



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

INFORMATION TECHNOLOGY

SEMESTER II

Sr No	Course Category	Course Code	Course Title	Hours per Week			Credits	Maximum Marks					No. of Hrs for ESE
				L	T	P		Mid-Sem Examination	Continual Assessment	End Sem Examination	Total	Minimum Passing Marks	
1	BSC	25IT201T	Engineering Physics and Materials Science	2	-	-	2	10	10	30	50	23	1.5
2	BSC	25IT201P	Engineering Physics and Materials Science Lab	-	-	2	1	-	25	25	50	25	-
3	BSC	25IT202T	Statistics and Probability	3	-	-	3	20	20	60	100	45	3
4	BSC	25IT202P	Statistics and Probability Lab	-	-	2	1	-	25	25	50	25	-
5	ESC	25IT203T	Object Oriented Programming	3	-	-	3	20	20	60	100	45	3
6	ESC	25IT203P	Object Oriented Programming Lab	-	-	2	1	-	25	25	50	25	-
7	ESC	25IT204T	Digital Logic Design	2	-	-	2	10	10	30	50	23	1.5
8	PCC	25IT205P	Software Lab - II	-	-	4	2	-	25	25	50	25	-
9	AEC	25IT206P	Business Communication Skills - II Lab	-	-	2	1	-	25	25	50	25	-
10	SEC	25IT207T	Design Thinking #	2	-	-	2	10	10	30	50	23	1.5
11	CC	25IT208P	Co-curricular Courses – II	-	-	4	2	-	50	-	50	25	-
Total				12	0	16	20	70	245	335	650	-	-

Course to be conducted online through NPTEL.

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INFORMATION TECHNOLOGY

SECOND SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25IT201T	Engineering Physics and Materials Science	2	-	-	2	10	10	30	50

Course Objectives	Course Outcomes
<p>This course is intended</p> <ol style="list-style-type: none"> To understand the basic laws of physics and their application in engineering and technology. To develop scientific temper and analytical capability. 	<p>Students will be able to</p> <ol style="list-style-type: none"> 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. Analyze the principles of optical communication by understanding light propagation in optical fibers, numerical aperture, modes of propagation, fiber losses, and fiber optic sensors. Apply the concepts of quantum physics such as wave-particle duality, de Broglie hypothesis, uncertainty principle, and wave function to physical systems. 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]
<p>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.</p> <p>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.</p>	
Unit II- OPTICAL COMMUNICATION	[11 Hrs]
<p>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)</p>	
Unit III- QUANTUM PHYSICS	[08 Hrs]
<p>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.</p>	

Text Books

S.N	Title	Authors	Edition	Publisher
1	Fundamentals of Physics	David Halliday, Robert Resnick and Jerle Walker	8th extended	John-Wiley India
2	Electronic Engineering Materials and Devices	John Allision	10 th 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	3 rd 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.geeksforgoeks.org/semiconductors/
3	https://www.sciencedirect.com/topics/chemistry/magnetic-material
4	https://www.livescience.com/33816-quantum-mechanics-explanation.html

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SECOND SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25IT201P	Engineering Physics and Materials Science		-	2	1	-	25	25	50

Course Objectives	Course Outcomes
<p>This course is intended</p> <ol style="list-style-type: none"> To understand the basic laws of physics and their application in engineering and technology. To develop scientific temper and analytical capability. 	<p>Students will be able to</p> <ol style="list-style-type: none"> Verify principles/ laws by selecting and using proper measuring instruments, interpret result and draw conclusions. 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.microscopyu.com/techniques/polarized-light/principles-of-birefringence

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25IT202T	Statistics and Probability	3	-	-	3	20	20	60	100

Course Objectives	Course Outcomes
This course is intended 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	[9hrs]
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.

Online Resources

1	https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2	https://www.coursera.org/learn/probability-statistics

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25IT202P	Statistics and Probability Lab	-	-	2	1	-	25	25	50

Course Objectives	Course Outcomes
<p>This course is intended</p> <ul style="list-style-type: none">To develop students' ability to analyze and interpret statistical data using SageMath.To enable students to model, simulate, and interpret probability distributions and compute associated measures using SageMath's computational tools.	<p>Students will be able to-</p> <ul style="list-style-type: none">Apply symbolic and numerical computation techniques using SageMath to solve problems in calculus and discrete mathematics.Analyze and interpret mathematical models using data fitting, correlation, and regression techniques.Evaluate and interpret statistical parameters for joint and marginal probability distributions using SageMath.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	1 st	Himalaya Publication
2	Applied Mathematics Using SageMath	Dr. Kirti Sahu and Dr. Sajid Anwar	1 st	Himalaya Publication

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25IT203T	Object Oriented Programming	3	-	-	3	20	20	60	100

Course Objectives	Course Outcomes
<p>This course is intended</p> <ol style="list-style-type: none"> To understand the basic concept of OOP and implement concept of Classes & Object, Inheritance, Polymorphism, File Handling using C++. To understand the concept of Exception handling. 	<p>Students will be able to</p> <ol style="list-style-type: none"> Describe and implement the concept of object-oriented programming Apply the operator & function overloading for performing the operation on the user defined data-types & functions. Apply the concept of inheritance for data hiding and encapsulation. Demonstrate the use of Exception in C++. Apply the file handling concepts in Object based programming.
Unit I: Concepts of OOP	[9Hrs]
Introduction to OOP, Procedural Vs. Object Oriented Programming, Benefits and applications of OOP; Beginning with C++: Overview and Structure of C++ Program, Access specifier, Classes and Objects, Array of object, Constructors and Destructors,	
Unit II: Operator & Function Overloading	[9Hrs]
Static data member & member function, friend function, Function overloading, Operators, Operators Overloading, using Friend function,	
Unit III: Inheritance	[9Hrs]
Introduction to inheritance, Types of Inheritance -Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance. Virtual Base Classes, Abstract Classes & Pure virtual function, Constructors in Derived Classes, Nesting of Classes	
Unit IV: Exception.	[9Hrs]
Introduction to Exceptions, Exception Handling Mechanism, Throwing Exceptions, Catching Exceptions, User-Defined Exceptions, Standard Exceptions in C++,Nested Try Blocks	
Unit V: File Handling	[9Hrs]
Streams classes, Stream Errors, Disk file I/O with streams, file pointers, overloading the extraction and insertion operators, command line arguments. Templates -function templates, Class templates. Exception handling in file.	

Text Books

Sr. No	Title	Authors	Edition	Publisher
1	Object Oriented Programming in C++	Robert Lafore	4 th	Sams Publication
2	Object Oriented Programming with C++	E. Balagurusamy	7 th	MCGraw Hill
3	Object Oriented Programming And C++	Rajaram, R	2 nd	New Age International Publishers

Reference Books

Sr. No	Title	Authors	Edition	Publisher
1	C++ : The Complete Reference	Schildt, Herbert	8 th	MCGraw Hill
2	The C++ Programming Language	B. Stroustrup	4 th	Addison-Wesley Pearson Education
3	C++ Primer	Stanley Lippman , Josée Lajoie , Barbara Moo	5 th	O'Reilly-2013

Online Resources

1	https://www.geeksforgeeks.org/c-plus-plus/
2	https://www.mycplusplus.com/tutorials/cplusplus-programming-tutorials
3	https://www.w3schools.com/cpp/cpp_intro.asp
4	https://www.programiz.com/cpp-programming

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25IT203P	Object Oriented Programming Lab	-	-	2	1	-	25	25	50

Course Objectives	Course Outcomes
This course is intended 1. To understand the basic concept of OOP. 2. To learn the features of OOP. 3. To implement concept of Classes & Object, Inheritance, Polymorphism, File Handling using C++. 4. To understand the concept of Exception handling	Students will be able to 1. Implement the concept of object-oriented programming 2. Apply the operator & function overloading for performing the operation on the user defined data-types & functions. 3. Develop the concept of inheritance for data hiding and encapsulation. 4. Demonstrate the use of pointer on array, function & objects 5. Apply the file handling, exception handling & template mechanism in Object based programming

Expt. No.	Experiments based on
1	Basics Structure of C++ programming.
2	Classes and Object.
3	Function Overloading and Operator overloading.
4	Constructors and Destructors
5	Inheritance (Single, Multilevel)
6	Inheritance (Multiple, Hierarchical, Hybrid)
7	Exception Handling
8	File Management

Text Books

Sr. No	Title	Authors	Edition	Publisher
1	Object Oriented Programming in C++	Robert Lafore	4 th	Sams Publication
2	Object Oriented Programming with C++	E. Balagurusamy	7 th	MCGraw Hill
3	Object Oriented Programming And C++	Rajaram, R	2 nd	New Age International Publishers

Reference Books

Sr. No	Title	Authors	Edition	Publisher
1	C++ : The Complete Reference	Schildt, Herbert	8 th	MCGraw Hill
2	The C++ Programming Language	B. Stroustrup	4 th	Addison-Wesley Pearson Education
3	C++ Primer	Stanley Lippman , Josée Lajoie , Barbara Moo	5 th	O'Reilly-2013

Online Resources

1	https://www.geeksforgeeks.org/c-plus-plus/
2	https://www.mycplusplus.com/tutorials/cplusplus-programming-tutorials
3	https://www.w3schools.com/cpp/cpp_intro.asp
4	https://www.programiz.com/cpp-programming

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SECOND SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25IT204T	Digital Logic Design	2	-	-	2	10	10	30	50

Course Objectives	Course Outcomes
This course is intended <ol style="list-style-type: none">Understand the fundamentals of number systems, Boolean algebra, and logic gatesAnalyze and minimize logical expressionsDesign and evaluate combinational and sequential logic circuits	Students will be able to- <ol style="list-style-type: none">Apply number system conversions, Boolean laws, and logic gate operationsSimplify logical functions using K-map and SOP/POS minimizationDesign and implement combinational & sequential logic circuits

Unit I : Number System & Boolean Algebra for logic circuits	[10Hrs]
Number System and Types, Basic Logic variables and logic functions, logic gates and symbols, Truth tables, Basic theorems and properties of Boolean algebra, DeMorgan's rules,	
Unit II: Logic Design Minimization Techniques:	[10Hrs]
Logic minimization, representation of truth-table, simplification of logical functions, minimization of SOP and POS forms, don't care conditions, reduction techniques: k-maps up to 4 variables	
Unit III: Combinational Logic & Sequential Logic Circuit	[10Hrs]
half- adder, full adder, half subtractor, full subtractor, Binary adder, binary subtractor, Decoders, Encoders, Multiplexers, and Demultiplexers, flip flop, application of flip- flops, Counters: asynchronous counter, synchronous counter.	

Text Books



Sr.No.	Title	Authors	Edition	Publisher
1	Digital design	M.M. Mano	4th	Pearson Education
2	Modern Digital Electronics	R. P. Jain	3rd	Tata McGraw-Hill
3	Fundamentals of Digital Logic with VHDL Design	Stephen Brown, Zvonko Vranesic	2nd	McGraw-Hill

Reference Books

Sr.No.	Title	Authors	Edition	Publisher
1	Fundamentals of Logic Design	Roth	5th	Thomson
2	Switching and Logic Design	C. V. S. Rao	3rd	Pearson Education
3	Digital Principles and Design	Donald D. Givone	3rd	Tata McGraw Hill

Online Resources

1	https://www.geeksforgeeks.org/binary-decoder-in-digital-logic/
2	https://www.tutorialspoint.com/digital_circuits/digital_circuits_useful_resources.htm
3	https://www.javatpoint.com/boolean-algebra-in-digital-electronics

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25IT205P	Software Lab - II	-	-	4	2	-	25	25	50

Course Objectives	Course Outcomes
This course is intended 1. To understand various UNIX utilities and shell scripting. 2. To understand File Operations and Text Processing. 3. To teach Regular Expression and Networking Analysis	Students will be able to 1. Evaluate the basic UNIX process structure and the UNIX file system. 2. Demonstrate the roles of Unix developers/systems programmers 3. Construct knowledge of simple UNIX filters. 4. Design pipes and redirection, imagine the UNIX environment



Expt. No.	Experiments based on
1	Creating files with VI editor.
2	Practical's based on basic UNIX commands
3	Practical's based on File Operations
4	Practical on Text Processing
5	Practical's based on Shell Scripting
6	Practical's based on Shell Variables and Environment
7	Practical's based on Regular Expressions
8	Practical's based on Networking

Text Books

Sr.No.	Title	Authors	Edition	Publisher
1	Unix in a Nutshell, 4th Edition	Arnold Robbins	1st	O'Reilly Media, Inc.

Online Resources

1	https://www.digitalocean.com/community/tutorials/linux-commands
2	https://afni.nimh.nih.gov/pub/dist/edu/data/CD.expanded/AFNI_data6/unix_tutorial/misc/unix_commands.html
3	https://www.digitalocean.com/community/tutorials/linux-commands

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Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25IT206P	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: <ol style="list-style-type: none">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.



Practical No.	Practical based on
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 & Sunita Mishra	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

Online Resources:

1	https://ieltsliz.com/
2	https://www.englishclub.com/business-english/
3	https://www.indiabix.com/verbal-ability/questions-and-answers/
4	https://prepinsta.com/interview-preparation/?utm_source=home+page&utm_medium=navigation

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SECOND SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation			
						MSE	CA	ESE	Total
25IT207T	Design Thinking	2	-	-	2	10	10	30	50

Course Objectives	Course Outcomes
<ol style="list-style-type: none">Learn design thinking concepts and principlesUse design thinking methods in every stage of the problemLearn the different phases of design thinkingApply various methods in design thinking to different problems	<ol style="list-style-type: none">Define key concepts of design thinkingPractice design thinking in all stages of problem solvingApply 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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