Bharati Vidyapeeth

(Deemed to be University)
Pune, India

College of Engineering, Pune

B.Tech. (Computer Science and Engineering) Program Curriculum

(2021 Course)

VISION OF UNIVERSITY:

Social Transformation through Dynamic Education

MISSION OF UNIVERSITY:

- To make available quality education in different areas of knowledge to the students as per their choice and inclination.
- To offer education to the students in a conducive ambience created by enriched infrastructure and academic facilities in its campuses.
- To bring education within the reach of rural, tribal and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities.
- To make available quality education to the students of rural, tribal and other deprived sections of the population.

VISION OF THE INSTITUTE:

To be World Class Institute for Social Transformation Through Dynamic Education.

MISSION OF THE INSTITUTE:

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- Toprovide an environment conducive to innovation, creativity, research, and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

VISION OF THE DEPARTMENT

To be focused on innovative and quality education in computer science and engineering that prepares professionals for development of society.

MISSION OF THE DEPARTMENT

- To provide academic environment for the development of skilled professionals
- To cultivate research culture that contributes to the sustainable development of the society.
- To enhance academic and industry collaborations for global exposure.

PROGRAM EDUCATIONAL OBJECTIVES

The students of B.TECH. (Computer Science and Engineering), after graduating will able to,

1. Demonstrate technical and professional competencies by applying Engineering Fundamentals, knowledge of computing and technologies.
2. Exhibit effective personality, good communication and team building skills
3. Adopt to the latest trends in the field of computer science and engineering.

PROGRAM SPECIFIC OUTCOMES

1. To design, develop and implement computer programs on hardware towards solving problems.
2. To employ expertise and ethical practice through continuing intellectual growth and adapting to the working environment.

PROGRAM OUTCOMES

a. Apply the knowledge of mathematics, science, engineering, and computing to provide a solution of complex engineering problems.
b. Identify, analyse complex engineering problems to derive conclusions using computer science and engineering knowledge.
c. Outline resolutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration, societal, and environmental considerations.
d. Use existing research knowledge and research techniques including design of experiments, data analysis, and synthesis to provide valid inferences.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools.
f. Apply inferences obtained by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the subsequent responsibilities relevant to the professional engineering practice.
g. Recognize the impact of the professional engineering solutions in societal and environmental contexts to demonstrate the knowledge for sustainable development.
h. Apply ethical principles and execute professional ethics and responsibilities and norms of the engineering practice.
i. Work effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary surroundings.
j. Talk effectively on complex engineering activities with the engineering community such as being able to comprehend and write effective reports and design documentation, make effective presentations.
k. Prove knowledge and understanding of the engineering and management principles and apply these to one's work, as a member and leader in a team.
l. Recognise the need for and have the preparation and ability to engage in independent and life-long learning in context of technological change.

CORELATION BETWEEN GRADUATE ATTRIBUTES AND PROGRAMME OUTCOMES

Graduate Attributes/ Programme Outcomes	a	b	c	d	e	f	g	h	i	j	k	l
Engineering Knowledge	✓											
Problem Analysis		✓										
Design/Development of solutions			✓									
Conduct Investigations of Complex Problems				✓								
Modern Tool Usage					✓							
The Engineer and Society						✓						
Environment and Sustainability							✓					
Ethics								✓				
Individual and teamwork									✓			
Communication										✓		
Project management and finance											✓	
Life-long learning												✓

DEFINITION OF CREDITS:

1 Hour Lecture (L) per week	1 credit
1 Hour Tutorial (T) per week	1 credit
2 Hour Practical (P) per week	1 credit
4 Hours Practical (P) per week	2 credit

STRUCTURE OF UNDERGRADUATE ENGINEERING PROGRAMME

Sr. No.	Category	Breakup of Credits
1	Basic Science Course (BSC)	22
2	Engineering Science Course (ESC)	15
3	Core Course (CC)	140
4	Elective Course (EC)	08
5	Project (PROJ)	08
6	Internship (INT)	03
7	Vocational Course (VC)	04
8	MOOCs (MOOC)	04 (Add-on course)
9	Research Paper Publication (Research)	02 (Add-on course)
10	Social Activity (SA)	04 (Add-on course)
11	Mandatory Course (MC)	Non-Credit
12	Internal Assessment (IA)	-
13	End Semester Examination (ESE)	-
TOTAL		200

DISTRIBUTION OF COURSE COMPONENTS

Sr. No.	Category	Number of Courses
1.	Basic Science Course	5
2.	Engineering Science Course	4
3.	Core Courses	34
4.	Elective Course	2
5.	Project	2
6.	Internship	1
7.	Vocational Course	4
8.	MOOCs	3
9.	Research Paper Publication	1
10.	Mandatory Course	1
11.	Social Activities	2
TOTAL		59

Program: **B.TECH. (Computer Science and Engineering)** **Semester – I** **CBCS 2021 Course**

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Mathematics for Computing-I	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Internet Programming	4	2	-	60	40	25	25	-	150	4	1	-	5
3		Organic and Electrochemistry	4	2	-	60	40	25	-	-	125	4	1	-	5
4		Digital Electronics	4	2	-	60	40	50	-	-	150	4	1	-	5
5		Programming and Problem Solving	4	2	-	60	40	50	-	50	200	4	1	-	5
6		Computer Aided Drafting	-	2	-	-	-	25	-	-	25	-	1	-	1
		Total	**19**	**10**	**1**	**300**	**200**	**175**	**25**	**50**	**750**	**19**	**5**	**1**	**25**

Program: B.TECH. (Computer Science and Engineering) Semester – II CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Mathematics for Computing-II	3	-	1	60	40	-	-	-	100	3	-	1	4
2		Probability and Statistics	4	2	-	60	40	25	-	25	150	4	1	-	5
3		Physics for Computing Systems	3	2	-	60	40	25	-	-	125	3	1	-	4
4		Electrical Technology	4	2	-	60	40	25	-	-	125	4	1	-	5
5		Linear Data Structures	4	4	-	60	40	50	-	50	200	4	2	-	6
6		Computer Systems Workshop Technology	-	2	-	-	-	25	-	25	50	-	1	-	1
		Total	**18**	**12**	**1**	**300**	**200**	**150**	**-**	**100**	**750**	**18**	**6**	**1**	**25**

Program: B.TECH. (Computer Science and Engineering) Semester – III CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Non-Linear Data Structures	3	2	1	60	40	25	-	25	150	3	1	1	5
2		Discrete Mathematical Structures	3	2	-	60	40	25	25	-	150	3	1	-	4
3		Machine Organization and Microprocessor	4	-	1	60	40	-	-	-	100	4	-	1	5
4		Software Engineering	4	2	-	60	40	25	-	25	150	4	1	-	5
5		Object Oriented Methodology*	4	2	-	60	40	25	-	25	150	4	1	-	5
6		Vocational Course-I	-	2	-	-	-	25	25	-	50	-	1	-	1
		Total	**18**	**10**	**2**	**300**	**200**	**125**	**50**	**75**	**750**	**18**	**5**	**2**	**25**
		Social Activity – I	-	-	-	-	-	-	-	-	-	-	-	-	2

***Industry Taught Course – II**

List of Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. (Computer Science and Engineering) Semester – IV CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Theory of Computation	3	-	1	60	40	-	-	-	100	3	-	1	4
2		System Programming and Operating System	4	2	-	60	40	25	25		150	4	1	-	5
3		Computer Graphics and Multimedia	3	-	-	60	40	-	-		100	3	-	-	3
4		Design of Algorithms	4	2	-	60	40	25	-	25	150	4	1	-	5
5		Database Systems*	4	2	-	60	40	25	-	25	150	4	1	-	5
6		CSE Skill Lab-I	-	4	-	-	-	25	-	25	50	-	2	-	2
7		Vocational Course-II	-	2	-	-	-	25	25	-	50	-	1	-	1
		Total	**18**	**12**	**1**	**300**	**200**	**125**	**50**	**75**	**750**	**18**	**6**	**1**	**25**
		MOOC - I#	-	-	-	-	-	-	-	-	-	-	-	-	2

*** Industry Taught Course – II**

 # Add-on Course - List of MOOC and Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. (Computer Science and Engineering) Semester – V CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Software Testing and Quality Assurance	3	2	-	60	40	25	25	-	150	3	1	-	4
2		Big Data Analytics	4	-	-	60	40	-	-	-	100	4	-	-	4
3		Human Machine Interaction	4	-	-	60	40	-	-	-	100	4	-	-	4
4		Computer Networks	4	2	-	60	40	25	-	25	150	4	1	-	5
5		Artificial Intelligence*	4	2	-	60	40	25	-	25	150	4	1	-	5
6		CSE Skill Lab –II	-	4	-	-	-	25	-	25	50	-	2	-	2
7		Vocational Course-III	-	2	-	-	-	25	25	-	50	-	1	-	1
	Total		**19**	**12**	**-**	**300**	**200**	**125**	**50**	**75**	**750**	**19**	**6**	**-**	**25**
		Social Activity-II	-	-	-	-	-	-	-	-	-	-	-	-	2
		Environmental Studies**	2	-	-	50	-	-	-	-	-	-	-	-	-

*** Industry Taught Course – III**

**** Mandatory Audit Course - 50 Marks Theory Examination**

List of Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. (Computer Science and Engineering) Semester – VI CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Business Intelligence System*	3	2	-	60	40	25	-	25	150	3	1	-	4
2		Cryptography and Network Security	4	2	-	60	40	25	-	25	150	4	1	-	5
3		Natural Language Processing	4	2	-	60	40	25	25	-	150	4	1	-	5
4		Quantitative Techniques, Communication and Values	4		-	60	40	-	-	-	100	4	-	-	4
5		Design Thinking	4	-		60	40	-	-	-	100	4		-	4
6		CSE Skill Lab –III	-	4	-	-	-	25	-	25	50	-	2	-	2
7		Vocational Course-IV	-	2	-	-	-	25	25	-	50	-	1	-	1
		Total	**19**	**12**	**-**	**300**	**200**	**125**	**50**	**75**	**750**	**19**	**06**	**-**	**25**
		MOOC - II #	-	-	-	-	-	-	-	-	-	-	-	-	2

***Industry Taught Course- IV**

 # Add-on Course - List of MOOC and Vocational Courses will be published by the department before the commencement of respective semester.

Program: B.TECH. (Computer Science and Engineering) Semester – VII CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Machine Learning	3	2	-	60	40	25	-	25	150	3	1	-	4
2		Internet of Things *	4	2	-	60	40	25	25	-	150	4	1	-	5
3		Optimization Techniques	4	-	-	60	40	-	-	-	100	4	-	-	4
4		Elective I	3	2	-	60	40	25	25	-	150	3	1	-	4
5		CSE Skill Lab–IV	-	4	-	-	-	25	-	25	50	-	2	-	2
6		Project Stage-I	-	2	-	-	-	50	50	-	100	-	2	-	3
7		Internship	-	-	-	-	-	25	25	-	50	-	3	-	3
		Total	**14**	**12**	**-**	**240**	**160**	**175**	**125**	**50**	**750**	**14**	**10**	**-**	**25**

***Industry Taught Course- V**

Elective I	Deep learning	Game Theory	Semantic Web	Text Mining

Program: B.TECH. (Computer Science and Engineering) Semester – VIII CBCS 2021 Course

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1		Data Visualization & Reporting	3	-	1	60	40	25	-	-	125	3	-	1	4
2		Augmented and Virtual Reality	4	2	-	60	40	-	25	-	125	4	1	-	5
3		Block Chain and Digital Currency*	3	2	-	60	40	-	-	25	125	3	1	-	4
4		Elective –II	3	2	-	60	40	-	25	-	125	3	1	-	4
5		CSE Skill Lab–V	-	4	-	-	-	25	-	25	50	-	2	-	2
6		Project Stage-II	-	4	-	-	-	100	100	-	200	-	6	-	6
		Total	**13**	**14**	**1**	**240**	**160**	**150**	**150**	**50**	**750**	**13**	**11**	**1**	**25**
		Research Paper Publication#	-	-	-	-	-	-	-	-	-	-	-	-	2

***Industry Taught Course- VI**

 # Add-on Course

Elective -II	Pattern Recognition	Industrial IOT	Knowledge Management System	Information Retrieval

B.TECH (Computer Science and Engineering)

SEMESTER – I

COURSE SYLLABUS

Mathematics for Computing-I

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
		Total	100 Marks	Total	04

Course Objective:

- Linear equations and its basis and dimension.
- Linear mapping and its matrix representation.
- Orthogonalization and diagonalisation of matrices

Prerequisite:
The students should have knowledge of algebra of matrices and determinants.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply rank of matrix in solving system of equations.
2. Identify basis and dimension of matrix.
3. Solve problems on kernel and image of linear transformation.
4. Apply linear operator to represent matrix.
5. Evaluate orthogonalization of inner product space.
6. Use methods to find eigen values and eigen vectors.

Unit I **06 Hours**

System of Linear Equation: Vectors and linear combinations, Rank of a matrix, Gaussian elimination, LU Decomposition, Solving Systems of Linear Equations using the tools of Matrices.

Unit II **06Hours**

Vector Spaces: Definition, linear combination, spanning sets subspaces, linear dependence and independence, basis and dimension, rank of matrix.

Unit III **06 Hours**

Linear Mapping: Linear mapping, Kernel and image of linear mapping, rank and nullity of a linear mapping, singular and non-singular linear mapping.

Unit IV **06 Hours**

Linear mapping and matrices: Matrix representation of linear operator, change of base, similarity matrices.

Unit V **06 Hours**

Inner Product space and orthogonalization: Inner product space,Cauchy-schwarz equality,orthogonality, orthogonal sets and bases, projections, Gramschidtorthogonalization, orthogonal and positive definite matrices, matrix representation of inner produc**t.**

Unit VI **06Hours**

Diagonalisation: Eigen values and eigenvectors: Characteristic polynomial, Cayley-Hamilton theorem, eigen values and eigenvectors, properties.

Textbooks

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune VidyarthiGrihaPrakashan, Pune, 2013
2. .B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi
3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.

4. ErwinKreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.

Reference Books

1. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.
2. MichaelGreenberg,Advanced Engineering Mathematics, 2nd Ed., Pearson Education, 1998.

List of Assignments

Six assignments to be given by the course coordinator (Theory)-one from each unit

Project Based Learning

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Gauss Elimination method.
2. LU-decomposition method
3. Rank of matrix
4. Linear combination
5. Basis and dimension
6. Spanning sets
7. Kernel and image of linear transformation
8. Rank-nullity theorem
9. Non-singular linear mapping
10. Linear operator
11. Similarity matrices
12. Change of base
13. Cauchy Schwarz equality
14. Orthogonality
15. Gram Schmidt Orthogonalization
16. Matrix representation of matrix
17. Cayley-Hamilton theorem
18. Eigen values and Eigen vectors

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Internet Programming

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks	Credits	
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Oral	25 Marks		
		Total	150 Marks	Total	05

Course Objectives:
To introduce students about all web programming languages with detailed study about HTML, CSS, DHTML, XML and DNS.

Prerequisite:
Basic knowledge about computers, web applications and internet.

Course Outcomes: On completion of the course, students will have the ability to:
1. Explain the fundamentals of programming languages.
2. Implement the Hyper Text Markup Language.
3. Use of Cascading Style Sheets in web page development.
4. Elucidate with implementation of Dynamic Hyper Text Markup Language.
5. Apply the knowledge to implement the Extensible Markup Language.
6. Implement the Hyper Text Transfer Protocol and DNS.

Unit I **08 Hours**

Introduction to internet programming: Computer Network, working of internet, Web applications, Introduction to web programming languages: HTML, DHTML, JSP, PHP, Role of the Server on the internet, Introduction to JSP, Introduction about Node JS and angular JS

Unit II **08 Hours**

Hyper Text Markup Language: Introduction to HTML, Tags, Div Span, Lists, Images, Hyperlink, Table, Iframe, Form, Headers, all content with HTML5

Unit III **08 Hours**

Cascading Style Sheets: Introduction to CSS, Syntax, Selectors, background, Text Fonts, Lists Tables, Box Models,Display Positioning, Floats.

Unit IV **08 Hours**

Dynamic Hyper Text Markup Language: Introduction of DHTML- HTML vs. DHTML, Advantages of DHTML, CSS of DHTML, Event Handling, Data Binding, Browser Object Models

Unit V **08 Hours**

Extensible Markup Language: Introduction of XML- Features of XML, Anatomy of XML document, The XML Declaration, Element Tags- Nesting and structure, XML text and text formatting element, Table element, Mark-up Element and Attributes,
XML Objects, Checking Validity, Understanding XLinks, XPointer, Event-driven Programming, XML Scripting, XML with Style Sheet Technologies- Concept of XSL, XML Schema, Importance of XML schema, Creating Element in XML Schema, XML Schema Types.

Unit VI **08 Hours**

Hyper Text Transfer Protocol and DNS: DNS, WWW, HTTP, HTTPs, XML HTTP Request-Introduction, XMLHttpRequest, The XMLHttpRequest Object, Events for the XMLHttpRequest Object, Request Object for XMLHttpRequest, Response Object for XMLHttpRequest, Complete working of web browser

Textbooks/ Reference Books:

1.HTML & CSS: The Complete Reference, Fifth Edition Paperback byThomas Powell, McGraw

Hill Education.
2.HTML & XHTML: The Complete Reference, byThomas Powell,McGraw Hill Education, McGraw-Hill Education.
3.XML: The Complete Reference, by Heather Williamson, McGraw Hill Education.
4.HTTP Pocket Reference (Pocket Reference (O'Reilly)), Clinton Wong, O′Reilly Publication.
5.HTML & XHTML: The Definitive Guide, 5th Edition, by Bill Kennedy and Chuck Musciano, O'Reilly Publications.

List of Assignments:

(Course coordinator can design his/her own theory assignment. Following are samples of theory assignments.)

1. Explain the role of web programming languages in internet.
2. Explain any five HTML tags with example.
3. Consider any web-based example to explain the role of CSS in web programming.
4. Explain the role of DHTML in web programming and web applications.

List of Laboratory Exercises:

1. Introduction to web format files and file extensions.
2. Implementation of simple HTML page.
3. Implementation of Images and Tables.
4. Implementation of frames.
5. Implementation of form.
6. Implementation of CSS.
7. Implementation of DHTML.
8. Implementation of XML.
9. Develop the web page with any scenario where HTML, CSS, XML will be used.
10. Develop any web project for any website or any portal.
11. Case Study on web programming languages.
12. Case Study on any web project

Project Based Learning

1. Website Development Hotel management
2. Website Development Personal Website
3. Website Development Organization website
4. Website Development Dummy Ecommerce website
5. Website Development Login page with user credentials
6. Development of aEmployee Interests Survey form / Student survey form
7. Technical documentation page
8. Create image slider
9. Railway concession form
10. Website development for personal portfolio

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Organic and Electrochemistry

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	**04 Hours/Week**	**End Semester Examination**	**60 Marks**	**Theory**	**04**
Practical:	**02 Hours/Week**	**Internal Assessment**	**40 Marks**		
		Term Work	**25 Marks**	**Practical**	**01**
		Total	**125 Marks**	**Total**	**05**

Course Objectives:

The student should acquire the knowledge of

- To develop the interest among the students regarding chemistry and their applications in engineering.
- To develop confidence among students about chemistry, how the knowledge of chemistry is applied in technological field.
- The student should understand the concepts of chemistry to lay the groundwork for subsequent studies in the computing field.

Prerequisite:

Basic Chemistry

Course Outcomes: On completion of the course, students will have the ability to:

1. Differentiate between ionic and covalent bonding and classify the bonding in a compound as ionic or covalent.
2. Develop a working knowledge of the twelve fundamental principles of green chemistry and what it is all about.
3. Apply standard reduction potential data to determine the relative strength of oxidizing/reducing agents
4. Demonstrate the knowledge of polymer materials for futuristic engineering applications
5. Describe the properties of materials and Application of semiconductor electronics
6. Describe the manufacturing and refining process of fuels and lubricants

Unit I **06 Hours**

Chemical Bonding in Molecules:MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra, and magnetic properties of complexes with relevance to bio-inorganic chemistry, organometallic chemistry.

Unit II **06 Hours**

Green Chemistry: Introduction, Twelve Principles of Green chemistry, numerical on atom economy, synthesis, adipic acid and indigo. Organic dye- Traditional methods of organic dye. Green solvents (ionic liquid supercritical CO2), and products from natural materials.

Unit III **06 Hours**

Electrochemistry: Electrochemical cells and Galvanic cells, EMF of a cell, Single electrode potential, Nernst equation, Electrochemical series, Types of electrodes, Reference electrodes, pH, pOH, acids and basis, Fuel cells, Construction and Working of - Acid and Alkaline Storage Battery, Dry Cell, Ni-Cd Batteries, Li-Ion Batteries, Li-Po Batteries.

Unit IV **06 Hours**

Polymers for The Electronics Industry: Polymers, Conduction mechanism, Preparation of conductive polymers, Polyacetylene, Poly (p- phenlylene), Polyhetrocyclic systems, Polyaniline Poly (Phenylene sulphide), Poly (1,6-heptadiyne), Applications, Photonic applications.

Unit V **06 Hours**

Semi-Conductors, Insulators and Superconductors: Semi conductivity in non-elemental materials, Preparations of semiconductors, Chalcogen photoconductors, photocopying process Introduction to Superconductors, types of Superconductors, Properties of superconductors, Applications of Superconductors, Electrical insulators, or Dielectrics.

Unit VI **06 Hours**

Fuels & Lubricants: Classification of fuels, Calorific values, Comparison between solid, liquid, and gaseous fuels, Theoretical calculation of calorific value of a fuel, Selection of coal, analysis of coal, Natural Gas, Producer gas, water gas, Lubricants, Mechanism of lubrication, classification of lubricants, lubricating oils, Solid lubricants, Greases or Semi-Solid lubricants, Synthetic lubricants, Lubricating emulsions, Properties of lubricating oils.

Textbooks:

1. Polymer Science and technology (2nd Edition), P. Ghosh, Tata McGraw Hill, 2008.
2. Polymers: Chemistry & Physics of Modern Materials (2nd edition) J.M.G.Cowie, Blackie Academic & Professional, 1994.
3. A Textbook of Engineering Chemistry, Shashi Chawla, DhanpatRai& Co, 2004
4. Engineering Chemistry (16th Edition) Jain, Jain, DhanpatRai Publishing Company, 2013.

Reference Books:

1. Inorganic Chemistry (4th edition), D. F. Shrives and P. W. Atkins, Oxford University, Oxford, 2006.
2. Reactions, Rearrangements and Reagents (4th edition), S. N. Sanyal, Bharti Bhawan (P & D), 2003.
3. Applications of Absorption Spectroscopy of Organic Compounds (4th edition), John R. Dyer, Prentice Hall of India Pvt. Ltd., 1978.

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum

Project Based Learning

1. 1.Green Chemistry approach to Nano-Structured Electronics
2. Assessment of Environmentally Benign Photopolymers as an Alternative to the Use of Formaldehyde Based Textile Finishing Agents
3. Solvent-Free Synthesis of Phthalocyanines
4. Synthesis of Conjugated Polymers and Molecules Using Sugar Reagents and Solventless Reactions
5. Environmentally Benign Control of Polymer Solubility: Photoresist Materials Using DNA Mimics
6. Enzymatic Synthesis of Non-Formaldehyde Phenolic Polymers: Control of Hydrogen Peroxide Concentration.
7. The materials chemistry and electrochemistry of lithium and sodium-ion batteries
8. Electroplating- the principles, how different metals can be used and the practical applications
9. Electroplating, Metal Polishing, Anodizing, Phosphating Metal Finishing and Powder Coating Projects.
10. To determine calorific value of a fuel by any suitable method
11. To study various properties of lubricants
12. To study various types of lubricants and its properties.
13. To determine quality of coal sample & its analysis.
14. To study mechanism of lubrication.
15. To study coal analysis & its significance.

Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Determination of Hardness of water sample by EDTA method.
2. Determination of Chloride content in water sample by precipitation titration method.
3. To determine strength of acid by pH – metric Titration
4. To measure the Conductance of a solution by conductometric titration
5. Measurement of Surface tension of a given liquid by Stalagmometer.
6. Determination of viscosity of a given liquid by Ostwald's Viscometer.
7. Determination of Saponification value of an oil sample.
8. To determine alkalinity water sample

9. Determination of Hardness of water sample by EDTA method.
10. Determination of Chloride content in water sample by precipitation titration method
11. To determine strength of acid by pH – metric Titration
12. To Prepare Phenol formaldehyde/Urea formaldehyde resin
13. To study set up of Daniel cell.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Digital Electronics

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	50 Marks	Practical	01
		Total	150 Marks	Total	05

Course Objective:

- To present the Digital fundamentals, Boolean algebra and its applications in digital systems
- To familiarize with the design of various combinational digital circuits using logic gates
- To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
- To understand the various semiconductor memories and related technology

Prerequisite:
Mathematics and Elementary Physics

Course Outcomes: On completion of the course, students will have the ability to:

1. Comprehend different number systems and Boolean algebraic principles.
2. Apply logic design minimization techniques to simplify Boolean expressions
3. Analyse and design combinational logic circuits.
4. Demonstrate the operations of systems with sequential circuit elements.
5. Comprehend characteristics and structure of Programmable Logic Devices and Memory.
6. Draw ASM charts for sequential circuit design.

Unit I **08 Hours**

Digital systems: Number Systems: Introduction to Number Systems-Decimal, Binary, Octal, Hexadecimal, Conversion of number system, Representation of Negative Numbers, 1's complement and 2's complement.
Binary Arithmetic: Binary addition, Binary subtraction, Subtraction using 1's complement and 2's complement, Binary multiplication, and division.
Digital Codes: BCD code, Excess-3 code, Gray code and ASCII code.
Logic Gates: Logical Operators, Logic Gates-Basic Gates, Universal Gates, realization of other gates using universal gates.

Unit II **08 Hours**

Logic Design Minimization: Boolean algebra, De Morgan's Theorems, Standard representation of logic functions, Sum of Product (SOP) form, Product of Sum (POS) form, Simplification of logical functions, Minimization of SOP and POS forms using Karnaugh-Maps up to 4 variables Don't care condition, Quine-McCluskey Method.

Unit III **08 Hours**

Combinational Circuits: Binary and BCD arithmetic, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Binary Adder (IC 7483), BCD adder, Code converters Multiplexers, De multiplexer, Decoder (IC 74138) and their use in combinational logic design, Priority Encoder, Digital Comparators, Parity generators and Checker(IC 74180), ALU

Unit IV **08 Hours**

Sequential Circuits: Flip- flop: SR, JK, D, T flip flops, Truth Tables and Excitation tables, Conversion from one type to another type of Flip Flop.
Registers: Buffer register, Shift register.
Counters: Asynchronous counters, Synchronous counters, Modulus counters

Unit V **08 Hours**

FSM and ASM charts: Introduction to FSM, Moore and Mealy State machine, state machine as a sequential controller. Design of state machines: state table, state assignment, transition/excitation table, excitation maps and equations, logic realization, ASM chart notations, ASM block, State diagram, ASM chart for sequential circuits, Multiplexer Controller.

Unit VI **08 Hours**

Memory and PLD: Semiconductor memories: memory organization, memory expansion, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM, DRAM.

Programmable logic devices: Study of PROM, PAL, PLAs. Architecture of PLA, Designing combinational circuits using PLDs.

Textbooks:

1. M. Morris Mano and M. D. Ciletti, Digital Design, Pearson Education.
2. RP Jain, Modern Digital Electronics, Tata McGraw Hill Publication.
3. F.J. Hill and G.L. Peterson, Switching Theory and Logic Design, John Wiley
4. J.F.Wakerly "Digital Design: Principles and Practices", 3rd edition, 4th reprint, Pearson Education, 2

Reference Books:

1. David J. Comer, Digital Logic & State Machine Design, Oxford University Press.
2. Digital Integrated Electronics- H. Taub&D.Shilling, McGraw Hill.

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit

Project Based Learning

1. Survey report of basic gates ICs 7432, 4011, 4050, 4070,4071,4010
2. Implement combinational logic Circuit of given Boolean Equation.
3. Implement Half Adder and Half Subtractor.
4. Implement Full Adder using two Half Adders
5. Build 4-bit parallel Adder / Subtractor using IC.
6. Build Code Converters: Binary to Gray
7. Build Code Converters: Excess 3 to Binary)
8. Implement Two Bit Magnitude Comparator using IC 7485
9. Implement given combinational logic using MUX
10. Implement 7 segment decoder driver using IC 7447.
11. Build a Decade counter and Up-Down Counter.
12. Build a Shift Registers: SISO and SIPO
13. Implement the Johnson Counter and Ring Counter.
14. Survey Report on Static I/O and transfer Characteristic of TTL and CMOS.
15. Implement given Boolean Function using PLA.(Function and Equation will be given by Subject Teacher)

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Verify truth tables of logic gates. (AND, OR, XOR, NOT, NAND, NOR). Simplify the given Boolean expression using K-map and implement using gates
2. State De-Morgan's theorem and write Boolean laws. Implement NAND and NOR as Universal gates.
3. Design (truth table, K-map) and implement half and full adder/ subtractor.
4. Design (truth table, K-map) and implement 4-bit BCD to Excess-3 Code converters.
5. Study of magnitude Comparator using IC 7485
6. Implement of logic functions using multiplexer IC 74151 (Verification, cascading & logic function implementation)
7. Implement logic functions using 3:8 decoder IC 74138.
8. Verify truth tables of different types of flip flops.

9. Design (State diagram, state table & K map) and implement 3 bit Up and Down Asynchronous and Synchronous Counter using JK flip-flop
10. Design and implement modulo ‘n’ counter with IC 7490.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Programming and Problem Solving

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work	50 Marks	Practical	01
		Practical	50 Marks		
		Total	200 Marks	Total	05

Course Objective:
The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Prerequisite:
Basic knowledge of mathematics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Describe the steps in problem-solvingand write a pseudocode for a given problem.
2. Identify the suitable control structure and write a C code for the same.
3. Write the C code for a given algorithm.
4. Illustrate use of pointers and functions
5. Write programs that perform operations using derived data types.
6. Validate the logic building and code formulation by designing code capable of passing various test cases

Unit I **08 Hours**

Introduction to Computer Problem Solving: The problem solving Aspect, Top Down Design, Implementation of Algorithms, Program Verification, The Efficiency of Algorithms, The Analysis of Algorithms, Fundamental Algorithms:
General problem solving strategies: Introduction to program Planning tools- algorithm, flowcharts, and pseudo codes. Introduction to Programming Logic.

Unit II **08 Hours**

Control structures: Features of C, basic concepts, structure of C program, program, declarations, variables, data types, expressions, operators assignment, arithmetic, relational, logical, increment and decrement, precedence of operators, type conversions, scanf and printf functions if-else, nested if-else, ladder if-else and switch statement. C Conditional control structures: for, while do-while Unconditional control structures: break, continue, goto statement.

Unit III **08 Hours**

Arrays and strings: Declaration initialization of one dimensional Array, two dimensional array, accessing array elements, Character Array/String, Character - Handling Library Functions, Standard Input/Output Library Functions for string.

Unit IV **08 Hours**

Functions and structures: What is a Function , Benefits of a Function , Function Terminology , Array of Structures, How does Function Works , Scope and Lifetime of Variables in function ,Storage Classes of Variables , Call by value and call by reference ,Recursion ,Overview of Structures , Defining and Using a Structure , Structures within a Structure.

Unit V **08 Hours**

Pointers: Declaring and Initializing Pointers, Function and Pointer Parameters, Pointer Arithmetic, Pointer and Arrays, Two Dimensional Arrays and Pointers.

Unit VI **08 Hours**

Files : FILE , Opening and Closing of Files , Writing and Reading in Text Format, Writing and Reading in Binary Format, Command Line Arguments

Textbooks:

1. Let Us C by YashavantKanetkar, 13e, BPB Publication.
2. BrainW. Kernighan& Dennis Ritchie, C Programming Language, 2nd edition, PHI.
3. E.Balaguruswamy, Programming in ANSI C 5th Edition McGraw-Hill.
4. How to Solve it by Computer by R. G. Dromey, 1e, Pearson Education.

Reference Books:

1. C: The Complete Reference by Herbert Schildt.

List of Assignments:

1. Write a pseudocode and draw a flowchart for a given problem.
2. Justify the selection of appropriate control structure
3. Write a function to check whether the string is palindrome.
4. List and explain the working of standard string I/O functions.
5. Define a dynamic array to store the student record.
6. List and explain the different modes of opening file.

Project Based Learning

1. Calendar using C
2. Snake Game
3. Cricket score display
4. Quiz game
5. Phone-book application
6. Election System
7. Simple Result system
8. Typing Tutor
9. Bill Calculator
10. Grade Calculator
11. CGPA Calculator
12. Digital Clock
13. Contact Management System
14. IP finder
15. Bank Management System.
16. Departmental Store Management.
17. Hangman Game Project.
18. Library Management System

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Describe the problem-solving steps.
2. Write a pseudocode and draw a flowchart.
3. Use mathematical operators and basic data types.
4. Demonstrate use of control structures.
5. Demonstrate use of logical operators.
6. Solve the real time problem using single and two dimensional array.
7. Perform the operations on string.
8. Solve the problems using recursive and non-recursive functions.
9. Solve the problems using dynamic memory allocations.
10. Perform the operations on files.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Computer Aided Drafting

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Practical:	**02 Hours/Week**	**Term Work**	**25 Marks**	**Practical**	**01**
		Total	**25 Marks**	**Total**	**01**

Course Objectives:

To provide knowledge about

- Fundamentals of engineering drawing and curves
- Isometric views and projection
- Projections of points, lines, planes & solids
- Use of CAD tools.

Prerequisite:

Basics of Mathematics at Secondary School Level

Course Outcomes: On completion of the course, students will have the ability to:

1. Understand dimensioning methods and drawing of engineering curves.
2. Draw orthographic projections using 1st angle method of projection.
3. Draw Isometric views from given orthographic projections.
4. Draw projection of Lines, its traces and projections of planes.
5. Draw projection of different solids.
6. Draw development of lateral surfaces of solids.

Unit I **04 Hours**

Lines and Dimensioning in Engineering Drawing and Engineering Curves: Different types of lines used in drawing practice, Dimensioning–linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

Ellipse by Arcs of Circles method, Concentric circles method. Involutes of a circle, Cycloid.

Introduction to Auto CAD commands.

Unit II **04 Hours**

Orthographic Projections: Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections.(Using AutoCAD commands)

Unit III **04 Hours**

Isometric Projections: Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view.(Using AutoCAD commands)

Unit IV **04 Hours**

Projections of Points & Lines: Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only). (Using AutoCAD commands).

Unit V **04 Hours**

Projections of Planes: Projections of Planes, Inclination of the plane with HP, VP. (Using AutoCAD commands)

Unit VI **04 Hours**

Projections of Solids: Projection of prism, pyramid, cone and cylinder by rotation method. (Using AutoCAD commands)

T**extbooks:**

1. "Elementary Engineering Drawing", N. D. Bhatt, Charotar Publishing house, Anand India,
2. "AutoCAD 2020 Beginning and Intermediate", MunirHamad, Mercury Learning & Information Publication, 2019.
3. "Engineering Drawing and Graphics", Venugopal K., New Age International publishers.

Reference Books:

1. "Textbook on Engineering Drawing", K. L. Narayana& P. Kannaiah, Scitech Publications, Chennai.
2. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi.
3. "Engineering Drawing", M. B. Shah and B.C. Rana,1st Ed, Pearson Education, 2005.
4. "Engineering Drawing", P. J. Shah, C. Jamnadasand Co., 1stEdition,1988.
5. "Engineering Drawing (Geometrical Drawing)", P. S. Gill, 10thEdition, S. K. Kataria and Sons, 2005.

List of Laboratory Exercises:

1. Types of lines, Dimensioning practice, free-hand lettering, 1ndand 3rdangle methods symbol.
2. Engineering curves.
3. Orthographic Projections.
4. Isometric views.
5. Projections of Points and Lines and planes.
6. Projection of Solids.

B.TECH (Computer Science and Engineering)

SEMESTER – II

COURSE SYLLABUS

Mathematics for Computing - II

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
		Total	100 Marks	Total	04

Course Objectives:

- Fourier series and integral transforms.
- Multiple integrals and its applications.
- Vector calculus and its applications.

Prerequisite:
The students should have knowledge of vector algebra, derivative and integration.

Course Outcomes: On completion of the course, students will have the ability to:

1. Use periodic functions as Fourier series.
2. Apply methods of finding Fourier and Z-transforms.
3. Apply methods of Laplace transform of piecewise continuous functions.
4. Identify concepts of double and triple integrals.
5. Apply vector derivative for physical quantities.
6. Evaluate line, surface and volume integrals.

Unit I **06 Hours**

Fourier Series: Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis

Unit II **06 Hours**

Fourier and Z-Transform: Fourier Transform (FT): Complex Exponential Form of Fourier series, Fourier Integral Theorem, Sine & Cosine Integrals, Fourier Transform, Fourier Sine and Cosine Transform and their Inverses. Introductory
Z-Transform (ZT): Definition, Standard Properties, ZT of Standard Sequences and their Inverses. Solution of Simple Difference Equations.

Unit III **06 Hours**

Laplace Transform and its application: Definition of LT, Inverse LT. Properties & theorems. LT of standard functions. LT of some special functions viz., Periodic, Unit Step, Unit Impulse, ramp, jump,. Problems on finding LT & inverse LT. Applications of LT and Inverse LT for solving ordinary differential equations.

Unit IV **06 Hours**

Multiple Integrals and their Application: Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values, moment of inertia, centre of gravity

Unit V **06 Hours**

Vector Differential Calculus: Physical interpretation of Vector differentiation, Vector differential operator, Gradient, Divergence and Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, Vector identities.

Unit VI **06 Hours**

Vector Integral Calculus and Applications: Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence theorem, Stoke's theorem. Applications to problem in engineering.

Textbooks:

1. P. N. Wartikar and J. N. Wartikar, Applied Mathematics (Volumes I and II), 7th Ed., Pune VidyarthiGrihaPrakashan, Pune, 2013.
2. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publication, Delhi
3. B.V. Ramana, Higher Engineering Mathematics, 6th Ed., Tata McGraw-Hill, New Delhi, 2008.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Wiley & Sons, Inc., 2015.
2. Peter V. O'Neil, Advanced Engineering Mathematics, 7th Ed., Cengage Learning, 2012.

List of Assignments:

Six assignments to be given by the course coordinator one from each unit.

Project Based Learning

Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code for it, wherever applicable.

1. Fourier series
2. Harmonic analysis
3. Fourier transform
4. Z-Transform
5. Laplace transform technique to solve ODE
6. Multiple Integral to evaluate area and volume
7. Directional derivative
8. Divergence and curl
9. Greens theorem
10. Gauss Divergence Theorem
11. Stokes theorem
12. Unit step function
13. Solenoidal and irrotational fields
14. Simple difference equation
15. Periodic functions

Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Probability and Statistics

TEACHING SCHEME		EXAMINATION SCHEME	CREDIT SCHEME	
				Credits
Lecture:	**4 Hours/Week**	**End Semester Examination: 60 Marks**	**Theory**	**4**
Practical:	**2 Hours/Week**	**Internal Assessment: 40 Marks**		
		Term Work : 25 Marks	**Practical**	**1**
		Practical: 25 Marks		
		Total: 150 Marks	**Total**	**5**

Course Objectives:

- Probability theory and expected value.
- Probability distribution and its applications.
- Multiple regression and ANOVA.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply Bayes theorem to find probability.
2. Compute mathematical expectations.
3. Identify various theoretical distributions.
4. Use correlation coefficient to interpret numerical data.
5. Use regression to estimate the dependent variable.
6. Apply concept of graph in optimization.

Unit I **08 Hours**

Probability Theory: Definition of probability: classical, empirical, and axiomatic approach of probability, Addition theorem of probability, Multiplication theorem of probability, Bayes' theorem of inverse probability, Properties of probabilities

Unit II **08 Hours**

Random Variable and Mathematical Expectation. Definition of random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs, Examples

Unit III **08 Hours**

Theoretical Probability Distributions: Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution

Unit IV **08 Hours**

Correlation: Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient, Properties of Spearman's rank correlation coefficient, Probable errors, Examples...

Unit V **08 Hours**

Linear Regression Analysis: Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Angle between the regression lines, Coefficients of regression, Theorems on regression coefficient, Properties of regression coefficient

Unit VI **08 Hours**

Multiple Regression and AVOVA: Multiple regression & multiple correlation, Analysis of variance (one way, two way with as well as without interaction)

Textbooks

1.S. C. Gupta, "Fundamentals of Statistics", 46th Edition, Himalaya Publishing House.
2.G. V. Kumbhojkar, "Probability and Random Processes", 14th Edition, C. Jamnadas and company.
3.Murray Spiegel, John Schiller, R. ALU Srinivasan, Probability and Statistics, Schaum's Outlines
Kishor S. Trivedi, "Probability, Statistics with Reliability, Queuing and Computer Science Applications", 2nd Edition, Wiley India Pvt. Ltd.
5.Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, An Introduction to Probability And Statistics, 3rd Edition, Wiley Publication
6.I.R. Miller, J.E. Freund and R. Johnson. Fun "Probability and Statistics for Engineers" (4th E dition)

List of Theory Assignments

One assignment on each unit

Project Based Learning

Students are expected prepare report on any one topic, write its definition, applications and analyse the hypothetical data. Also, write pseudo code for it, wherever applicable.

1. Bayes theorem
2. Additive and multiplicative law of probability
3. Mathematical expectation
4. Joint and marginal probability distribution
5. Theoretical probability distribution
6. Coefficient of correlation
7. Regression estimates
8. Simple regression model
9. Multiple regression model
10. One way ANOVA
11. Two way ANOVA
12. Correlation
13. Multiple correlation

Note: - *Students in a group of 3 to 4 shall complete any one project from the above list.

List of Laboratory Experiments (The course co-ordinator may frame 8-10 experiments)

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Physics for Computing Systems

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Total	125 Marks	Total	04

Course Objective:
To impart knowledge of basic concepts in physics relevant to engineering applications in a broader sense with a view to lay foundation for the Computer Engineering and Science.

Prerequisite:
Basic understanding of physics and calculus.

Course Outcomes: On completion of the course, students will have the ability to:

1. Interpret the properties of charged particles to develop modern instruments such as electron microscopy.
2. Appraise the wave nature of light and apply it to measure stress, pressure, and dimension etc.
3. Summarise the structure and properties of lasers to their performance and intended applications.
4. Classify the optical fiber, understanding the structure, types, and its applications in the field of communication.
5. Solve quantum physics problems to micro level phenomena and solid-state physics
6. Explain mechanical properties of solid matter and connect to applications in the field of engineering.

Unit I **06 Hours**

Modern Physics Motion of a charged particle in electric and magnetic fields, Electrostatic and Magnetostatic focusing, Electron microscope, Wavelength and resolution, Specimen limitation, Depth of field and focus, Transmission electron microscope (TEM), Scanning electron microscope (SEM), Separation of isotopes by Bainbridge mass spectrograph, Cathode ray tube (CRT).

Unit II **06 Hours**

Wave Optics: Interference of waves, interference due to thin film (Uniform and nonuniform (only formula-no derivation is expected), Newton's ring, Applications of interference (optical flatness, highly reflecting films, non-reflecting coatings). Diffraction Introduction, Classes of diffraction, Diffraction at a single slit (Geometrical method), Conditions for maximum and minimum, Plane diffraction grating, Conditions for principal maxima and minima Polarisation, Introduction, Double refraction and Huygen's theory, Positive and negative crystals, Nicol prism, Dichroism.

Unit III **06 Hours**

Lasers : Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Single Hetro-junction laser, Gas laser: CO2 laser, Properties of lasers, Laser speckles, Applications of lasers (Engineering/ industry, medicine, Computers)

Unit IV **06 Hours**

Fibre Optic: Principle of fibre optics, Construction, Numerical Aperture for step index fibre; critical angle, angle of acceptance, V number, number of modes of propagation, types of optical fibres, Fibre optic communication system, advantages, and disadvantages of fibre optics.

Unit V **06 Hours**

Quantum Mechanics: Dual nature of matter, DeBroglie's hypothesis, Heisenberg's uncertainty principle with illustrations, Physical significance of wave function, Schrodinger's time dependant and time independent wave equation, Application of Schrodinger's time independent wave equation to the problems of Particle in a rigid box, step potential and potential barrier (analytical discussion), tunnelling effect.

Unit VI **06 Hours**

Solid state physics: Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.

Textbooks:

1. A Textbook of Engineering Physics, M N Avadhanulu, P G Kshirsagar and TVS Arun Murthy, S. Chand Publishing (2018)
2. Engineering Physics, R K Gaur and S L Gupta, DhanpatRai Publishing Co Pvt Ltd (2015)
3. Concepts of Modern Physics, Arthur Beiser, Shobhit Mahajan and S. Rai Choudhury, McGraw Hill Education (2017)

Reference Books:

1. Fundamentals of Physics, Jearl Walker, David Halliday and Robert Resnick, John Wiley and Sons (2013
2. Optics, Francis Jenkins and Harvey White, Tata McGraw Hill (2017)
3. Principles of Physics, John W. Jewett, Cengage publishing (2013
4. Introduction to Solid State Physics, C. Kittel, Wiley and Sons (2004)
5. Principles of Solid State Physics, H. V. Keer, New Age International (1993)
6. Laser and Non-Linear Optics, B. B. Laud, New Age International Private Limited (2011)
7. Nanotechnology: Principles and Practices, Dr. S. K. Kulkarni, Capital Publishing Company (2014)
8. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan, New Age International Pvt. Ltd. (1997)
9. Introduction to Electrodynamics –David R. Griffiths, Pearson (2013
10. Renewable Energy: Power for a Sustainable Future, Boyle, Oxford University Press (2012)

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit/one mini project with report-students can work in group of 4 Maximum

Project Based Learning

1. Measurement and effect of environmental noise in the college
2. Design and simulation of automatic solar powered time regulated water pumping
3. Solar technology: an alternative source of energy for national development
4. Design and construction of digital distance measuring instrument
5. Design and construction of automatic bell ringer
6. Design and construction of remote control fan
7. Design and construction of sound or clap activated alarm
8. Electronic eye (Laser Security) as autos witch/security system
9. Electric power generation by road power
10. Determination of absorption coefficient of sound absorbing materials
11. Determination of velocity of O-ray and E-ray in different double refracting Materials.

12. Need of medium for propagation of sound wave
13. Tesla Coil
14. Thin film interference in soap film-formation of colours
15. LiFi- wireless data transfer system using light

Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Study of lissajous figure by Cathode Ray Oscilloscope (CRO)
2. Determination of e/m by Thomson method
3. Determination of radius of planoconvex lens/wavelength of light/Flatness testing by Newton's rings
4. Determination of wavelength of light using diffraction grating
5. Determination of resolving power of telescope
6. Determination of thickness of a thin wire by air wedge
7. Determination of refractive index for O-ray and E-ray
8. Determination of divergence of a laser beam
9. Particle size by semiconductor laser
10. Determination of wavelength of laser by diffraction grating
11. To study Hall effect and determine the Hall volatge
12. Calculation of conductivity by four probe method
13. Study of solar cell characteristics and calculation of fill factor
14. Determination of band gap of semiconductor
15. Determination of Planck's Constant by photoelectric effect

Syllabus for Unit Tests:

Unit Test -1	Unit:- Unit -I, Unit-II Unit-III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Electrical Technology

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term work	25 Marks	Practical	01
		Total	125 Marks	Total	05

Course Objective:
To study of power system basics, magnetic circuits electrical machines, transformers, wiring, measurements, illumination and batteries.

Prerequisite: NIL
-

Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the various parameters related to magnetic circuit.
2. Describe basic concepts of AC fundamentals and circuits.
3. Illustrate constructional features and describe different parameters of transformer.
4. Describe basic concepts of power system and three phase circuits.
5. Demonstrate AC and DC electrical machines.
6. Classify types of batteries.

Unit I **08 Hours**

Magnetic Circuits:Magnetic effect of electric current, Cross & DotConvention, Right hand thumb rule, Concept of flux, flux linkages, magnetic field, magnetic field strength, magnetic field intensity, absolute permeability, relative permeability Kirchhoff's laws for magnetic circuits. Magnetic circuit concepts, analogy between electric& magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling.

Unit II **08 Hours**

AC Fundamentals and circuits:AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasor, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel and series-parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low power factor, power factor improvement; resonance in series and parallel circuits, bandwidth and quality factor (simple numerical problems.

Unit III **08 Hours**

Single Phase Transformer: Faradays law of electromagnetic induction, statically and dynamically induced emf, self-inductance, mutual inductance , coefficient of coupling. Single Phase Transformer: Principle of operation, construction, e .m. f. equation, voltage ratio, current ratio, KVA rating ,determination of efficiency and regulation by direct load test, equivalent circuit, power losses,(simple numerical problems), introduction to auto transformer. Three phase transformer and its different winding connections.

Unit IV **08 Hours**

Introduction to Power System and Three Phase: Circuits: General layout of electrical power system and functions of its elements, standard transmission and distribution voltages, concept of grid (elementary treatment only) Power generation to distribution through overhead lines and underground cables with single line diagram. Three phase system-its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relations, three phase power and its measurement (simple numerical problems).

Unit V **08 Hours**

Electrical Machines: DC & AC:Principles of electromechanical energy conversion, DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics, and applications of dc motors (simple numerical problems). single Phase Induction motor: Principle of operation and introduction to methods of starting, applications. Three Phase Induction Motor: types, Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only).

Unit VI **08 Hours**

Batteries: Basic idea of primary and secondary cells, Construction, working principle and applications of Lead-Acid, Nickel Cadmium and Silver-Oxide batteries, charging methods used for lead-acid battery (accumulator), Care and maintenance of lead-acid battery, Series and parallel connections of batteries, General idea of solar cells, solar panels and their applications, Introduction to maintenance free batteries, Safe disposal of Batteries; Fuel cell: Principle & Types of fuel cell.

Textbooks:

1. B.L.Theraja, A Textbook of Electrical Technology, Vol.1, S.Chand& Company Ltd. New Delhi
2. V.K.Mehta, Basic Electrical Engineering, S Chand & Company Ltd. New Delhi.
3. J.Nagarath and Kothari, Theroy and applications of Basic Electrical Engineering, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. Electrical Technology - Edward Huges (Pearson
2. Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC)
3. Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall)
4. Electrical, Electronics Measurements and Instruments - (SatyaPrakashan)

List of Assignments:

Six assignments to be given by the course coordinator (Theory)-one from each unit.

Project Based Learning

1. Building a small resistive load lamp bank
2. Building a small resistive load lamp bank for various types of connections like series, parallel, star, delta
3. Building a small inductive load lamp bank for various types of connections like series, parallel, star, delta
4. Building a small capacitive load lamp bank for various types of connections like series, parallel, star, delta
5. Building a small resistive load lamp bank
6. Building a staircase wiring model on a board
7. Building a Go down wiring model on a board
8. Rewinding of a choke
9. Rewinding of a small transformer
10. Building a small rectifier circuit on bread board
11. Building a mobile charger circuit on a bread board
12. Building an electric buzzer circuit
13. Building a solar charger for mobile phone
14. Building a small wind turbine
15. Small Agricultural pump model with DC motor
16. Small Agricultural pump model with AC motor

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Plotting B-H characteristics for a material.
2. Load test on single phase transformer.
3. Testing and maintenance of batteries.
4. Verification of voltage and current relationships in star and delta connected 3-phase networks.
5. Load test on DC machine.
6. To find the performance of series R-L-C circuit at different condition
7. OS & SC test on single phase transformer to find efficiency and regulation
8. Speed control of DC motor
9. Study of different types of starters for DC & AC Machine
10. Load test on 3 phase Induction motor.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Linear Data Structures

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	04 Hours/Week	Internal Assessment	40 Marks		
		Term Work	50 Marks	Practical	02
		Practical	50 Marks		
		Total	200 Marks	Total	06

Course Objective:
The objective of the course is to provide the students in-depth knowledge of different Linear Data structures and their use to solve the programming problems.

Prerequisite: Basic knowledge of computer

Course Outcomes: On completion of the course, students will have the ability to:

1. Use appropriate data structure to solve a particular problem
2. Demonstrate the use of linked list and compare it with array.
3. Demonstrate the use of stack as an ADT.
4. Perform the operations on queue.
5. Apply the searching and sorting algorithms
6. Demonstrate the use of Files and different File Organizations

Unit I **08 Hours**

Introduction to Data structures: Introduction to algorithm, Algorithm analysis, Big O Notations, Need of Data structure, Classification of Data Structures, Operations on Data Structures. **Arrays:** Introduction, Array Operations, representation of Arrays in Memory, One- & Two-dimensional array in function, Implementation of One- & Two-Dimensional Arrays in Memory, Abstract Data Types.

Unit II **08 Hours**

Linear Lists: Introduction, Singly linked list, Circularly Linked List, Doubly Linked lists, Basic operations, - Insertion, Deletion, retrieval, traversal, create List, insert node, delete node, List Search, Empty list, Destroy list, Applications of Linked List

Unit III **08 Hours**

Stacks: Stack Structure, Operations on Stacks – create stack, Push stack, Pop stack, Array and Linked Representation, operations (For both array and Linked representation),Types of Notations, Applications of Stack: Reversing Data, Converts Decimal to Binary, Parsing, Postponement.

Unit IV **08 Hours**

Queue: Introduction, Definition, Storage Methods Queue Operations- Enqueue, Dequeue, Queue front, Queue rear, Queue Example, Create Queue, priority Queue, Circular Queue, Application of Queue: Categorising Data, Queue. Simulation, Array and Linked representation of queue (operations on array and Linked representation.

Unit V **08 Hours**

Implementation &Application: Searching: Linear Search, Binary Search, Hashing: Introduction. Hash Tables, Hash Functions, Collision, Applications
Sorting – Selection Sort, Bubble Sort, Insertion Sort, Merge Quick Sort, Shell Sort

Unit VI **08 Hours**

Files and Organization: Introduction, Data Hierarch, FileAttributes, Text and Binary Files, Basic File Operations, File Organization, Sequential Organization, Relative File Organization, Indexed Sequential File `Organization.

Textbooks:

1. Richard F Gilberg&Behrouz A Forouzan, Data Structures (A PseudocodeApproach with C), second edition, Cengage Learning, 2004.
2. PAI, Data Structures, Tata McGraw-Hill Education, 2008
3. Data Structures Using C, ReemaThareja, OXFORD University Press

Reference Books:

1. Mayank Patel, Data Structure and Algorithm With C, Educreation Publishing, 2018
2. Thomas H. Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, Introduction to Algorithms, MIT Press, 2001.

List of Assignments:

1. Write an algorithm for a given problem and analyse it's complexity
2. Describe representation of a linked list in the memory and Write a pseudocode to perform deletion operation on list.
3. Illustrate the use of stack to solve the Tower of Hanoi problem.
4. Write a pseudocode to perform operations on priority queue.
5. Compare bubble sort and selection sort
6. Describe the sequential file organization.

Project Based Learning

1. Expression Evaluation
2. Traffic Management System
3. Library Management System for a small library in a department
4. Employee Record System
5. Dictionary
6. Calendar Application
7. Medical Store Management System
8. Cricket Score Sheet
9. Bank Management System that handles only savings account
10. Ticket booking system for bus

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Use of array and operations on Array.
2. Operations on singly and doubly linked list.
3. Polynomial operations using linked list.
4. Create stack and demonstrate it's use.
5. Develop a priority queue and perform the operations.
6. Demonstrate the use of different file organizations.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Computer System Workshop Technology

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Practical:	02 Hours/Week	Term Work	25 Marks	Practical	1
		Practical	25 Marks		
		Total	50 Marks	Total	01

Course Objective:
Provide student a much-needed knowledge of computer hardware and networking, enabling them to identify computer hardware, software and network related problems, and develop an ability to use the basics of computing, necessary for computing courses

Prerequisite:
Basic knowledge of Computer and Electronics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Identify the architecture of a computer and its different components, including their technology evolution.
2. Apply their knowledge about computer peripherals to identify problems.
3. Install and uninstall given software step-by-step.
4. Learn the working of Internet.
5. Prepare document using Latex.
6. Learn GitHub tool for coding and collaboration.

Unit I **04 Hours**

Computer hardware peripherals: Introduction to hardware components, random access memory (ram), Types Of RAM & their speed, tips for buying ram, how to add memory to a computer, problems when installing memory, Central Processing Unit (CPU), Types Of CPU: considerations when buying a new CPU (Types & Differences), different speeds available for CPU and what do they mean, 32 Bit vs 64 Bit – Which One To Choose &Why? How to choose a CPU type for different needs? Graphic Card & Types, How to install a Graphics Card, Installing a CD or DVD burner, Jumper Switch settings, Hard Disk upgrade, Different ports and why we use them - USB, PS2, DivX, Graphic card & types, Virtual Memory and how to configure it for optimum system performance.

Unit II **04 Hours**

Assembly of Computer and Software Installations: Assembling the motherboard, Replacing fan, how to avoid common mistakes during assembly, Installation of system software: Operating system (Windows and Linux), Installations step for operating system, Dual booting, Configure the BIOS, Installation of Antivirus, Installation of the open source software such as Scilab, Latex Installation of Ms Office.

Unit III **04 Hours**

Basic Diagnostic of Hardware and Software : Diagnosis of Power Up problem, Boot Drive, Errant Keyboard, mouse problems, slow computer performance, Computer freezes and displays BSOD (Blue screen of death), no display on monitor, no sound, computer rebooting or turning itself off, how to troubleshoot a computer that does not boot, Registry Cleaner

Unit IV **04 Hours**

Computer network environments: Network connecting devices. Configure the TCP/IP setting, connect to Local Area Network and access the Internet, Configuring Wireless network. Server and Its Configuration, Email Clients, Browsers, Office tools, customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers, Browsing netiquettes and cyber laws. Cloud Access Tools

Unit V **04 Hours**

Configuration of External devices: Physical set-up of Printers- Performing test print out, Printing of document etc, Scanner set-up, Webcam, Bluetooth device, Memory card reader etc

Unit VI **04 Hours**

Productivity tools: Open Source Tools Such as Latex, GitHubLaTeX: Format words, lines, and paragraphs, design pages, create lists, tables, references, and figures in LATEX. Introduction to LaTeX Packages and classes. Using Git, Version Control Systems, interacting with GitHub, Reverting Changes, Creating Pull Requests.

Textbooks:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. PC Hardware and A Handbook – Kate J. Chase PHI (Microsoft).
3. LaTeX Companion – Leslie Lampert, PHI/Pearson.
4. https://nptel.ac.in/courses/106/105/106105081/.
5. http://nptel.ac.in/courses/106105084/.
6. https://guides.github.com/.
7. Introduction to Linux: Installation and Programming B Venkateswarlu, BS Publication.

Reference Books:

1. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
2. Computer Fundamentals, MS Office and Internet & Web Technology by Dinesh Maidasani.

Project Based Learning

1. Collect specifications of similar types of hardware and software and prepare report comparing them
2. Assembling and disassembling the PC back to working condition.
3. Installation of operating systems LINUX on Server and different packages on a PC.
4. Practice hardware troubleshooting exercises related to various components of computer like monitor, drives, memory devices, printers etc. and software troubleshooting related to BIOS etc
5. To start your own computer repair workshop. What would your initial planning involve? What would you look for in terms of building, furnishings, tools and any other equipment that you can think of?
6. Cyber Hygiene: Installing antivirus for Windows.
7. Prepare the report of need of programming language in 21st century.
8. Collect various types of computer hardware and prepare summary report
9. Prepare Seminar report using LaTex
10. Prepare Project report using LaText

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Demonstrate the Computer Hardware Components and explain its working.
2. Demonstrate the Networking Components and explain its working.
3. Installation of operating system MS windows, Unix on the personal computer
4. Installation of Application software Scilab, Latex, MS office on the personal computer
5. Troubleshooting hardware related problem.
6. Customize web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.
7. Execution of Important “layout” and formatting commands in Latex,
8. Installation of Antivirus and customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms
9. Assignment on Pull request, code review and collaboration using GitHub.

10. Demonstrate the Computer Hardware Components and explain its working.

B.TECH (Computer Science and Engineering)

SEMESTER – III

COURSE SYLLABUS

Non-Linear Data Structures

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
Tutorial:	01 Hours/Week	Term work	25 Marks	Practical	01
		Practical	25 Marks		
		Total	150 Marks	Total	05

Course Objective:
The objective of the course is to provide the students the knowledge of different Non-linear data structures and how to use these to solve real world problems.

Prerequisite:
Basic Knowledge of Algorithm, programming fundamentals, Data types.ADT, Linear data Structure.

Course Outcomes: On completion of the course, students will have the ability to:

1. Identify and Apply appropriate algorithms on the graph to solve real world problems.
2. Demonstrate the use of trees and binary search trees to solve the real world problem.
3. Compare the different types of trees like AVL trees, BTree,B+ Tree, red Black tree and select an appropriate one to solve a particular one
4. Perform insertion and deletion operation on heap.
5. Apply appropriate hash function for a search process.
6. Explains the use of dictionaries and concept of text processing.

Unit I **06 Hours**

Graphs: Introduction to Non-Linear data structure, Graphs, Representation of graph, AND/OR Graphs, ADT for Graph, Traversing a Graph, Dijkstra's Algorithm, Minimum Spanning Trees.

Unit II **06 Hours**

Trees: Introduction, Binary Trees, Binary Tree Representation, Tree Traversal Algorithms, Threaded Binary Tree, Binary Search Tree, Operations on Binary Search Tree, Huffman's Algorithm.

Unit III **06 Hours**

Special forms of trees:AVL Trees, m-way Search Trees, B Trees, B+ Trees, Red Black Tree, 2-3 Trees, Splay Trees, Applications of Trees.

Unit IV **06 Hours**

Heaps: Heaps as priority queues, Heap Implementation, Insertion and Deletion operations, binary heaps, binomial and Fibonacci heaps, heapsort, heaps in Huffman coding.

Unit V **06 Hours**

Hashing: Introduction, Hash functions, Collision Resolution Strategies,
Types of Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

Unit VI **06 Hours**

Dictionaries & Text Processing: Definition, Dictionary Abstract Data Type, Implementation of Dictionaries, Text Processing: String -+Operations, Brute-Force Pattern Matching, The Boyer-Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard tries, Suffix Tries, The Huffman Coding Algorithm.

Textbooks:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 2nd Edition, Pearson, 2004.
2. M T Goodrich, Roberto Tamassia, Algorithm Design, John Wiley, 2002.
3. Fundamentals of Data Structures in C by Horowitz, Sahni& Anderson-Freed, 2e
Universal Press

Reference Books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms,
MIT Press, 3/e, 2009.
2.A. M. Tenenbaum, Y. Langsam, and M. J. Augenstein, Data Structures Using C and
C++,Prentice Hall, 3/e.

List of Assignments:

The following are some sample assignments. The course co-ordinator will frame one assignment on each unit for internal assessment.

1. Apply the shortest path algorithm on the given graph.
2. Apply the appropriate algorithm and find the solution for the problem.
3. Generate Huffman code
4. Write a pseudocode for tree traversal operation
5. Explain the concept of linear probing
6. Explain the steps in text processing

Project Based Learning

1. Hashing for cryptography
2. Payroll system
3. Network route identifier
4. Path finder
5. Telephone directory
6. Library Management system
7. Document indexing
8. Data Compressor
9. Railway reservation system
10. Supermarket stock management

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Apply Graph traversal technique.
2. Demonstrate use of Dijkstra's Algorithm.
3. Perform operations on binary search trees.
4 Perform on Tree Traversal Algorithms.
5. Applications and Demonstration on different types of trees.
6. Perform the operations on Heaps.
7. Apply Hash Function to solve the real time problem.
8. Demonstrate use of dictionaries and concept of text processing.
9. Mini Project

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Discrete Mathematical Structures

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Practical:	02 Hours/Week	Internal Assessment	40 Marks	Tutorial	00
		Term Work	25 Marks	Practical	01
		Oral	25 Marks		
		Total	150 Marks	Total	04

Course Objective:
The objective is to provide a mathematical foundation and skills those are required in further study of Computer Science and Engineering. The course Discrete Mathematical Structures deals with discrete objects, countable sets. It helps to develop logical thinking and a wide variety of real-world applications to computer science. It is a very good tool for improving reasoning and problem-solving capabilities.

Prerequisite:
Basic knowledge of Elementary Linear Algebra, Numerical Mathematical Computation, Programming basics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Demonstrate the ability to write the sentences in the symbolic logic and evaluate a proof technique.
2. Apply the basic principles of set theory to analyse the data relationship and prove basic properties of set.
3. Analyse the properties of relations and functions to determine their properties.
4. Apply the knowledge of Boolean algebra for building basic electronic and digital circuits.
5. Solve problems of combinatorics and recurrence relations.
6. Model problems in Computer Science using graphs and trees.

Unit I **06 Hours**

Mathematical Logic: Propositional Logic, Predicate logic, First order logic, Rules of inference, Introduction to proof techniques, resolution, Mathematical induction, Methods of proofs.

Unit II **06 Hours**

Set Theory: Types of sets, Sets operations and laws, Algebra of Sets, Multisets, Application of the principle of inclusion and exclusion.
Number Theory: Modular arithmetic, prime numbers, and properties, GCD, Chinese remainder theorem, Extended Euclidean algorithm.

Unit III **06 Hours**

Relations: Basic definition, properties and types of relations, relations and digraphs, paths in relations and digraphs, equivalence and partially ordered relations, Transitive closure and Warshall's algorithm.
Functions: Types of functions, Identity functions, Composition of functions, Mathematical functions, Pigeonhole principle.

Unit IV **06 Hours**

Algebraic Structures: Isomorphism and Homomorphism, Groups, Algebraic Structures with Binary Operations, rings, Cyclicgroups, codes.
Lattice: Posets andHasse Diagrams, Lattice as an algebraic system, Properties of lattices. Group Codes: The Communication Model and Basic notion of Error Correction, Generation of Group codes, Parity Check, Error Recovery

Unit V
Combinatorics and Recurrence Relations: **06 Hours**
Combinatorics: Permutations, Sumrule, Product rule, Combinatorial proofs.
Recurrence Relations: Linear Recurrence relation, Second order RR with constant coefficients, Applications of Recurrence Relation.

Unit VI **06 Hours**

Concepts of Graphs and Trees: Definition, Degree, Types, Operations on graphs, Paths, Circuits, Connectedness, Planar graphs and their properties, Eulerian and Hamiltonian graphs.
Trees: Basic properties of trees, Binary trees, Application: Minimum Spanning Tree, Shortest Path.

Textbooks:

1. J.P. Tremblay and Manohar: Discrete mathematical structures with application to Computer Science, McGraw hill- New Delhi.
2. Kolman and R.C. Busby: Discrete mathematical structures for computer science Prentice Hall, New-Delhi.
3. Malik and M. K. Sen: Discrete Mathematics, Cengage Learning India Pvt. Ltd.
4. R.M. Somasundaram: Discrete Mathematical Structures, Prentice Hall India Learning Private Limited.
5. C.L.Liu, Elements of Discrete Mathematics, second edition, McGraw-Hill Book Company.

Reference Books:

1. Kenneth H. Rosen: Discrete Mathematics and its applications Eighth Edition McGraw Hill Education.
2. Stanat and McAlister: Discrete Mathematics for Computer Science, PHI.

List of Assignments:
The following are some sample assignments. The course co-ordinator will frame one assignment on each unit for internal assessment.

1. Given a fact or a statement prove or disprove using suitable technique.
2. Write the given English language sentences represent in the Symbolic logic.
3. Given the statement forms Infer the validity of the statement form.
4. Draw a Hasse diagram and find chains and antichains.
5. Find the number of ways for any event or given sample space.
6. Given a problem represent in a graph and compute the optimal solution.
7. Given a communication network find the path between the given nodes.

Project Based Learning

1. Discrete Mathematics in Railway Planning using graph theory and linear algebra.
2. Object transformations using linear algebra.
3. Discrete mathematics in cryptography.
4. In Google maps to determine fastest driving routes and times.
5. In image processing
6. In relation database using sets.
7. In cyber security using graph theory.
8. Shortest path between two cities using a transportation system.
9. Data compression system with the help of Huffman coding.
10. Find the shortest tour that visits each of a group of cities only once and then ends in the starting city using graphs.

List of laboratory Exercise:

1. Perform set Operations.
2. Compute a power set of a given set.
3. List various properties of Relation and construct a program to evaluate it with a program.
4. Apply Warshall's algorithm to compute a Transitive Closure of a given relation entered by the user.(Use any suitable programming language).
5. Solve a programming problem based on application of Eulerian and Hamiltonian Graph.
6. Develop a program using RSA algorithm

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Machine Organization and Microprocessor

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
				Total	05

Course Objective:
The course would provide students with an understanding of the design of fundamental blocks used in organization of computer system and interfacing techniques of these blocks to achieve different configurations of Machine organization. Students will learn the basic operations of computing hardware and how it interfaces to software.

Prerequisite:
The students should have basic Knowledge Digital electronics and logic design.

Course Outcomes: On completion of the course, students will have the ability to:

1. Explain the architecture and functional blocks of Computer System.
2. List the functional requirements for implementing ALU.
3. Discuss design approaches implementing control unit.
4. Analyse the characteristics and hierarchy of memory system.
5. Describe Peripherals and Input-Output organization.
6. Describe the concepts of parallel processing and pipelining.

Unit I **08 Hours**

CPU:-Machine architecture and organization, Von Neumann architecture Structure of IAS machine, memory, input-output subsystems, control unit. Introduction to 80x86 microprocessor, Architecture, Register organization, Segmentation, Instruction execution cycle, Addressing modes, and Instruction set. Instruction Formats, Instruction Types.

Unit II **08 Hours**

ALU:-Computer arithmetic, Signed number representation, fixed and floating point representations, character representation. Integer addition and subtraction, signed number multiplication, Booth's multiplierit's Hardware Implementation, Restoring and Non-restoring Division techniques, floating point arithmetic, IEEE 754 format.

Unit III **08 Hours**

Control Unit :- Design approaches, Instruction cycle and micro operations, Control signals and timing sequence, design of Hardwired Control unit
Micro instructions and micro program, Organization and Optimization of micro-programmed Control unit, Microinstruction Sequencing, Sequencing Techniques, Address Generation, Microinstruction Execution, Microinstruction Encoding.

Unit IV **08 Hours**

Memory:- Characteristics of Memory system, Memory hierarchy, Cache memory, cache size and block size, mapping functions, replacement algorithms, cache coherency, Multilevel Caches, Cache Coherence, Snooping & MESI Protocols, Memory Segmentation & Interleaved Memory System.

Unit V **08 Hours**

I/O organization: - I/O module, Peripheral devices and their characteristics, Input-output subsystems, I/O device interface, I/O transfers, interrupt driven and DMA transfer, I/O device interfaces – SCSI, USB, Fire wire.

Unit VI **08 Hours**

Parallel Organization – Overview of Instruction Pipelining, Performance Improvement, Flynn's classification for Multiple Processor Organizations, Closely and Loosely Coupled Multiprocessors Systems, Symmetric Multiprocessor (SMP) Organization, Multithreading – Fine Grained, Coarse Grained & Simultaneous (SMT) Threading, Chip Multiprocessing, Cluster Configuration, UMA, NUMA & CC-NUMA. Multicore Architectures – Hardware & Software Issues in Multicore Organization.

Textbooks:

1. William Stallings. "Computer organization and architecture: designing for performance". Pearson Education India, 2010
2. Carl Hamacher, ZvonkoVranesic and SafwatZaky. "Computer Organization", McGraw Hill, 2011.
3. Computer System Architecture M. M. Mano:, 3rd ed., Prentice Hall of India, New Delhi, 1993.
4. Computer Architecture and Organization, John P. Hayes.

Reference Books:

1. Computer Organization and Design: The Hardware/Software Interface, David A. Patterson and John L. Hennessy.
2. David A. Patterson, John L. Hennessy. "Computer organization and design: the hardware/software interface". Elsevier, 2011

List of Assignments:

1. Describe the structure of IAS computer with neat block diagram.
2. Describe architecture of 8086 with neat block diagram.
3. Explain the concept of Segmentation and state its advantages and disadvantage.
4. Draw and explain working of Micro programmed Control Unit.
5. Describe structure of IAS computer with neat block diagram.
6. Describe architecture of 8086 with neat block diagram.

Project Based Learning

1. Automatic night lamp with morning alarm
2. Traffic light with sensor + 7segment
3. Multi pattern running lights.
4. .Washing machine
5. Simple Lock Using Keypad and 7 segment
6. Electronic quiz table
7. Electronic Digital Clock
8. .temperature controller
9. Plant Irrigation System
10. Car Parking Management
11. Customer counter for supermarket
12. Electronic queue management system in food stall
13. Safety box
14. Shop lot automatic door with 7segment display
15. Bank queue management system
16. Water level controller
17. Automatic home system
18. Commuter system
19. Automatic room light control
20. Elevator control system

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit – III
Unit Test-2	Unit – IV, Unit – V, Unit – VI

Software Engineering

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	InternalAssessment	40 Marks		
		Term Work	25 Marks	Practical	01
		Practical	25 Marks		
		Total	150 Marks	Total	05

Course Objective:
The main purpose of this course is to impart knowledge on the basic principles of software development life cycle.

Prerequisite:
Programming paradigms, Basic mathematical ability

Course Outcomes: On completion of the course, students will have the ability to:

1. Outline the basic concepts of software engineering lifecycle.
2. Analyse and categorize the requirements of software systems.
3. Design the software qualitatively.
4. Implement the software with the standard guidelines.
5. Validate the software with standard testing techniques.
6. Demonstrate troubleshooting of software application.

Unit I **08 Hours**

Introduction:
Software and Software Engineering: The Nature of Software, The Software Process, Software Myths.
Process Models: A Generic Process Model, Prescriptive Process Models, Specialized Process Models, The Unified Process.
Agile Development: Agility, Agility and the Cost of Change, Agile Process, Agile Process Models.

Unit II **08 Hours**

Requirement engineering and modelling:
Understanding Requirements: Requirements Engineering, Eliciting Requirements, Building the use case, Building Analysis Model, negotiating requirements and Validating Requirements. Drafting the software requirement specification.
Requirement Analysis and Modelling: Domain Analysis, Object Oriented Analysis, Scenario based Modelling, Class Based Modelling, Behaviour Modelling. CASE Tools.

Unit III **08 Hours**

Software project management: Introduction to Software Project Management, Selection of a Project Approach, Project Estimation Techniques, Project Planning and Project Scheduling, Project Organization and Team Structures, Risk Management, Resource Allocation, Project Monitoring and Control, Software Configuration Management, Software Quality Management, CASE Tool.

Unit IV **08 Hours**

Design
Design Concepts: The Design Process, Design Model - Data Design model, Architecture Design model, Transform and Transaction Flow, Interface design Flow, Component Level and Deployment level design elements.
Design Concepts – Abstraction, Architecture, Patterns, Modularity, Functional Independence, Refinement, Refactoring, Object-Oriented Design Concepts. CASE Tools in Software Design.

Unit V **08 Hours**

Coding and Testing:

Coding Approach, Coding Standards, Error, Bug,Defects.

Software Testing Life Cycle, Software Testing Principles, Verification and Validation, Types of Testing, White Box Testing techniques, Black Box Testing techniques, Testing OO Applications, Website Testing. CASE Tool.

Unit VI **08 Hours**

Implementation and maintenance: Software Maintenance-Software Supportability. Reengineering-Business Process Reengineering- Software Reengineering- Reverse Engineering, Restructuring.

Forward Engineering- Economics of Reengineering.

Textbooks:

1. Roger S, "Software Engineering – A Practitioner's Approach", seventh edition, Pressman, 2010.
2. Pearson Edu, "Software Engineering by Ian sommerville", 9th edition, 2010.

Reference Books:

1. Van Vliet, "Software Engineering: Principles and Practices"–, 2008.
2. Richard Fairley, "Software Engineering Concepts", 2008..

List of Assignments:

1. Presentation on one topic related to this syllabus.
2. Conducting six Multiple choice question online test on each unit
3. Prepare a report based on the understanding by viewing the NPTEL videos of this subject.
4. Perform the following Assignments:
    i. Suggest Which SDLC model will be used to develop ATM software? Justify?
    ii. Develop Requirement Specification for ATM Software.
    iii. Design the Class Diagram and Use case Diagram for ATM software.
    iv. Discuss on Automated Software Testing. Create Test cases for Functionality of ATM software using a Test Tool (Test Link).
    v. Discuss and Prepare IEEE Quality Document for ATM software.
    vi. vi. Prepare a Gantt chart using MS Project CASE Tool for a small Project.

Project Based Learning

1. ATM system
2. Online Banking system
3. Airline reservation system
4. Railway reservation system
5. Library Management System
6. College Management System
7. Hospital Management system
8. Traffic Monitoring System
9. Hotel Management System
10. Bus ticket reservation system
11. Online shopping system

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. For the given system, students are required to identify and document the RequirementsSpecifications.
2. To study and explore the working of any UML modelling CASE Tools.
3. For the given system, students are required to Model UML Use Case Diagrams and Capture the Use Case Scenarios.
4. For the given system, students are required to create data models like ER and EER.
5. For the given system, students are required to Model UML State chart and Activity diagrams.
6. For the given system, students are required to Model UML Class and sequence diagrams.
7. For the given system, students are required to Model UML collaboration, Component and Deployment diagrams.
8. To study and explore the working of any Software Testing CASE Tools.
9. For the given system, students are required to design and execute the test suites.
10. Prepare a case study on Agile Methodologies.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Object Oriented Methodology

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	04 Hours/Week	End Semester Examination	60 Marks	Theory	04
Practical:	02 Hours/Week	Internal Assessment	40 Marks		
		Term Work	25 Marks	Practical	01
		Practical	25 Marks		
		Total	150 Marks	Total	05

Course Objective:

- To teach fundamentals of object-oriented concepts and programming.
- To apply the concepts of object-oriented paradigm.
- To develop object-oriented programming skills.
- To design and implement applications for real life problems by using object-oriented programming.

Prerequisite:
Paradigms of Programming.

Course Outcomes: On completion of the course, students will have the ability to:

1. Analyse the basics of object-oriented programming withJava.
2. Identify class, objects,methods for real time problems.
3. Make use of constructor,garbage collector and methods of string class.
4. Explore the concept of inheritance and polymorphism with the help of real time applications.
5. Handle exception with exception handling mechanism and understand the concept of multithreading.
6. Design the graphical user interface by using Applets AWT and SWING.

Unit I **08 Hours**

Introduction: History and Features of Java, Difference between Java, C, C++, Internals of Java Program, Difference between JDK, JRE and JVM, Internal Details of JVM,
Basics of Java Language-Variable and Reserve / Keywords present in Java, Primitive Data types, Java Operators, Decision making and branching statements in Java.

Unit II **08 Hours**

Classes, Objects and Methods: Creating a Class, Visibility/Access Modifiers, Encapsulation, Methods: Adding a Method to Class, returning a Value, adding a Method That Takes Parameters,' this' Keyword, Method Overloading, Object Creation, Using Object as a Parameters, Returning Object, Array of Objects, Memory Allocation: 'new', Static Data Members, Static Methods.

Unit III **08 Hours**

Constructors, Destructors and String Handling: Use of Constructor, Characteristics of Constructors, Types of Constructor, Constructor Overloading, Constructor with Default Arguments, Symbolic Constants, Garbage Collection, Destructors and Finalizers.
String Handling: String: Immutable String, String Comparison, String Concatenation, Substring, Methods of String class, String Buffer class, StringBuilder class, Creating Immutable class, to String method.

Unit IV **08 Hours**

Inheritance and Polymorphism: Use of Inheritance, Types of Inheritance in Java, Role of Constructors in inheritance, Polymorphism in OOP, Types of Polymorphism, static and dynamic polymorphism, Overriding Super Class Methods. Use of "super" keyword. Interfaces, Implementing interfaces.

Unit V **08 Hours**

Exception Handling and Multithreaded programming:
Exception Handling: try and catch block, catch block, Nested try, finally block, throw keyword, Exception Propagation, throws keyword, Exception Handling with Method Overriding, Custom Exception
Introduction to threads, life cycle of a thread, thread states, threadproperties, methods in Threads and Runnable, setting priority of threads,synchronization and inter thread communication Life Cycle of a Thread.

Unit VI **08 Hours**

Designing Graphical User Interfaces in Java: Applet and its use, Design Patterns using Applet and JApplet. Run Applet application by browser and applet tool. Applet Architecture. Parameters to Applet Life Cycle.
Basics of Components Using Containers, Layout Managers and User defined layout. Border Layout, Flow Layout, Grid Layout, Grid bagLayout, Box Layout. AWT Components, Adding a Menu to Window, Extending GUI Features Using SWING, Components Designing GUI, Advanced swing components like Progress, JSlider, JRadioButton, JTree, JTable, JToggleButton, etc.

Textbooks

1. E. Balaguruswamy, "Object Oriented Programming Using C++ and Java", Tata McGrawHill
2. Steven Holzner et al. "Java 2 Programming", Black Book, Dreamtech Press, 2009.

Reference Books

1. Java The complete reference, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd. 9th edition, 2014, ISBN: 978-0-07-180856-9 (E-book).
2. Object-Oriented Design Using Java, Dale Skrien, McGraw-Hill Publishing, 2008, ISBN - 0077423097, 9780077423094.
3. MitsunoriOgihara, "Fundamentals of Java Programming", Springer; 2018, ISBN 978-3-319-89490-4.
4. Brahma DathanSarnathRamnath, "Object-Oriented Analysis, Design and Implementation An Integrated Approach", Springer; 2nd ed. 2015, ISSN 1863-7310 ISSN 2197-1781 (electronic) Undergraduate Topics in Computer Science ISBN 978-3-319-24278-1, ISBN 978-3-319-24280-4.
5. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition, PearsonEducation, India.
6. J. Nino, F. A. Hosch (2002), An Introduction to programming and OO design using Java, John Wiley & sons, New Jersey.
7. Y. Daniel Liang (2010), Introduction to Java programming, 7th edition, Pearson education, India.

List of Assignments:

1. Write a program to implement Class and object.
2. Write a program to differentiate between method overloading and method overriding.
3. Write a program to implement Constructor Overloading
4. Write a program to implement different Types of Inheritance in Java
5. Write a program to implement concept of Exception Handling &Multithreaded Programming
6. Write a program to use different controls of AWT classes.
7. Write a program to implement Applet swings.

1. **Project Based Learning**
    1. **Smart City Project**
    2. Currency Converter
    3. Online Exam Project in Java
    4. Moving Balls mini project using Java Applet
    5. Text Editor in Java using AWT controls.
    6. Album Manager Project in Java
    7. Vehicle Management System in Java
    8. Music Player project in Java
    9. Student Management System Project in Java
    10. Simple Calculator project in Java
    11. Image to PDF Convertor in java
    12. Simple Chat System
    13. Online Quiz project
    14. Pong game in java
    15. Tokenize implementation.

(Note:- *Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises

1. Write a program that checks whether a given string is a palindrome or not.
2. Write a program that describes a class person. It should have instance variables to record name, age and salary. Create a person object. Set and display its instance variables.
3. Write a program that creates a class circle with instance variables for the centre and the radius. Initialize and display its variables.
4. Write a program that counts the number of objects created by using static variable.
5. Write a program to demonstrate the constructors in java.
6. Write a program to demonstrate the constructor overloading.
7. Write a program to display the use of this keyword.
8. Write a program to implement Class and Inheritance Concept.
9. Write an application that creates an interface' and implement it.
10. Write a program that can count the number of instances created for the class.
11. Write a program to implement the concept of Multithreaded Programming.
12. Create an abstract class shape. Let rectangle and triangle inherit this shape class. Add necessary functions.
13. Write an application that shows the usage of try, catch, throws and finally.
14. Write an Applet that displays ―Hello World (Background colour-black, text colour-blue and your name in the status window).
15. Develop mini project using Applet and Swings.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

B.TECH (Computer Science and Engineering)

SEMESTER – IV

COURSE SYLLABUS

Theory of Computation

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Theory:	03 Hours/Week	End Semester Examination	60 Marks	Theory	03
Tutorial:	01 Hours/Week	Internal Assessment	40 Marks	Tutorial	01
		Total	100 Marks	Total	04

Course Objective:

This course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton and Turing machine. This subject not only forms the basic models of computation, it also includes the foundation of many branches of computer science, e.g. compilers, software engineering, concurrent systems, etc.

Prerequisite:
Discrete Mathematics

Course Outcomes: On completion of the course, students will have the ability to:

1. Estimate the importance of automata theory in designing computer languages.
2. Demonstrate and understand the relationships between language classes and regular expression
3. Design grammars and recognizers for different formal languages
4. Identify the equivalence of languages described by pushdown automata
5. Evaluate the Language Acceptability by Turing Machine
6. Explain the basics of compiler

Unit I **06 Hours**

Preliminaries and Finite state machines: Introduction to Theory of Computation-Automata, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ε-Transition, Equivalence of NFA's with and without ε-Transition, Finite Automata with output- Moore machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata.

Unit II **06 Hours**

Regular Languages -Definition and Examples. Conversion of RE To FA, FA to RE, algebraic laws, applications of RE. Pumping lemma for regular languages and applications. Closure properties of regular Languages Union, Concatenation, Complement, Intersection and Kleene closure. Decidability- Decision properties.

Unit III **06 Hours**

Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF),Chomsky Hierarchy, Programming problems based on the properties of CFGs.

Unit IV **06 Hours**

Push Down Automata (PDA): Introduction, Pushdown Automata (PDA), Transition Diagrams, Functions and Tables, Deterministic Push- down Automata (DPDA) - definition, Nondeterministic Pushdown Automata (NPDA), Equivalence of context free grammars and PDA, properties of context free languages. Introduction to Post Machines (PMs).

Unit V **06 Hours**

Turing Machines: The Turing Machine Model and Definition of TM, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction,

Modifications of Turing Machine, Composite and Iterative Turing machines ,Multi Tape Turing machine ,Multi Stack and Multi Track Turing machine ,Universal Turing machine, Linear Bounded Automata, Church's Thesis, Halting Problem.

Unit VI **06 Hours**

Applications: Applications of Regular expressions, Lexical analyser, Text editor, and searching using RE, Context free grammar, Basics of parsing techniques, application of leftmost and rightmost derivations during parsing, Primitive recursive functions, Recursive and recursively enumerable languages, Introduction to Natural language Processing.

Textbooks:

1. Vivek Kulkarni "Theory Computation" Oxford higher education
2. Theory of Computer Science (Automata, Language & Computation) K. L. P. Mishra & N. Chandrasekaran, PHI Second Edition.
3. E.V. Krishnamurthy, "Theory of Computer Science", EWP Publication.

Reference Books:

1. Hopcroft Ullman, "Introduction to Automata Theory, Languages &Computations, Narosa.
2. Daniel A. Cohen, "Introduction to Computer Theory", Wiley Publication.
3. Automata Theory, Languages, and Computation, John E. Hopcroft Cornell University, Rajeev Motwani Stanford University, Jeffrey D. Ullman Stanford University,3rd Edition.

List of Assignments:

1. Study of JFLAP tool for Constructing FA.
2. Construct regular expressions defined over the alphabet $\Sigma = \{a, b\}$, which denote the given languages.
3. Translate the following Mealy machine into its equivalent Moore machine.
4. Write a context-free grammar (CFG) which generates the language L denoted by:(a+ b)*bbb(a+ b)*.
5. Construct a PDA that accepts the language defined by the following regular grammar.
6. Design a TM to recognize an arbitrary string divisible by 4, from $\Sigma = \{0, 1, 2\}$.

Project Based Learning

1. Develop a tool to illustrate the algorithm for converting an arbitrary NFA to a DFA .
2. Develop a tool to draw a transition diagram for any given DFA.
3. Approximation algorithms
4. Greedy algorithms.
5. Enumeration of finite automata
6. Enumeration of PDA
7. Enumeration of Turing machines
8. Ambiguous grammars
9. Disambiguation of Grammars
10. Enumeration of Context-free languages
11. . Enumeration of Turing machines
12. . Universal Turing machines.
13. Randomized Turing machines
14. NP Complete Algorithm
15. Problem solvability using Reduction
16. Design of TM to emulate a finite automata
17. . Design of TM to emulate a PDA
18. Complexity analysis of encryption algorithms using TM.
19. . Design of TM to perform sorting
20. Design TM to perform searching.

Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

System Programming and Operating System

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture:	04 Hours/Week	End Semester Examination:	60 Marks		
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Theory	04
		Term Work	25 Marks	Practical	01
		Oral	25 Marks		
		Total	150 Marks	Total	05

Course Objectives:

- To help the students understand functioning of various system programs and Compiler, Loaders and Linkers.
- To help students for different concepts of operating system and management with file system.

Prerequisite:

Knowledge of Microprocessor concepts and Assembly language and Concept of system software, application software, knowledge of input output devices and its usage.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply fundamental concepts and practical skills of system programming.
2. Design and Demonstrate working of assemblers, Loaders and Linkers.
3. Compare and evaluate different scheduling algorithms.
4. Outline the concept of concurrency and deadlocks.
5. Analyse of Memory Management and Virtual Memory.
6. Prepare a comparison report of different operating system.

Unit I **08 Hours**

Introduction to Systems Programming: Introduction: Components of System Software, Language Processing Activities, Fundamentals of Language Processing.
Assemblers: Elements of Assembly language programming. Simple assembler scheme, Structure of an assembler, Design of single and two pass assembler. Macro Processors: Macro Definition and call, Macro expansion, Nested Macro Calls, Advanced Macro Facilities, Design of a two-pass macro-processor, Case study related to unit contents**.**

Unit II **08 Hours**

Compiler, Loaders and Linkers: Compilers: Basic compilers function, Phases of compilation, memory allocation, compilation of expression, Compilation of expressions, compilation of control structures, Code of optimization.
Loaders: Loader Schemes: Compile and go, General Loader Scheme, Absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, Design of an absolute loader. Linkers: Relocation and linking concepts, Design of linker, self-relocating programs, Static and dynamic linker, Case study related to unit contents.

Unit III **08 Hours**

Introduction to OS and Process management: Introduction to OS: Architecture, Goals & Structures of O.S, Basic functions, Interaction of O. S. & hardware architecture, System calls, Batch, multiprogramming. Multitasking, time sharing, parallel, distributed & real -time O.S. Process Management: Process Concept, Process states, Process control, Threads, Scheduling: Types of scheduling: Pre-emptive, Nonredemptive, Scheduling algorithms: FCFS, SJF, RR, Case study on Unix /Linux OS.

Unit IV **08 Hours**

Concurrency control: Concurrency: Interprocess communication, Mutual Exclusion, Semaphores, Classical Problems of Synchronization: Readers-Writers, Producer Consumer, and Dining Philosopher problem. Deadlock: Principles of deadlock,

Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Case study related to unit contents.

Unit V **08 Hours**

Memory Management: Basics of memory management, Swapping, Memory Allocation, Paging, Segmentation,Virtual memory, Demand Paging, Page replacement, Page replacement algorithms – Optimal FIFO, LRU, LRU approximation, Allocation of frames, Case study related to unit contents.

Unit VI **08 Hours**

Input and Output, File System: I/O management & Disk scheduling: I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS), RAID, Disk Cache. File Management: Concepts, File Organization, File Directories, File Sharing, Record Blocking, Allocation methods, Free Space management, Case study related to unit contents.

Textbooks:

1. System Programming by John J. Donovan, TATA McGRAW-HILL Edition.

Reference Books:

1. Operating System Concepts, 9th edition Peter B. Galvin, Greg Gagne, Abraham Silberschatz, John Wiley & Sons, Inc.
2. Operating Systems 5th Edition, William Stallings, Pearson Education India.
3. D. M. Dhamdere : "Systems programming and operating system", Tata McGraw Hill.

List of Assignments:

1. Describe the types of errors that can be identified in the process of language translation. Illustrate the same with example
2. Explain the different types of optimization techniques
3. Compute average waiting time and average response time for the given set of processes.
4. Apply page replacement algorithm and compute the number of page faults.
5. Case study 1
6. Case study 2

Project Based Learning

1. Develop Heap Memory Manager in C
2. Design the Processes and thread management with deadlock's, synchronization
3. Design Preemptive Priority Scheduling algorithm implementation in any language.
4. Java program to analyze page fault for a given page frame using NRU with paging.
5. The project on simulating the multiprogramming of a specific operating system and dealing with CPU scheduling and Job scheduling.
6. Design the project that computes FCFS, SSTF, and SCAN disk-scheduling algorithms
7. Operating Systems mini-project to explore the different algorithms of main memory page replacement
8. Develop any one project on one or two pass assemblers.
9. design a simple language and develop a compiler for the three-address code generation and evaluation using Lex and Yacc.
10. Construct a parser that recognizes a specific language.

Note:-*Students in a group of 3 to 4 shall complete any one project from the above list.

List of Laboratory Exercises:

1. Design one pass assembler
2. Design two pass assembler
3. Write a program to create Dynamic Link Library for any mathematical operation and write an application program to test it
4. Write a program using Lex specifications to implement lexical analysis phase of compiler to count no. of words, lines and characters of given input file.
5. Implement UNIX system calls like ps, fork, join, exec family, and wait for process management.
6. Implementation of various scheduling algorithm.
7. Implementation of Banker's algorithm.
8. Find out the page fault of any given string.
9. Implementation of various Page replacement Algorithm.
10. Study assignment on process scheduling algorithms for latest OS.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Computer Graphics and Multimedia

Teaching Scheme		Examination Scheme		Credit Scheme	
					Credits
Lecture:	**03 Hours/Week**	**End Semester Examination:**	**60 Marks**		
		Internal Assessment:	**40 Marks**	**Theory**	**03**
				Total	**03**

Course Objectives:

- To introduce the principles of computer graphics and the components of a graphics system.
- To introduce basic algorithms for drawing line, circle and curves.
- To develop understanding of the basic principles of 2D and 3D computer graphics and how to transform the shapes to fit them as per the picture definition.
- To introduce multimedia architecture and hardware.
- To introduce multimedia file formats.

Prerequisite:

Knowledge of C programming language, Linear Algebra.

Course Outcomes: On completion of the course, students will have the ability to:

1. Apply fundamental concepts and practical skills in computer graphics.
2. Design and apply two-dimensional graphics.
3. Implement and use classic and modern algorithms and data structures in computer graphic to 3-D geometry.
4. Apply Illumination and colour models.
5. Identify suitable file format to develop a multimedia application.
6. Design Basic 3- D Scenes using Blender.

Unit I **08 Hours**

Introduction to computer graphics and devices: Introduction to computer graphics, Graphics Primitives: Raster scan & random scan displays, display processor, display file structure, Output primitives, points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives. GRAPHIC DEVICES Cathode Ray Tube, Quality of Phosphors, CRTs for Colour Display, Beam Penetration CRT, The Shadow -Mask CRT, Direct View Storage Tube, Tablets, The light Pen, Three Dimensional Devices.

Unit II **08 Hours**

Two-dimensional graphics: Two dimensional geometric transformations — Matrix representations and homogeneous coordinates, composite transformations; Two-dimensional viewing — viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations — point, line, and polygon clipping algorithms.

Unit III **08 Hours**

Three-dimensional graphics: Three dimensional concepts; Three-dimensional object representations — Polygon surfaces- Polygon tables- Plane equations — Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations — Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modelling transformations — Translation, Rotation, Scaling, composite transformations; Three-dimensional viewing — viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

Unit IV **08 Hours**

Illumination and colour models: Light sources, basic illumination models, halftone patterns and dithering techniques; Properties of light, Diffused illumination, point

source illumination, Standard primaries and chromaticity diagram; Intuitive colour concepts, RGB colour model, YIQ colour model, CMY colour model ,HSV colour model; Colour selection, ray tracing.

Unit V **08 Hours**

Multimedia system design & multimedia file handling: Multimedia basics – Multimedia applications – Multimedia system architecture – Evolving technologies for multimedia – Defining objects for multimedia systems – Multimedia data interface standards – Multimedia databases. Compression and decompression – Data and file format standards – Multimedia I/O technologies – Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval technologies.

Unit VI **08 Hours**

Hypermedia: Multimedia authoring and user interface-Hypermedia messaging - Mobile messaging – Hypermedia message component – Creating hypermedia message – Integrated multimedia message standards– Integrated document management – Distributed multimedia systems. CASE STUDY: BLENDER GRAPHICS Blender Fundamentals—Drawing Basic Shapes— Modelling—Shading & Textures.

Textbooks

1. Donald Hearn and Pauline Baker M, Computer Graphics", Prentice Hall, New Delhi, second edition.
2. Andleigh, P. K and KiranThakrar, Multimedia Systems and Design, PHI, 2015.

Reference Books

1. Foley, Vandam, Feiner and Hughes, Computer Graphics: Principles and Practice, 2nd Edition, Pearson Education, 2003.
2. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, Fundamentals of Computer Graphics, CRC Press, 2010.

List of Assignments:

1. Study on any latest data generating device in computer Graphics .
2. Describe in detail any one color model process.
3. Using the determinant to calculate the signed areas, determine whether the point $\boldsymbol{p}$=[23]T is in the triangle formed by the points $\boldsymbol{s}$=[22]T, $\boldsymbol{t}$=[51]T and $\boldsymbol{r}$=[35]T. Show all of your work.
4. Elaborate in detail the any one curve generation methods.
5. Describe how Multimedia system architecture process is used in real time.

Project Based Learning

1. Helicopter game
2. Sinking Ship
3. Scientific calculator
4. Traditional wall Clock
5. Tower of Hanoi game
6. Windmill
7. Steam engine
8. Traffic signal
9. Aquarium
10. Prepare a PowerPoint Presentation
11. Mobile app for online shopping
12. Arrival and departure of the train with announcement and signal
13. Mobile application for online tour guidance app
14. Create a small video on the given topic
15. Story tell mobile app

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

List of Laboratory Exercises:

1. Study of Fundamental Graphics Functions.
2. Implementation of Line drawing algorithms: DDA Algorithm, Bresenham's Algorithm.
3. Implementation of Circle drawing algorithms: Bresenham's Algorithm, Mid-Point Algorithm.
4. Programs on 2D and 3D transformations.
5. Write a program to implement Cohen Sutherland line clipping algorithm.
6. Using Flash/Maya perform different operations (rotation, scaling move etc..) on objects Create a Bouncing Ball using Key frame animation and Path animation.
7. Write a program to make wave audio file.
8. Write a program to create links in HTML.
9. Write a program to create file split.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Design of Algorithms

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Lecture	04 Hours/Week	End Semester Examination:	60 Marks	Theory	04
Practical	02 Hours/Week	Internal Assessment:	40 Marks	Practical	01
		Term Work:	25 Marks		
		Practical:	25 Marks		
		Total	150 Marks	Total	05

Course Objective:
The Course gives an overview of about the Performance and Analysis of Algorithms.

Prerequisite:
The students should possess the knowledge of Data Structures and Discrete Mathematics.

Course Outcomes: On completion of the course, students will have the ability to:

1. Analyze the asymptotic performance of algorithms by providing Optimal Solution.
2. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
3. Analyze the performance of Greedy Methods and describe its limitations.
4. Analyse Dynamic Programming Problems.
5. Solve Problems using Backtracking Approach.
6. Compare NP-Hard, NP-Complete Problems and Online Algorithms.

Unit I **06 Hours**

Models of Computation: Algorithm Specification, Pseudocode Conventions Recursive Algorithms, PERFORMANCE ANALYSIS, Space Complexity Time Complexity Asymptotic Notation, Practical Complexities, Performance Measurement Randomized AlgorithmsIterative Algorithms: Measures of Progress and Loop Invariants. Steps to develop Iterative Algorithms.

Unit II **06 Hours**

Divide-and-Conquer: Binary Search Finding the Maximum and Minimum, Merge Sort, Quick Sort, Performance Measurement: Best Case and Worst-Case Analysis. Strassen's matrix Multiplication.

Unit III **06 Hours**

The Greedy Method: Knapsack Problem, Job Sequencing with deadlines, Minimum-Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm, Single-Source Shortest Paths.

Unit IV **06 Hours**

Dynamic Programming: Multistage graph, All Pairs Shortest paths, Single-Source Shortest Path, Optimal Binary search trees, 0/1-knapsack, The Traveling Salesperson Problem, Basic Traversal and Search Technique.

Unit V **06 Hours**

Backtracking: Backtracking: The General Method, The 8- Queens Problem, Sum of Subsets, Graph Colouring, and Hamiltonian Cycles. Branch and Bound: Least Cost (LC) Search, The 15-puzzle Control abstraction of LC Search, Bounding, FIFO Branch and Bound, LC Branch and Bound.

Unit VI **06 Hours**

Files:NP-HARD AND NP-COMPLETE PROBLEMAlgorithm Complexities: Nondeterministic Algorithms, The classes NP-Hard and NP- Complete, Cook's Theorem, NP-Hard Graph Problems, NP-Hard Scheduling Problems, NP-Hard Code Generation Problems. Approximation Problems.Online Algorithms: The Online Paging Problem, Adversary Models, Paging against an Oblivious Adversary, Relating the Adversaries, The Adaptive Online Adversary, The k-Server Problem

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Textbooks:

1. Alfred Aho, John E. Hopcroft, "Design and Analysis of Computer Algorithms", Pearson Education.
2. Thomas Cormen, Charles E Leiserson, Ronald Rivest, "Introduction to Algorithms, Tata Mc-Graw Hill Publication, Second Edition.
3. Rod Stephens, "Essential Algorithms: A Practical Approach to Computer Algorithms", John Wiley and Sons Publications.
4. Jon Kleinberg, Eva Tardos, " Algorithm Design", Pearson Education.
5. Robert Sedgewick, Philippe Flajolet, "An Introduction to the Analysis of Algorithms", Adison-Wesley Publication, Second Edition.
6. Jeff Edmonds, How to think about Algorithms, York University, Cambridge University Press.
7. Python Algorithms: Mastering Basic Algorithms in the Python Language, by Magnus Lie, Hetland ,APress.
8. Ian Parberry and William Gasarch, WProblems on Algorithms, Second Edition, Prentice Hall Inc.
9. Rajeev Motwani, PrabhakarRaghavan, Randomized Algorithms, Cambridge University Press.

Reference Books:

1. ElitzHorowith and SartajSahani, S. Rajasekaran, "Fundamentals of Computer Algorithms", Galgotia Publications.

List of Assignments:

1. Calculate the space complexity of various algorithms.
2. Implement Knapsack Algorithm.
3. Implement Prim's Algorithm
4. Implement Kruskal's Algorithms
5. Study and analysis of 8-Queens Problem.
6. Implement Optimal Binary Search Tree.

Project Based Learning

1. Design a Sudoku using Recursion
2. Design a Phonebook
3. Simulate 15 Puzzle Problem
4. Design Tic Tac Toe
5. Travelling Salesman Problem
6. Design a board for simulating N-Queen Problem
7. Implement Multistage Graphs
8. Prime Number Generator
9. Random Number Generator
10. Devise and algorithm for large sparse matrix multiplication

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

Database Systems

Teaching Scheme		Examination Scheme		Credit Scheme	
					Credits
Lecture:	**04 Hours/Week**	**End Semester Examination:**	**60 Marks**		
Practical:	**02 Hours/Week**	**Internal Assessment:**	**40 Marks**	**Theory**	**04**
		Term Work	**25 Marks**	**Practical**	**01**
		Practical	**25 Marks**		
		Total	**150 Marks**	**Total**	**05**

Course Objective:
This course focuses on the core principles and techniques required in the design and implementation of database systems.

Prerequisite:
Discrete mathematics, Data structures and Programming languages.

Course Outcomes: On completion of the course, students will have the ability to:

1. Use the basic concepts of Database Systems in Database design.
2. Design a Database using ER Modelling
3. Apply SQL queries to interact with Database.
4. Apply normalization on database design to eliminate anomalies.
5. Analyse database transactions and can control them by applying ACID properties.
6. Investigate the knowledge about emerging trends in the area of database for unstructured data and applications for it.

Unit I **08 Hours**

Introduction to Databases and Database Design: Introduction, purpose of database system, Data Independence, view of data, Database System architecture- Levels, Mappings, Database users and DBA, applications of DBMS,The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction., Database Design Process, ER Diagrams - Entities, Attributes, Relationships, Constraints, keys, extended ER features, Generalization, Specialization, Aggregation, Conceptual design with the E-Rmodel.

Unit II **08 Hours**

Relational Model: Introduction to the relational model, Integrity constraints over relations, enforcing integrity constraints, querying relational data, Logical database design: E-R to relational, Introduction to views, Destroying/altering tables and views.
Relational Algebra and Calculus: Preliminaries, relational algebra operators, relational calculus - Tuple and domain relational calculus, expressive power of algebra and calculus.

Unit III **08 Hours**

Schema Refinement and Normal Forms: Introduction to schema refinement, functional dependencies, reasoning about FDs. Normal forms: 1NF, 2NF, 3NF, BCNF, properties of decompositions, normalization, schema refinement in database design, case studies**.**

Unit IV **08 Hours**

SQL: Basics of SQL, DDL, DML,DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, IN operator, Functions - aggregate functions, Built-in functions – numeric, date, string functions, set operations, sub-queries, correlated sub-queries, Use of group by, having, order by, join and its types, Exist, Any, All, view and its types. transaction control commands – Commit, Rollback, Save point, cursors, stored procedures, Triggers.

Unit V **08 Hours**

Transactions Management: Transaction concept, transaction state, implementation of atomicity and durability, concurrent executions, Serializability, recoverability, implementation of isolation, transaction definition in SQL, testing for Serializability.
Concurrency Control and Recovery System: Concurrency control, lock based protocols, time-stamp based protocols, validation based protocols, multiple granularity. Recovery system - failure classification, storage structure, recovery and atomicity, log- based recovery, shadow paging, buffer management, failure with loss of non-volatile storage, advanced recovery techniques, remote backup systems.

Unit VI **08 Hours**

Emerging Database Technologies: Introduction to unstructured data, NOSQL, Introduction to unstructured data, NOSQL, spatial and geographic databases, Database Analysis Tools multimedia databases, Massive Datasets and Hadoop.

Textbooks:

1. Raghurama Krishnan, Johannes Gehrke , Database Management Systems, 3rd edition, Tata McGraw Hill, New Delhi,India**.**
2. ElmasriNavate, Fundamentals of Database Systems, Pearson Education,India.

Reference Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan (2005), Database System Concepts, 5th edition, McGraw-Hill, New Delhi,India.
2. Peter Rob, Carlos Coronel (2009), Database Systems Design, Implementation and Management, 7thedition.

List of Assignments:

1. Define Database. Explain Importance of Data Models in detail
2. Write a short note on Following:
    a) Relational Algebra and Calculus
    b) Integrity Constraints
3. Define Normalization. Explain all Normal forms in detail
4. Explain DDL, DML and DCL in detail.
5. Explain ACID properties of TCL in detail.\
6. Explain NOSQL and Database Analysis Tools in detail.

Project Based Learning

1. Inventory Management System.
2. Online Jewelry Shopping System
3. Library Management System
4. Online Examination System
5. Hospital Management System
6. Railway Reservation System
7. Payroll Management System
8. Cooking Recipe Portal
9. Art Gallery Management System
10. Student Database Management System
11. Restaurant Management Database System
12. Electric Bill System Database
13. Online Examination System
14. Event Management System
15. Attendance Management System

(Note: -*Students in a group of 3 to 4 shall complete any one project from the above list)

Laboratory Exercises:

1. Draw E-R Diagram and extended ER Diagram (as given by course coordinator) on given System.
2. Demonstrate Queries on Relational Algebra(as given by course coordinator).
3. To discuss normalization and build normalized schema (as given by course coordinator)on given System.
4. Write a SQL Statement ((as given by course coordinator) on DDL,DML and DCL.
5. Demonstrate Queries on Joins(as given by course coordinator).
6. Demonstrate Queries on aggregate functions(as given by course coordinator).
7. Use WEKA tool to derive analytical model for the given dataset.
8. Case study on NOSQL database: MongoDB.

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

CSE Skill Lab - I

Teaching Scheme		Examination Scheme		Credit Scheme	
	Hours/Week		Marks		Credits
Practical:	04 Hours/Week	Term Work	25 Marks		
		Practical	25 Marks	Practical	02
		Total	50 Marks	Total	02

Course Objective:

The objective of this course is to impart students with the knowledge to setup the development environment, design and develop dynamic database driven web applications using PHP.

Prerequisite:

1. Create PHP programs that use various php library functions,
2. Design interactive forms using PHP.
3. Implement various operations on arrays and control structures in PHP
4. Create database and demonstrate the manipulation of Files, Directories and relational data.
5. Implement cookies and session
6. Develop dynamic web Content.

Unit I **08 Hours**

Introduction to Dynamic Web Content &Environment: Overview of HTTP & HTML, Request/Response Procedure, Advantage of PHP, MySQL, JavaScript, CSS & HTML 5, The Apache Web Server, Overview of Open Source. Basics of WAMP, MAMP,LAMP, Installation, Accessing document root, Working Remotely – Looking In, Using FTP, Using IDE.

Unit II **08 Hours**

Introduction to PHP, Expression & Control Flow: Incorporating PHP within HTML, Structure of PHP – Comments, Basic Syntax, variables, operators, Assignments, multiline commands, constants, echo & print commands, Functions, variable Scope. Expressions: TRUE or FALSE, Literals & Variables. Operators: Precedence, Associativity, Relational Operators. Conditionals – if, else, elseif, switch operator. Looping: While, do-while, breaking out of loop, continue statement

Unit III **08 Hours**

PHP Functions, Objects &Arrays:PHP Functions: Defining, returning a value, Returning an Array, do not Pass arguments by reference, Returning Global Variables, Include statement: include once, require &require once.

PHP Objects: Declaring a class, creating an object, accessing objects, constructors, PHP 5 Destructors, writing methods, declaring properties & constants, inheritance. Arrays: Basic Access, foreach as loop, multidimensional Arrays, Using Array functions.

Unit IV **08 Hours**

PHP in Action & Introduction to MySQL: UsingPrintf, Date and Time Functions, File handling, System Calls.Introduction to MySQL: Basics, Database Terms, Accessing MySQL via Command line, MySQL Commands, Data types, Indexes, MySql Functions, Accessing Mysql via PhpMyAdmin, Primary Keys, Relationships, Select Queries, creatingmysqldump, backup file, dumping data in CSV format.

Unit V **08 Hours**

Cookies, Sessions, Authentications and Accessing: Using cookies in PHP, HTTP Authentication, Using Sessions. Accessing: Querying a MySQL Database with PHP – The Process, create login file, connecting to database, Practical Example, Preventing Hacking Attempts: Using Placeholders, HTML Injection. Building Forms, Retrieving submitted Data.

Unit VI **08 Hours**

Exploring JavaScript: JavaScript and HTML Text – using within a Document Head, Older & Nonstandard Browsers, Including Javascripts, debugging Javascript errors, using variables, semicolon, variables, operators, variable typing, functions, global variables, local variables, Document Object Model, Document.write.

Textbooks:

1. Learning PHP, MySQL &Javascript, Robin Nixon, OREILLY, 4thEditon, 2015.
2. Head First PHP & MySQL-Lynn Beighley& Michael Morrison-O'Reilly.
3. PHP: A Beginner's Guide-VikramVaswani- McGraw-Hill Education.

Reference Books:

1. The Complete Reference PHP – Steven Holzner, Tata McGraw-Hill.
2. The Joy of PHP Programming: A Beginner's Guide – Alan Forbes, BeakCheck LLC,6th edition.

List of Laboratory Exercises:

1. Write a PHP function to count total number of vowels from the string. Accept a string using HTML form.
2. Write a PHP script to print Fibonacci series.
3. Create a student registration form using text box, check box, radio button, select, submit button. Display the user inserted value in new PHP page.
4. Write a program to perform the following operations on an associative array.
   Display elements of an array along with their keys.
   Display size of array.
   Delete an element from an array from the given index.
5. Write a Program to insert a roll no and student name in a database (use PostgreSQL data to create a database).
6. Write PHP script to demonstrate passing variables with cookies.
7. Implement Admin login/logout functionality and cookie wherever required.
8. Write a PHP script to connect MYSQL server from your web application. Write a PHP script to create and drop database.
9. Create database using phpMyAdmin. Write a program to read input data from table and display the information in tabular form.
10. Develop PHP application using forms and database.

Project Based Learning

1. Design personal website using HTML and CSS
2. Login page with user credentials and data base
3. Drawing palette based web page
4. Student registration form with data base connectivity
5. Dummy social networking website
6. Image editing using we page
7. Animation based website
8. Simple game website
9. Ecommerce website with data base connectivity
10. Any Complete web project with real time database connectivity
11. Login authentication
12. Design Survey Form
13. Quiz Game
14. Implement Employee Management System
15. Social Media Dashboard
16. Search Application
17. E-Commerce Website
18. Develop Freelance platform

19. Hospital Management System

Note: -*Students in a group of 3 to 4 shall complete any one project from the above list.