ability Enhancement Courses

Ability Enhancement Courses

Couse Code	Course Name	L	T	P	C
AEC1	Environmental Studies – I	2	-	-	2
AEC2	Communication Skills: Listening and Speaking Skills	2	-	-	2

Course code	AEC1			
Course Name	ENVIRONMENTAL STUDIES-I			
Semester /Year	1st Semester / 1st Year			
	L	T	P	C
	2	0	0	2

L - Lecture T – Tutorial P – Practical C – Credit

Unit I. Humans and the EnvironmentCourse Learning Outcomes

After completing this unit, students will be able to:

- Appreciate the historical context of human interactions with the environment.
- Gain insights into the international efforts to safeguard the Earth's environment and resources.

Unit Outline

- Human population growth: Impacts on environment, human health and welfare
- Dams: Resettlement and rehabilitation of project-affected persons (case studies)
- Disaster management: Floods, earthquake, cyclones and landslides
- Environmental movements: *Chipko*, Silent valley, *Bishnois* of Rajasthan
- Environmental ethics: Role of Indian and other religions and cultures in environmentalconservation
- Environmental communication and public awareness, case studies (e.g., CNG vehicles inDelhi).

Suggested readings

1. Fisher, Michael H. (2018) An Environmental History of India- From Earliest Times to theTwenty-First Century, Cambridge University Press.
2. Headrick, Daniel R. (2020) Humans versus Nature- A Global Environmental History, Oxford University Press.
3. Hughes, J. Donald (2009) An Environmental History of the World- Humankind's Changing Role in the Community of Life, 2nd Edition. Routledge.
4. Perman, R., Ma, Y., McGilvray, J., and Common, M. (2003) Natural Resource and Environmental Economics. Pearson Education.
5. Simmons, I. G. (2008). Global Environmental History: 10,000 BC to AD 2000. Edinburgh University Press

Unit II. Natural Resources and Sustainable Development

Course Learning Outcomes

After completion of this unit, students would be able to:

- Understand the concept of natural resources; identify types of natural resources, their distribution and use with special reference to India.
- Discuss the factors affecting the availability of natural resources, their conservation andmanagement.
- Explain sustainable development, its goals, targets, challenges and global strategies for sustainable development.

Unit Outline

- Definition of resource; Classification of natural resources- biotic and abiotic, renewableand non-renewable.
- Forest resources: Types, threats and conservation strategies.
- Water resources: Types of water resources- fresh water and marine resources; Availabilityand use of water resources; Environmental impact of over-exploitation, issues and challenges;
- Water scarcity and stress; Conflicts over water.
- Soil and mineral resources: Important minerals; Mineral exploitation; Environmental problems due to extraction of minerals and use; Soil as a resource and its degradation.
- Energy resources: Sources of energy and their classification, renewable and non-renewable sources of energy
- Introduction to sustainable development: Sustainable Development Goals (SDGs)-targetsand indicators, challenges and strategies for SDGs.

Suggested readings

1. Chiras, D. D and Reganold, J. P. (2010). Natural Resource Conservation: Managementfor a Sustainable Future.10th edition, Upper Saddle River, N. J. Benjamin/ Cummins/ Pearson.
2. John W. Twidell and Anthony D. (2015). Renewable Energy Sources, 3rd Edition, WeirPublisher (ELBS).
3. William P. Cunningham and Mary A. (2015) Cunningham Environmental Science: A Global Concern, Publisher (Mc-Graw Hill, USA).
4. Gilbert M. Masters and W. P. (2008). An Introduction to Environmental Engineering andScience, Ela Publisher (Pearson).
5. Singh, J.S., Singh, S.P. & Gupta, S.R. 2006. Ecology, Environment and Resource Conservation. Anamaya Publications https://sdgs.un.org/goals.

Unit III. Environmental Issues: Local, Regional and Global

Course Learning Outcomes

After completion of this unit, students would be able to:

- Develop a critical understanding of the environmental issues of concern
- Understand the concepts of spatial and temporal scales and their importance
- Understand the sectoral effects on the local, regional, and global environmental issues

Unit Outline

- Pollution: Types of Pollution- air, noise, water, soil, thermal, radioactive; municipal solidwaste, hazardous waste; transboundary air pollution; acid rain; smog.
- Land use and Land cover change: land degradation, deforestation, desertification, urbanization.
- Global change: Ozone layer depletion; Climate change. Disasters – Natural and Man-

made (Anthropogenic).

Suggested Readings

1. Harper, Charles L. (2017) Environment and Society, Human Perspectives on Environmental Issues 6th Edition. Routledge.
2. Harris, Frances (2012) Global Environmental Issues, 2nd Edition. Wiley- Blackwell.
3. William P. Cunningham and Mary A. (2015). Cunningham Environmental Science: A global concern, Publisher (Mc-Graw Hill, USA)
4. Manahan, S.E. (2022). Environmental Chemistry (11th ed.). CRC Press. https://doi.org/10.1201/9781003096238
5. Rajagopalan, R. (2011). Environmental Studies: From Crisis to Cure. India: Oxford University Press.

Unit IV. Conservation of Biodiversity and Ecosystems

Course Learning Outcomes

After completion of this unit, students would be able to:

- Understand the concepts of ecosystems, biodiversity and conservation.
- Describe the main types of ecosystems and their distribution.
- Discuss the factors impacting biodiversity loss and ecosystem degradation.
- Explain major conservation strategies taken in India.

Unit Outline

- Biodiversity and its distribution: Biodiversity as a natural resource; Levels and types ofbiodiversity; Biodiversity hotspots; Species and ecosystem threat categories.
- Ecosystems and ecosystem services: Major ecosystem types in India and their basic characteristics-forests, wetlands, grasslands, agriculture, coastal and marine; Ecosystemservices- classification and their significance.
- Threats to biodiversity and ecosystems: Land use and land cover change; Commercial exploitation of species; Invasive species; Fire, disasters and climate change.
- Major conservation policies: in-situ and ex-situ conservation approaches; Major protectedareas; National and International Instruments for biodiversity conservation; the role of traditional knowledge.

Suggested Readings

1. Bawa, K.S., Oomen, M.A. and Primack, R. (2011) Conservation Biology: A Primer forSouth Asia. Universities Press.
2. Sinha, N. (2020) Wild and Wilful. Harper Collins, India.
3. Varghese, Anita, Oommen, Meera Anna, Paul, Mridula Mary, Nath, Snehlata (Editors)(2022) Conservation through Sustainable Use: Lessons from India. Routledge.
4. Bhagwat, Shonil (Editor) (2018) Conservation and Development in India: ReimaginingWilderness, Earthscan Conservation and Development, Routledge.
5. Krishnamurthy, K.V. (2003) Textbook of Biodiversity, Science Publishers, Plymouth, UK

Unit V. Case Studies & Fieldwork

- Discussion on one national case study related to the environment and sustainable development.
- Documentation of campus biodiversity.
- Documentation of the biodiversity of any nearby terrestrial/aquatic ecosystem.
- Participation in plantation drives and nature camps.

- Case Studies on any one Natural Disaster: Kedarnath Disaster, Tsunami 2004, Bhuj Earthquake).
- Prepare a report on Environmental Impacts of the Tehri Dam.
- Prepare a report on any one environmental movement of India: (*Chipko*, Silent valley,
- *Bishnois* of Rajasthan).
- Prepare a map highlighting the protected areas of India.

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Recall and list the major environmental challenges faced by humanity, including population growth, resource depletion, pollution types, and theimpact of human-made structures such as dams.
CO2	Comprehend the concepts of sustainable development, the classification of natural resources, and the significance of biodiversity and ecosystem services.
CO3	Demonstrate the ability to document biodiversity in various ecosystems, participate in environmental conservation activities like plantation drives, and use knowledge of environmental issues in real-world contexts.
CO4	Examine and interpret the causes and effects of major environmental problems,including land degradation, deforestation, and climate change, and analyze the environmental impact of over-exploitation of resources.
CO5	Assess the effectiveness of various conservation policies, both national and international, in preserving biodiversity and ecosystems, and critique the role of different environmental movements in India.
CO6	Design and construct detailed reports on specific environmental case studies, such as the Tehri Dam's impact, and produce maps highlighting the protected areas of India.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	3	1	1	1	1	1	2	2	2
CO2	3	2	2	3	1	2	1	1	1	3	2	2
CO3	2	3	3	2	2	2	2	2	1	3	3	3
CO4	2	3	3	3	2	2	2	2	2	3	3	3
CO5	1	2	2	3	3	2	2	2	1	2	2	2
CO6	2	3	3	2	2	2	3	2	2	3	3	3
AVG	**2**	**2.5**	**2.5**	**2.67**	**1.83**	**1.83**	**1.83**	**1.67**	**1.33**	**2.67**	**2.5**	**2.5**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	AEC2			
Course Name	COMMUNICATION SKILLS: LISTENING AND SPEAKING			
Semester /Year	2nd Semester / 1st Year			
	L	T	P	C
	2	0	0	2

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. To communicate appropriately in real-life situation.
2. To use English effectively for study and communicative purpose for successful career.
3. To develop and integrate the use of two language skills- Listening and Speaking.
4. To understand different types of theories and needs of communication.

COURSE CONTENTS

Unit 1: Introduction: Theory of Communication

Definition and function of Communication, Needs For effective Communication, Process ofcommunication

Unit 2: Listening Skills

Types of Listening, Developing effective listening skills,
Listening to Talks and Presentation, Monologue, dialogue, miscommunication

Unit 3: Speaking Skills

Interview, Public speech, Mock interviews and Group discussions

Reference Books:

1. Dangwal, Surekha. *The Art Effective Communication.* Delhi: Macmillan,2017.
2. Prasad, P. *The Functional Aspects of Communication skills*, Delhi
3. Sen, Leena. *Communication Skills*, Prentice hall of India, New Delhi.
4. McCarty, Michel. *English Vocabulary in Use*, Cambridge University Press.
5. Communication Skill by Sanjay Kumar & Pushp Lata, Oxford University Press
6. An Introduction to Professional English and Soft Skills by B.K. Das, CambridgeUniversity.

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	To memorize the functions of communication and related topics.

CO2	To explain listening and speaking skills.
CO3	To acquire necessary listening and speaking skills in order to follow and comprehend discourse.
CO4	To organize vocabulary and improve accuracy in grammar.
CO5	To select positive attitudes for English Communication.
CO6	To implement communicative skills at interviews, presentations and Group discussions for successful career skills.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	1	1	2	1	1	1	1	2	3	2
CO2	1	3	1	1	2	1	1	1	1	1	3	2
CO3	1	3	2	1	2	2	2	1	1	2	3	2
CO4	1	2	1	1	2	2	1	1	1	1	3	2
CO5	1	2	1	1	3	1	1	1	1	2	3	2
CO6	1	3	2	2	3	2	2	2	1	2	3	3
AVG	**1.17**	**2.67**	**1.33**	**1.17**	**2.33**	**1.5**	**1.33**	**1.17**	**1**	**1.67**	**3**	**2.17**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

22/7/24
Dr. S. Shaw

Value AdditionCourses

Couse Code	Course Name	L	T	P	C
CITVC101	Computers and Ethics	2	-	-	2
CITVC201	The Art of Clean Code	2	-	-	2
CITVC301	Digital Empowerment	2	-	-	2
CITVC401	Challenges in Programming	2	-	-	2

Course code	CITVC101			
Course Name	COMPUTERS AND ETHICS			
Semester /Year	1st Semester / 1st Year			
	L	T	P	C
	2	0	0	2

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Understand ethical considerations in computing and information technology.
2. Explore the ethical dimensions of privacy, cybersecurity, and social media.
3. Analyze the ethical implications of emerging technologies and artificial intelligence.
4. Apply ethical decision-making models to resolve ethical dilemmas in computing.
5. Evaluate the social and cultural impacts of technology on society.
6. Develop ethical guidelines for responsible technology use and development.

COURSE CONTENTS

Unit 1: Introduction to Computers and Ethics

Introduction to ethical theories and frameworks, Ethical decision-making models and approaches, Ethical considerations in computing and information technology, Historical perspectives on computers and ethics

Unit 2: Privacy and Data Protection

Concepts of privacy and data protection, Ethical issues related to data collection, storage, and sharing, Legal and regulatory frameworks for privacy, Privacy-enhancing technologies and practices, Privacy implications of emerging technologies (e.g., Internet of Things, biometrics)

Unit 3: Intellectual Property and Copyright

Introduction to intellectual property rights, Ethical issues surrounding software piracy and copyright infringement, Open source software and its ethical implications, Digital rights management and fair use of copyrighted material, Ethical considerations in software development and intellectual property licensing

Unit 4: Cybersecurity and Ethical Hacking
Fundamentals of cybersecurity and its importance, Ethical considerations in hacking and penetration testing, Ethical hacking techniques and methodologies, Legal and ethical issues related to vulnerability disclosure, Cybersecurity ethics in the context of organizational securitypractices

Unit 5: Social Media and Online Ethics
Social media ethics and responsible online behavior, Privacy risks and ethical dilemmas in social media usage, Cyberbullying, harassment, and online hate speech, Implications of social media algorithms and filter bubbles, Social media and its impact on democracy and political discourse

Unit 6: Ethical Implications of Artificial Intelligence
Introduction to artificial intelligence (AI) and machine learning, Ethical considerations in AI algorithm development and bias, Privacy and transparency issues in AI systems, Automation, job displacement, and socioeconomic impacts of AI, Ethical guidelines and principles for AI development and deployment

Unit 7: Technology and Society
Ethical issues arising from the digital divide, Social and cultural impacts of technology, Ethicalconsiderations in emerging technologies (e.g., blockchain, virtual reality), Technology addiction and its ethical implications, Ethical responsibilities of technology professionals

Text Books:

1. Computers and Society: Modern Perspectives by by Ronald M. Baecker
2. THE HANDBOOK OF INFORMATION AND COMPUTER ETHICS by Kenneth
3. Einar Himma and Herman T. Tavani.

Reference Books/ Online Resources

1. "Ethics for the Information Age" by Michael J. Quinn
2. "Ethics in Information Technology" by George Reynolds
3. "Ethics in Computing: A Concise Module" by Joseph Migga Kizza
4. "Information Ethics: Privacy, Property, and Power" by Adam D. Moore

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Recall and explain key ethical theories and frameworks relevant to computing and information technology. Identify and describe the legal and regulatory frameworks for privacy and intellectual property in the digital domain.
CO2	Demonstrate an understanding of the ethical considerations in computing, including privacy, cybersecurity, and social media. Explain the social and cultural impacts of technology and the ethical responsibilities of technology professionals.

CO3	Apply ethical decision-making models and approaches to analyze and resolve ethical dilemmas in computing and information technology. Apply privacy-enhancing technologies and practices to protect personal dataand mitigate privacy risks.
CO4	Analyze the ethical implications of emerging technologies, such as artificial intelligence, blockchain, and virtual reality, on society and individuals. Evaluate the ethical considerations in hacking and penetration testing, considering legal and ethical issues related to vulnerability disclosure.
CO5	Evaluate the ethical implications of social media usage, including privacy risks, cyberbullying, and the impact of algorithms on information access. Critically evaluate the ethical dimensions of artificial intelligence, including algorithmic bias, job displacement, and transparency.
CO6	Construct well-reasoned arguments and proposals for addressing ethical challenges in the use of computers and information technology. Design ethical guidelines and principles for the development and deployment of emerging technologies, considering privacy, transparency, and societal impact.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1	2	1	1	1	1	2	2	2
CO2	2	3	3	2	3	2	2	2	2	3	3	3
CO3	2	2	2	1	2	2	1	1	1	2	2	2
CO4	1	2	2	2	2	1	1	1	1	2	2	2
CO5	1	2	2	2	2	1	1	1	1	2	2	2
CO6	2	2	2	2	2	2	2	2	2	2	2	2
AVG	**1.6**	**2.4**	**2.4**	**1.8**	**2.4**	**1.6**	**1.4**	**1.4**	**1.4**	**2.4**	**2.4**	**2.4**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated

Course code	**CITVC201**			
Course Name	**THE ART OF CLEAN CODE**			
Semester /Year	**2nd Semester / 1st Year**			
	L	**T**	**P**	**C**
	2	**0**	**0**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives: The objectives of this course are

1. Understand the principles of clean code and its significance in software development.
2. Apply coding standards and best practices for writing readable and maintainable code.
3. Analyze and refactor existing code to eliminate code smells and improve code quality.

4. Implement design patterns to enhance code structure and flexibility.
5. Develop effective unit tests using Test-Driven Development (TDD) principles.
6. Evaluate and optimize code performance to identify and resolve bottlenecks.
7. Create software projects showcasing clean code practices and design patterns.

COURSE CONTENTS

Unit 1: Introduction to Clean Code and Coding Standards

Definition and significance of clean code, The impact of clean code on software development Code readability and maintainability, Naming conventions and meaningful identifiers,Formatting and indentation, Comments and documentation

Unit 2: Refactoring and Code Smells

Introduction to code refactoring, identifying code smells, Common refactoring techniques, understanding common code smells and anti-patterns, Refactoring exercises to improve code quality

Unit 3: Design Principles and Design Patterns

SOLID principles, DRY (Don't Repeat Yourself) principle, KISS (Keep It Simple, Stupid) principle, Introduction to design patterns, Creational, Structural, and Behavioral patterns, Applying design patterns to real-world problems

Unit 4: Unit Testing and Test-Driven Development (TDD)

Importance of testing in clean code development, Writing effective unit tests, Test-Driven Development (TDD) methodology

Unit 5: Debugging, Error Handling, and Performance Optimization Techniques for effective debugging, Proper error handling and exception management, identifying performance bottlenecks, Techniques for optimizing code performance

Unit 6: Version Control, Code Collaboration, Code Reviews, and Code Quality Metrics

Using version control systems (e.g., Git), Collaborating on code using version control, Conducting code reviews, Code quality metrics and tools, Real-world Case Studies, Presentations and discussions on code quality improvement

Text Books:

1. Clean Architecture: A Craftsman's Guide to Software Structure and Design by Robert
2. C. Martin
3. Code Complete: A Practical Handbook of Software Construction by Steve McConnellTB3. Working Effectively with Legacy Code by Michael C. Feathers

Reference Books/ Online Resources

1. Refactoring: Improving the Design of Existing Code by Martin Fowler
2 Design Patterns: Elements of Reusable Object-Oriented Software by Erich Gamma,
3. Test-Driven Development: By Example by Kent Beck

Course Outcomes (CO):

After completion of the course, a student will be able to:

CO#	Detailed Statement of the CO
CO1	Recall the importance of clean code in software development and its impact on project maintainability and collaboration. List and explain the basic coding standards and best practices, including naming conventions, formatting, and code documentation. Identify common code smells and anti-patterns and describe their negative impact on code quality.
CO2	Demonstrate an understanding of various design principles, such as SOLID, DRY, and KISS, and apply them to design cleaner and maintainable code. Explain the purpose and characteristics of different design patterns and illustrate their use in solving specific software design challenges.
CO3	Apply code refactoring techniques to improve existing codebases by eliminating code smells and enhancing code readability. Implement unit testing and Test-Driven Development (TDD) methodologies to write effective unit tests for code validation and enhancement.
CO4	Analyze codebases to identify performance bottlenecks and inefficiencies, and propose appropriate optimization strategies. Critically evaluate code quality using code reviews, code quality metrics, and static analysis tools to suggest improvements.
CO5	Evaluate the trade-offs and benefits of using various design patterns and justify their application in specific software development scenarios.
CO6	Design and implement clean code solutions for real-world software development problems, demonstrating creativity and proficiency in coding practices.

CO-PO Mapping:

	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	2	2	1	2	1	2	2	2
CO2	2	2	3	2	2	2	2	2	2	2	2	3
CO3	1	2	2	1	1	2	1	1	1	1	1	2
CO4	1	2	2	2	2	2	1	1	1	1	2	2
CO5	1	2	2	2	2	2	1	1	1	1	2	2
CO6	3	3	3	3	3	3	2	2	2	2	3	3
AVG	**1.8**	**2.4**	**2.6**	**2**	**2**	**2.4**	**1.6**	**1.8**	**1.6**	**1.8**	**2.2**	**2.6**

3: Highest Correlated, 2: Medium Correlated, 1: Lowest Correlated