ST. VINCENT PALLOTTI COLLEGE OF ENGINEERING & TECHNOLOGY, NAGPUR

(An autonomous institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

B. Tech. Scheme of Examination & Syllabus 2025-26

COMPUTER SCIENCE AND ENGINEERING

SEMESTER II

Sr. No	Course Category	Course Code	Course Title	Hours per Week			Credits	Maximum Marks				Minimum Passing Marks	Duration of ESE (hrs.)
				L	T	P		Mid-Sem Examination	Continual Assessment	End Semester Examination	Total		
1	BSC	**25CE201T**	Engineering Physics and Materials Science	**2**	**-**	**-**	**2**	**10**	**10**	**30**	**50**	**23**	**1.5**
2	BSC	**25CE201P**	Engineering Physics and Materials Science Lab	**-**	**-**	**2**	**1**	**-**	**25**	**25**	**50**	**25**	**-**
3	BSC	**25CE202T**	Statistics and Probability	**3**	**-**	**-**	**3**	**20**	**20**	**60**	**100**	**45**	**3**
4	BSC	**25CE202P**	Statistics and Probability Lab	**-**	**-**	**2**	**1**	**-**	**25**	**25**	**50**	**25**	**-**
5	ESC	**25CE203T**	Problem Solving with Python	**3**	**-**	**-**	**3**	**20**	**20**	**60**	**100**	**45**	**3**
6	ESC	**25CE203P**	Problem Solving with Python Lab	**-**	**-**	**2**	**1**	**-**	**25**	**25**	**50**	**25**	**-**
7	ESC	**25CE204T**	Competitive Programming – II	**2**	**-**	**-**	**2**	**10**	**10**	**30**	**50**	**23**	**1.5**
8	PCC	**25CE205T**	Modern Web Technologies	**2**	**-**	**-**	**2**	**10**	**10**	**30**	**50**	**23**	**1.5**
9	AEC	**25CE206P**	Business Communication Skills – II Lab	**-**	**-**	**2**	**1**	**-**	**25**	**25**	**50**	**25**	**-**
10	SEC	**25CE207T**	Design Thinking #	**2**	**-**	**-**	**2**	**10**	**10**	**30**	**50**	**23**	**1.5**
11	CC	**25CE208P**	Co-curricular Courses – II	**-**	**-**	**4**	**2**	**-**	**50**	**-**	**50**	**25**	**-**
Total				**14**	**00**	**12**	**20**	**80**	**230**	**340**	**650**		

 # To be conducted online through NPTEL

		July 2025	NEP 3.0	**Applicable for 2025-26**
Chairman - BoS	**Dean – Academics**	**Date of Release**	**Version**	

SECOND SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits		Evaluation		
						MSE	CA	ESE	Total
25CE201T	Engineering Physics and Materials Science	2	--	--	2	10	10	30	50

Course Objectives	Course Outcomes
This course is intended 1. To understand the basic laws of physics and their application in engineering and technology. 2. To develop scientific temper and analytical capability.	Students will be able to **1** Explain the fundamental concepts of solid-state physics including free electron theory, band formation, semiconductors, magnetic materials, and their applications in electronic and storage devices. **2** Analyze the principles of optical communication by understanding light propagation in optical fibers, numerical aperture, modes of propagation, fiber losses, and fiber optic sensors. **3** Apply the concepts of quantum physics such as wave–particle duality, de Broglie hypothesis, uncertainty principle, and wave function to physical systems. **4** Evaluate the role of semiconductors, magnetic materials, optical fibers, and quantum mechanics in modern technologies, including communication systems, storage devices, and quantum computing applications.

Unit I BASICS OF SOLID-STATE PHYSICS	**[11 Hrs]**
Semiconductors: Free electron Theory (qualitative idea) and its features; Idea of band formation in solids, Classification of solids: Metal, Insulator, Semiconductor; Fermi Energy, Types - Intrinsic and Extrinsic Semiconductors, Applications of solid state devices - p-n junction diode and transistor. **Magnetic materials**: Terms and definitions, Types of magnetic materials, characteristics of Diamagnetic, Paramagnetic and Ferromagnetic Materials, Applications of soft and hard magnetic materials with a special emphasis on storage devices such as hard disk, floppy disk and magnetic tapes, advantages & disadvantages.	
Unit II OPTICAL COMMUNICATION	**[11 Hrs]**
Introduction, Optical Fiber, Total Internal Reflection, Propagation of light through an Optical Fiber, Fractional Refractive Index Change, Numerical Aperture, Modes of Propagation, Classification of Optical Fibers, The Three types of fibers, Comparative characteristics, V-Number, Losses in Optical Fiber, Fiber Optic Communication System, Merits of Optical Fibers, Fiber Optic Sensors (Temperature sensor and Liquid Level detector)	
Unit III QUANTUM PHYSICS	**[08 Hrs]**
Dual nature, de-Broglie hypothesis, Wave packet, phase and group velocity, Uncertainty principle - physical significance and its application, Wave function - probability and normalization, Brief idea of application of quantum mechanics in quantum computing.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Fundamentals of Physics	David Halliday, Robert Resnick and Jerle Walker	8e extended	John-Wiley India
2	Electronic Engineering Materials and Devices	John Allision	10th edition reprint	TMH
3	Engineering Physics	M. N. Avadhanulu	Latest edition	S. Chand & Co.

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Solid State Physics	Charles Kittel	Eighth edition	John Wiley & Sons, Inc
2	Optical Fiber Communication - Principles & Practice	John M. Senior	3rd Edition	Prentice Hall
3	Quantum Mechanics	Schiff	First Edition	McGraw-Hill Book Company, Inc.

Online Resources

1	https://www.britannica.com/science/semiconductor#ref233890
2	https://www.geeksforgeeks.org/semiconductors/
3	https://www.sciencedirect.com/topics/chemistry/magnetic-material
4	https://www.livescience.com/33816-quantum-mechanics-explanation.html

SECOND SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
25CE201P	Engineering Physics and Materials Science Lab	--	--	2	1	25	25	50

Course Objectives	Course Outcomes
This course is intended 1. To understand the basic laws of physics and their application in engineering and technology. 2. To develop scientific temper and analytical capability.	Students will be able to 1. Verify principles/ laws by selecting and using proper measuring instruments, interpret result and draw conclusions. 2. Find various parameters using various properties of light. Apply the concepts of Semiconductors and Quantum Mechanics.

Expt. No.	Title of the experiment
1	Study of semiconductor diodes
2	Study of Phenomenon of Diffraction
3	Study of Interference
4	Study of Birefringence
5	Determination of Numerical Aperture (NA) of given Optical Fiber
6	Determination of Planck's Constant using LED
7	Guoy's Balance Method a) Determination of Magnetic Susceptibility of different magnetic materials. b) Identification of different types of Magnetic Materials
8	Study of Planck's Constant by means of LED
9	Determination of Curie Temperature of Ferromagnetic Material.
10	Study of Transistors.
11	Study of Hall Effect.
12	Experiment on 'Quantum Eraser'.
13	Demonstration of phenomena of Optics using Laser.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Fundamentals of Physics	David Halliday, Robert Resnick and Jerle Walker	8e extended	John-Wiley India
2	A Textbook of Engineering Physics	Dr. M. N. Avdhanulu, Dr. P. G. Kshirsagar	Latest edition	S. Chand Publication.
3	Principles of Physics	David Halliday, Robert Resnick, Jearl Walker	10th Edition	John Wiley and Sons (2017)

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Solid State Physics	Charles Kittel	Eighth edition	John Wiley & Sons, Inc
2	Solid State Physics	R.L. Singhal	Eighth edition	Kedarnath Ramnath
3	University Physics	Young and Freedman	Fifteenth edition	Pearson Education

Online Resources

1	https://www.britannica.com/science/semiconductor#ref233890
2	https://www.geeksforgeeks.org/semiconductors/
3	https://www.sciencedirect.com/topics/chemistry/magnetic-material

SECOND SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits		Evaluation		
25CE202T	Statistics and Probability	3	-	1	3	MSE	CA	ESE	Total
						20	20	60	100

Course Objectives	Course Outcomes
This Course is intended to 1. To equip students with the skills to analyze, interpret, and model statistical data using appropriate computational and analytical techniques. 2. To equip learners with the skills to analyze random phenomena, compute expectations, and interpret results using probability distributions.	**Students will be able to** 1. Solve numerical integration and find analytical solutions to difference equations. 2. Apply statistical methods such as regression, correlation, and least squares fitting to analyze data. 3. Apply probability theory and expectations to analyze data and solve engineering problems. 4. Apply probability distributions to model and interpret random phenomena.

Unit I	**[9hrs]**
Finite Differences: Operator E and delta, Factorial Polynomial, Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Difference equations with constant coefficients.	
Unit II	**[9hs]**
Statistics: Fitting of straight line, parabola and exponential curves by method of least squares, Coefficient of correlation and lines of regressions, Rank correlation, Multiple regression.	
Unit III	**[9hrs]**
Probability: Random Variable: Discrete & Continuous random Variable, Probability function, Distribution function, Baye's rule, Mathematical expectations, Variance and Standard deviation.	
Unit IV	**[9hrs]**
Joint probability: Joint probability function of discrete random variable, Marginal probability function and Conditional distribution of discrete random variable, Mathematical expectation of discrete random variable, Variance and Standard deviation, and Covariance of joint distribution.	
Unit V	**[9hrs]**
Probability Distributions: Binomial Distribution, Poison's Distribution, Normal Distribution.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Higher Engineering Mathematics	B. S. Grewal	40th	Khanna Publishers, New Delhi.
2	Higher Engineering Mathematics	H. K. Dass and Er. Rajnish Verma	1st	S. Chand & Co. Pvt. Ltd., New Delhi.

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Higher Engineering Mathematics	B. V. Ramana	11th reprint, 2010.	Tata McGraw-Hill Publications, New Delhi.
2	A Text Book of Engineering Mathematics	Peter O' Neil	8th	Thomson Asia Pvt. Ltd., Singapore.

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SECOND SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
25CE202P	Statistics and Probability Lab	--	--	2	1	25	25	50

Course Objectives	Course Outcomes
This Course is intended to: 1. To develop students' ability to analyze and interpret statistical data using SageMath. 2. To enable students to model, simulate, and interpret probability distributions and compute associated measures using SageMath's computational tools.	**Students will be able to:** 1. Apply symbolic and numerical computation techniques using SageMath to solve problems in calculus and discrete mathematics. 2. Analyze and interpret mathematical models using data fitting, correlation, and regression techniques. 3. Evaluate and interpret statistical parameters for joint and marginal probability distributions using SageMath. 4. Model, compute, and visualize discrete probability distributions using SageMath tools.

List of Experiments:-

Experiment No.	List of Experiment
1	To compute factorial polynomials for a given algebraic function with the help of SageMath.
2	To evaluate definite integrals by employing SageMath using Numerical Techniques.
3	To fit linear and quadratic models by means of the SageMath environment using least squares method.
4	To calculate the correlation coefficient and derive regression lines through the use of SageMath tools.
5	To determine Spearman's rank correlation coefficient with the help of SageMath.
6	To evaluate statistical parameters of a given probability distribution with the help of SageMath.
7	To construct and interpret joint and marginal distributions Using SageMath functionality.
8	To model and visualize the Poisson distribution executed through SageMath.
9	To compute and plot the Binomial distribution within the SageMath platform.
10	To analyze the Normal distribution using SageMath's statistical and graphical tools.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Computational Mathematics with SageMath	Paul Zimmermann	1st	SIAM Publications Library.
2	Basics of SageMath : Mathematics(Practicals)	Varun Kumar	1st	Amazon KDP

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Mathematics-SageMath Math Software System	Indrajeet Varhadpande & Dr. Kirti Sahu	1st	Himalaya Publication
2	Applied Mathematics Using SageMath	Dr. Kirti Sahu and Dr. Sajid Anwar	1st	Himalaya Publication

SEMESTER II

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25CE203T	Problem Solving with Python	3	-	-	3	20	20	60	100

Course Objectives	Course Outcomes
This course is intended 1. To Focuses on paradigms of programming language. 2. To study various python programming concepts	**Student will able to** 1. Apply Python basics, data types, operators, and core data structures to develop simple programs 2. Apply conditional, looping, and loop-control statements to develop logical Python programs 3. Analyze programming needs to select and use appropriate Python data structures such as lists, tuples, dictionaries, and sets 4. Apply functions and modules to develop modular Python programs 5. Analyze problem requirements to implement file handling, exception handling, and basic object-oriented concepts using classes and objects

Unit I:	**[9Hrs]**
Basics of Python: Introduction, features, applications, Variables, data types, keywords, Input/output functions, comments, operators and basic expressions, other data types-Tuples, lists, dictionary, sets	
Unit II:	**[9Hrs]**
Control Structures: Conditional branching statements- if, if-else, nested if, if-elif-else, switch; Looping- for, while; Loop control statements- break, continue, pass	
Unit III:	**[9Hrs]**
Python Data Structures: Lists: creation, indexing, slicing, methods, Tuples: properties and operations, Dictionaries: keys, values, methods, Sets: creation and basic set operations	
Unit IV:	**[9Hrs]**
Functions & Modules: Function declaration & definition , function call, variable scope and lifetime, Function arguments and return values, lambda function; Modules- Library modules and user defined modules	
Unit V	**[9Hrs]**
File Handling and Exception Handling: File operations: open, read, write, close, File modes: r, w, a, **Exception handling:** try, except, else, finally, Object Oriented Programming basics: classes, objects	

Text Books

S. N.	Title	Authors	Edition	Publisher
1	Python Programming using problem solving Approach	Reema Theraja	First Edition, 2017.	Oxford University Press
2	A Byte of Python	C. H. Swaroop	Edition2.1	Swaroop C H

Reference Books

S. N.	Title	Authors	Edition	Publisher
1	Python: The Complete Reference	Martin C. Brown	First Edition, 2017.	Oxford University Press

SEMESTER II

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25CE203P	Problem Solving with Python Lab	-	-	2	1	-	25	25	50

Course Objectives	Course Outcomes
This course is intended 1. Focuses on paradigms of programming language. 2. Enhancing the programming environment. 3. To study various programming language 4. To study the python as one of the important programming languages	**Student will able to** 1. Develop a program using python operators 2. Develop a python code using sequential concepts. 3. Develop a python code using non- sequential concepts. 4. Implement the program using conditional and looping

Expt. No.	Title of the experiment
1	(A). Installation of Latest Python version from Genuine Website, its installation process, path setting & its testing. (B) Implementation of some python program on interaction mode
2	Introduction to inbuilt IDE. Implementation of python programming in batch mode
3	Implementation of Python programming on various conditional operators
4	Implementation of Python programming on various arithmetic operators
5	Implementation of Python programming on various Loops
6	Implementation of Python programming on functions
7	Implementation of Python programming on List, Tuples & Dictionary
8	Implementation of Python programming on Object Oriented Programming concepts
9	Implementation of Python programming on File Handling
10	Mini Project

Text Books

S.N	Title	Authors	Edition	Publisher
1	Python Programming using problem solving Approach	Reema Theraja	First Edition, 2017.	Oxford University Press
2	A Byte of Python	C. H. Swaroop	Edition2.1	Swaroop C H

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Python: The Complete Reference	Martin C. Brown	First Edition, 2017.	Oxford University Press

GROUP 1: SEMESTER II

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25CE204T	Competitive Programming – II	2	-	-	2	10	10	30	50

Course Objectives	Course Outcomes
This course is intended to 1. Understand Fundamental Algorithms and Data Structures 2. Master Text Processing and Pattern Searching 3. Enhance Problem-Solving Skills	**Students will be able to** 1. Apply underlying principles of data structures and abstract data types (ADT) in solving computational problems. 2. Implement arrays in various sorting techniques such as selection sort and insertion sort, and utilize binary search and hash search algorithms for efficient data retrieval. 3. Identify features unique to object-oriented languages, and demonstrate the benefits and applications of object-oriented programming.

Unit I	**[10 Hrs]**
Data Structures and Algorithms Basics: Introduction: basic terminologies, elementary data organizations, data structure operations; abstract data types (ADT) and their characteristics. Array ADT: definition, operations and representations – row-major and column-major.	
Unit II	**[10 Hrs]**
Array Techniques: Array order Reversal, Array counting or Histogramming, Finding the maximum number in a set, removal of duplicates from an ordered array, partitioning an array, Finding the kth smallest Element Longest monoton sub sequence Merging: the two-way merge. Sorting: Sorting by selection, sorting by exchange, sorting by insertion, sorting by diminishing increment, sorting by partitioning. Searching: binary search, hash search.	
Unit III	**[10 Hrs]**
Object Oriented concepts: Introduction to structured programming language, procedural programming language, object oriented paradigms, features of object oriented programming language-abstraction, encapsulation, polymorphism, inheritance, benefits and applications.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	How to solve it by Computer	R. G. Dromey		Prentice-Hall India EEE Series.
2	Fundamentals of Data Structures in C	Ellis Horowitz, Sartaj Sahni Susan Anderson-Freed	Second	Universities Press

Reference Books

S.N	Title	Authors	Edition	Publisher
1	The Art of Computer Programming	Donald E. Knuth	3	Addison Wesley Longman
2	Object Oriented Programming	E. Balaguruswami		McGraw Hill

SEMESTER II

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25CE205T	Modern Web Technologies	2	-	-	2	10	10	30	50

Course Objectives	Course Outcomes
This course is intended 1. Understand the fundamental concepts of web development, including the structure and syntax of HTML, and the role of HTML in creating web pages 2. Acquire knowledge of basic website structure and layout principles for effective web page design. 3. understanding of the need for CSS in web development and its role in styling HTML elements	**Student will able to** 1. create well-structured and semantically correct web pages using HTML 2. demonstrate proficiency in incorporating multimedia elements and table structure 3. design more complex and interactive web pages using advanced HTML topics such as div elements, classes, IDs, iframes, and forms 4. Understand modern website development tools through case studies

Unit I	**[10 Hrs]**
Introduction to HTML: Overview of the Internet and World Wide Web, Basics of HTML - Structure, Syntax, and Elements, Text Formatting and Semantic Markup, HTML Lists - Ordered and unordered, HTML Tables - Border, Size, Header, Padding & Spacing, Colspan & Rowspan, Table Styling, Table Colgroup.	
Unit II	**[10 Hrs]**
Basic HTML Topics: Hyperlinks, HTML Media - Images, audio, video, youtube, Advance HTML Topics: HTML Div, HTML classes, HTML Id, HTML Iframes, HTML Form - Form attributes, Form elements, Input Types, Input Attributes, Website structure.	
Unit III	**[10 Hrs]**
Style Sheet: Need for CSS, Introduction to CSS, CSS Syntax and Selectors, Types of CSS - Inline, External CSS, Internal CSS (Text Formatting, Colors, Backgrounds, Box Model: Margins, Borders, Padding), Introduction to Wordpress, Case studies on Wordpress.	

Text Books

S. N.	Title	Authors	Edition	Publisher
1	HTML and CSS: Design and Build Websites	Jon Duckett		

Reference Books

S. N.	Title	Authors	Edition	Publisher
1	Head First HTML and CSS	Elisabeth Robson and Eric Freeman		
2.	Internet and World Wide Web: How to Program	Paul Deitel, Harvey & Abbey Deitel	5th edition	Pearson

SECOND SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
25CE206P	Business Communication Skills – II Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
To empower students to develop a career oriented mindset while harnessing the power of LSRW skills.	**Students would be able to:** 1. Participate in Group Discussions. 2. Improve their reading and formal writing skills. 3. Develop upon their listening skills to engage in meaningful conversations. 4. Develop oratory skills to engage and inform audiences. 5. Prepare themselves for participating in business meetings.

Expt. No.	Title of the experiment
1	Group Discussion
2	Reading for Competitive Exams II
3	Listening Skills II
4	Presenting a TED Talk
5	Media Interaction
6	Business Correspondence II
7	Report Writing
8	Mock Meeting

Reference Books

S. N	Title	Authors	Edition	Publisher
1.	Communication Skills for Engineers	C. Muralikrishna & SunitaMIshra	2nd Edition, 2011	Pearson India Education Services
2.	Communication Skills	Dr. L .Bisen, Dr. B. Agrawal& Dr. N. T. Kalyani	1st Edition, 2021	Himalaya Publishing House
3.	Barron's IELTS Superpack	Lin Lougheed	2012	Barrons Educational Series

SECOND SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25CE207T	Design Thinking	2	-	-	2	10	10	30	50

Course Objectives	Course Outcomes
1. Learn design thinking concepts and principles 2. Use design thinking methods in every stage of the problem 3. Learn the different phases of design thinking 4. Apply various methods in design thinking to different problems	1. Define key concepts of design thinking 2. Practice design thinking in all stages of problem solving 3. Apply design thinking approach to real world problems

Unit I **[10 Hrs**

INTRODUCTION: Why Design? - Four Questions, Ten Tools - Principles of Design Thinking - The process of Design Thinking - How to plan a Design Thinking project.
UNDERSTAND, OBSERVE AND DEFINE THE PROBLEM: Search field determination - Problem clarification - Understanding of the problem – Problem analysis - Reformulation of the problem - Observation Phase - Empathetic design - Tips for observing - Methods for Empathetic Design - Point-of-View Phase - Characterization of the target group - Description of customer needs.

Unit II **[10 Hrs**

IDEATION AND PROTOTYPING: Ideate Phase - The creative process and creative principles - Creativity techniques - Evaluation of ideas - Prototype Phase - Lean Startup Method for Prototype Development - Visualization and presentation techniques.

Unit III **[10 Hrs**

TESTING AND IMPLEMENTATION: Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How to conduct workshops - Requirements for the space - Material requirements - Agility for Design Thinking.
FUTURE:Design Thinking meets the corporation – The New Social Contract – Design Activism – Designing tomorrow.

Text Books

S.N	Title	Authors	Edition	Publisher
1.	Handbook of Design Thinking - Tips & Tools for how to design thinking	Christian Mueller-Roterberg	2021	Independently Published
2.	Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation	Tim Brown	2019	HarperCollins

Reference Books

S.N	Title	Authors	Edition	Publisher
1.	Design Thinking for Strategic Innovation	Idris Mootee		Wiley

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