



People's Education Society's (Mumbai)

P. E. S. COLLEGE OF ENGINEERING

An Autonomous Institute

Nagsen Vana, Chhatrapati Sambhajnagar, Maharashtra, 431002

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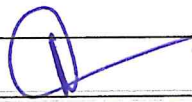
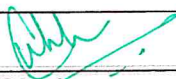


CURRICULUM for UNDER GRADUATE PROGRAMME

B.Tech Second Year

Department of Computer Science & Engineering

**In line with National Education Policy 2020 Guidelines
[With Effect from the Academic Year 2026-2027]**

			13/06/2026	1.00
Chairman Board of Studies	Dean Academics	Chairman Academic Council	Date of Release	Version

Institute Vision and Mission

Vision

- To create sound technical manpower with global competitiveness, morality and social sense.

Mission

- M1:** To provide the state-of art technical infrastructure and motivate students to realize their own potential.
- M2:** To provide an embellished academic and congenial environment to students for complete learning experience.
- M3:** To promote intellectual, moral and social democracy to ensure all round development of the students.

Department Vision and Mission

Vision

- To become centre of excellence in computer education to create globally competitive graduate with moral and social responsibilities.

Mission

- M1:** The CSE department is committed to create computer engineers with updated professional competencies to work in various domains and having moral and social attributes leading to global competency by providing advance technical infrastructure and learning environment.

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Dated :-.....13/06/2026

Grading and Evaluation Process:

i. Based on the Examinations and Evaluation, students will be awarded letter grades after combining the performance of all evaluations for the respective course.

These letter grades will be derived from quantitative and qualitative Evaluation converted into 10-point scale called as grade point for credit courses. The performance with grade points and equivalent letter grades for Absolute grading for admitted batches will be as mentioned in the following table:

Percentage of Marks	Letter Grade	Grade Points
91-100	EX	10.0
86-90	AA	9.0
81-85	AB	8.5
76-80	BB	8.0
71-75	BC	7.5
66-70	CC	7.0
61-65	CD	6.5
56-60	DD	6.0
51-55	DE	5.5
40-50	EE	5.0
0-39	FF	00

ii. Class is awarded based on CGPA of all eighth semester of B. Tech Program. CGPA for pass is minimum 5.0

CGPA upto <5.50	Pass class
CGPA ≥ 5.50 & <6.00	Second Class
CGPA ≥ 6.00 & <7.5	First Class
CGPA >7.50	Distinction
[Percentage of Marks =CGPA*10.0]	

iii. Apart from credit courses, Non credit courses will be awarded with letter grades based on quantitative and qualitative Evaluations as PP (Pass) and NP (Not Passed).

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Passing Criteria:

Student should score minimum 20 out of 60 in End Semester Examination.

Passing Percentage: 40 out of 100

*Minimum 50% of total credits should be there to promote the student in the next class or year with maximum three theory and / or two practical/viva/oral subject remain backlog of a student.

*National / State level sports/ cultural events/ NSS/ NCC/ Yoga etc certificates shall be considered at department level by HOD or Subject teacher for attendance and internal assessment.

*If the student is passed in all subjects of First year then only that student can take admission in the Third year and if the student is passed in all subjects of Second year then only that student can take admission in the Fourth/Final year.

Gracing Rule:

Three marks grace to maximum three subjects(total 09 marks) for every year if the result of the student will change (e.g. fail to pass or pass class to second class or second class to first class or first class to distinction) .

If student fails in more than three subjects, no grace will be given.

Calculation of SGPA and CGPA:

a. Semester Grade Point Average (SGPA):

The performance of a student in a semester is indicated by Semester Grade Point Average (SGPA) which is a weighted average of the grade points obtained in all the courses taken by the student in the semester and scaled to a maximum of 10. (SGPI is to be calculated up to two decimal places). A Semester Grade Point Average (SGPA) will be computed for each semester as follows:

$$SGPA = \frac{[\sum_{i=1}^{i=n} c_i g_i]}{[\sum_{i=1}^{i=n} c_i]}$$

Where;

'n' is the number of subjects for the semester,

'c_i' is the number of credits allotted to a particular subject, and

'g_i' is the grade-points awarded to the student for the subject based on his performance as per the above table.

SGPA will be rounded off to the second place of decimal and recorded as such.

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Dated :-..13/06/2026

b. Cumulative Grade Point Average (CGPA):

An up to date assessment of the overall performance of a student from the time he entered the Institute is obtained by calculating Cumulative Grade Point Average (CGPA) of a student. The CGPA is weighted average of the grade points obtained in all the courses registered by the student since s/he entered the Institute. CGPA is also calculated at the end of every semester (upto two decimal places). Starting from the first semester at the end of each semester (S), a Cumulative Grade Point Average (CGPA) will be computed as follows:

$$CGPA = \frac{\left[\sum_{i=1}^{i=m} c_i g_i \right]}{\left[\sum_{i=1}^{i=m} c_i \right]}$$

Where,

'm' is the total number of subjects from the first semester onwards up to and including the semesters,

'c_i' is the number of credits allotted to a particular subject, and

'g_i' is the grade-points awarded to the student for the subject based on his/her performance as per the above table.

CGPA will be rounded off to the second place of decimal and recorded as such

It is to be noted that the CGPA is not the average of SGPA

CGPA to equivalent Percentage Conversion

CGPA shall be calculated with the following formula

Percentage (%) = (CGPA*10.0)

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Illustrative Semester wise Credit distribution structure for Four Year UG**Engineering Program - One Major, One Minor**

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC/ESC	06-08	08-10		--	--	--	--	--	14-18
Engineering Science Course		10-08	06-04		--	--	--	--	--	16-12
Programme Core Course (PCC)	Program Courses	--	02	08-10	08-10	10-12	08-10	04-06	04-06	44-56
Programme Elective Course (PEC)		--	--	--	--	04	08	02	06	20
Multidisciplinary Minor (MD M)	Multidisciplinary Courses		-	02	02	04	02	02	02	14
Open Elective (OE) Other than a particular program		--	--	04	02	02	--	--	--	08
Vocational and Skill Enhancement Course (VSEC)	Skill Courses	02	02	--	02	--	02	--	--	08
Ability Enhancement Course (AEC -01, AEC-02)	Humanities Social Science and Management (HSSM)	02	--	--	02	--	--	--	--	04
Entrepreneurship Economics/ Management Courses		--		02	02	--	--	--	--	04
Indian Knowledge System (IKS)			02		--	--	--	--	--	02
Value Education Course (VEC)		--	--	02	02	--	--	--	--	04
Research Methodology	Experiential Learning Courses	--	--	--	--	--	--	04		04
Comm. Engg. Project (CEP)/Field Project (FP)		--	--	02	--	--	--	-	-	02
Project		--	--	--	--	--	--	04		04
Internship/ OJT		--	--			--	--	12	-	12
Co-curricular Courses (CC)	Liberal Learning Courses	02	02		--	--	--	--	-	04
Total Credits (Major)		20-22	20-22	20-22	20-22	20-22	20-22	20-22	20-22	160-176

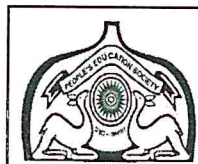
Abbreviations: Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Indian Knowledge System: IKS; Value Education Courses: VEC; OJT: On Job Training; Internship/ Apprenticeship;

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Dated :-.....13.10.6.1.2026

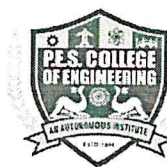
**Illustrative Semester and Course Category wise Credit Distribution Structure for Four Year UG Program
Computer Science & Engineering**

Semester		I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course	BSC ESC	7	7	-	3	-	-	-	-	17
Engineering Science Course		9	9	-	-	-	-	-	-	18
Programme Core Course (PCC)	Program Course	-	-	10	8	11	10	4	4	47
Programme Elective Course (PEC)		-	-	-	-	3	7	2	6	18
Multidisciplinary Minor (MDM)	Multidisciplinary Course	-	-	2	2	4	2	2	2	14
Open Elective (OE) Other than a particular program		-	-	4	2	2	-	-	-	8
Vocational and skill Enhancement Course(VSEC)	Skill Course	2	2	-	1	-	2	-	-	7
Ability Enhancement Course (AEC -01 ,AEC-02)	Humanities Social Science and Management (HSSM)	-	2	1	1	2	-	-	-	6
Entrepreneurship/Economics/Management Courses				2	2					4
Indian Knowledge System(IKS)		2	-	-	-	-	-	-	-	2
Value Education Course(VEC)		-	-	1	3	-	-	-	-	4
Research Methodology	Experimental Learning Course	-	-	-	-	-	-	-	4	4
Comm Engg Project(CEP)/Field Project(FP)		-	-	2	-	-	-	-	-	2
Project		-	-	-	-	-	-	-	4	4
Internship OJT		-	-	-	-	-	-	12	-	12
Co-Curricular Course(CC)	Liberal Learning Course	2	2	-	-	-	-	-	-	4
Total Credits(Major)		22	22	22	22	22	21	20	20	171

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Chhatrapati Sambhajanagar
Department of Computer Science & Engineering



B.Tech. Second Year Computer Science and Engineering
Semester-III

Sr. No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	PCC	BTPESCS301T	Discrete Mathematics & Graph Theory	3	1	0	20	20	60	100	3
2	PCC	BTPESCS302T	Data Structures	3	1	0	20	20	60	100	3
3	PCC	BTPESCS303T	Object Oriented Programming using Java	3	0	0	20	20	60	100	3
4	PCC LAB	BTPESCS301L	Data Structure using C/C++ & Object Oriented Programming using Java Laboratory	0	0	2	60	-	40%	100	1
5	HSSM	BTPESCS304T	Economics & Management	2	0	0	20	20	60	100	2
6	MDM	BTPEXXMXX	MDM 1*	2	0	0	10	10	30	50	2
7	OE	BTPEOEEXX	Open Elective 1 @	4	0	0	20	20	60	100	4
8	VEC	BTPEHS410T	Constitution of India	2	0	0	30	20		50	1
9	AEC LAB	BTPESCS302L	Web Application Development Laboratory	0	0	2	30	-	20%	50	1
10	CEP LAB	BTPESCS303L	Community Engagement Project	0	0	4	30	-	20%	50	2
Total				19	2	8	260	130	410	800	22

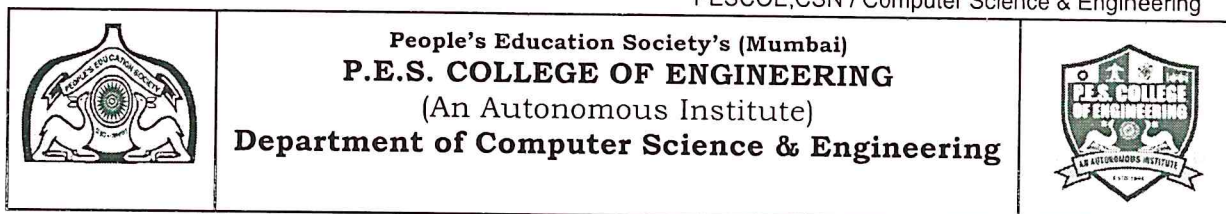
Note:

* Refer to Multidisciplinary Minor Bucket of other departments

@ Refer to Open Elective Bucket available in this syllabus

& Practical/Oral evaluation at the end of the semester.

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 Dated :-.....13/06/2026



**B.Tech. Second Year Computer Science and Engineering
Semester-IV**

Sr.No.	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	BSC	BTPES401T	Engineering Mathematics-III	3	0	0	20	20	60	100	3
2	PCC	BTPESCS401T	Design and Analysis of Algorithms	3	0	0	20	20	60	100	3
3	PCC	BTPESCS402T	Operating Systems	3	0	0	20	20	60	100	3
4	PCC LAB	BTPESCS401L	Design and Analysis of Algorithms Laboratory	0	0	2	30	-	20%	50	1
5	PCC LAB	BTPESCS402L	Operating Systems Laboratory	0	0	2	30	-	20%	50	1
6	HSSM	BTPESCS403T	Entrepreneurship Development	2	0	0	20	20	60	100	2
7	MDM	BTPESXXMXX	MDM 2 *	1	0	2	30*	-	20%	50	2
8	OE	BTPESOEXX	Open Elective 2 @	2	0	0	10	10	30	50	2
9	AEC LAB	BTPESCS403L	Android Application Development Laboratory	0	0	2	30	-	20	50	1
10	VEC	BTPESUHVT	Universal Human Values (UHV)	3	0	0	20	20	60	100	3
11	VSEC LAB	BTPESCS404L	Seminar	0	0	2	30	-	20%	50	1
Total				17	0	10	260	110	430	800	22

Note:

* Refer to Multidisciplinary Minor Bucket of other departments

@ Refer to Open Elective Bucket available in this syllabus

& Practical/Oral evaluation at the end of the semester

Evaluation on the basis of Practical performance

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Academic Council Meeting
Dated :-..... 13/06/2026

List of Multidisciplinary Minor courses offered by department of Computer Science & Engineering

Sr. No.	Minor Course Programme	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	MDM 1 Sem-III	BTPESCSM01	Data Structures	2	0	0	10	10	30	50	2
2	MDM 2 Sem-IV	BTPESCSM02	Programming in Python	1	0	2	30*	-	20*	50	2
3	MDM 3 Sem-V	BTPESCSM03	Object Oriented Programming in Java	3	0	2	30*	20	50	100	4
4	MDM 4 Sem-VI	BTPESCSM04	Database Management Systems	2	0	0	10	10	30	50	2
5	MDM 5 Sem-VII	BTPESCSM05	Computer Networks	2	0	0	10	10	30	50	2
6	MDM 6 Sem-VIII	BTPESCSM06	Artificial Intelligence	2	0	0	10	10	30	50	2
Total				12	0	4	100	60	190	350	14

& Practical/Oral evaluation at the end of the semester.

Evaluation on the basis of Practical performance

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 Dated :-.....13.10.2026.....

List Of Open Elective (OE) Courses (Domain wise baskets of OE)

Sr. No.	Open Elective	Semester	Course Code	Domain	Subject
1	Open Elective 1	III	BTPEOE2T	Management, Commerce & Entrepreneurship	Business Communication
2		III	BTPEOE4T	Management, Commerce & Entrepreneurship	Digital Marketing and E-commerce
3		III	BTPEOE13T	Humanities, Social Sciences & Life Skills	Employability and Skill Development
4	Open Elective 2	IV	BTPEOE8T	Law, Policy & Governance	Intellectual Property Rights(IPR)
5		IV	BTPEOE17T	Humanities, Social Sciences & Life Skills	Rural Development and Governance
6		IV	BTPEOE26T	Health, Wellness & Psychology	Emotional Intelligence
7	Open Elective 3	V	BTPEOE11T	Law, Policy & Governance	Cyber Law
8		V	BTPEOE23T	Design, Built Environment & Planning	Smart Cities and Urban Technologies
9		V	BTPEOE35T	Science, Engineering & Technology	Sensor Technology


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 Dated :-.....13/06/2020

Semester-III

BTPESCS301T	Discrete Mathematics & Graph Theory	PCC	3L-1T-0P	3 Credit
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives

1	Develop a strong foundation in discrete mathematical concepts such as logic, set theory, combinatorics, graph theory, and algebraic structures for computational applications.
2	Enhance analytical and problem-solving skills by applying mathematical techniques to model and solve computer science problems.
3	Build the ability to understand abstract mathematical structures and use them effectively in advanced studies of computer science and related fields.

Course Outcomes

At the end of this course, the students will be able to:

**Bloom's
Taxonomy
Level**

CO1	Explain the principles of propositional and predicate logic, including logical connectives, normal forms, and rules of inference to construct valid arguments.	K2
CO2	Apply concepts of sets, relations, and functions to solve problems and analyze their properties in mathematical contexts.	K3
CO3	Use combinatorial techniques such as counting principles, permutations, combinations, and recurrence relations to solve discrete mathematical problems.	K3
CO4	Analyze graphs and apply graph algorithms to represent data structures and solve real-world problems efficiently.	K4
CO5	Describe algebraic structures such as groups, rings, and Boolean algebra, and interpret their significance in mathematical and computational systems.	K2

Unit 1	Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence, Normal Forms, Predicate Calculus: Predicates, Quantifiers, Rules of Inference.	9 Hours
Unit 2	Set theory: Sets: Sets, Venn Diagrams, Power Sets, Cartesian Products, Set operations, Principle of Inclusion-Exclusion, Relations: Relations and Their Properties, n-ary Relations, Partition and Covering, Transitive Closure, Equivalence, Partial Ordering, Hasse Diagram, Functions: Introduction, Subjective, Injective, Bijective, inverse functions, Composition of functions.	9 Hours
Unit 3	Combinatorics: Basis of Counting, Permutations, Combinations, Recurrence relations, generating functions.	9 Hours
Unit 4	Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.	9 Hours
Unit 5	Algebraic Structures and Morphism: Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields, Boolean Algebra and Boolean Ring.	9 Hours

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 Academic Council Meeting
 Dated :-.....13/06/2026

Text Books	
1	C. L. Liu, Elements of Discrete Mathematics, McGraw-Hill Publication, 3rd Edition, 2008.
2	Kenneth H. Rosen, <i>Discrete Mathematics and Its Applications</i> , 9th Edition, 2025.

Reference Books	
1	Lipschutz, Discrete Mathematics, McGraw-Hill Publication, 3 rd Edition, 2009.
2	V. K. Balakrishnan, Schaum's Outline of Graph Theory, McGraw-Hill Publication, 1 st Edition, 1997.

NPTEL Links	
1	https://onlinecourses.nptel.ac.in/noc26_cs68/preview


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 Dated :-.....13.06.2026

BTPESCS302T	Data Structures	PCC	3L-1T-0P	3 Credit
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives	
1	Explain The concept of Pointer and Dynamic Memory allocation, Data Abstraction and data structure and Solve computational problems by applying appropriate data structures such as arrays, hash tables, stacks, queues, and linked lists.
2	Implement tree and graph data structures, including binary trees, binary search trees, heaps, and adjacency matrix representations, and perform related operations and traversals.
3	Demonstrate proficiency in searching and sorting algorithms, including sequential, binary search, skip lists, insertion sort, selection sort, and radix sort, along with file handling techniques. Select and implement suitable data structures and algorithms to develop efficient, maintainable, scalable software solutions.

Course Outcomes		Bloom's Taxonomy Level
At the end of this course, the students will be able to:		
CO1	Apply basic operations on Arrays and Understand and define abstract data types (ADTs) and specify algorithms formally, separating the logical definition from the physical implementation.	K3
CO2	Apply operations on Stack and Queues using Array and Linked List Implementations.	K3
CO3	Create and Traverse Tree to solve problems and Create Graphs to solve problems.	K6
CO4	Apply different Searching and Sorting methods.	K3
CO5	Apply operation of Priority Queues and Heap sort.	K3

Unit 1	Data, Data types, Data structures, Abstract Data Types (ADT), Representation of Information, Characteristics of an algorithm, Program and Analyzing Programs. Pointers and Dynamic Memory Allocation, Algorithm Specification, Data Abstraction, Performance Analysis, Performance Measurement. Arrays and Data structures: Arrays, Dynamically Allocated Arrays, Dynamically Allocated Arrays, Structures and Unions Polynomials, Sparse Matrices: Representation of Multidimensional Arrays.	9 Hours
Unit 2	Stacks and Queues Stacks: Stacks Using Dynamic Arrays, Queues : Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues, Linked Lists ,Singly Linked Lists ,Polynomials, Additional List Operations, Sparse Matrices, Doubly Linked Lists, Application of stack for expression evaluation and expression conversion, Recursion, Priority queue.	9 Hours
Unit 3	TREES -1: Introduction Binary Trees, Binary trees and their representation, Insertion and deletion of nodes in binary trees, Binary tree traversals, Threaded Binary Trees, Heap, Balanced Trees. TREES -2: GRAPHS, Binary Search Trees, Selection Trees, Forests Representation of Disjoint Sets, Counting Binary Trees, The Graph, Abstract Data Types.	9 Hours
Unit 4	Priority Queues and Heap : Priority Queues, Single-Ended Priority Queues, Double-Ended Priority Queues (DEPQs), Heaps: Types of heaps, Binomial Heaps ,Fibonacci Heaps, Pairing heaps.	9 Hours
Unit 5	Efficient Binary Search Trees : Introduction of Binary search trees, Types of Binary Search trees, Properties of binary search trees Operations on binary search trees, Optimal Binary Search Trees, AVL Trees, Red-Black Trees, Splay Trees.	9 Hours


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Text Books

1	Fundamentals of Data Structures in C, 2nd Edition, by Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed, published by Universities Press in 2007.
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Reference Books

1	Data Structures Using C and C++ Authors: Yedidyah Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum Edition: 2nd Edition .
2	Data Structures: A Pseudocode Approach with C by Richard F. Gilberg (Author), Behrouz A. Forouzan (Author) 2nd Edition.

NPTEL Links

1	nptel.ac.in/courses/106102064
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 Dated :-.....13.06.2026

BTPESCS303T	Object Oriented Programming using Java	PCC	3L-0T-0P	3 Credit
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives	
1	To understand the fundamentals of Java programming and object-oriented concepts for developing Java applications.
2	To develop modular Java programs using packages, APIs, inheritance, polymorphism, and exception handling mechanisms.
3	To implement multithreading and networking concepts for concurrent and client-server application development in Java.

Course Outcomes		Bloom's Taxonomy Level
At the end of this course, the students will be able to:		
CO1	Explain the fundamental concepts of classes, objects, methods, instance variables, control statements, and arrays in Java.	K2
CO2	Apply modular programming concepts using packages, static members, method overloading, and Java API libraries.	K3
CO3	Analyze and implement object-oriented principles such as inheritance, polymorphism, abstract classes, final methods, and interfaces.	K4
CO4	Design robust Java programs using exception handling, iterators, and parameterized (generic) classes.	K5
CO5	Develop Java applications using multithreading techniques and networking concepts for concurrent execution and client-server communication.	K4

Unit 1	Introduction to Classes and Objects :Introduction, Java Class Libraries, Typical Java Development Environment, Memory Concepts, Arithmetic. Classes, Objects, Methods and Instance Variables, Declaring a Class with a Method and Instantiating an Object of a Class, Declaring a Method, Instance variables, set Methods and get Methods, Primitive Types vs. Reference type double Types, Initializing Objects with Constructors, floating point numbers. Control Statements and Array.	9 Hours
Unit 2	Modulization in Java: Java Package, importing packages, Methods: static methods, static Fields, scope of declaration, method overloading, and Java API packages.	9 Hours
Unit 3	Inheritance and Polymorphism in Java: Inheritance: Super classes and Subclasses, protected members, relationship between super classes and subclasses, constructors in subclasses, object class. Polymorphism: Abstract classes and methods, final methods and classes, polymorphism examples, and Interfaces.	9 Hours
Unit 4	Exception Handling: Exception Handling Overview, Handling Arithmetic Exceptions and Input Mismatch Exceptions, When to Use Exception Handling, Java Exception Hierarchy, try-catch Blocks, Multiple Catch Blocks, throw and throws Keywords, finally Block, User Defined Exceptions.	9 Hours
Unit 5	Multithreading and Networking: Introduction to Multithreading, Thread Life Cycle, Creating Threads using Thread Class and Runnable Interface, Thread Priorities, Synchronization, Inter-thread Communication, Exception Handling in Threads. Introduction to Networking, Java Networking Packages, URL and URLConnection Classes, InetAddress Class, Socket Programming, Client-Server Communication using TCP/IP.	9 Hours

APPROVED in...3rd.....
 Academic Council Meeting
 Dated :-.....13.10.2026

Text Books	
1	Paul Deitel and Harvey Detail, Java: How to Program, Pearson's Publication, 9th Edition 2012.
2	E. Balagurusamy, Programming with Java, McGraw Hill Education (India), 7 th Edition 2023.

Reference Books	
1	Joel Murach and Michael Urban, Murach's Beginning Java with Eclipse, Murach's Publication, 1st Edition, 2016. Doug Lowe, Java All-in-One For Dummies, Wiley Publication, 4th Edition, 2014.
2	Herbert Schildt, Java: The Complete Reference, McGraw-Hill Publication, 9th Edition 2014.
3	Patrick Niemeyer, Daniel Leuck, Learning Java, O'Reilly Media, 4th Edition, 2013.

NPTEL Links	
1	Programming in Java – NPTEL Online Course (SWAYAM): https://onlinecourses.nptel.ac.in/noc21_cs56/preview


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BTPESCS301L	Data Structure using C/C++ & Object Oriented Programming using Java Laboratory	PCC LAB	OL-OT-2P	1 Credit
Evaluation Scheme	CA-60 Marks	ESE-40 Marks	ESE Time Duration 2 Hrs	

Course Objectives

1	Understand fundamental data structures.
2	Analyze algorithm efficiency.
3	Develop problem-solving skills.

Course Outcomes

At the end of this course, the students will be able to:

Bloom's Taxonomy Level

CO1	Select appropriate data structures.	K1
CO2	Implement core data structures.	K3
CO3	Evaluate algorithm performance.	K5
CO4	Solve complex problems.	K3
CO5	Implement standard algorithms.	K3

List of Experiments (Data Structure using C/C++)**(Minimum of 8 experiments to be performed by students)**

1	Write a program to implement stack using arrays and also perform Push and Pop Operations.
2	Write a program to evaluate a given postfix expression using stacks.
3	Write a program to convert a given infix expression to postfix form using stacks.
4	Write a program to implement circular queue using arrays.
5	Write a program to implement double ended queue (dequeue) using arrays.
6	Write programs to implement the following data structures: (a) Single linked list (b) Double linked list.
7	Write a program to create a binary search tree (BST) by considering the keys in given order and perform the following operations on it. (a) Minimum key (b) Maximum key (c) Search for a given key (d) Find predecessor of a node (e) Find successor of a node (f) delete a node with given key.
8	Write a program to construct an AVL tree for the given set of keys. Also write function for deleting a key from the given AVL tree.
9	Implement the following sorting algorithms: (a) Insertion sort (b) Merge sort (c) Quick sort (d) Heap sort.
10	Write programs for implementation of graph traversals by applying: (a) BFS (b) DFS.

Recommended Tools and Platforms

1	Visual Studio Code (VS Code)
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NPTEL Links

1	nptel.ac.in/courses/106102064
2	Data Structures - Course

APPROVED in.....3rd.....
 Academic Council Meeting
 Dated :-12/06/2026 Page 11 of 54

BTPESCS301L	Data Structure using C/C++ & Object Oriented Programming using Java Laboratory	PCC LAB	OL-OT-2P	1 Credit
Evaluation Scheme	CA-60 Marks	ESE-40 Marks	ESE Time Duration 2 Hrs	

Course Objectives

1	To develop the ability to write basic Java programs using variables, operators, control statements, and arrays.
2	To implement object-oriented programming concepts such as classes, inheritance, polymorphism, and abstraction in Java.
3	To develop modular and reliable Java applications using packages, static members, and exception handling mechanisms.

Course Outcomes**At the end of this course, the students will be able to:****Bloom's
Taxonomy
Level**

CO1	Apply Java variables, operators, control statements, and arrays to solve basic programming problems.	K3
CO2	Implement Java classes using objects, methods, constructors, and getter/setter techniques.	K3
CO3	Apply static members, method overloading, and packages to develop modular Java programs.	K3
CO4	Apply object-oriented concepts such as inheritance, abstraction, and polymorphism in Java applications.	K3
CO5	Apply exception handling techniques using try-catch and finally blocks to develop robust Java programs.	K3

**List of Experiments (Object Oriented Programming using Java Laboratory)
(Minimum of 8 experiments to be performed by students)**

1	Write a Java program to perform arithmetic operations using variables and operators.
2	Write a Java program to demonstrate control statements (if-else, switch, loops).
3	Write a Java program to create and use arrays.
4	Write a Java program to define a class, create objects, and call methods.
5	Write a Java program using constructors and getter/setter methods.
6	Write a Java program to demonstrate static methods, static variables, and method overloading.
7	Write a Java program to create and use packages and import Java API packages.
8	Write a Java program to demonstrate inheritance and method overriding.
9	Write a Java program to demonstrate polymorphism using abstract classes or interfaces.
10	Write a Java program to handle exceptions using try-catch and finally block.
11	Write a Java program to create two threads using the Thread class to print numbers simultaneously.
12	Write a Java program to create two threads using the Runnable interface and demonstrate synchronization using a shared resource.

APPROVED in.....3rd.....
 Academic Council Meeting
 Dated :-.....13/06/2026

Recommended Tools and Platforms	
1	Java Development Kit (JDK)
2	Code Editors: 1. Visual Studio Code (VS Code) 2. Sublime Text
3	Integrated Development Environments (IDEs): 1. Eclipse IDE 2. IntelliJ IDEA 3. NetBeans
4	Online Compilers & Learning Platforms: 1. Replit 2. JDoodle 3. Coding Rooms / HackerRank / LeetCode

Web References	
1	W3Schools Java Tutorial – Free step-by-step Java lessons with examples. 🔗 https://www.w3schools.com/java/
2	GeeksforGeeks Free Java Course for Beginners – Structured tutorials and quizzes. 🔗 https://www.geeksforgeeks.org/free-java-course-for-beginners/
3	LearnJavaOnline.org – Interactive online Java tutorial (no signup required). 🔗 https://www.learnjavaonline.org/
4	TutorialsClass Java Tutorial – Free Java tutorial covering basics to OOP. 🔗 https://tutorialscs.com/learn/java/

NPTEL Links	
1	Programming in Java – NPTEL Online Course (SWAYAM): https://onlinecourses.nptel.ac.in/noc21_cs56/preview

APPROVED in.....3rd.....
 Academic Council Meeting
 Dated :-.....13/06/2026.....

BTPESCS304T	Economics & Management	HSSM	2L-0T-0P	2 Credit
Evaluation Scheme	CA-20 Marks	MSE-20Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives	
1	To impart knowledge, with respect to concepts, principles and practical applications of economics which govern the functioning of a firm/organization.
2	To help the students to understand the fundamental concepts and principles of management; the basic roles, skills, functions of management and basic knowledge of various functional areas.

Course Outcomes		Bloom's Taxonomy Level
At the end of this course, the students will be able to:		
CO1	Demonstrate an awareness with respect to concepts, principles and practical applications of economics that governs the functioning of an organization and to evaluate how changes in price of the product affect its demand and supply.	K3
CO2	Relate production function and cost function	K3
CO3	Understand the banking system, monetary policy and fiscal policy and the role they play in the development of the economy.	K2
CO4	Describe the basic principles of management, managerial roles, skills and functions of management.	K2
CO5	Develop an understanding in functional management areas like finance, marketing, human resource and production management.	K3

Unit 1	Introduction to Economics: Definitions, Nature, Scope, Difference between Microeconomics & Macroeconomics Theory of Demand & Supply; meaning, determinants, law of demand, law of supply, equilibrium between demand & supply Elasticity: elasticity of demand, price elasticity, income elasticity, cross elasticity	4 Hours
Unit 2	Production Theory, Costs and Revenue: Theory of production; production function, meaning, factors of production (meaning & characteristics of Land, Labour, capital & entrepreneur), Law of variable proportions & law of returns to scale Meaning of costs, types of costs and Revenue.	5 Hours
Unit 3	Money and Banking: Money - Meaning, functions and types. Monetary policy - Meaning, objectives and tools. Fiscal policy - Meaning, objectives and tools. Banking - Meaning, types and functions. Central Bank- RBI and its functions	7 Hours
Unit 4	Introduction to Management : Meaning and definitions of management, nature, scope, Management & administration, skill and roles of managers. Management Principles - Scientific principles, Administrative principles Function of Management - Planning, Organizing, Staffing, Directing and Controlling - Meaning, nature and importance. Types of Management: Marketing, Finance, Human Resource, Production, etc	7 Hours
Unit 5	Introduction to Marketing, Finance, Production and Human Resource Management: Introduction to Marketing management - Meaning, Marketing concepts, Marketing Mix and Market segmentation . Introduction to Production Management - Meaning, objectives, functions, types of plant layout & factors affecting it Introduction to Finance Management - Meaning, sources and functions. Introduction to Human Resource Management - Meaning, objectives of manpower planning, sources of recruitment and selection process.	7 Hours

APPROVED in 3rd
Page 14 of 54
Academic Council Meeting
Dated :- 13.06.2025

Text Books	
1	Principles of Economics — 10th Edition, 2024, Cengage Learning.
2	Managerial Economics — 9th Edition, 2023, Vikas Publishing House
3	Indian Economy — 17th Edition, 2025, McGraw Hill Education.
4	Marketing Management — 16th Edition, 2022, Pearson Education.
5	Principles and Practice of Management — 9th Edition, 2022, Sultan Chand & Sons.
6	Human Resource Management — 17th Edition, 2024, Pearson Education.

Reference Books	
1	Economics — 20th Edition, 2024, McGraw Hill Education.
2	Principles of Marketing — 19th Edition, 2024, Pearson Education.
3	Essentials of Management — 11th Edition, 2023, McGraw Hill Education.
4	Management — 16th Edition, 2022, Pearson Education.
5	Human Resource Management — 18th Edition, 2023, Sultan Chand & Sons
6	Fundamentals of Financial Management — 16th Edition, 2022, Cengage Learning.


 APPROVED in...380/.....
 Academic Council Meeting
 Dated :-...13/06/2026

BTPESHS410T	Constitution of India	VEC	2L-0T-0P	1 Credit
Evaluation Scheme	CA-30 Marks	MSE-20 Marks	-	

Course Objectives	
1	To familiarize the students with the legacy of India's constitutional development and assist them in comprehending the country's most varied legal text and its underlying philosophy.
2	To educate students about the Indian Parliamentary System's theoretical and practical features.

Course Outcomes		Bloom's Taxonomy Level
At the end of this course, the students will be able to:		
CO1	Establish and explore the fundamental aspects and procedures of the Indian constitution.	K2
CO2	Compare and relate the operation of India's parliamentary system at the national and state levels.	K2
CO3	Learn about and implement the various laws and rules pertaining to engineering procedures relevant with IPR.	K2

Unit 1	Introduction and Basic Information about Indian Constitution: Constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act-1935 and Indian Independence Act-1947, Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government.	6 Hours
Unit 2	Union Executive and State Executive: Powers of Indian Parliament, Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, LokPal, LokAyukta, The Lokpal and Lokayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts. Intellectual Property Laws and Regulation to Information: Intellectual Property Laws- Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement, Regulation to Information- Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act.	9 Hours

APPROVED in.....3rd.....
 Academic Council Meeting
 Dated :-.....13/06/2026

Text Books	
1	Brij Kishore Sharma: Introduction to the Indian Constitution, PHI, New Delhi, latest edition.
2	Subhash C. Kashyap: Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 2018.
3	P M Bakshi: The Constitution of India, Latest Edition, Universal Law Publishing.
4	V. K. Ahuja: Law Relating to Intellectual Property Rights (2007).
5	P.Narayan: Intellectual Property Law, Eastern Law House, New Delhi.

Reference Books	
1	Granville Austin: The Indian Constitution: Corner stone of a Nation. 1966, Oxford Clarendon Press.

APPROVED in.....3rd.....
 Academic Council Meeting
 Dated :-.....13/06/2026

BTPESCS302L	Web Application Development Laboratory	AEC LAB	OL-OT-2P	1 Credit
Evaluation Scheme	CA-30 Marks	ESE-20 Marks	ESE Time Duration 2 Hrs	

Course Objectives	
1	To develop the ability to design and create interactive web pages using HTML, CSS, JavaScript, PHP, and AJAX technologies.
2	To apply client-side and server-side scripting techniques for form validation, dynamic content generation, database operations, and web-based applications.
3	To build problem-solving skills in developing responsive and user-friendly web applications involving data processing, authentication, and asynchronous communication.

Course Outcomes		Bloom's Taxonomy Level
At the end of this course, the students will be able to:		
CO1	Design structured web pages using HTML elements, tables, forms, images, hyperlinks, and multimedia components.	K3
CO2	Apply CSS techniques to create interactive, visually appealing, and responsive web interfaces.	K3
CO3	Develop JavaScript programs for client-side validation, calculations, string manipulation, and number processing.	K3
CO4	Implement dynamic and interactive web applications using PHP scripting and server-side programming concepts.	K3
CO5	Develop database-driven web applications to perform searching, sorting, and data handling operations using PHP and AJAX.	K4
CO6	Analyze and integrate client-side and server-side technologies to create complete web-based solutions with improved usability and functionality.	K4

List of Experiments (Minimum of 10 experiments to be performed by students)	
1	Design an html form for displaying information using interactive css including images, tables.
2	Create a webpage with HTML describing your department with following specification: a. Change the background color of the page. At the bottom create a link to take user to the top of the page. b. Insert an image and create a link such that clicking on image takes user to other page. c. Also apply font styling like italics, underline and two other fonts to words you find appropriate. Also use header tags.
3	Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
4	Write a JavaScript to validate the following fields of employee on html form: email, name, mobile no., address, salary.
5	Develop and demonstrate a HTML file that includes JavaScript script that uses functions for the following problems: a. Parameter: A string Output: Length of the String b. Parameter: A number Output: The number with its digits in the reverse order
6	Develop and demonstrate a HTML file that includes JavaScript for the following problems: a. Input: A starting and ending number b. Output: find all the prime numbers between starting and ending number
7	Write a PHP program to display a digital clock which displays the current time of the server.
8	Write a PHP program to implement sign-In and Sign-out functionality.
9	Write a PHP program to keep track of the number of visitors visiting the Web page and to display this count of visitors, with proper headings.

APPROVED in..... 3rd Q
 Page 18 of 64
 Academic Council Meeting
 Dated :- 13/06/2026

10	Write a PHP code to implement AJAX functionality.
11	Write a PHP program to perform search operation on the student records using AJAX.
12	Write a PHP program to sort the student records which are stored in the database using ascending/descending order.

Text Books

1	HTML 5 Black Book, Covers CSS 3, JavaScript, XML, XHTML, Ajax, PHP and jQuery, 2ed (English, Paperback, DT Editorial Services).
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Recommended Tools and Platforms

1	Robin Nixon, Learning PHP, MySQL & JavaScript with j Query, CSS & HTML5 Paperback by Orielly Publication.
2	E. Robson, E. Freeman, Head First HTML & CSS, O'Reilly Media, 2nd Edition, 2012.

Web References

1	https://www.w3schools.com/?utm_source=chatgpt.com
2	https://www.php.net/docs.php?utm_source=chatgpt.com
3	https://developer.mozilla.org/en-US/docs/Web/CSS?utm_source=chatgpt.com
4	https://www.geeksforgeeks.org/web-tech/web-technology/

APPROVED in.....3rd.....
 Academic Council Meeting
 Dated :-.....13.10.6/2026

BTPESCS303L	Community Engagement Project	CEP LAB	OL-OT-4P	2 Credit
Evaluation Scheme	CA-30 Marks	ESE-20 Marks	ESE Time Duration 2 Hrs	

Course Objectives	
1	To provide students with field-based learning experiences that help them understand community needs and apply engineering knowledge, technical skills, and interdisciplinary approaches to develop sustainable solutions for real-world socio-economic and environmental challenges.
2	To enhance students' teamwork, leadership, communication, project management, ethical values, social responsibility, and civic awareness through active participation in community engagement activities and collaborative projects.

Course Outcomes At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Identify and analyze community problems through field surveys, data collection, and interaction with stakeholders.	K2
CO2	Apply engineering knowledge and technical skills to design and implement sustainable solutions for community-related issues.	K3
CO3	Demonstrate effective teamwork, leadership, communication, and project management skills during community engagement activities.	K3
CO4	Evaluate the social, environmental, and ethical impact of community-based projects and exhibit responsibility toward sustainable community development.	K5

Course Description	The Community Engagement Project course is structured to offer students practical, field-oriented learning experiences that connect engineering concepts with real-world community challenges. Through active participation in socially relevant projects, students gain exposure to socio-economic issues while applying technical knowledge to develop meaningful and sustainable solutions. The course also helps students strengthen teamwork, leadership, communication, and problem-solving abilities, while fostering social responsibility and civic awareness.
Project Guidelines for Students	- Under the supervision of faculty mentors, a team of maximum four students shall carry out a socioeconomic survey in a nearby community or residence. The students will interact with local residents and gather information using a well-structured questionnaire. - The student group shall identify a topic relevant to their major discipline(CSE) and undertake a project involving problem identification, data collection, analysis, and preparation of suitable conclusions or solutions. - At the end of the project, students must submit a detailed project report duly signed by the faculty mentor. - The performance and progress of students shall be evaluated continuously by the mentor using a rubric-based assessment method.
Documentation	Maintain proper documentation throughout the project work. The project report should include: - Abstract - Introduction - Literature Review - Problem Statement - Methodology - Design and Implementation - Results and Analysis - Conclusion and Future Scope - References

Approved in 3rd
 Page 20 of 54
 Academic Council Meeting
 Dated :- 13/06/2026

Evaluation Criteria	The project evaluation may be based on: • Field Work and Engagement • Project Implementation • Reports and Documentation • Presentation
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 APPROVED in...3rd 
Academic Council Meeting
Dated :-...13/06/2026...

Semester-IV

BTPE401T	Engineering Mathematics-III	BSC	3L-0T-0P	3 Credit
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives	
1	To equip students with the knowledge of integral transforms (Laplace and Fourier) and develop their ability to apply these transforms as tools for solving differential equations and evaluating complex integrals arising in engineering problems.
2	To introduce students to partial differential equations, their formation, and solution techniques, enabling them to model and analyze physical phenomena such as heat conduction and wave propagation in one dimension.
3	To develop student understanding of higher-order linear differential equations and their applications to real-world engineering systems, including electrical circuits, mechanical vibrations, and civil engineering structures, through analogous system analysis.

Course Outcomes At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Apply Laplace transforms and their properties to evaluate integrals and solve problems involving special functions.	K3
CO2	Find inverse Laplace transforms using partial fractions and convolution theorem to solve linear differential equations.	K3
CO3	Compute Fourier transforms and apply their properties including Parseval's identity to engineering problems.	K3
CO4	Form and solve partial differential equations and apply separation of variables to heat and wave equations.	K6
CO5	Analyze free, forced, and damped oscillations in mechanical and electrical systems using higher-order differential equations.	K4

Unit 1	Laplace Transform: Definition – conditions for existence ,Transforms of elementary functions, Properties of Laplace transforms-Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n , scale change property, transforms of functions divided by t , transforms of integral of functions, transforms of derivatives, Evaluation of integrals by using Laplace transform, Transforms of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.	9 Hours
Unit 2	Inverse Laplace Transform: Introductory remarks, Inverse transforms of some elementary functions, theorems of finding inverse transforms, Partial fraction method and Convolution Theorem for finding inverse Laplace transforms, Applications to find the solutions of linear differential equations and simultaneous linear differential equations with constant coefficients.	9 Hours
Unit 3	Fourier Transform: Definitions – integral transforms, Fourier integral theorem (without proof), Fourier sine and cosine integrals, Complex form of Fourier integrals, Fourier sine and cosine transforms, Properties of Fourier transforms, Parseval's identity for Fourier Transforms.	9 Hours

Unit 4	Partial Differential Equations and Their Applications: Formation of Partial differential equations by eliminating arbitrary constants and functions, Equations solvable by direct integration, Linear equations of first order (Lagrange's linear equations), Method of separation of variables applications to find solutions of one dimensional heat flow equation ($\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$) and one dimensional wave equation ($\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$).	9 Hours
Unit 5	Applications of Linear Differential Equations (Higher order): To Electrical circuits & to mechanical system (Analogous study of two systems) Free oscillations/vibrations, Forced oscillations/vibrations, Damped Free oscillations/vibrations, Damped Forced oscillations/vibrations, Applications of civil engineering.	9 Hours

Text Books

1	Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, New Delhi.
2	Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, New York.
3	A Text Book of Applied Mathematics (Volume-I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
4	Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt. Ltd., New Delhi.

Reference Books

1	Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.
2	A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd., Singapore.
3	Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
4	Integral Transforms and Their Engineering Applications by Dr. B. B. Singh, Synergy. Knowledge ware, Mumbai.
5	A text Book of Engineering Mathematics by N. P. Bali, Dr. Manish Goyal, 8 th edition, Laxmi Publications.
6	Integral Transforms by I. N. Sneddon, Tata McGraw-Hill, New York.


 APPROVED in.....3rd.....
 Academic Council Meeting
 Dated :-...13/06/2026...

BTPESCS401T	Design and Analysis of Algorithms	PCC	3L-0T-0P	3 Credit
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives

1	Develop a solid understanding of fundamental algorithmic concepts, including algorithm analysis, and evaluate time and space complexity using asymptotic notations.
2	Design and analyze efficient algorithms by applying standard algorithm design paradigms and appropriate algorithmic techniques to solve computational problems.
3	Understand the theoretical limits of computation, including problem hardness and NP-Completeness, to assess the feasibility of algorithmic solutions.

Course Outcomes

At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Explain fundamental concepts and properties of algorithms.	K2
CO2	Analyze algorithm performance using asymptotic notations.	K4
CO3	Design algorithms using Divide & Conquer, Greedy, and Dynamic Programming techniques.	K3
CO4	Solve combinatorial problems using Backtracking and Branch & Bound.	K4, K3
CO5	Classify problems based on complexity classes P, NP, and NP-Complete.	K5

Unit 1	Fundamentals of Algorithms & Complexity Analysis: Definition and Properties of Algorithms, Expressing Algorithms: Pseudocode, Flowcharts, Algorithm Design Techniques, Performance Analysis of Algorithms: Time Complexity, Space Complexity, Types of Algorithm Analysis: Best Case, Average Case, Worst Case, Order of Growth, Asymptotic Notations: Big-O (O), Big-Ω (Omega), Big-Θ (Theta).	9 Hours
Unit 2	Recursion, Divide and Conquer & Sorting Algorithms: Recursion, Recurrence Relations, Methods for Solving Recurrences: Substitution Method, Iterative Method, Recursion Tree Method, Master Theorem, Changing Variable Method, Divide and Conquer: Strategy, Binary Search, Merge Sort, Quick Sort, Strassen's Matrix Multiplication, Heap Sort.	9 Hours
Unit 3	Backtracking and Branch & Bound: Concept of Backtracking, N-Queens Problem: Four-Queens Problem, Eight-Queens Problem, Hamiltonian Cycle Problem, Sum of Subsets Problem, Graph Coloring Problem, Branch and Bound: Introduction to Branch and Bound, Traveling Salesperson Problem, 15-Puzzle Problem, Comparison between Backtracking and Branch and Bound.	9 Hours
Unit 4	Greedy Algorithms and Graph Algorithms: Introduction to Greedy Technique, Greedy Method: Characteristics, Feasibility, Optimality, Greedy Algorithms: Optimal Merge Patterns, Huffman Coding, Knapsack Problem (Fractional), Activity Selection Problem, Job Sequencing with Deadline, Graph Algorithms: Minimum Spanning Tree: Prim's Algorithm, Kruskal's Algorithm, Single Source Shortest Path : Dijkstra's Algorithm.	9 Hours
Unit 5	Dynamic Programming and NP-Completeness: Introduction and Characteristics, Components of Dynamic Programming, Comparison of Divide-and-Conquer and Dynamic Programming, Dynamic Programming Algorithms: Longest Common Subsequence, Matrix Chain Multiplication, Shortest Path Algorithms, Bellman-Ford Algorithm, Floyd-Warshall Algorithm, Applications of Dynamic Programming. NP-Completeness: Introduction to Computational Complexity, Complexity Class P, Complexity Class NP, Polynomial-Time Reduction, NP-Complete Problems.	9 Hours

APPROVED in..... 309

Academic Council Meeting

Dated :..... Page 24 of 54 13/06/2024

Text Books	
1	T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein, Introduction to Algorithms, MIT Press, 3rd Edition.
2	Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Fundamentals of Computer Algorithms, Universities Press, 2nd Edition.

Reference Books	
1	Aho, Hopcroft, Ullman, The Design and Analysis of Computer Algorithms, Pearson, 1st Edition.
2	Brassard & Bratley, Fundamentals of Algorithmics, Prentice Hall, 1st Edition.
3	Kleinberg & Tardos, Algorithm Design, Pearson, 1st Edition.
4	S. Dasgupta, C. Papadimitriou, U. Vazirani, Algorithms, McGraw-Hill, 1st Edition.

NPTEL Links	
1	https://nptel.ac.in/courses/106106131
2	https://nptel.ac.in/courses/106101060

APPROVED in.....3rd.....
 Academic Council Meeting
 Dated :-...13/06/2026...

BTPESCS402T	Operating Systems	PCC	3L-0T-0P	3 Credit
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives	
1	Understand the fundamental concepts, services, structures, and design principles of modern operating systems.
2	Analyze process management, CPU scheduling techniques, inter-process communication, and synchronization mechanisms for efficient resource utilization.
3	Evaluate deadlock handling techniques and memory management strategies, including virtual memory and page replacement algorithms.
4	Understand file system organization, storage management, disk scheduling algorithms, and their role in improving system performance.

Course Outcomes		Bloom's Taxonomy Level
At the end of this course, the students will be able to:		
CO1	Explain the architecture, services, structures, system calls, and implementation of modern operating systems.	K2
CO2	Analyze process management, CPU scheduling algorithms, threads, and inter-process communication techniques for efficient execution.	K4
CO3	Apply synchronization mechanisms, semaphores, monitors, and deadlock handling techniques to solve concurrent processing problems.	K3
CO4	Evaluate memory management techniques, virtual memory concepts, paging, segmentation, and page replacement algorithms for efficient memory utilization.	K5
CO5	Analyze file systems, disk scheduling algorithms, storage management, and file allocation techniques to improve system performance.	K4

Unit 1	Introduction and Operating system structures: Definition, Types of Operating system, Real-Time operating system, System Components: System Services, Systems Calls, System Programs, System structure, Virtual Machines, System Design and Implementation, System Generations.	5 Hours
Unit 2	Processes and CPU Scheduling: Process Concept, Process Scheduling, Operation on process, Inter-process Communication, Cooperating processes, Threads, Multithreading model, Scheduling criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Scheduling Algorithms evaluation.	10 Hours
Unit 3	Process Synchronization: The critical-section problem, Critical regions, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of synchronization, and Monitors Deadlocks: Systems Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined approach to deadlock Handling.	10 Hours
Unit 4	Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Continuous Memory Allocation, Fixed and variable partition, Internal and external fragmentation and compaction, Paging: Principle of operation, Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging; Segmentation. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page / Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).	10 Hours

APPROVED in 3rd
 Academic Council Meeting
 Dated :- 13/06/2026

Unit 5	File Management: File Concept, Access methods, File types, File operation, Directory and disk structure, File System Structure, File System Implementation, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Mass-Storage Structure: Disk Structure, Disk attachment, Disk scheduling, Disk management, Swap Space Management.	10 Hours
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Text Books

1	Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts, Wiley Publication, 8th Edition, 2008.
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Reference Books

1	Andrew S. Tanenbaum, Modern Operating System, PHI Publication, 4th Edition, 2015.
2	D. M. Dhamdhare, Systems Programming and Operating Systems, McGraw-Hill, 2nd Edition, 1996.
3	Thomas W. Doeppner, Operating System in Depth: Design and Programming, Wiley Publication, 2011.

APPROVED in.....3rd.....
 Academic Council Meeting
 Dated :-.....13/06/2026.....

BTPESCS401L	Design and Analysis of Algorithms Laboratory	PCC LAB	OL-OT-2P	1 Credit
Evaluation Scheme	CA-30 Marks	ESE-20 Marks	ESE Time Duration 1 Hrs	

Course Objectives	
1	To understand fundamental algorithm design techniques such as Divide and Conquer, Greedy Method, Sorting, Searching, and Graph Algorithms for solving computational problems efficiently.
2	To develop programming skills for implementing and analyzing algorithms related to arrays, trees, and graphs using appropriate data structures and traversal techniques.
3	To evaluate algorithm performance in terms of correctness, efficiency, and time complexity through practical implementation of searching, sorting, shortest path, spanning tree, and traversal algorithms.

Course Outcomes At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Explain the fundamentals of algorithm design techniques such as Divide and Conquer, Greedy Method, and Graph Algorithms.	K2
CO2	Implement searching and sorting algorithms including Binary Search, Selection Sort, Merge Sort, and Quick Sort.	K3
CO3	Apply Divide and Conquer techniques to solve problems such as finding maximum and minimum elements in an array.	K3
CO4	Implement Greedy algorithms for Job Sequencing, Minimum Spanning Tree, and Shortest Path problems.	K3
CO5	Analyze graph traversal and shortest path algorithms such as BFS, DFS, Dijkstra's, and Floyd-Warshall algorithms.	K4
CO6	Evaluate the efficiency and correctness of various algorithms based on their computational complexity and practical performance.	K5

List of Experiments (Minimum of 8 experiments to be performed by students)	
1	Implementation of Binary Search.
2	Implementation of finding maximum and minimum numbers using divide and conquer.
3	Implementation of Merge / Quick sort.
4	Implementation of Selection sort.
5	Implementation of Job Sequencing with deadlines.
6	Program for finding the minimum cost Spanning Tree.
7	Implementation of single-source shortest path.
8	Implementation of all-pairs shortest path.
9	Program for Tree traversal techniques.
10	Program for Graph Traversal Technique.

Recommended Tools and Platforms	
1	Visual Studio Code
2	Python
3	GitHub

APPROVED in.....^{3rd} 
 Academic Council Meeting
 Dated :-.....Page 28 of 54 13/06/20

Web References	
1	https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-fall-2011/?utm_source=chatgpt.com
2	https://www.programiz.com/dsa?utm_source=chatgpt.com
3	https://www.geeksforgeeks.org/dsa/dsa-tutorial-learn-data-structures-and-algorithms/
4	https://nptel.ac.in/courses/106101060?utm_source=chatgpt.com
5	https://www.tutorialspoint.com/design_and_analysis_of_algorithms/index.htm?utm_source=chatgpt.com


 APPROVED in...^{3rd}.....
 Academic Council Meeting
 Dated :-...13/06/2026...

BTPESCS402L	Operating Systems Laboratory	PCC LAB	OL-OT-2P	1 Credit
Evaluation Scheme	CA-30 Marks	ESE-20 Marks	ESE Time Duration 1 Hrs	

Course Objectives

1	To provide practical knowledge of operating system concepts through implementation of algorithms related to process scheduling, memory management, and file systems.
2	To develop programming skills using the C language and UNIX environment for implementing synchronization problems, shell programming, and system-level operations.
3	To enable students to analyze and simulate various operating system algorithms such as CPU scheduling, page replacement, disk scheduling, and memory allocation techniques.

Course Outcomes

At the end of this course, the students will be able to:

Bloom's Taxonomy Level

CO1	Demonstrate the use of UNIX commands and develop shell scripts for file handling operations.	K3
CO2	Implement and analyze different CPU scheduling algorithms such as FCFS, SJF, Round Robin, and Priority scheduling.	K4
CO3	Develop C programs to solve process synchronization problems like Producer-Consumer and Dining Philosophers using semaphores.	K3
CO4	Implement and evaluate memory management techniques, including contiguous memory allocation strategies and page replacement algorithms.	K5
CO5	Simulate different file organization and file allocation methods used in operating systems.	K3
CO6	Implement and compare various disk scheduling algorithms such as FCFS, SCAN, and C-SCAN.	K4

List of Experiments

(Minimum of 8 experiments to be performed by students)

1	Hands on Unix Commands.
2	Shell programming for file handling.
3	Simulate the following CPU scheduling algorithms. a) FCFS b) SJF c) Round Robin d) Priority.
4	Write a C program to simulate producer-consumer problem using Semaphores.
5	Write a C program to simulate the concept of Dining-philosophers problem.
6	Write a C program to simulate the following contiguous memory allocation Techniques a) Worst fit b) Best fit c) First fit.
7	Simulate all page replacement algorithms a) FIFO b) LRU c) OPTIMAL.
8	Simulate all File Organization Techniques a) Single level directory b) Two level directory.
9	Simulate all file allocation strategies a) Sequential b) Indexed c) Linked.
10	Write a C program to simulate disk scheduling algorithms. a) FCFS b) SCAN c) C-SCAN.

Recommended Tools and Platforms

1	Operating System: Ubuntu Linux/ Windows
2	GCC- Used to compile C programs for OS experiments
3	Debugger: GDB
4	Editor: VS Code / Vim

APPROVED in 3rd Q
 Academic Council Meeting
 Dated :- 13/06/2026

Web References	
1	Operating System Lab Tools – IIT Delhi https://www.cse.iitd.ac.in/~kedia/os/tools.html
2	Operating System Engineering Tools – MIT OpenCourseWare https://ocw.mit.edu/courses/6-828-operating-system-engineering/
3	Oracle VM VirtualBox Documentation https://www.virtualbox.org/wiki/Documentation


 APPROVED in.....^{3rd} 
 Academic Council Meeting
 Dated :- 13/06/2026.....

BTPESCS403T	Entrepreneurship Development	HSSM	2L-0T-0P	2 Credit
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives	
1	Understand the fundamentals of entrepreneurship, entrepreneurial mindset, opportunity identification, and the process of new venture creation.
2	Develop innovative business ideas by applying design thinking, prototyping, testing, validation, and commercialization techniques.
3	Acquire knowledge of startup financing, technological innovation, incubation support, and the entrepreneurial ecosystem, with emphasis on the Indian startup landscape.
4	Evaluate entrepreneurial strategies, startup case studies, and sustainable business practices to promote innovation, employment generation, and socio-economic development.

Course Outcomes		Bloom's Taxonomy Level
At the end of this course, the students will be able to:		
CO1	Explain entrepreneurial concepts, entrepreneurial journey, opportunity discovery, and business idea generation for venture creation.	K2
CO2	Apply innovation, prototyping, testing, validation, and commercialization techniques to develop viable startup ideas.	K3
CO3	Analyze startup financing methods, technological innovation, incubation support, and the Indian entrepreneurial ecosystem for new venture development.	K4
CO4	Evaluate entrepreneurial strategies, startup growth models, employment generation, and startup case studies to recommend sustainable business solutions.	K5

Unit 1	Entrepreneurial Foundations and Opportunity Discovery: Introduction to Entrepreneurship, Meaning, importance and characteristics of entrepreneurship Types of entrepreneurs Entrepreneurial competencies and mindset, Entrepreneurial Journey, Stages of entrepreneurial journey, Challenges and successfactors, Entrepreneurial ethics and leadership, Entrepreneurial Discovery, Opportunity identification, Problem identification and market need analysis ,Creativity and innovation techniques, Opportunity evaluation Business Idea Generation, DesignThinking approach, Brainstorming techniques, Customer need identification , Idea screening and selection.	8 Hours
Unit 2	Innovation, Product Development and Commercialization : Ideation and Prototyping, Product ideation process, Designthinking methodology, Prototype development , Minimum Viable Product (MVP), Testing and Validation, Customer discovery, Customer validation, Market validation, Commercialization, Business Model Canvas, Value Proposition Go-to-Market Strategy, Disruptive Innovation, Innovation strategies, Disruptive technologie.	7 Hours

APPROVED in 3rd Academic Council Meeting
Dated :- 13/06/2026

Unit 3	Startup Development and Entrepreneurial Ecosystem: Technological Innovation and Entrepreneurship, Technology-based startups, Digital entrepreneurship, Industry 4.0 opportunities, Startup Financing, Bootstrapping, Angel Investors Venture Capital, Crowdfunding, Government funding schemes, Entrepreneurship Education, Role of higher education, Incubation centres, Startup accelerators, Innovation hubs.	8 Hours
Unit 4	Entrepreneurial Growth, Culture and Employment: National Entrepreneurial Culture, Entrepreneurial ecosystem, Innovation culture, Policy support for entrepreneurship, Entrepreneurial Thermodynamics, Growth dynamics of startups, Entrepreneurial resilience, Risk management, Sustainable entrepreneurship, Entrepreneurship and Employment, Job creation, Self-employment, Social entrepreneurship, Rural entrepreneurship	7 Hours

Text Books

1	C. Bhaktavatsala Rao, <i>Entrepreneurship</i> , NPTEL Online Course, IIT Madras, SWAYAM.
2	Robert D. Hisrich, Michael P. Peters, and Dean A. Shepherd, <i>Entrepreneurship</i> , 11th Edition, McGraw-Hill Education, 2020.
3	Vasant Desai, <i>Dynamics of Entrepreneurial Development and Management</i> , Himalaya Publishing House, Latest Edition.
4	S.S. Khanka, <i>Entrepreneurial Development</i> , S. Chand Publishing, Latest Edition.

Reference Books

1	Peter F. Drucker, <i>Innovation and Entrepreneurship: Practice and Principles</i> , Harper Business, Latest Edition.
2	Eric Ries, <i>The Lean Startup</i> , Crown Business, 2011.
3	Alexander Osterwalder and Yves Pigneur, <i>Business Model Generation</i> , John Wiley & Sons, 2010.
4	Steve Blank and Bob Dorf, <i>The Startup Owner's Manual</i> , K&S Ranch Press, Latest Edition.

NPTEL Links

1	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_mg114
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APPROVED in 3rd 
 Academic Council Meeting
 Dated :- 13/06/2026

BTPESCS403L	Android Application Development Laboratory	AEC LAB	OL-OT-2P	1 Credit
Evaluation Scheme	CA-30 Marks	ESE-20 Marks	ESE Time Duration 1 Hrs	

Course Objectives	
1	To understand the fundamentals of Android application development and mobile application architecture.
2	To design and develop Android applications using user interfaces, databases, APIs, and cloud services.
3	To implement real-world mobile applications integrating modern tools, Firebase, location services, and data management techniques.

Course Outcomes At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Understand Android architecture, activity lifecycle, and application components.	K2
CO2	Design responsive Android user interfaces using layouts, widgets, and event handling techniques.	K3
CO3	Develop Android applications using intents, RecyclerView, and form validation mechanisms.	K3
CO4	Implement local data storage and session management using SQLite and SharedPreferences.	K4
CO5	Integrate Firebase services, REST APIs, and Google Maps into Android applications.	K4
CO6	Build complete real-world Android applications by integrating UI, database, networking, and cloud services.	K6

List of Experiments (Minimum of 10 experiments to be performed by students)	
1	Introduction to Android Studio and App Development Create and run a simple Android application to understand Android Studio, emulator, and project structure.
2	User Interface Design using Layouts and Widgets Design responsive UI using Linear Layout, Constraint Layout, Text View, Edit Text, Button, Image View, and Scroll View.
3	Event Handling and Interactive Applications Develop an application using button click events, Toast messages, and listeners.
4	Activity Lifecycle and Navigation using Intents Implement activity lifecycle methods and navigation between activities using explicit and implicit intents.
5	Student Registration Form with Validation Create a registration form with validation for email, password, mobile number, and mandatory fields.
6	Recycler View Based Application Design an application using Recycler View to display dynamic lists such as contacts, products, or students.
7	SQLite Database CRUD Application Develop an Android application to perform Create, Read, Update, and Delete operations using SQLite database.
8	Shared Preferences and Session Management Implement login/logout functionality using Shared Preferences for storing user session data.
9	Firebase Authentication Application Create user authentication system using Firebase Email/Password login.

APPROVED in 3rd ①
Page 34 of 54
Academic Council Meeting
Dated :- 13/06/2026

10	REST API Integration using Retrofit/Volley Fetch and display online data from REST APIs such as weather, news, or JSON Placeholder API.
11	Google Maps and Location-Based Application Develop an app to display current location and nearby places using Google Maps API.
12	Mini Project – Complete Android Application Build a real-world application integrating UI, database, API, Firebase, and storage features.

Recommended Tools and Platforms

1	Android Studio
2	Kotlin Programming Language
3	Firebase Console
4	Google Maps Platform
5	Postman API Platform
6	GitHub
7	JSONPlaceholder API

Web References

1	https://developer.android.com/develop?utm_source=chatgpt.com
2	https://firebase.google.com/docs?utm_source=chatgpt.com
3	https://kotlinlang.org/docs/home.html
4	https://developers.google.com/maps/documentation/android-sdk?utm_source=chatgpt.com
5	https://square.github.io/retrofit/?utm_source=chatgpt.com
6	https://developer.android.com/jetpack?utm_source=chatgpt.com

APPROVED in.....3rd.....
 Academic Council Meeting
 Dated :-.....13/06/2026.....

BTPESUHV	Universal Human Values (UHV)	VEC	3L-0T-0P	3 Credit
Evaluation Scheme	CA-20 Marks	MSE-20 Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives

1	To develop right understanding through self-exploration and cultivate harmony with self, society, and nature, enabling students to apply universal human values and ethical principles in personal and professional life.
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Course Outcomes

At the end of this course, the students will be able to:

Bloom's Taxonomy Level

CO1	Analyse self and surroundings to understand personal and societal harmony.	K2
CO2	Evaluate human aspirations and happiness to enhance well-being.	K2
CO3	Assess universal values in relationships and design strategies for trust, respect, and justice.	K2
CO4	Analyse human impact on nature and propose sustainable practices.	K3
CO5	Evaluate eco-friendly systems and develop strategies for sustainable technologies.	K2

Unit 1	Introduction: Purpose and motivation for the course, Self-Exploration, 'Natural Acceptance' and Experiential Validation, Continuous Happiness and Prosperity, Right understanding, Relationship and Physical Facility, Understanding Happiness and Prosperity correctly, Understanding and living in harmony at various levels.	9 Hours
Unit 2	Understanding Harmony: Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health, correct appraisal of Physical needs, Prosperity in detail, Programs to ensure Sanyam and Health.	9 Hours
Unit 3	Values in relationships: Understanding nine universal values in human-human relationship, Justice and program for its fulfilment to ensure mutual happiness, Trust and Respect as the foundational values of relationship, difference between intention and competence, respect and differentiation, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.	9 Hours
Unit 4	Co-existing with nature: Understanding the harmony in Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Coexistence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence. Human being as cause of imbalance in nature, pollution, depletion of resources and role of technology etc.	9 Hours

APPROVED in... 3rd ①
 Academic Council Meeting
 Dated :- 13/06/2026

Unit 5	Holistic approach for Engineers: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems. c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers. b. At the level of society: as mutually enriching institutions and organizations	9 Hours
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Text Books

1	Human Values and Professional Ethics, Gaur, Sangal, Bagaria, 2010, Excel Books, New Delhi.
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Reference Books

1	Jeevan Vidya: Ek Parichaya, A. Nagaraj, 1999, Jeevan Vidya Prakashan, Amarkantak.
2	Human Values, A.N. Tripathi, 2004, New Age Intl. Publishers, New Delhi.
3	The Story of My Experiments with Truth, M.K.Gandhi, 2009, Fingerprint Publishers.

APPROVED in.....3rd.....
 Academic Council Meeting
 Dated :-...12/06/2026...

BTPESCS404L	Seminar	VSEC LAB	OL-OT-2P	1 Credit
Evaluation Scheme	CA-30 Marks	ESE-20 Marks	ESE Time Duration 1 Hrs	

Course Objectives	
1	To develop students' research, analytical, presentation, and communication skills through the study and presentation of seminars on emerging and latest technologies, enabling them to explore innovative and industry-relevant advancements independently and effectively.

Course Outcomes At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Analyze emerging and latest technologies through independent research and literature review.	K4
CO2	Demonstrate effective presentation and communication skills by delivering technical seminars on industry-relevant topics.	K3

Course Description	The Seminar course is designed to develop students' research, presentation, and communication skills through the preparation and presentation of seminars. The topics of the seminar will be based on emerging and latest technologies. Students are encouraged to choose innovative and industry-relevant topics such as Artificial Intelligence, Machine Learning, Cloud Computing, Cyber Security, Internet of Things (IoT), Blockchain, Data Science, Digital Marketing Trends, Augmented Reality, Green Computing, and other recent technological advancements. The selected topic should be approved by the supervising faculty. Under the supervision of faculty, students will engage in independent research, organize their findings, and present them effectively to their peers and faculty members. This course aims to enhance students' ability to communicate complex ideas clearly and confidently, fostering a deeper understanding of their elective subjects.
Assessment Methodology	The assessment for the Seminar course will be based on continuous evaluation of the following components: 1. Topic Selection and Proposal • Relevance and appropriateness of the selected topic. • Clarity and feasibility of the seminar proposal. 2. Literature Review • Depth and thoroughness of the literature review. • Use of credible and relevant sources. 3. Seminar Outline and Content Development • Logical organization and structure of the seminar. • Clarity and coherence of the content. • Integration of theoretical concepts with practical examples. 4. Presentation Skills • Clarity, confidence, and engagement during the presentation. • Effective use of visual aids and multimedia. • Ability to handle questions and engage in discussion. 5. Seminar Report • Quality and thoroughness of the written seminar paper. • Proper formatting, citations, and adherence to guidelines. 5. Presentation • Students will present their seminars to peers and faculty. • Each presentation will be followed by a Q&A session. 6. Final Submission • A written seminar report summarizing the research and presentation will be submitted. • Proper formatting and citation guidelines must be followed.

APPROVED in 3rd

Academic Council Meeting

Dated :- 13/06/2026

List of Courses for Minor in Computer Science & Engineering (Except CSE)

Sr. No.	Minor Course Programme	Course Code	Course Title	Teaching Scheme			Evaluation Scheme				
				L	T	P	CA	MSE	ESE	Total	Credit
1	MDM 1 Sem-III	BTPESCSM01	Data Structures	2	0	0	10	10	30	50	2
2	MDM 2 Sem-IV	BTPESCSM02	Programming in Python	1	0	2	30 [#]	-	20 ^{&}	50	2
3	MDM 3 Sem-V	BTPESCSM03	Object Oriented Programming in Java	3	0	2	30 [#]	20	50	100	4
4	MDM 4 Sem-VI	BTPESCSM04	Database Management Systems	2	0	0	10	10	30	50	2
5	MDM 5 Sem-VII	BTPESCSM05	Computer Network	2	0	0	10	10	30	50	2
6	MDM 6 Sem-VIII	BTPESCSM06	Artificial Intelligence	2	0	0	10	10	30	50	2
Total				12	0	4	100	60	190	350	14

APPROVED in...3rd...
 Academic Council Meeting
 Dated :-...13/06/2026...

**Multidisciplinary Minor 1
Semester III**

BTPESCSM01	Data Structures	MDM1	2L-0T-0P	2 Credit
Evaluation Scheme	CA-10 Marks	MSE-10 Marks	ESE-30 Marks	ESE Time Duration 2 Hrs

Course Objectives	
1	Understand fundamental concepts of data structures. Learn linear and non-linear data structures. Implement stacks, queues, linked lists, trees, and hashing.
2	Understand concepts of linear and non-linear data structures. Learn operations on linked lists, trees, graphs, hashing, BST, and heaps. Develop skills to implement efficient data handling techniques.

Course Outcomes At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Understand and classify various data structures. Implement arrays, stacks, queues, linked lists, trees, and hashing techniques.	K2
CO2	Explain concepts and types of linked lists, trees, graphs, hashing, BST, and heaps. Perform operations such as insertion, deletion, searching, and traversal.	K3
CO3	Understand searching and sorting techniques. Perform sequential and binary searching operations. Implement insertion, deletion, and searching in skip lists.	K3

Unit 1	Overview and importance of data structures, arrays, data structure types: stacks, queues, linked list, trees, hashing table, binary search tree, heaps. stacks and queues: introduction, stack and queue as adt, representation and implementation of stack and queue using sequential and linked allocation, circular queue and its implementation, application of data structure.	10 Hours
Unit 2	Linked lists: concept, operations and types: singly list, double link list and circular link list, trees and graphs: basic terminology, operations and types- binary trees and their representation, insertion and deletion of nodes in binary trees, binary search tree and its traversal, hashing table, binary search tree, heaps, graphs, types of graphs and application o graphs.	10 Hours
Unit 3	Searching and sorting: sequential, binary searching, skip lists dictionaries, linear list representation, skip list representation, sorting operations: insertion, deletion, and searching, insertion sort, selection sort, radix sort, merege sort and file handling. application of searching and sorting.	10 Hours

Text Books	
1	Fundamentals of Data Structures in C, 2nd Edition, by Ellis Horowitz, Sartaj Sahni, and Susan Anderson-Freed, published by Universities Press in 2007.

Reference Books	
1	Data Structures Using C and C++ Authors: Yedidyah Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum Edition: 2nd Edition .
2	Data Structures: A Pseudocode Approach with C by Richard F. Gilberg (Author), Behrouz A. Forouzan (Author) 2nd Edition.


APPROVED in.....3rd.....
Academic Council Meeting
Dated :-...13/06/2026..

Multidisciplinary Minor 2
Semester IV

BTPESCSM02	Programming in Python	MDM 2	1L-0T-2P	2 Credit
Evaluation Scheme	CA-30 Marks	ESE-20 Marks	ESE Time Duration 1 Hrs	

Course Objectives	
1	To provide students with a strong foundation in Python programming concepts, problem-solving techniques, data structures, functions, modules, file handling, and object-oriented programming for developing efficient software solutions.
2	To develop students' practical programming skills, logical thinking, debugging abilities, and application development capabilities through hands-on laboratory exercises and real-world programming problems using Python.

Course Outcomes At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Understand and apply fundamental Python programming concepts including data types, control structures, functions, and modules.	K 2
CO2	Develop Python programs using appropriate data structures, file handling techniques, and object-oriented programming concepts.	K 3
CO3	Analyze and solve computational problems through logical program design, debugging, and testing techniques.	K 3
CO4	Design and implement Python-based applications for real-world problems using programming best practices and teamwork skills.	K 4

Unit 1	Informal introduction to programming, algorithms and data structures, downloading and installing Python, run a simple program on Python interpreter.	5 Hours
Unit 2	Variables, operations, control flow - assignments, conditionals, loops, functions: optional arguments, default values, passing functions as arguments, Statements, Expressions. Strings: String processing. Exception handling, Basic input/output, handling files.	5 Hours
Unit 3	Class and Object, Data Structure: List, Tuple and Sequences, Set, Dictionaries. Structured Query Languages: SQLite manager, Spidering Twitter using a Database, Programming with multiple tables, JOIN to retrieve data.	5 Hours

List of Experiments (Minimum of 10 experiments to be performed by students)	
1	To Study Introduction of Python, install Python and execute a simple Python program.
2	To perform arithmetic operations using variables.
3	To implement conditional statements using if-else.
4	To implement loops using for and while.
5	To demonstrate functions with default arguments.
6	To perform string manipulation.
7	To Study and Implement Exception Handling
8	To implement list, tuple and set.
9	To understand the concept of Object Oriented Programming (OOP) in Python.
10	To implement dictionary and file handling.
11	To connect Python with SQLite database.
12	To understand how to create and manage multiple tables in an SQLite database using Python.
13	To learn how to retrieve related data from multiple tables using SQL JOIN operations in an SQLite database through Python.

APPROVED in.....3rd..... Page 41 of 54
Academic Council Meeting
Dated :-...13.10.6/2026

Recommended Tools and Platforms	
1	Operating System: Linux/ Windows
2	Python IDEs (Integrated Development Environments): Pycharm, visual studio code, Jupyter Code
3	Online Platforms to Practice Python: Google Colab, Replit, Programiz

Web References	
1	GeeksforGeeks Python Programming Tutorials https://www.geeksforgeeks.org/python-programming-language/
2	W3Schools Python Tutorial https://www.w3schools.com/python/

Text Books	
1	Michael Urban and Joel Murach, Murach's Python Programming, Murach's Publication, 2016
2	Charles Severance, Python for Informatics: Exploring Information, University of Michigan, Version 2.7.0, 2014.
3	Dr. R. Nageswara Rao, Core Python Programming, Dreamtech Press, 1st Edition, 2016.

Reference Books	
1	Mark Lutz, Learning Python, O'Reilly Media, 5th Edition, 2013.
2	Mark Pilgrim, Dive into Python 3, A press Publication, 2nd Edition, 2009.
3	Allen B. Downey, Think Python, O'Reilly Media, 2nd Edition, 2012.
4	Jon Kleinberg and Eva Tardos, Algorithm Design, Pearson Education, 1st Edition, 2006.

NPTEL Links	
1	https://onlinecourses.nptel.ac.in/noc25_cs59
2	https://nptel.ac.in/courses/106106145

APPROVED in... 3rd ...
 Academic Council Meeting
 Dated :- 13/06/2026

List Of Open Elective (OE) Courses (Domain wise baskets of OE)

Sr. No.	Open Elective	Semester	Course Code	Domain	Subject
1	Open Elective 1	III	BTPESOE2T	Management, Commerce & Entrepreneurship	Business Communication
2		III	BTPESOE4T	Management, Commerce & Entrepreneurship	Digital Marketing and E-commerce
3		III	BTPESOE13T	Humanities, Social Sciences & Life Skills	Employability and Skill Development
4	Open Elective 2	IV	BTPESOE8T	Law, Policy & Governance	Intellectual Property Rights(IPR)
5		IV	BTPESOE17T	Humanities, Social Sciences & Life Skills	Rural Development and Governance
6		IV	BTPESOE26T	Health, Wellness & Psychology	Emotional Intelligence
7	Open Elective 3	V	BTPESOE11T	Law, Policy & Governance	Cyber Law
8		V	BTPESOE23T	Design, Built Environment & Planning	Smart Cities and Urban Technologies
9		V	BTPESOE35T	Science, Engineering & Technology	Sensor Technology

APPROVED in 3rd 
 Academic Council Meeting
 Dated :- 13/06/2026

**Open Elective 1
Semester III**

BTPEOE2T	Business Communication	OE 1	4L-0T-0P	4 Credit
Evaluation Scheme	CA-20 Marks	MSE-20Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives	
1	To build up comprehensive understanding of business correspondence and conditions
2	To create influential oral, written and practical skills among students

Course Outcomes At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Explain the meaning, scope, importance, and characteristics of business communication.	K2
CO2	Demonstrate an understanding of intercultural communication, including key concepts, non-verbal communication, body language, and the relationship between language, thought, and speech in a business context.	K2
CO3	Explain different barriers to effective communication and listening, and demonstrate the communication principles such as the Four S's and Ten Golden Rules for effective interaction.	K3
CO4	Demonstrate professional business correspondence skills by drafting business letters, emails, job application letters, resumes, and business proposals using proper structure and language.	K3
CO5	Apply group communication skills in practical situations such as group discussions, interviews, meetings, conferences, and public relations, incorporating soft skills like teamwork, emotional intelligence, and problem-solving.	K3

Unit 1	Introduction of Business Communication Meaning and Scope of Business Communication, Characteristics of Business Communication, Business Communication Need of Time, Five Ways to Improve your Business Communication Skills, Elements of Communication Process, Stages in Communication Process, Types of Business Communication along with example, Methods of Business Communication, Process of Characteristics of Business Communication.	10 Hours
Unit 2	Intercultural Communication Key Terms of Intercultural Communication, Importance of Intercultural Communication in Business, Non- Verbal Communication - Introduction to Non Verbal Communication, Aspects of Body Language, Non- Verbal Communication Codes, Thought and Speech - Introduction to Thought and Speech, Language is Ability.	12 Hours
Unit 3	Conceptual Barrier to Effective Communication Introduction and Types of Barriers, Physical Barriers, Mechanical Barrier, Psychological Barrier, Listening - Introduction and Definitions to Listening, Types of Listening , Barriers to Listening, Communication Rules - Simple Rules for Better Communicator, Four S's of Communication, Ten Golden Rules of Communication Case Study on Effective Communication	12 Hours
Unit 4	Business Correspondence Business Correspondence - Theory of Business Letter Writing Parts, Structure, Layouts, Principles of Effective Letter Writing, Principles of effective E - mail Writing Personnel Correspondence - Job Application Letter and Resume, Letter of Acceptance of Job Offer, Letter of Resignation. Language and Writing Skill - Paragraph Writing, Business Proposals, Oral and Written Vocabulary in	12 Hours

APPROVED in 3rd
 Academic Council Meeting
 Dated : 13/06/2026

	Communication, Common Errors. Case Study on Report Writing.	
Unit 5	Group Communication Group Discussions – Process of GD, Skills tested in GD. Interviews - Preparing for an Interview, Types of Interviews – Selection, Appraisal, Grievance, Exit, Online. Soft Skills – Emotional Intelligence, Conflict Management, Teamwork, Problem-Solving. Meetings - Types of Meetings, Agenda and Resolutions. Committees & Conferences. Public Relations - Meaning and Functions of Public Relations (PR), External and Internal Measures of Promoting PR, Crisis Management	12 Hours

Text Books

1	Kaul, Asha, Business Communication, Prentice-Hall of India, Delhi.
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Reference Books

1	Mary Ellen Guffey, Essentials of Business Communication, Sixth Edition, South-Western College Publishing.
2	Monippally, Matthukutty M. Business Communication Strategies. Tata McGraw-Hill Publishing Company Ltd., New Delhi
3	Bahl, J.C. and Nagamia, S.M. (1974) Modern Business Correspondence and Minute Writing
4	Bovee Courtland, L and Thrill, John V (1989) Business Communication, Today McGrawHill, New York, Taxman Publication.

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 Academic Council Meeting
 Dated :-.....13/06/2026.....

**Open Elective 1
Semester III**

BTPEOE4T	Digital Marketing & E-commerce	OE 1	4L-0T-0P	4 Credit
Evaluation Scheme	CA-20 Marks	MSE-20Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives

1	To introduce students to the fundamentals of Digital Marketing and E-Commerce systems.
2	To develop understanding of online business models, digital consumer behavior, and marketing strategies.
3	To enable students to apply digital tools, analytics, and e-commerce technologies for business growth and entrepreneurship.

Course Outcomes

At the end of this course, the students will be able to:

Bloom's Taxonomy Level

CO1	Describe the fundamentals of Digital Marketing and E-Commerce ecosystems.	K2
CO2	Use SEO, SEM, email, and social media marketing techniques in online business platforms.	K3
CO3	Differentiate digital consumer behavior and various e-commerce business models.	K4
CO4	Design simple digital marketing strategies using analytics and online tools.	K4
CO5	Explain security, ethical, legal, and emerging trends in e-commerce and digital business.	K5

Unit 1	Introduction to Digital Marketing: Fundamentals of Marketing and Digital Marketing, Planning and Structure Importance of Digital Marketing, Scope of Digital Marketing, Digital Marketing vs Traditional Marketing, Inbound vs Outbound Marketing, Digital Marketing Ecosystem, Digital Business Models, Consumer Behavior in Digital Environment, Website Basics and Content Management Systems, Introduction to Google Ads and Digital Platforms.	12 Hours
Unit 2	Search Engine and Social Media Marketing: Search Engine Optimization Fundamentals, On-page and Off-page SEO, Optimize Organic Search Ranking, Website SEO Auditing, Web Analytics: Data and Traffic Analysis, Search Engine Marketing, Pay Per Click, Advertising, Social Media Marketing (Facebook, Instagram, LinkedIn, YouTube), Influencer Marketing, Online Brand Building.	12 Hours
Unit 3	E-Commerce Fundamentals: Introduction to E-Commerce, Types of E-Commerce: B2B, B2C, C2C, C2B, E-Commerce Business Models, Electronic Payment Systems, Digital Wallets and Payment Gateways, E-Commerce Website Design, Supply Chain and Logistics in E-Commerce.	11 Hours
Unit 4	Digital Analytics and Online Advertising: Importance of Digital Analytics, Digital Analytics Process, Web Analytics and Google Analytics, Types of Web Analytics, Features and benefits of Google Analytics, Metrics and KPIs in Digital Marketing, Email Marketing, Affiliate Marketing, Mobile Marketing, Content Marketing Strategies, Online Advertising and Campaign Management.	11 Hours
Unit 5	Security, Ethics, and Emerging Trends: Introduction to Security and Ethics in Digital Business, Cyber Security in E-Commerce, Privacy and Data Protection, Ethical Issues in Digital Marketing, Ethical Marketing Practices, Legal Aspects of E-Commerce, Indian Legal Framework, Artificial Intelligence in Digital Marketing, Chatbots and Marketing Automation, Future Trends in E-Commerce and Digital Business, Risk Management in E-Commerce.	12 Hours

3rd
APPROVED in 13/06/2026
Academic Council Meeting
Dated :- 13/06/2026

Text Books	
1	Seema Gupta, <i>Digital Marketing</i> , 3rd Edition, McGraw Hill Education, 2022.
2	Kenneth C. Laudon and Carol Guercio Traver, <i>E-Commerce: Business, Technology, Society</i> , 16th Edition, Pearson Education, 2021.
3	Simon Kingsnorth, <i>Digital Marketing Strategy: An Integrated Approach to Online Marketing</i> , 2nd Edition, Kogan Page, 2022.
4	Dave Chaffey, <i>E-Business and E-Commerce Management</i> , 7th Edition, Pearson Education, 2019.
5	Dr. Rana S. Mahajan, Dr. Manoj V. Bhalerao, Dr. Dipak P. Patil, Dr. D. G. Bhalke, <i>Digital Marketing</i> , 2nd Edition, Technical Publications, 2024.

Reference Books	
1	Philip Kotler, Hermawan Kartajaya and Iwan Setiawan, <i>Marketing 4.0: Moving from Traditional to Digital</i> , 1st Edition, Wiley, 2017.
2	Tracy L. Tuten and Michael R. Solomon, <i>Social Media Marketing</i> , 4th Edition, Sage Publications, 2020.
3	Gary P. Schneider, <i>Electronic Commerce</i> , 12th Edition, Cengage Learning, 2017.
4	Ryan Deiss and Russ Henneberry, <i>Digital Marketing for Dummies</i> , 2nd Edition, Wiley, 2020.

NPTEL Links	
1	https://nptel.ac.in/courses/110105083


 APPROVED in..... 3rd 
 Academic Council Meeting
 Dated :-..... 13/06/2026

Open Elective 1
Semester III

BTPESOE13T	Employability and Skill Development	OE 1	4L-0T-0P	4 Credit
Evaluation Scheme	CA-20 Marks	MSE-20Marks	ESE-60 Marks	ESE Time Duration 3 Hrs

Course Objectives	
1	Develop employability skills among mechanical engineering students and Enhance communication, teamwork, and professional ethics.
2	Build technical aptitude related to manufacturing, maintenance, quality, and industrial practices.
3	Prepare students for internships, placements, and industrial environments.

Course Outcomes At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Demonstrate effective communication and interpersonal skills in professional settings.	K2
CO2	Apply aptitude, analytical, and problem-solving skills for employment opportunities.	K3
CO3	Understand industrial practices, workplace safety, and engineering ethics.	K2
CO4	Develop technical employability skills relevant to mechanical engineering industries.	K2
CO5	Demonstrate entrepreneurship, leadership, and lifelong learning abilities.	K2

Unit 1	Communication Skills and Personality Development: Fundamentals of professional communication, Verbal and non-verbal, communication Technical communication and workplace etiquette ,Group discussion techniques Presentation skills and public speaking, Resume writing and cover letter preparation, Interview skills and mock interview practices, Personality development and confidence building.	12 Hours
Unit 2	Quantitative Aptitude and Problem-Solving Skills: Quantitative aptitude fundamentals, Numerical ability and logical reasoning, Analytical thinking and decision making, Basic data interpretation, Engineering problem-solving techniques, Time management and critical thinking, Introduction to psychometric and aptitude tests for placements .	12 Hours
Unit 3	Industrial Skills, Safety and Professional Ethics: Industrial work culture and organizational behaviour, Basics of industrial safety practices, Occupational health and hazard identification, Safety standards in mechanical workshops, Introduction to quality concepts (5S, Kaizen, Lean Manufacturing), Professional ethics and workplace discipline ,Engineering ethics and sustainable practices.	12 Hours
Unit 4	Technical Employability Skills: Automation and Smart Manufacturing, Internet of Things (IoT) Basics, Green Engineering and Sustainable Technologies, Artificial Intelligence basics. Industrial automation and Industry 4.0 overview, Preventive and predictive maintenance concepts, Quality control tools and inspection techniques ,Documentation and report writing.).	11 Hours

APPROVED in.....3rd.....
 Academic Council Meeting
 Dated :-.....13/06/2026

Unit 5	Entrepreneurship, Innovation and Career Development: Concept and Meaning of Entrepreneurship, Characteristics and Types of Entrepreneurs, Entrepreneurship development, Role of Entrepreneurship in Economic Development Start-up ecosystem and innovation, Career planning and higher education opportunities, Professional networking and digital platforms, Leadership and teamwork skills, Internship and project management basics.	11 Hours
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Text Books

1	Sanjay Kumar & Pushp Lata, Communication Skills –Oxford University Press.
2	S. P. Dhanavel, Soft Skills – Orient Black Swan.
3	R. S. Aggarwal, S. Chand., Quantitative Aptitude for Competitive Examinations.
4	Charles E. Harris Jr., Engineering Ethics –Cengage Learning.
5	S. S. Khanka, S. Chand..Entrepreneurship Development.

Reference Books

1	Barun K. Mitra , Personality Development and Soft Skills –,Oxford University Press.
2	Dr. M. Sen Gupta.Skills for Employability.
3	L. M. Deshmukh.,Industrial Safety Management .
4	Stephen R. Covey The 7 Habits of Highly Effective People.

NPTEL Links

1	https://nptel.ac.in/courses/109105110
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 Academic Council Meeting
 Dated :-.....13.06.2026

**Open Elective 2
Semester IV**

BTPESOE8T	Intellectual Property Rights (IPR)	OE 2	2L-0T-0P	2 Credit
Evaluation Scheme	CA-10 Marks	MSE-10 Marks	ESE-30 Marks	ESE Time Duration 2 Hrs

Course Objectives	
1	To introduce the fundamentals and importance of Intellectual Property Rights (IPR).
2	To understand different forms of intellectual property such as patents, copyrights, trademarks, trade secrets, geographical indications, and industrial designs.

Course Outcomes At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Explain the fundamentals, importance, and various forms of Intellectual Property Rights (IPR) along with international treaties and regulatory agencies.	K2
CO2	Analyze the concepts and legal provisions related to trademarks, trade secrets, and geographical indications for protection of intellectual assets.	K4
CO3	Understand the principles of copyright, patents, and industrial designs including criteria for protection and registration procedures.	K1

Unit 1	Introduction: Introduction to Intellectual Property Rights, types of intellectual property, importance of intellectual property rights, Evolution of IP acts and treaties, Agencies responsible for IPR registrations, Role and value of IP in international commerce, Issues affecting IP internationally.	10 Hours
Unit 2	Trade Marks: Purpose and function of trademarks, Acquisition of trade mark rights, transfer of rights, Selecting and evaluating trademark, registration of trademarks, claims. Trade Secrets: Trade secret law, determination of trade secret status, liability for misappropriation of trade secrets, trade secret litigation. Geographical Indication of Goods: Basic aspects and need for the registration.	10 Hours
Unit 3	Copyrights: Fundamentals of copyright law, originality of material, right of Reproduction, right to perform the work publicly, copyright ownership issues, notice of copyright. Patents: Foundation of patent law, patent searching process, Basic Criteria of Patentability. Industrial Designs: Kind of protection provided in Industrial design.	10 Hours

Text Books	
1	Deborah, E. Bouchoux, "Intellectual Property Right", Cengage learning.
2	Prabuddha Ganguli, "Intellectual property right: Unleashing the knowledge economy", Tata.

Reference Books	
1	Ajit Parulekar, Sarita D'Souza, "Indian Patents Law-Legal and Business implications", Macmillan India Ltd., 2006.
2	B. L. Wadhera, "Law related to patents, Trademarks, Copyrights, Designs and Geographical indications", Universal law Publishing Pvt. Ltd., India, 2000.

NPTEL Links	
1	https://nptel.ac.in/courses/109106137


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Dated :-...13.06.2020.

**Open Elective 2
Semester IV**

BTPEOE17T	Rural Development and Governance	OE 2	2L-0T-0P	2 Credit
Evaluation Scheme	CA-10 Marks	MSE-10 Marks	ESE-30 Marks	ESE Time Duration 2 Hrs

Course Objectives	
1	To understand the basics of rural development and local governance systems in India.
2	To learn the role of Panchayati Raj Institutions and government schemes for rural development and to create awareness about sustainable rural development and citizen participation.

Course Outcomes At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Describe the concepts of rural development, governance, and Panchayati Raj Institutions.	K2
CO2	Explain rural development programs and government initiatives in India.	K3
CO3	Discuss sustainable rural development practices and emerging trends in rural governance.	K4

Unit 1	Fundamentals of Rural Development and Governance: Meaning and Importance of Rural Development, Characteristics of Rural Society and Rural Economy, Problems of Rural Areas: Poverty, Unemployment, Migration Panchayati Raj System: Gram Sabha, Gram Panchayat, Panchayat Samiti, Zilla Parishad, 73rd Constitutional Amendment, Concept of Rural Governance, Citizen Participation in Rural Governance.	10 Hours
Unit 2	Rural Development Programs and Government Initiatives: Rural Development Planning in India, Five Year Plans and Rural Development, Rural Employment Schemes, MGNREGA, Rural Housing Schemes, Digital India and Rural Development, Self Help Groups (SHGs) and Women Empowerment, Role of Government in Rural Development.	10 Hours
Unit 3	Sustainable Rural Development and Emerging Trends: Sustainable Development Concepts, Rural Infrastructure Development, Water Management and Sanitation, Rural Health and Education, Agriculture and Rural Industries, Role of NGOs in Rural Development, Smart Villages and E-Governance, Rural Entrepreneurship, Environmental Challenges and Future Trends in Rural Development.	10 Hours

Text Books	
1	Katar Singh, <i>Rural Development in India</i> , 3rd Edition, Sage Publications, 2014.
2	V.C. Sinha, <i>Rural Development and Planning in India</i> , 1st Edition, Deep & Deep Publications, 2012.
3	Hoshier Singh, <i>Panchayati Raj and Rural Development</i> , 2nd Edition, Rawat Publications, 2016.


APPROVED in.....3rd.....
Academic Council Meeting
Dated :-.....12.10.2026

Reference Books	
1	Robert Chambers, <i>Rural Development: Putting the Last First</i> , 1st Edition, Pearson Education, 2008.
2	S.K. Mishra and V.K. Puri, <i>Indian Economy and Rural Development</i> , 34th Edition, Himalaya Publishing House, 2016.
3	S.R. Maheshwari, <i>Governance in Rural India</i> , 1st Edition, Orient Blackswan, 2011.

NPTEL Links	
1	https://nptel.ac.in/courses/109104203


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 Academic Council Meeting
 Dated :-.....12/06/2026...

**Open Elective 2
Semester IV**

BTPESOE26T	Emotional Intelligence	OE 2	2L-0T-0P	2 Credit
Evaluation Scheme	CA-10 Marks	MSE-10 Marks	ESE-30 Marks	ESE Time Duration 2 Hrs

Course Objectives	
1	To understand the concepts, components, and importance of Emotional Intelligence for personal and professional development.
2	To develop emotional competencies, communication skills, stress management abilities, and teamwork skills for effective workplace and engineering practices.

Course Outcomes At the end of this course, the students will be able to:		Bloom's Taxonomy Level
CO1	Explain the concepts, models, and emotional competencies associated with Emotional Intelligence.	K2
CO2	Analyze emotions, emotional behavior, stress, and interpersonal relationships for personal and professional effectiveness.	K4
CO3	Apply Emotional Intelligence skills in teamwork, leadership, workplace communication, and engineering project environments.	K3

Unit 1	Introduction to Emotional Intelligence (EI): Definition, Components of EI, Development of emotions and emotional maturity, Power of emotions, Importance of EI in personal life, EQ and IQ. Introduction to theories of EI, Models of emotions. Understanding of Emotions: Basics of emotion, Classification of emotions, Relationship between mood and emotion, control of emotions, and Impulse control, Marshmallow Experiment- Negative and Positive Emotions, Emotion and Health.	10 Hours
Unit 2	Emotional Intelligence Competencies: Self-awareness, Self-regulation, Social-skills, Relationship management, EI and motivation, Emotional competence, Developing EI. Managing Emotions: Emotional intelligence and psychological adjustment, Issues in Anxiety, Stress, Depression, and Anger, Empathy, Self-esteem and management, Building a successful career using EI.	10 Hours
Unit 3	EI Practice at Workplace: EI and decision making, EI and personality, work frustrations, and work performance, EI and leadership, EI and job stress, EI and information processing, Handling stress and pressure in the workplace, EI and communication, role of EI in job interviews. Emotional Intelligence and Team Work: Applying Emotional Intelligence in Engineering Projects, Team dynamics and emotional intelligence, Emotional Quality Management.	10 Hours

Text Books	
1	Daniel Goleman, Emotional Intelligence: Why It Can Matter More Than IQ, Bantam Books, 2012.
2	Dalip Singh, Emotional Intelligence at Work, Response Books, 2001.
3	Travis Bradberry, Jean Greaves, Emotional Intelligence 2.0, TalentSmart, 2009.

APPROVED in.....3rd.....
Academic Council Meeting
Dated :-.....12/06/2026.....

Reference Books	
1	Daniel Goleman, Working with Emotional Intelligence, Bantam Books, 2005.
2	Jeanne Segal, The Language of Emotional Intelligence, McGraw-Hill, 2000.
3	John D. Mayer, Peter Salovey, David R. Caruso, Emotional Intelligence: Theory, Findings and Implications, Psychological Inquiry Publication, 2004.
4	Steven J. Stein, Howard E. Book, The EQ Edge, Wiley Publications, 2011.

NPTEL Links	
1	https://nptel.ac.in/courses/109105116

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