

**CURRICULUM AND SYLLABUS**

**FOR**

**B.TECH. DEGREE (INFORMATION TECHNOLOGY) PROGRAMME**

**REGULATION 2020**

**CHOICE BASED CREDIT SYSTEM**

**FOR THE STUDENTS ADMITTED FROM THE**

**ACADEMIC YEAR 2020-2021 ONWARDS**

**Sri Ramakrishna Institute of Technology**

(An Autonomous Institution)

Pachapalayam, Perur Chettipalayam, Coimbatore – 641 010

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## **SRI RAMAKRISHNA INSTITUTE OF TECHNOLOGY, COIMBATORE – 641010**

### **I) VISION OF THE INSTITUTION**

Our Vision is to develop into a World Class Technological Institute with centres of excellence in various disciplines by providing quality and value-based education with continuous upgradation of infrastructure, human resources and teaching - learning process

### **II) MISSION OF THE INSTITUTION**

Our Mission is to produce Quality Engineers, Scientists and Managers equipped with unbounded technical skills, domain knowledge and excellent moral values, for the advancement of the industry, business and for the emancipation of society.

### **III) VISION OF THE DEPARTMENT**

Our Vision is to develop the department as a centre of excellence in Information Technology comparable with best institutions in India by upgrading Hardware, Software and improving the quality of faculty

### **IV) MISSION OF THE DEPARTMENT**

Our Mission is to develop Quality IT professionals equipped with domain knowledge, analytical skills with creativity and high moral values for the advancement of technological excellence.

### **V ) PROGRAMME EDUCATIONAL OBJECTIVES (PEO) FOR B.TECH.INFORMATION TECHNOLOGY PROGRAMME**

**PEO1.** Graduates who effectively demonstrate engineering knowledge and entrepreneurial skills by providing practical solutions in information technology.

**PEO2.** Graduates who effectively demonstrate professionalism in multi-disciplinary engineering environment, leadership quality and teamwork.

**PEO3.** Graduates who make contributions to knowledge and establish best engineering practice through research and development.

**PEO4.** Graduates who demonstrate an ethical commitment to the community and the profession through involvement with professional organizations and society.

**PEO5.** Graduates who engage in life-long learning as demonstrated through career advancement.

#### CONSISTENCY OF PEO WITH MISSION OF THE DEPARTMENT

PEOs	ELEMENTS OF MISSION STATEMENT OF THE PROGRAMME		
	domain knowledge, analytical skills	creativity and high moral values	advancement of technological excellence
PEO1	3	1	2
PEO2	-	2	3
PEO3	3	2	1
PEO4	-	3	2
PEO5	-	-	3

#### VI) PROGRAM OUTCOMES (POS)

**1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

**2. Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

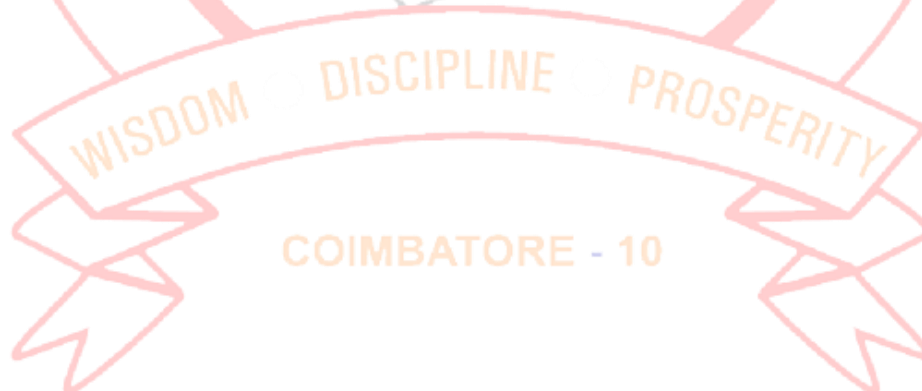
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## CONSISTENCY OF PEOs WITH POs OF THE PROGRAMME

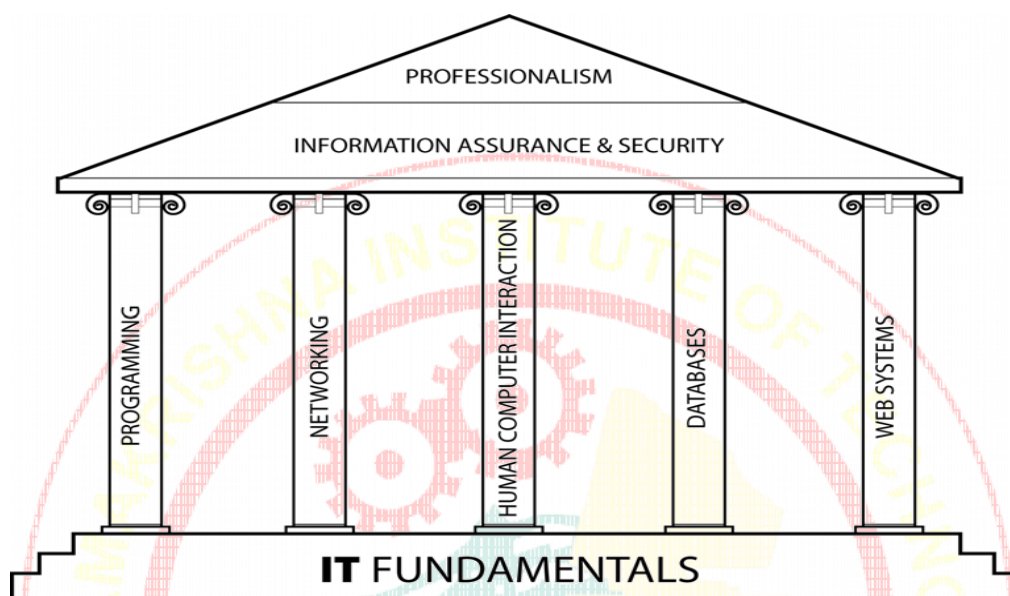
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO1	✓	✓		✓							✓	
PEO2									✓	✓		
PEO3			✓		✓		✓					
PEO4						✓		✓				
PEO5												✓

## VII) PROGRAM SPECIFIC OUTCOMES (PSO) FOR B. TECH.INFORMATION TECHNOLOGY PROGRAMME

1. An ability to use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking, and web systems and technologies.
2. An ability to assist in the creation of an effective project plan by applying the best practices and standards.



## CURRICULUM GUIDELINES (CSAB, ACM & IEEE)



### CREDIT DISTRIBUTION

S. No.	Course Work - Subject Area	Credits/Semester								Credits Total
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Sciences including Management Courses (HSMC)	3	6							9
2	Basic Sciences Courses (BS)	9.5	9.5	4						23
3	Engineering Science Courses (ES)	10	7	3						20
4	Professional Core Courses (PC)			12	18	15	15	3		63
5	Professional Elective Courses (PE)					3	3	9	3	18
6	Open Electives (OE)			3	3	3		3		12
7	Employability Enhancement Courses (EC)						4	3	8	15
<b>Total</b>		<b>22.5</b>	<b>22.5</b>	<b>22</b>	<b>21</b>	<b>21</b>	<b>22</b>	<b>18</b>	<b>11</b>	<b>160</b>



## VII) CURRICULUM STRUCTURE

### SEMESTER – I

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20HSG01	Technical English	HS	2	0	2	4	3
2	20MHG01	Calculus and Linear Algebra	BS	3	1	0	4	4
3	20CHG01	Engineering Chemistry	BS	3	1	0	4	4
4	20ITG01	Programming for Problem Solving using C	ES	3	0	0	3	3
5	20EEG01	Basic Electrical and Electronics Engineering	ES	3	0	0	3	3
PRACTICALS								
6	20MEG01	Engineering Graphics	ES	0	0	4	4	2
7	20CHG02	Engineering Chemistry Laboratory	BS	0	0	3	3	1.5
8	20ITG02	Programming in C Laboratory	ES	0	0	4	4	2
Total				14	2	13	29	22.5

## SEMESTER – II

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20HSG02	Universal Human Values – II Understanding Harmony	HS	3	0	0	3	3
2	20MHG02	Differential Equations and Complex Variables	BS	3	1	0	4	4
3	20PHG01	Engineering Physics	BS	3	1	0	4	4
4	20CSG01	Object Oriented Programming using C++	ES	3	0	0	3	3
5	20HMG01	Information Technology Essentials and Ethics	HM	3	0	0	3	3
6	20AC001	Environmental Science and Engineering	AC	3	0	0	3	0
PRACTICALS								
7	20MEG02	Engineering Workshop	ES	0	0	4	4	2
8	20PHG02	Engineering Physics Laboratory	BS	0	0	3	3	1.5
9	20CSG02	Programming in C++ Laboratory	ES	0	0	4	4	2
Total				18	2	11	31	22.5



### SEMESTER – III

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20MHG06	Probability and Statistics	BS	3	1	0	4	4
2	20IT001	Data Structures	PCC	3	0	0	3	3
3	20IT002	Java Programming	PCC	3	0	0	3	3
4	20CS001	Computer Organization and Architecture	PCC	3	0	0	3	3
5	20ECG02	Digital Principles and System Design	ES	3	0	0	3	3
6	20XXEXX	Open Elective - I	OE	3	0	0	3	3
PRACTICALS								
7	20IT003	Data Structures Laboratory	PCC	0	0	3	3	1.5
8	20IT004	Java Programming Laboratory	PCC	0	0	3	3	1.5
Total				18	1	6	25	22

### SEMESTER – IV

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20IT005	Discrete Structures	PCC	3	0	0	3	3
2	20IT006	Computer Networks	PCC	3	0	0	3	3
3	20CS004	Software Engineering	PCC	3	0	0	3	3
4	20IT007	Database	PCC	3	0	0	3	3

		Management Systems						
5	20IT008	Operating Systems	PCC	3	0	0	3	3
6	20XXEXX	Open Elective - II	OE	3	0	0	3	3
<b>PRACTICALS</b>								
7	20IT009	Database Management Systems Laboratory	PCC	0	0	3	3	1.5
8	20IT010	Operating Systems Laboratory	PCC	0	0	3	3	1.5
<b>Total</b>				<b>18</b>	<b>0</b>	<b>6</b>	<b>24</b>	<b>21</b>

### SEMESTER – V

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20IT011	Compiler Design	PCC	3	0	0	3	3
2	20IT012	Design and Analysis of Algorithms	PCC	3	0	0	3	3
3	20CS007	Object Oriented Analysis and Design	PCC	3	0	0	3	3
4	20IT013	Web Technology	PCC	3	0	0	3	3
5	20ITPXX	Professional Elective - I	PE	3	0	0	3	3
6	20XXEXX	Open Elective - III	OE	3	0	0	3	3
PRACTICALS								
7	20CS011	CASE Tools Laboratory	PCC	0	0	3	3	1.5
8	20IT014	Web Technology Laboratory	PCC	0	0	3	3	1.5
Total				18	0	6	24	21

### SEMESTER – VI

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20IT015	Machine Learning	PCC	3	0	0	3	3
2	20IT016	Internet of Things	PCC	3	0	0	3	3
3	20IT017	Data Analytics	PCC	3	0	0	3	3
4	20IT018	Cloud Computing	PCC	3	0	0	3	3
5	20ITPXX	Professional Elective - II	PE	3	0	0	3	3
6	20AC002	Constitution of India	AC	3	0	0	3	0
PRACTICALS								
7	20IT019	Data Analytics and Cloud Laboratory	PCC	0	0	3	3	1.5
8	20IT020	Internet of Things Laboratory	PCC	0	0	3	3	1.5
9	20IT901	Design Project	EC	0	0	8	8	4
Total				18	0	14	32	22

### SEMESTER – VII

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20IT021	Cryptography and Network Security	PCC	3	0	0	3	3
2	20ITPXX	Professional Elective - III	PE	3	0	0	3	3
3	20ITPXX	Professional Elective - IV	PE	3	0	0	3	3
4	20ITPXX	Professional Elective - V	PE	3	0	0	3	3
5	20XXEXX	Open Elective - IV	OE	3	0	0	3	3
PRACTICALS								
6	20IT902	Project Phase - I	EC	0	0	6	6	3
Total				15	0	6	21	18

### SEMESTER – VIII

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1	20ITPXX	Professional Elective - VI	PE	3	0	0	3	3
PRACTICALS								
2	20IT903	Final Year Project	EC	0	0	16	16	8
Total				3	0	16	19	11

**TOTAL NUMBER OF CREDITS: 160**

## PROFESSIONAL ELECTIVES

### ELECTIVE – I [PROGRAMMING]

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	20ITP11	Python Programming	PE	3	0	0	3	3
2	20ITP12	Advanced Java Programming	PE	3	0	0	3	3
3	20ITP13	Unix Internals	PE	3	0	0	3	3
4	20ITP14	C# and .Net Framework	PE	3	0	0	3	3
5	20ITP15	Programming with Open source Software	PE	3	0	0	3	3
6	20ITP16	Translators and System Software	PE	3	0	0	3	3
7	20ITP17	Introduction to Artificial Intelligence	PE	3	0	0	3	3

### ELECTIVE – II [NETWORKING]

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	20ITP21	Distributed Systems	PE	3	0	0	3	3
2	20ITP22	Mobile Computing	PE	3	0	0	3	3
3	20ITP23	Communication Switching Techniques	PE	3	0	0	3	3
4	20ITP24	Ad-hoc and Sensor	PE	3	0	0	3	3

		Networks						
5	20ITP25	Software Defined Networks	PE	3	0	0	3	3
6	20ITP26	Quantum Computing	PE	3	0	0	3	3
7	20ITP42	Data Mining and Data Warehousing	PE	3	0	0	3	3

### ELECTIVE – III [HUMAN COMPUTER INTERACTION]

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	20ITP31	Digital Image Processing	PE	3	0	0	3	3
2	20ITP32	Pattern Recognition	PE	3	0	0	3	3
3	20ITP33	User Experience Design	PE	3	0	0	3	3
4	20ITP34	Computer Graphics and Multimedia	PE	3	0	0	3	3
5	20ITP35	Game Programming	PE	3	0	0	3	3
6	20ITP36	Introduction to Augmented Reality	PE	3	0	0	3	3

### ELECTIVE – IV [DATABASES]

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	20ITP41	Advanced Database Technology	PE	3	0	0	3	3
2	20ITP43	Predictive Analytics	PE	3	0	0	3	3
3	20ITP44	Deep Learning	PE	3	0	0	3	3



4	20ITP45	Parallel Computing	PE	3	0	0	3	3
5	20ITP46	Business Intelligence	PE	3	0	0	3	3

### ELECTIVE – V [WEB SYSTEMS]

S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	20ITP51	Web Engineering	PE	3	0	0	3	3
2	20ITP52	Advanced Web Programming	PE	3	0	0	3	3
3	20ITP53	PHP and MySQL	PE	3	0	0	3	3
4	20ITP54	Mobile Application Development	PE	3	0	0	3	3
5	20ITP55	Service Oriented Architecture	PE	3	0	0	3	3
6	20ITP56	Blockchains	PE	3	0	0	3	3

### ELECTIVE – VI [INFORMATION ASSURANCE AND SECURITY]

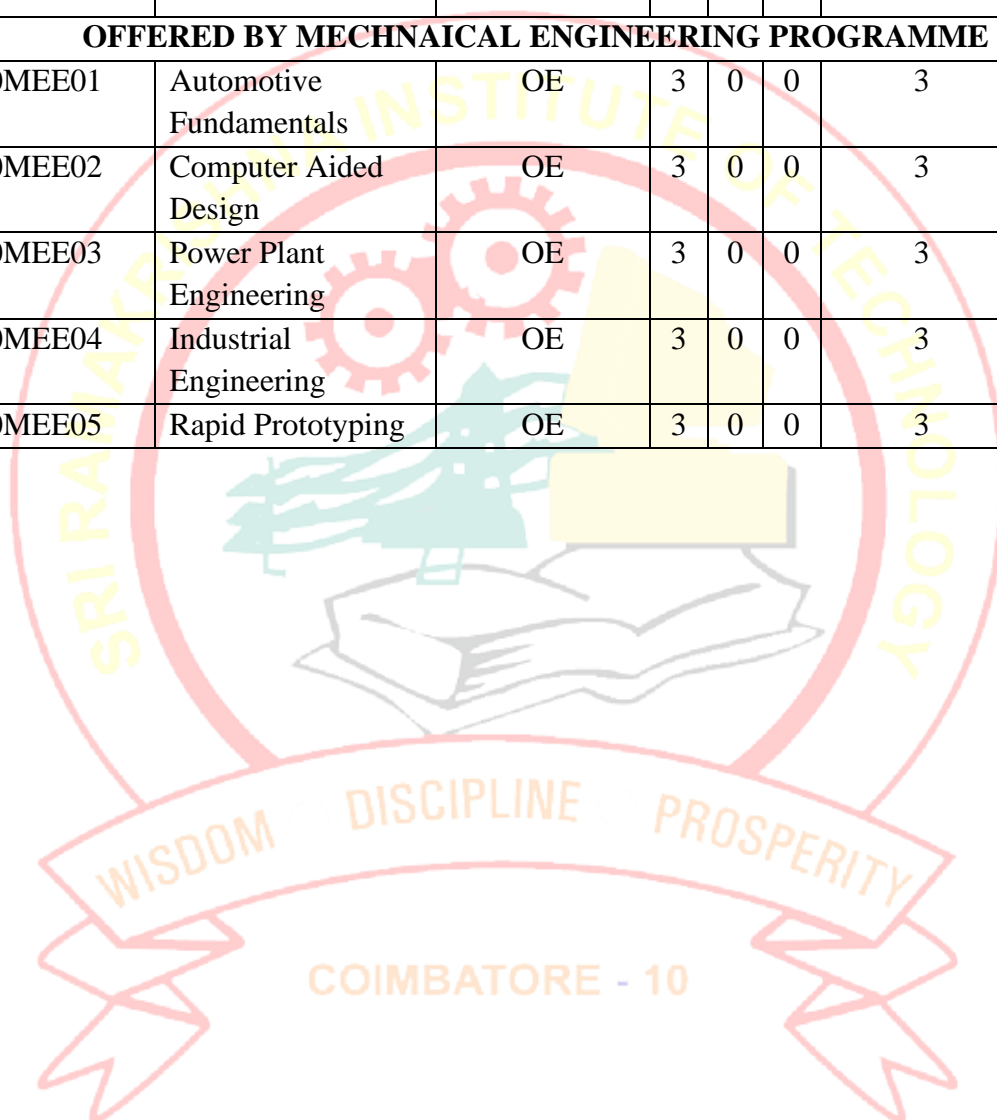
S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
1	20ITP61	Management Information Systems	PE	3	0	0	3	3
2	20ITP62	Software Testing	PE	3	0	0	3	3
3	20ITP63	Software Quality Assurance	PE	3	0	0	3	3
4	20ITP64	Principles of Cyber Security	PE	3	0	0	3	3
5	20ITP65	IT Security and Risk Management	PE	3	0	0	3	3

6	20ITP66	Secure Software Development	PE	3	0	0	3	3
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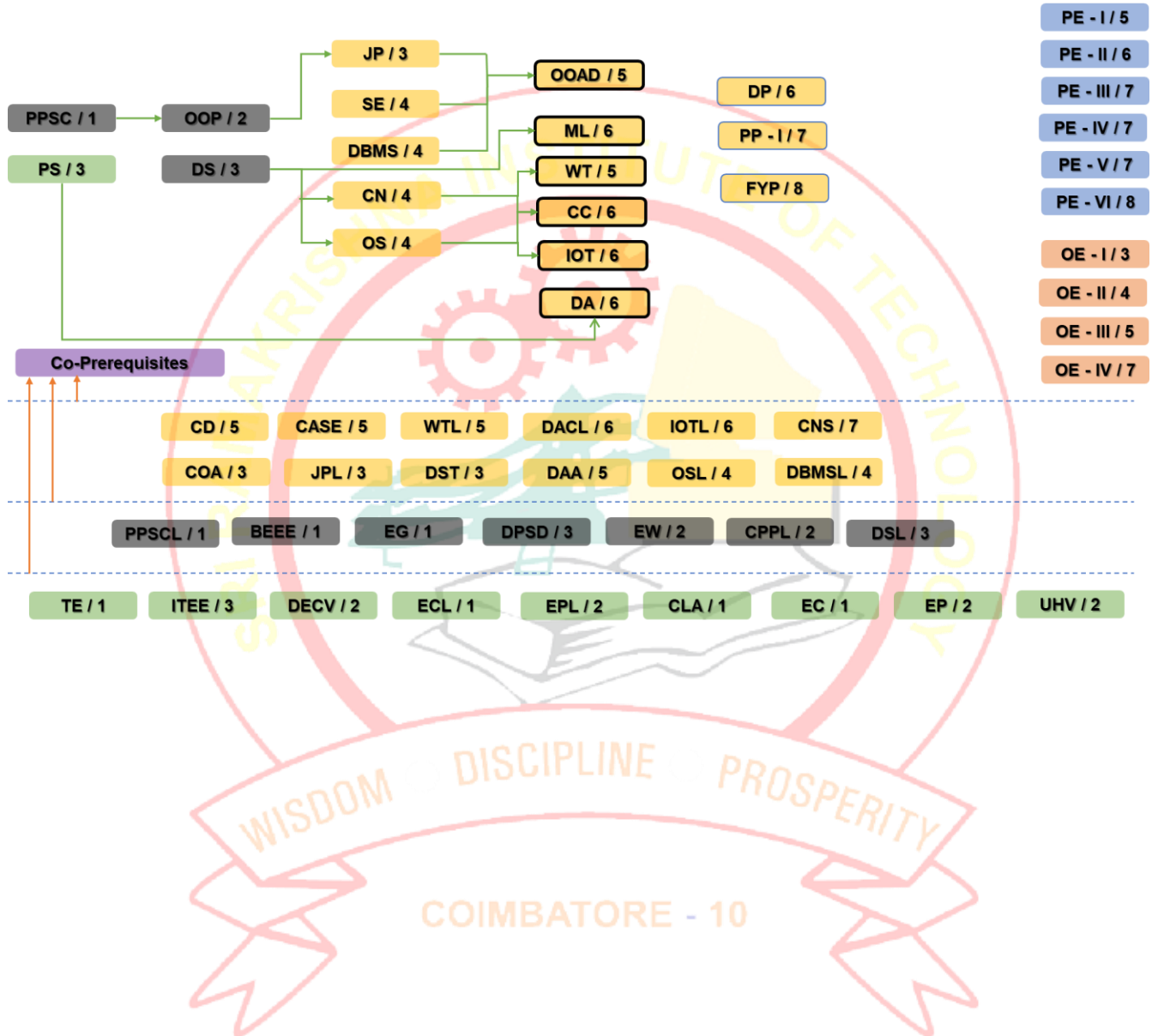
### OPEN ELECTIVES

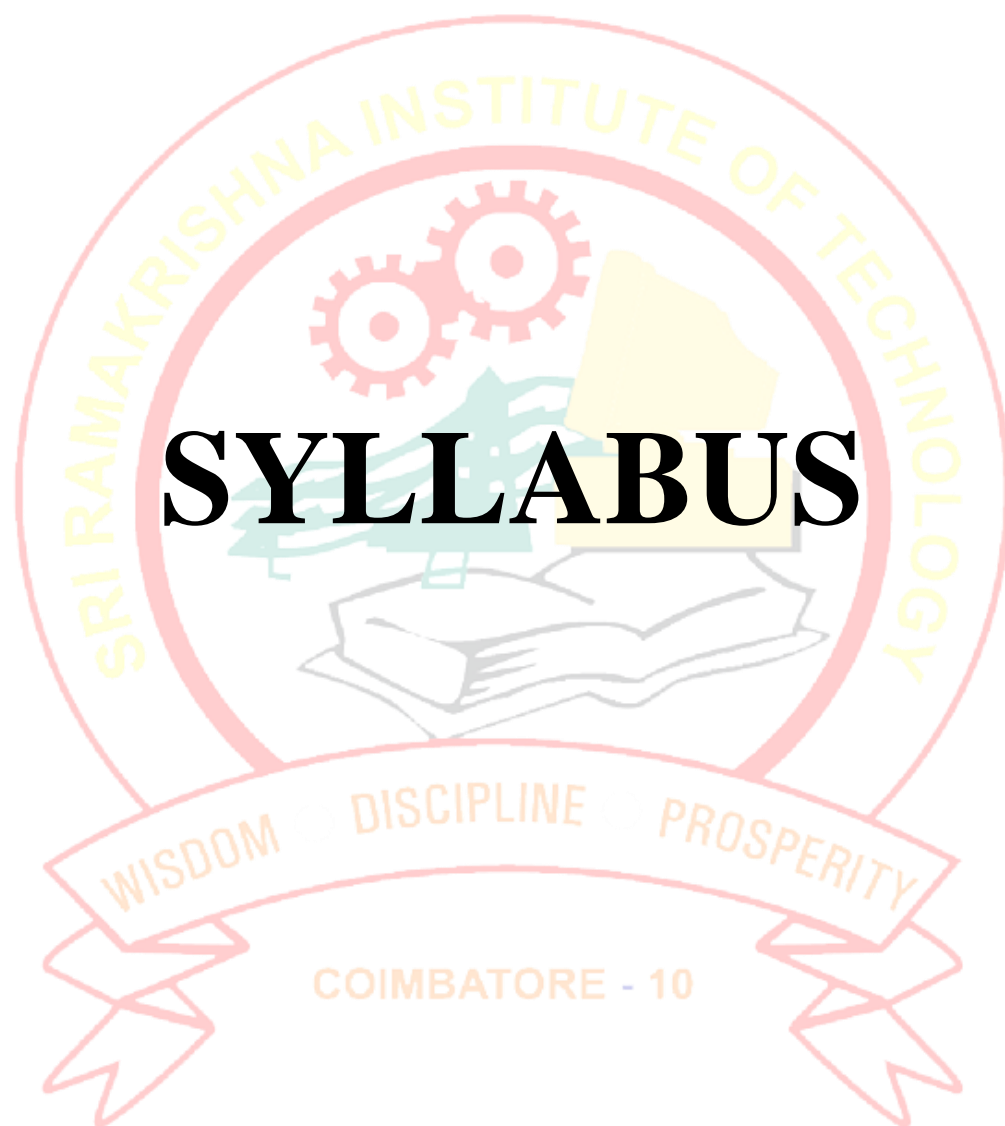
S. NO.	COURSE CODE	COURSE NAME	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
OFFERED BY ELECTRICAL AND ELECTRONICS ENGINEERING PROGRAMME								
1	20EEE01	Energy Management Systems	OE	3	0	0	3	3
2	20EEE02	Medical Instrumentation	OE	3	0	0	3	3
3	20EEE03	PLC Programming	OE	3	0	0	3	3
4	20EEE04	Renewable Energy Systems	OE	3	0	0	3	3
5	20EEE05	Virtual Instrumentation and Data Acquisition	OE	3	0	0	3	3
6	20EEE06	Electric Vehicles	OE	3	0	0	3	3
OFFERED BY ELECTRONICS AND COMMUNICATION ENGINEERING PROGRAMME								
1	20ECE01	Electronic Measurements and Instrumentation	OE	3	0	0	3	3
2	20ECE02	Microcontrollers and its Applications	OE	3	0	0	3	3
3	20ECE03	Introduction to Embedded Systems	OE	3	0	0	3	3

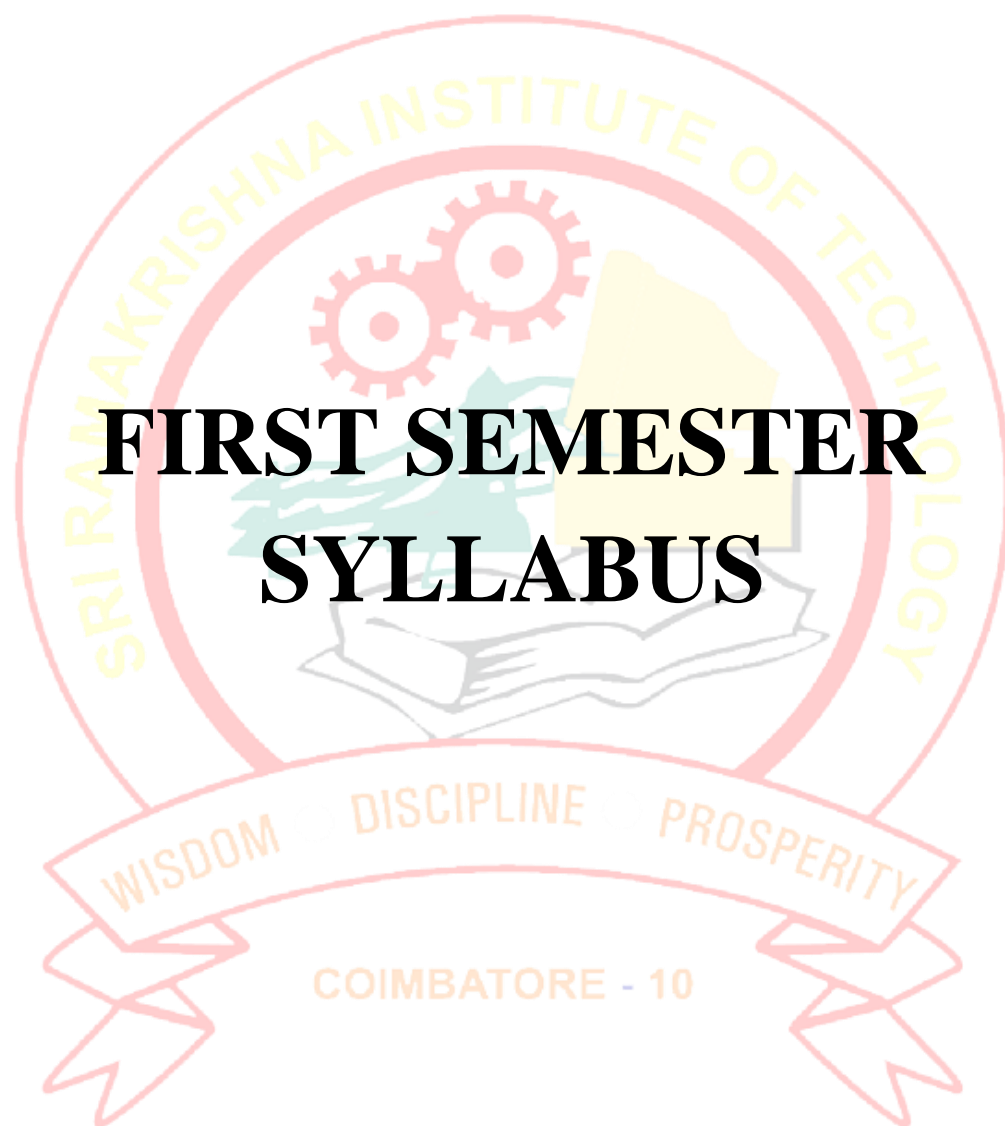
4	20ECE04	Nano Electronics and Sensors	OE	3	0	0	3	3
5	20ECE05	Principles of VLSI Systems	OE	3	0	0	3	3
<b>OFFERED BY MECHNAICAL ENGINEERING PROGRAMME</b>								
1	20MEE01	Automotive Fundamentals	OE	3	0	0	3	3
2	20MEE02	Computer Aided Design	OE	3	0	0	3	3
3	20MEE03	Power Plant Engineering	OE	3	0	0	3	3
4	20MEE04	Industrial Engineering	OE	3	0	0	3	3
5	20MEE05	Rapid Prototyping	OE	3	0	0	3	3



## KNOWLEDGE FLOW







# **FIRST SEMESTER SYLLABUS**



20HSG01	TECHNICAL ENGLISH	L	T	P	C
		2	0	2	3

### COURSE OBJECTIVE:

This course provides to take part in fluent communication and to use proper grammar in formal writing. Also, to infer analytic based writing, email writing, structures of grammar and to interpret TED talks and understand various grammatical concepts, extensive writing and to participate in role-play activities. It Interpret graphics, reading comprehension and to take part in presentation and organize technical reports, proposals and resume preparation.

### COURSE CONTENT:

#### Importance of Communication

6+3

Listening: Importance of listening in the corporate world. Exposure to structured talks

Speaking: Self-introduction, Peer introduction, Extempore

Reading: Skimming and Scanning, Note-Making

Writing: Parts of Speech, Tense, Subject-Verb Agreement, Prepositions, Instructions

Formal Letters (Quotations, Clarification, Placing orders & Complaint letter

#### Formal Communication

6+3

Listening: Listening to motivational talks / TED talks, Note-taking practice.

Speaking: Describing a product/place, Conversation practice, Telephonic Conversation.

Reading: Reading Comprehension, Reading for specific information.

Writing: Voices, Compound Nouns, Paragraph Writing, Recommendations, Email writing, Analytical and issue-based essays.

#### Writing Strategies

6+3

Listening: Listening to Announcements, Listening to Product description and Process

Speaking: Role-Play, Picture description.

Reading: Cloze reading, Introduction to Blogs, Social media etiquette.

Writing: Cause and Effect, Gerunds and Infinitives, Tag Questions, Modal Verbs, Checklist.

## **Presentation Skills**

**6+3**

Listening: Listening to Group Discussion and Interview Skills.

Speaking: Presentation on the technical topic, Sales talk.

Reading: Interpreting pictures of visual graphics.

Writing: If Conditional Clause, Use of sequence words, Process Description.

## **Technical Communication**

**6+3**

Listening: Listening to talks of scientific nature, Listening for specific information.

Speaking: Giving impromptu talks, Giving a summary of an article.

Reading: Journals, Articles both general and technical.

Writing: Purpose and Function, extended definitions Wh- questions, Resume Writing, Report (Industrial visit reports, Accident report, Feasibility Reports) Proposals.

## **LIST OF LABORATORY EXERCISES**

1. Speaking - Self and Peer Introduction
2. Speaking - General Conversation on Business Context
3. Listening to short recordings
4. Listening to conversation
5. Technical Presentation (PPT)

## **COURSE OUTCOMES:**

**CO1:** Ability to understand listening skills, use proper grammar, proficiency in oral communication and to write in formal English.

**CO2:** Ability to inculcate the concept of email writing, structures of grammar and to interpret advance listening skills.

**CO3:** Ability to infer the strategies of academic writing and to use advance grammar mechanics.

**CO4:** Ability to predict graphics, reading comprehension and to participate in presentation.

**CO5:** construct technical reports, documentations, proposals, read journals and listen for specific information.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	2	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3	-	-	-	-	-	-

### Program Articulation matrix

20HSG01	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3	-	-	-	-	-	-

### REFERENCES:

1. Ian wood, Anne Williams with Anna Cowper, "Pass Cambridge BEC Preliminary", 2<sup>nd</sup> Edition, Cengage Learning, 2015.
2. Whitby, Norman, "Business Benchmark Pre-intermediate to Intermediate Business preliminary", 1<sup>st</sup> Edition Cambridge University Press, 2014.
3. Rizvi M.Ashraf, "Effective Technical Communication", Tata McGraw-Hill Publishing Company Limited, 4<sup>th</sup> Edition, 2010.
4. Gerson Sharon J, Steven M.Gerson, "Technical Writing-Process and Product", Pearson Education Pvt. Ltd. Third Edition, 2009.
5. Sanborn Pfeiffer, Padmaja, "Technical Communication, A Practical Approach" Pearson Publication, Sixth Edition, 2007.

20MHG01	CALCULUS AND LINEAR ALGEBRA	L	T	P	C
		3	1	0	4

### COURSE OBJECTIVE:

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To explain about functions of several variables which is useful in optimization.
- To make the students understand different methods for integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

### COURSE CONTENT:

#### Matrices

9+3

Introduction – Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms – Stretching of an Elastic Membrane – Vibrating System of two masses on two springs.

#### Differential Calculus

9+3

Limit of function – One sided limit – Limit Laws – Continuity – left and right continuity – types of discontinuities – Intermediate Value Theorem – Derivatives of a function – Differentiation rules – Chain rule – Implicit differentiation – logarithmic differentiation – Maxima and minima – Mean value theorem

#### Functions of Several Variables

9+3

Partial derivatives – Total derivative – Differentiation of implicit functions – Change of variables – Jacobian – Partial differentiation of implicit functions – Taylor's series for functions of two variables Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

## Integral Calculus

9+3

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

## Multiple Integrals

9+3

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

### COURSE OUTCOMES:

**CO1:** Ability to solve practical problems that can be expressed as matrix algebra.

**CO2:** Ability to apply differential calculus tools in solving various application problems.

**CO3:** Ability to determine maxima and minima of multi variable functions.

**CO4:** Ability to apply different methods of integration in solving practical problems.

**CO5:** Ability to apply multiple integral ideas in solving areas, volumes and other practical problems.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO1	PSO2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2				
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-		
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-		
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-		
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-		
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-		

### Program Articulation matrix

20MHG01	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-

### TEXT BOOK:

1. Erwin Kreyszig, “Advanced Engineering Mathematics”, 10<sup>th</sup> Edition, Wiley India, 2016.
2. Grewal. B.S, “Higher Engineering Mathematics”, 44<sup>th</sup> Edition, Khanna Publications, Delhi, 2017

### REFERENCES:

1. James Stewart, “Calculus, Early Transcendental”, 7<sup>th</sup> Edition, Cengage learning, New Delhi, 2018.
2. Joel Hass, Christopher Heil and Maurice D.Weir, Thomas “Calculus”, Pearson, 14<sup>th</sup> Edition, New Delhi, 2018.
3. Srimanta Paul and Subodh C. Bhunia, “Engineering Mathematics”, Oxford University Press, 1<sup>st</sup> Edition, 2015.



20CHG01	ENGINEERING CHEMISTRY	L	T	P	C
		3	1	0	4

#### COURSE OBJECTIVE:

- To know the basic concepts of electrochemistry for solving engineering problems
- To provide knowledge on batteries and fuel cells
- To impart solid foundation in photochemistry for doing instrumental chemical analysis
- To understand the importance of water treatment for industrial and domestic use that satisfy the requirements and need for the society
- To introduce nanochemistry in order to incorporate it in the field of engineering and technology

#### COURSE CONTENT:

##### Electrochemistry

9+3

Electrochemical cells – Nernst Equation (Problems), Electrode potential – Representation of a cell -Galvanic cell-Construction and working - Electrodes – Standard Hydrogen Electrode (SHE), Saturated Calomel Electrode (SCE) and Glass Electrode – Electrochemical Series and its applications - Conductometric titrations (Acid -Base Titration).

##### Batteries

9+3

Batteries – Characteristics – Current, Power, Capacity, Classification of batteries – Primary (Dry and Alkaline battery) – Secondary batteries (Lead acid and Nickel – Cadmium) and Flow batteries (Hydrogen – Oxygen and Methanol – Oxygen fuel cells) – Modern batteries – Lithium Ion batteries – Applications.

##### Photochemistry and Spectroscopy

9+3

Photochemistry: Laws of photochemistry - Grotthuss-Draper law, Stark-Einstein law and Lambert-Beer Law. Photo physical processes – Jablonski diagram. Chemiluminescence, photo-sensitization and photoquenching– mechanism and examples. Spectroscopy: Electromagnetic spectrum - absorption of radiation - electronic, vibrational and rotational

transitions. Atomic absorption spectroscopy, UV-Vis and IR spectroscopy- principles, instrumentation (Block diagram) and applications.

## **Water Treatment**

**9+3**

Importance of water – Water sources – Impurities – Carbonate and Non Carbonate Hardness (simple problems) – Potable water and its specifications, Steps involved in treatment of potable water – Disinfection methods – Internal Conditioning (Phosphate, Calgon, Carbonate and Colloidal conditioning method) - External Conditioning – Demineralisation process -Zeolite process– Desalination (Reverse Osmosis).

## **Nanochemistry**

**9+3**

Basics-distinction between molecules, nanomaterials and bulk materials; size-dependent properties. Types –nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Characterization - Scanning Electron Microscope and Transmission Electron Microscope - Principle and instrumentation (block diagram). Properties (optical, electrical, mechanical and magnetic) and Applications of nanomaterials - medicine, agriculture, electronics and catalysis.

## **COURSE OUTCOMES:**

**CO1:** Ability to understand the basics of electrochemistry and role of reference electrodes.

**CO2:** Ability to understand the construction, working and applications of various batteries.

**CO3:** Ability to apply the laws of photochemistry in spectral analysis of chemical substances.

**CO4:** Ability to identify quality of water for domestic and industrial purposes through analysis of water quality parameters

**CO5:** Ability to apply basic concepts of Nanoscience and Nanotechnology as a key component in Engineering

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

### Program Articulation matrix

20CHG01	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

### REFERENCES:

1. Jain P. C. & Monica Jain., "Engineering Chemistry", 16<sup>th</sup> Edition, Dhanpat Rai Publishing Company (P) Ltd, New Delhi, 2015.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, New Delhi, 6<sup>th</sup> Edition, 2012.
3. Dara S. S, "A text book of Engineering Chemistry", Chand Publications, 2<sup>nd</sup> Edition, 2014.
4. Palanna O G, "Engineering Chemistry", Tata McGraw – Hill Education, 1<sup>st</sup> Edition, 2009.
5. Shikha Agarwal, "Engineering Chemistry – Fundamentals and applications", Cambridge university press, 2<sup>nd</sup> Edition, 2019.

20ITG01	<b>PROGRAMMING FOR PROBLEM SOLVING USING C</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

This course provides an introduction to computer hardware. The course further deals with problem solving techniques and their implementations through syntax and semantics of C language.

### **COURSE CONTENT:**

#### **Fundamentals of Computing**

**9**

Basic concepts of 20ITs, Generation and classification of computers, Number System Representation, Fundamentals of algorithms, Pseudo code, Flow charts.

#### **C Language Fundamentals**

**9**

Introduction to C programming, Structure of a C program, Compilation and Linking Processes, Character Set, Identifiers, Keywords, Data Types, Constant and Variables, Statements, Expressions, Operators, Precedence of operators, Input-Output Operations, Control Structures, Decision Making, Branching & Looping. Application: Solving Simple Scientific and Mathematical Problems.

#### **Arrays and Strings**

**9**

Introduction to Arrays, One Dimensional Array, Multidimensional Array. Application: Matrix Operations, Sorting, Searching, Sum of Series and Statistical Problems. String Manipulation, String Arrays. Application: Solving problems using String Functions.

#### **Functions and Pointers**

**9**

User Defined and Standard Functions, Formal and Actual arguments, Function Prototypes, Parameter Passing, Call-by-Value, Call-by-Reference, Recursion. Application: Math Functions, Computation of Sine Series, Random Number Generation, Tower of Hanoi and Factorial using Recursive Functions. Pointers, Pointer Variables, Pointer Arithmetic, Passing Parameters by Reference, Pointer to Pointer, Pointers to Functions, Dynamic Memory Allocation. Application: Card shuffling and Dealing Simulation using Pointers.

## Structures, Unions and File Handling

9

Declaration of Structures, Nested Structure, Pointer to Structure, Declaration of Unions, Pointer to Union, Application: Student Records. Storage Classes, Pre-Processor Directives. Files -Types of File Processing: Sequential Access, Random Access. Application: Transaction Processing Program.

### COURSE OUTCOMES:

**CO1:** Ability to apply the concepts of algorithm, pseudo code and flow chart to solve problems

**CO2:** Ability to build control structures to solve problems

**CO3:** Ability to choose data structures for managing user data

**CO4:** Ability to apply memory and I/O management constructs of C

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	2	3	2	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### Program Articulation matrix

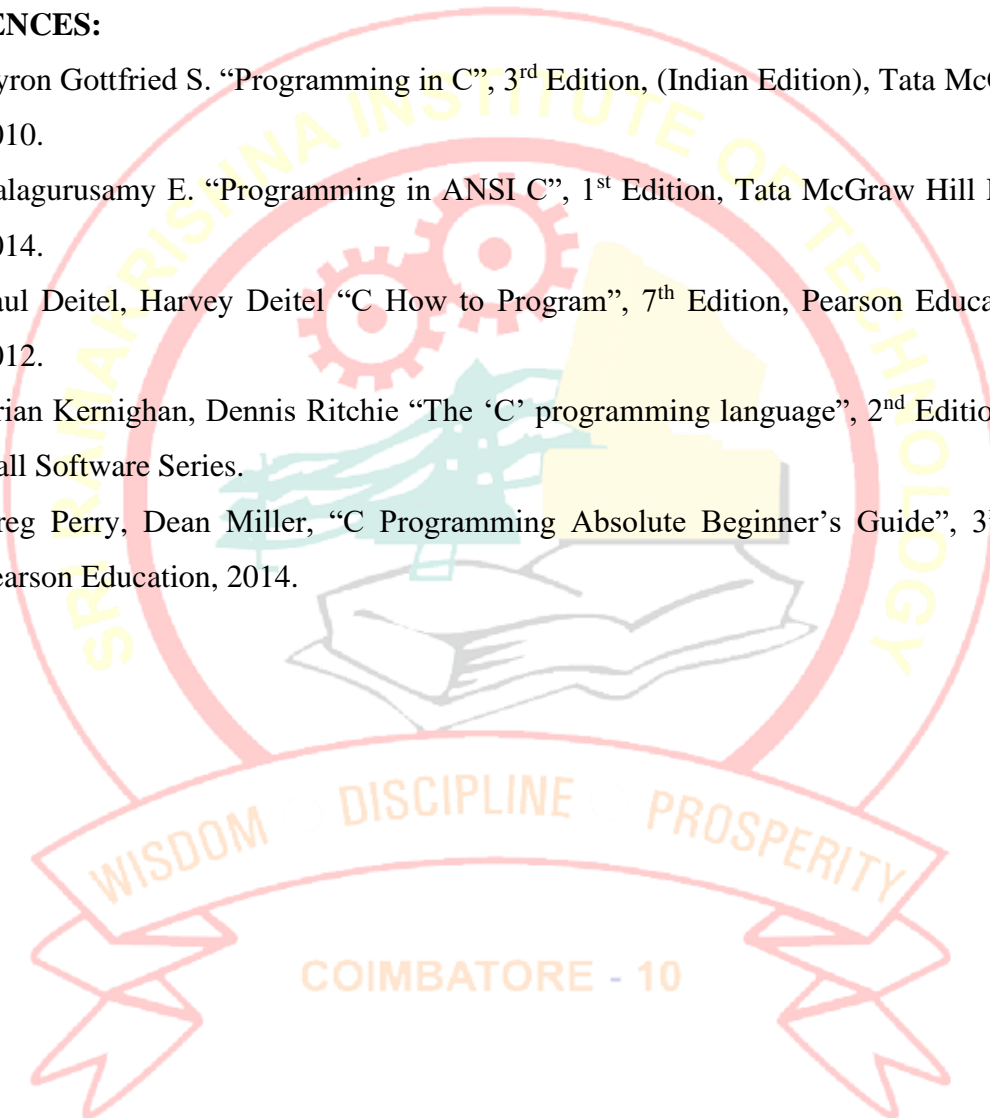
20ITG01	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	2	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

**TEXT BOOK:**

1. Behrouz A. Forouzan, Richard F. Gilberg, “Computer Science: A Structured Programming Approach Using C”, 3<sup>rd</sup> Edition, Course Technology Inc, 2005.

**REFERENCES:**

1. Byron Gottfried S. “Programming in C”, 3<sup>rd</sup> Edition, (Indian Edition), Tata McGraw Hill, 2010.
2. Balagurusamy E. “Programming in ANSI C”, 1<sup>st</sup> Edition, Tata McGraw Hill Education, 2014.
3. Paul Deitel, Harvey Deitel “C How to Program”, 7<sup>th</sup> Edition, Pearson Education Asia, 2012.
4. Brian Kernighan, Dennis Ritchie “The ‘C’ programming language”, 2<sup>nd</sup> Edition Prentice Hall Software Series.
5. Greg Perry, Dean Miller, “C Programming Absolute Beginner’s Guide”, 3<sup>rd</sup> Edition, Pearson Education, 2014.





20EEG01	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

The course aims to provide the basic principles of electric circuits, electron devices, electrical wiring and AC/DC machines for applications in real time engineering problems.

### COURSE CONTENT:

#### Electric circuits and Domestic Wiring 9

Ohm's Law and Kirchhoff's laws - series and parallel circuits, equivalent resistance- Mesh and Nodal Analysis (Analysis with only independent source and DC circuits)- Superposition theorem, Thevenin's theorem, Norton's theorem. Types of wiring- Domestic wiring - Specification of Wires – Importance of Earthing.

#### AC Circuits 9

Concepts of AC circuits –RMS value, average value, form and peak factors. Power relations in single phase and three phase circuits- real and reactive power – power factor, Star connection – Delta connection –Balanced Loads.

#### Electrical Machines 9

Construction, Principle of operation and characteristics of DC separately excited generator and DC Shunt and Series motor, EMF equation of DC separately excited generator and Torque equation of DC Shunt and Series motor- applications. Construction and Principle of operation of transformer, EMF Equation- applications. Construction and Principle of operation of synchronous Motor. Construction and Principle of operation of single-phase Induction motor - applications.

#### Semiconductor Devices and Applications 9

Introduction to semiconductors- PN junction diode - forward and reverse bias characteristics –Zener diode and its characteristics. Operation of Half wave and Full wave rectifiers – Capacitive filters- Zener diode Voltage regulators

## Current Controlled Devices

9

Operation of PNP and NPN transistors - Early effect – Input and Output Characteristics of CB, CE, CC Configurations , Working principle and characteristics of SCR, UJT.

### COURSE OUTCOMES:

**CO1:** Ability to understand the basic concepts of electric circuits, electronic devices & circuits and electric machines

**CO2:** Ability to understand the concepts related with electrical domestic wiring

**CO3:** Ability to apply the concepts of electrical machines for industrial applications

**CO4:** Ability to analyze the characteristics of electronic devices and circuits

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1
CO1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

### Program Articulation matrix

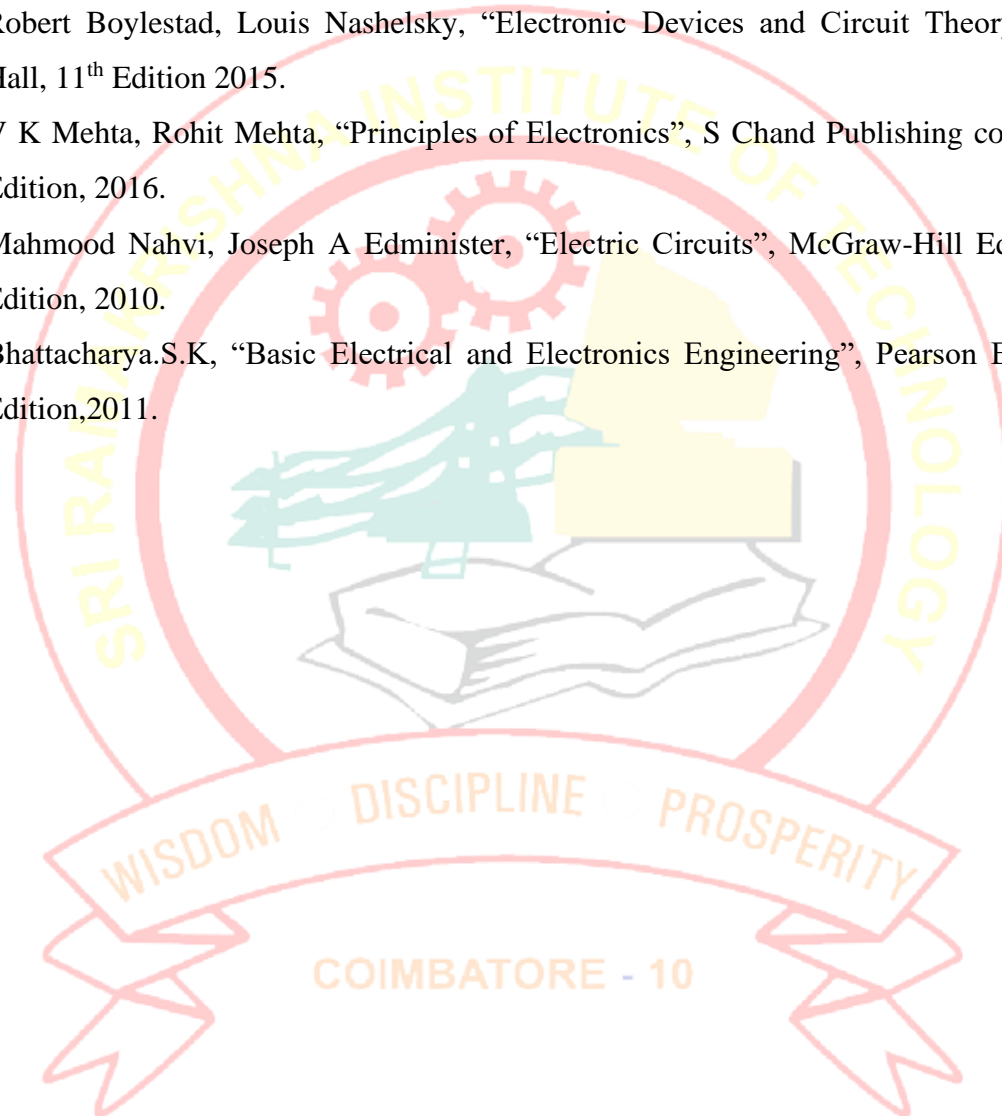
20EEG01	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1
CO	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1

**TEXT BOOK:**

1. A Fitzgerald, Charles Kingsley, Stephen Umans, “Electric Machinery”, 7<sup>th</sup> Edition, McGraw-Hill, 2013.

**REFERENCES**

1. Robert Boylestad, Louis Nashelsky, “Electronic Devices and Circuit Theory”, Prentice Hall, 11<sup>th</sup> Edition 2015.
2. V K Mehta, Rohit Mehta, “Principles of Electronics”, S Chand Publishing company, 11<sup>th</sup> Edition, 2016.
3. Mahmood Nahvi, Joseph A Edminister, “Electric Circuits”, McGraw-Hill Education, 5<sup>th</sup> Edition, 2010.
4. Bhattacharya.S.K, “Basic Electrical and Electronics Engineering”, Pearson Education, 1<sup>st</sup> Edition, 2011.



20MEG01	ENGINEERING GRAPHICS	L	T	P	C
		0	0	4	2

### COURSE OBJECTIVE:

The objectives of this course are to impart knowledge to interpret engineering drawings and to enable the students to communicate the concepts, ideas, and basic designs through graphical representations as per related engineering conventions and standards.

### COURSE CONTENT:

#### **Curve Constructions and Orthographic Projection 12**

Lettering – Types of lines – Dimensioning – Conics- Construction of ellipse, parabola and hyperbola by eccentricity method-Construction of cycloid- Construction of involutes of square and circle- Drawing of tangents and normal to these curves. Principles of Orthographic projection – Layout of views Orthographic projection of simple Engineering components using first angle Projection. Drawing of multiple views from pictorial views of objects

#### **Projection of Points, Lines and Plane Surfaces 12**

Projection of points – Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces – Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method

#### **Projection of Solids 12**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

#### **Projection of Sectioned Solids and Development of Surfaces 12**

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of

section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone. Development of lateral surfaces of solids with cut-outs and holes.

## Isometric and Perspective Projections

12

Principles of isometric projection – isometric scale – isometric projections of simple solids and truncated solids – Prisms, pyramids, cylinders, cones – Perspective projection of simple solids prisms, pyramids and cylinder by visual ray method and vanishing point method.

## COURSE OUTCOMES:

**CO1:** Ability to interpret and construct geometric entities, orthographic projection of engineering components

**CO2:** Ability to construct orthographic views of points and straight lines

**CO3:** Ability to apply orthographic principles to construct views of planes and solids

**CO4:** Ability to build orthographic projection of section of solids and develop the lateral surfaces of solids

**CO5:** Ability to develop isometric and perspective projections of solids

## COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9			PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

## Program Articulation matrix

20MEG01	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	2	2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

### TEXT BOOK:

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 53<sup>rd</sup> Edition, 2014.

### REFERENCES

1. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Publications, Bangalore, 2017.
2. Jolhe, D. A., Engineering drawing, Tata McGraw Hill, 2017.
3. Shah, M. B. and Rana, B. C., Engineering Drawing, Pearson Education, 2009
4. K.V. Natarajan, A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2016.
5. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2018.
6. Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2015.
7. Sekkilar.S.M., “Engineering Graphics” Alpha Science International Ltd, 2018.



20CHG02	ENGINEERING CHEMISTRY LABORATORY	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVE:

- To make the students to understand the basic principles of volumetric analysis
- To impart skills in analysis of various water quality parameters
- To enable the students to gain exposure in corrosion studies
- To familiarize the students with water of crystallization of hydrated compounds and molecular weight determination of polymers
- To develop experimental skills of students through instrumental chemical analysis

### COURSE CONTENT:

#### LIST OF EXPERIMENTS

1. Estimation of acidity of industrial effluent by conductometric titration.
2. Determination of corrosion rate by weight loss method.
3. Determination of water of crystallization of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
4. Estimation of hardness of water by complexometric method.
5. Determination of DO content of water sample by Winkler's method.
6. Determination of molecular weight of polyvinyl alcohol using Ostwald Viscometer.
7. Determination of strength of Hydrochloric acid using pH meter.
8. Determination of Alkalinity in the given water sample.
9. Estimation of iron content of the given solution using potentiometer.
10. Conductometric precipitation titration using Barium chloride and Sodium Sulphate
11. Determination of strength of acids in a mixture using conductivity meter.
12. Determination of Chloride content in the given water sample by Argentometric method.

**TOTAL PERIODS: 45**

### COURSE OUTCOMES:

**CO1:** Ability to demonstrate analytical techniques for the quality assessment of domestic and industrial waste water.

**CO2:** Ability to apply experimental chemistry for the investigation of corrosion related problems in industrial field.

**CO3:** Ability to demonstrate determination of molecular weight of polymeric materials so as to use them for various engineering applications.



**CO4:** Ability to make use of titrimetric analysis for estimating the amount of metal ions present in unknown substances.

**CO5:** Ability to analyze the given sample using various instrumental methods.

#### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

#### Program Articulation matrix

20CHG02	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-

#### REFERENCES:

1. Beran J.A, "Laboratory Manual for Principles of General Chemistry", Wiley publications, 10<sup>th</sup> Edition, 2014.
2. Manoj Kumar Solanki, "Engineering Chemistry Laboratory Manual", Educreation publishing, 2019.
3. Jeffery G. H, and Basset J., "Vogel's text book of quantitative chemical analysis", Prentice Hall, 5<sup>th</sup> Edition, 2012.

20ITG02	PROGRAMMING IN C LABORATORY	L	T	P	C
		0	0	4	2

### COURSE OBJECTIVE:

This course provides guidance to find solutions for engineering problems by developing computer applications using C language.

### COURSE CONTENT:

#### LIST OF EXPERIMENTS:

1. Problem Solving Techniques (Algorithm, Pseudo code, Flowcharts).
2. Program using Simple Statements and Expressions.
3. Scientific Problem Solving using Decision Making and Looping.
4. Program using Single and Multidimensional Array.
5. Program using String, Math Inbuilt Functions.
6. Program using User Defined Functions (string & array manipulation) and Storage Classes.
7. Program using Recursive Function.
8. Program using Dynamic Memory Allocation.
9. Program using Structures and Unions.
10. Program using Files.

**TOTAL PERIODS: 60**

### COURSE OUTCOMES:

**CO1:** Ability to find solution methodology using different problem solving techniques

**CO2:** Ability to use appropriate data types and control structures for solving a given problem

**CO3:** Ability to apply the various concepts of C programming for solving engineering problems

**CO4:** Ability to analyse the problem solving techniques which is appropriate for solving real world problems

**COs, POs, and PSOs - Articulation matrix**

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

**Program Articulation matrix**

201TG02	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

**TEXT BOOK:**

1. Behrouz A. Forouzan, Richard F. Gilberg, "Computer Science: A Structured Programming Approach Using C", 3<sup>rd</sup> Edition, Course Technology Inc, 2005.

**REFERENCES:**

1. Byron Gottfried S. "Programming in C", 3<sup>rd</sup> Edition, (Indian Edition), Tata McGraw Hill, 2010.
2. Balagurusamy E. "Programming in ANSI C", 8<sup>th</sup> Edition, Tata McGraw Hill Education.
3. Paul Deitel, Harvey Deitel "C How to Program", 7<sup>th</sup> Edition, Pearson Education Asia, 2012.



<b>20HSG02</b>	<b>UNIVERSAL HUMAN VALUES – II UNDERSTANDING HARMONY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

### **COURSE CONTENT:**

#### **Introduction**

**9**

Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration—what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority,5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

#### **Understanding Harmony in the Human Being**

**9**

Harmony in Myself! Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility, Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of ‘I’ and harmony in ‘I’,

Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.

### **Understanding Harmony in the Family and Society**

**9**

Harmony in Human-Human Relationship Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

### **Understanding Harmony in the Nature and Existence**

**9**

Whole existence as Coexistence Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

### **Implications of the above Holistic Understanding of Harmony on Professional Ethics**

**9**

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics:

- a. Ability to utilize the professional competence for augmenting universal human order
- b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,



c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. At the level of society: as mutually enriching institutions and organizations , Sum up.

### COURSE OUTCOMES:

**CO1:** Ability to become more aware of themselves, and their surroundings (family, society, nature)

**CO2:** Ability to become more responsible in life, and in handling problems with sustainable solutions, While keeping human relationships and human nature in mind.

**CO3:** Ability to have better critical ability.

**CO4:** Ability to become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

**CO5:** Ability to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	1	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	1	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	1	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	1	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	1	-	-	-



## Program Articulation matrix

20HSG02	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	1	-	-	-

### READINGS:

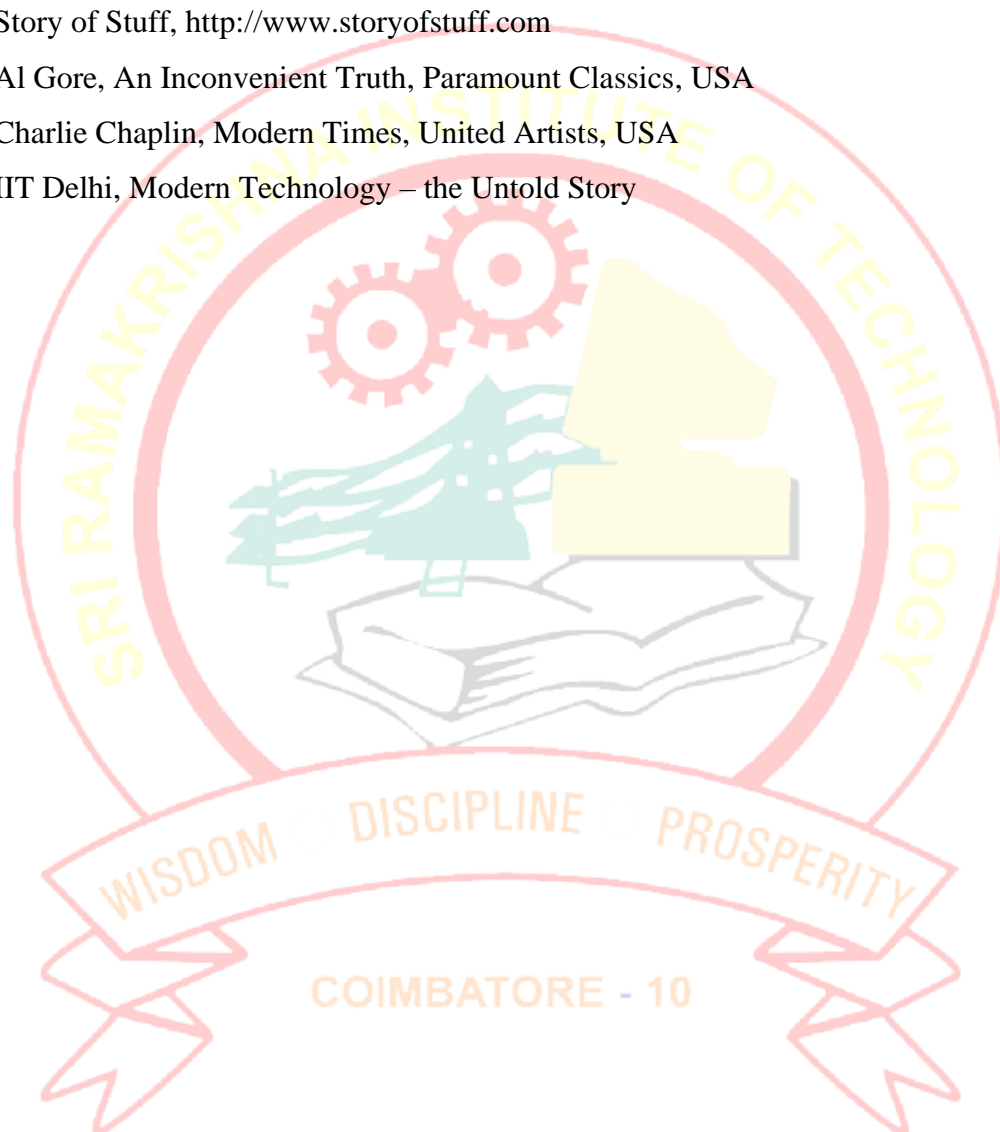
1. R R Gaur, R Asthana A Foundation Course in Human Values and Professional Ethics, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

### REFERENCES:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

### **RELEVANT CDS, MOVIES, DOCUMENTARIES & OTHER LITERATURE:**

1. Value Education website, <http://www.uptu.ac.in>
2. Story of Stuff, <http://www.storyofstuff.com>
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology – the Untold Story



20MHG02	<b>DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **COURSE OBJECTIVE:**

This course provides knowledge on various concepts of differential equations, vector calculus, complex differentiation, complex integration, Laplace transforms and apply them in various engineering problems.

### **COURSE CONTENT:**

#### **Second and Higher Order Linear Differential Equations 9 + 3**

Linear equations of second and higher order with constant coefficients – Homogenous equations of Euler's and Legendre's type – Method of variation of parameters – First order Simultaneous linear equations with constant coefficients – Simple Applications.

#### **Vector Calculus 9 + 3**

Gradient and directional derivative – Divergence and curl - Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's theorem, Gauss divergence theorem and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

#### **Analytic Function 9 + 3**

Analytic functions – Necessary and sufficient conditions for analyticity– Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions  $w = c + z$ ,  $az$ ,  $\frac{1}{z}$ ,  $z^2$  – Bilinear transformation – Temperatures in a Quarter-plane metallic sheet.

#### **Complex Integration 9 + 3**

Line integral – Cauchy's Integral theorem– Cauchy's Integral formula – Taylor's and Laurent's series – Singularities – Residues – Cauchy Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour with no pole on real axis.

## Laplace Transform

9 + 3

Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions – Derivatives and integrals of transforms – Transforms of unit step function and impulse function – Transform of periodic functions. Inverse Laplace transform – Convolution theorem – Initial and final value theorems – Application to solution of linear ordinary differential equations with constant coefficients.

### COURSE OUTCOMES:

**CO1:** Ability to apply higher order linear differential equations in real life applications.

**CO2:** Ability to solve problems in the domain of fluid dynamics using vector calculus

**CO3:** Ability to construct analytic functions and use their conformal mapping property in application problems..

**CO4:** Ability to apply the Cauchy's integral formula and residue theorem to evaluate real and complex integrals.

**CO5:** Ability to apply Laplace transforms techniques to solve ordinary differential equations.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-

### Program Articulation matrix

20MHG02	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-

### TEXT BOOK:

Erwin Kreyszig, “Advanced Engineering Mathematics”, 10<sup>th</sup> Edition, Wiley India, 2016.

### REFERENCES:

1. Grewal. B.S, “Higher Engineering Mathematics”, 43<sup>rd</sup> Edition, Khanna Publications, Delhi, 2016.
2. Ravish R Singh and Mukul Bhatt, “Engineering Mathematics”, 1<sup>st</sup> Edition, Tata McGraw Hill Education, New Delhi, 2016.
3. Srimanta Paul and Subodh C. Bhunia, “Engineering Mathematics”, Oxford University Press, 1<sup>st</sup> Edition, 2015.
4. Peter V.O’Neil, “Advanced Engineering Mathematics”, Cengage Learning India Pvt., Ltd, 7<sup>th</sup> Edition, New Delhi, 2012.

COIMBATORE - 10

20PHG01	ENGINEERING PHYSICS	L	T	P	C
		3	1	0	4

### COURSE OBJECTIVE:

This course imparts knowledge in basic concepts and advances in Acoustics, Mechanics, Optics and Electromagnetic waves and develops an intuitive understanding of Physics by emphasizing Quantum computing for engineering applications.

### COURSE CONTENT:

#### Acoustics, Ultrasonics and Thermal Insulation

9+3

Classification of Sound - decibel - Weber - Fechner law - Sabine's formula - derivation using growth and decay method - Absorption Co efficient and its determination - factors affecting acoustics of buildings and their remedies - Production of ultrasonic- Piezoelectric generator - Detection of ultrasonic waves - Applications - NDT - pulse echo system through transmission and reflection mode - thermal insulation of buildings.

#### Introduction to Mechanics and applications

9+3

Moment of inertia (M.I) - Radius of gyration - M.I of circular disc, solid cylinder, diatomic molecule - K.E of a rotating body — centre of mass - conservation of linear momentum - Relation between Torque and angular momentum - Torsional pendulum - The concept of gravity - Law of universal gravitation - weigh and weightlessness - Projectile motion - range - height - time.

#### Quantum Mechanics

9+3

Photons and light waves - Electrons and matter waves - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - particle in an infinite potential well - Introduction to quantum computing - History of quantum computation and quantum information - Quantum bits - Quantum Physics and Computation Global perspectives - Future directions.

#### Oscillations, Optics and Lasers

9+3



Simple harmonic motion - resonance - waves on a string - standing waves - traveling waves - Energy transfer of a wave - sound waves - Doppler effect - reflection and refraction of light waves - total internal reflection - interference – Michelson interferometer - air wedge experiment. Laser - characteristics - Spontaneous and stimulated emission - population inversion - CO<sub>2</sub> laser, semiconductor laser - applications - holography.

### **Electromagnetic Waves**

**9+3**

Gauss's law – Faraday's law - Ampere's law - The Maxwell's equations (qualitative only) - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves.

### **COURSE OUTCOMES:**

**CO1:** Ability to understand the concepts of acoustic and thermal insulation to solve engineering problems.

**CO2:** Ability to understand the importance of mechanics and gravitation force for engineering applications.

**CO3:** Ability to use the basics of quantum physics and computations in engineering field.

**CO4:** Ability to understand the concepts of wave optics and laser for engineering application.

**CO5:** Ability to apply the concepts of propagation of electromagnetic waves to solving engineering problems.



### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO2	-	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO3	-	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO4	-	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-

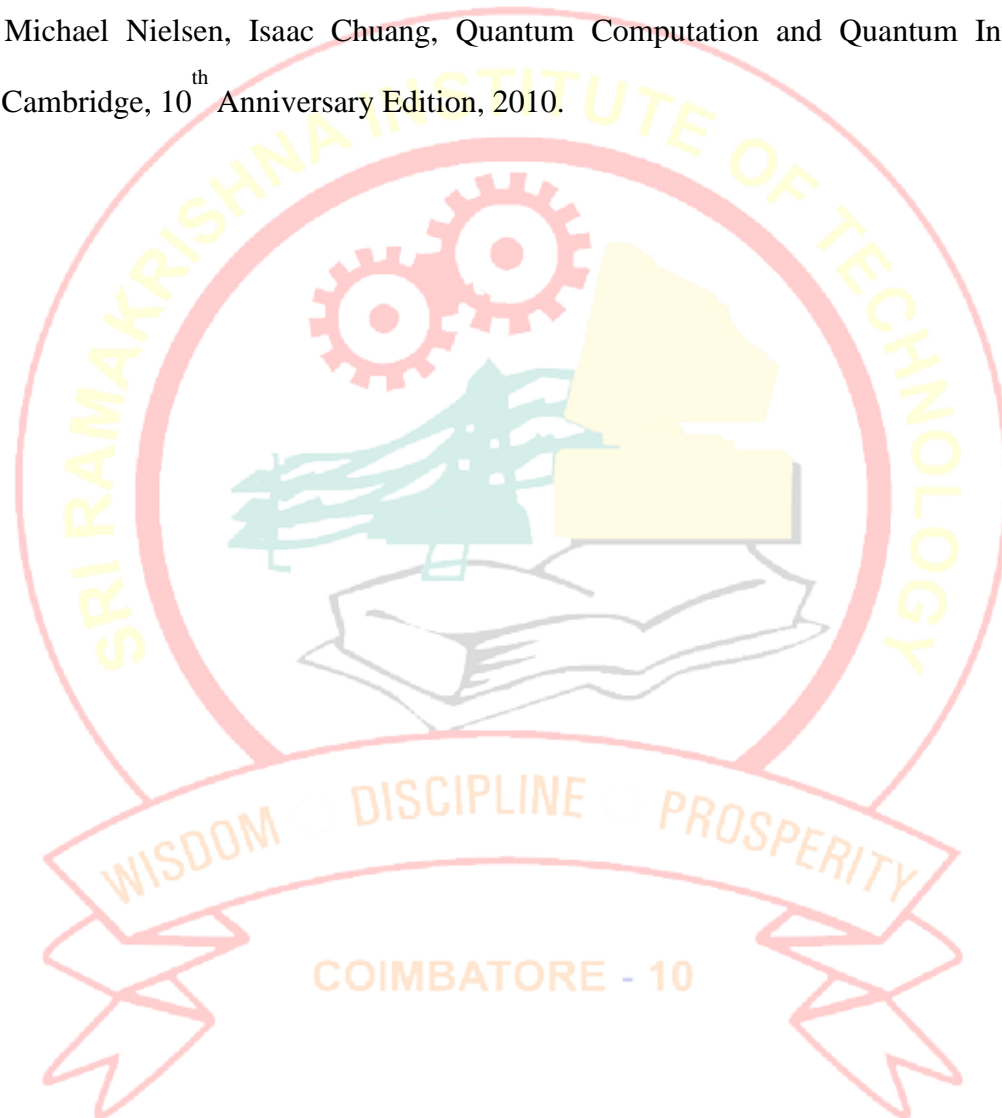
### Program Articulation matrix

20PHG01	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-

### REFERENCES:

1. D. Halliday, R. Resnick and J. Walker. Principles of Physics. John Wiley & Sons 10<sup>th</sup> Edition, 2015.
2. D. Kleppner, R. J. Kolenkow, An Introduction to Mechanics, Tata Mc Graw Hill, 10<sup>th</sup> Edition, 2005.
3. D. J. Griffiths. Introduction to Electrodynamics. Pearson Education, 3<sup>rd</sup> Edition 2015.
4. Mani Naidu S, Engineering Physics, Pearson Publications, 2014.
5. Marikani A, Engineering Physics, PHI Publications, 2<sup>nd</sup> Edition, 2014.
6. Larry .D Kirkpatrick, Gregory E. Francis, Physics: A Conceptual World View, 7<sup>th</sup> Edition, Cengage Learning, 2010.
7. Paul G. Hewitt, John Suchocki, Leslie A. Hewitt, Conceptual Physical Science Pearson, 6<sup>th</sup> Edition, 2017.

8. Michael Nielsen, Isaac Chuang, Quantum Computation and Quantum Information, Cambridge, 10<sup>th</sup> Anniversary Edition, 2010.
6. Paul G. Hewitt, John Suchocki, Leslie A. Hewitt, Conceptual Physical Science Pearson, 6<sup>th</sup> Edition, 2017.
7. Michael Nielsen, Isaac Chuang, Quantum Computation and Quantum Information, Cambridge, 10<sup>th</sup> Anniversary Edition, 2010.



20CSG01	OBJECT ORIENTED PROGRAMMING USING C++	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

This course provides an insight on the basic principles of Object-Oriented Programming using C++ and its applications in real world scenarios.

### COURSE CONTENT:

#### Fundamentals of OOP and C++ 9

Structural versus object-oriented Programming - Elements of object oriented programming- benefits of OOP – Structure of C++ program - Variables - Tokens - Keywords – Identifiers -Type modifiers - Type casting - Input and Output - Data Types and Expressions - Operators - Flow of control - Arrays, Strings and Pointers.

#### Classes and Objects 9

Classes and Objects - Class specification: Class Members, Access Specifier, Scope resolution operator- Class Instantiation - Accessing class members- Passing and returning objects - Array of objects – Constructors: Parameterized constructors - Default arguments – Copy Constructor - Constructor overloading, Destructors - new, delete operators - “this” pointer - Friend classes and friend functions.

#### Overloading and Inheritance 9

Function overloading - Operator overloading: Overloadable operators - Unary operator overloading - Binary operator overloading, Overloading the Operator Using Friend Function - Inheritance: Base class and derived class relationship - Derived class declaration - Types of inheritance - Member accessibility - Constructors in derived class.

#### Virtual functions and Generic Programming 9

Virtual Functions: Need for virtual function - Pointer to derived class objects - Pure virtual functions - Abstract classes – Virtual Destructors, Generic programming with templates: Function templates - class templates

Streams: Formatted and unformatted data – Manipulators - Files: Opening and Closing a file - File modes - File pointers and their manipulation, Sequential access to a file - Random access to a file - Reading and Writing files, Exception handling: Exception handling constructs - Handling exceptions.

### COURSE OUTCOMES:

**CO1:** Ability to understand the concepts of Object-Oriented Programming

**CO2:** Ability to choose appropriate Object-Oriented features for solving various problems

**CO3:** Ability to develop C++ application for real world scenarios

**CO4:** Ability to apply the concepts of Exception handling, generic programming and file handling in programmes using C++

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	2	2	2	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	2	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	-	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	2	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### Program Articulation matrix

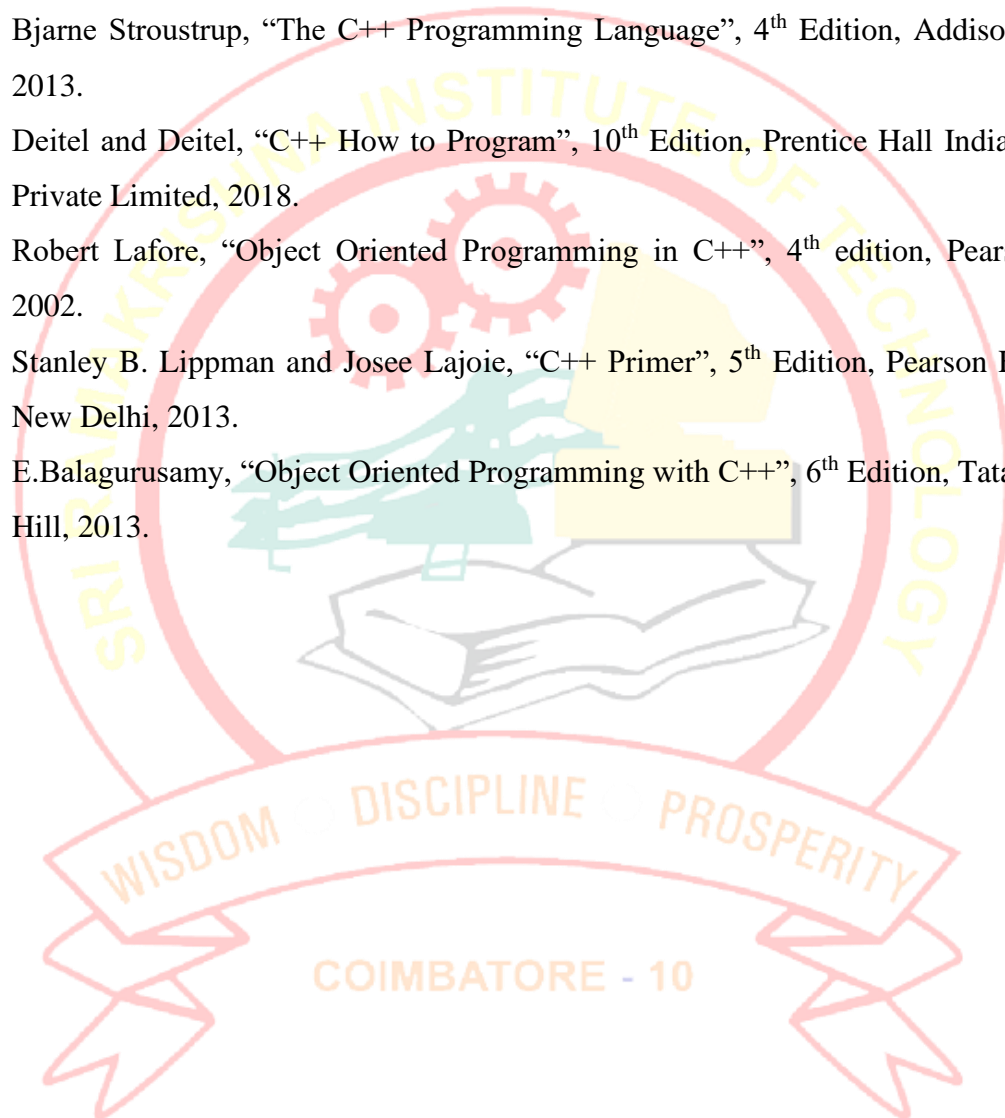
20CSG01	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	2	3	3	3	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

**TEXT BOOK:**

1. Herbert Schildt, “C++ The Complete Reference”, 5<sup>th</sup> Edition, Tata McGraw Hill, New Delhi, 2012

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1. Bjarne Stroustrup, “The C++ Programming Language”, 4<sup>th</sup> Edition, Addison-Wesley, 2013.
2. Deitel and Deitel, “C++ How to Program”, 10<sup>th</sup> Edition, Prentice Hall India Learning Private Limited, 2018.
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4. Stanley B. Lippman and Josee Lajoie, “C++ Primer”, 5<sup>th</sup> Edition, Pearson Education, New Delhi, 2013.
5. E.Balagurusamy, “Object Oriented Programming with C++”, 6<sup>th</sup> Edition, Tata McGraw Hill, 2013.



<b>20HMG01</b>	<b>INFORMATION TECHNOLOGY ESSENTIALS AND ETHICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

This course provides a basic understanding of essentials concepts, terminologies, recent trends, roles, issues and ethical practices for Information Technology professionals.

### **COURSE CONTENT:**

#### **Introduction 9**

Definition of Information Technology –Role of IT Professional in society – Driving forces through IT Innovations –IT graduate profile and professional readiness – Competencies– Industry perspectives on Information technology – Current trends and IT terminologies.

#### **Ethics in Information Technology 9**

Overview of Ethics – Ethics for IT workers and IT users – Computer and Internet crime – Privacy.

#### **Ethical Key Issues in Information Technology 9**

Freedom of Expression – Intellectual property: Copyrights – Patents –Key Intellectual property Issues – Software development: Strategies for Engineering Quality Software – Key Issues in Software development.

#### **Ethical and legal Implication 9**

The impact of Information Technology on productivity and quality of life – Social Networking - Ethics of IT organizations.

#### **Code of Ethics and other Case Studies 9**

ACM code of ethics and professional conduct – Association of Information Technology Professionals (AITP) code of ethics and standard of conduct – Institute of Electrical and Electronics Engineers Computer Society Code – Project Management Institute code of

ethics and professional conduct, SysAdm, Audit, Network, Security (SANS) IT code of ethics – Case Study: Bank fraud detection – Wells Fargo case – John Deere case.

### COURSE OUTCOMES:

**CO1:** Ability to understand the roles and responsibilities of Information Technology professional in the society

**CO2:** Ability to understand the impact of Information Technology on society and ethics

**CO3:** Ability to interpret ethical issues under various ethical codes and standards

**CO4:** Ability to analyses the ethical issues in Information Technology domain

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-

### Program Articulation matrix

20HMG01	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-

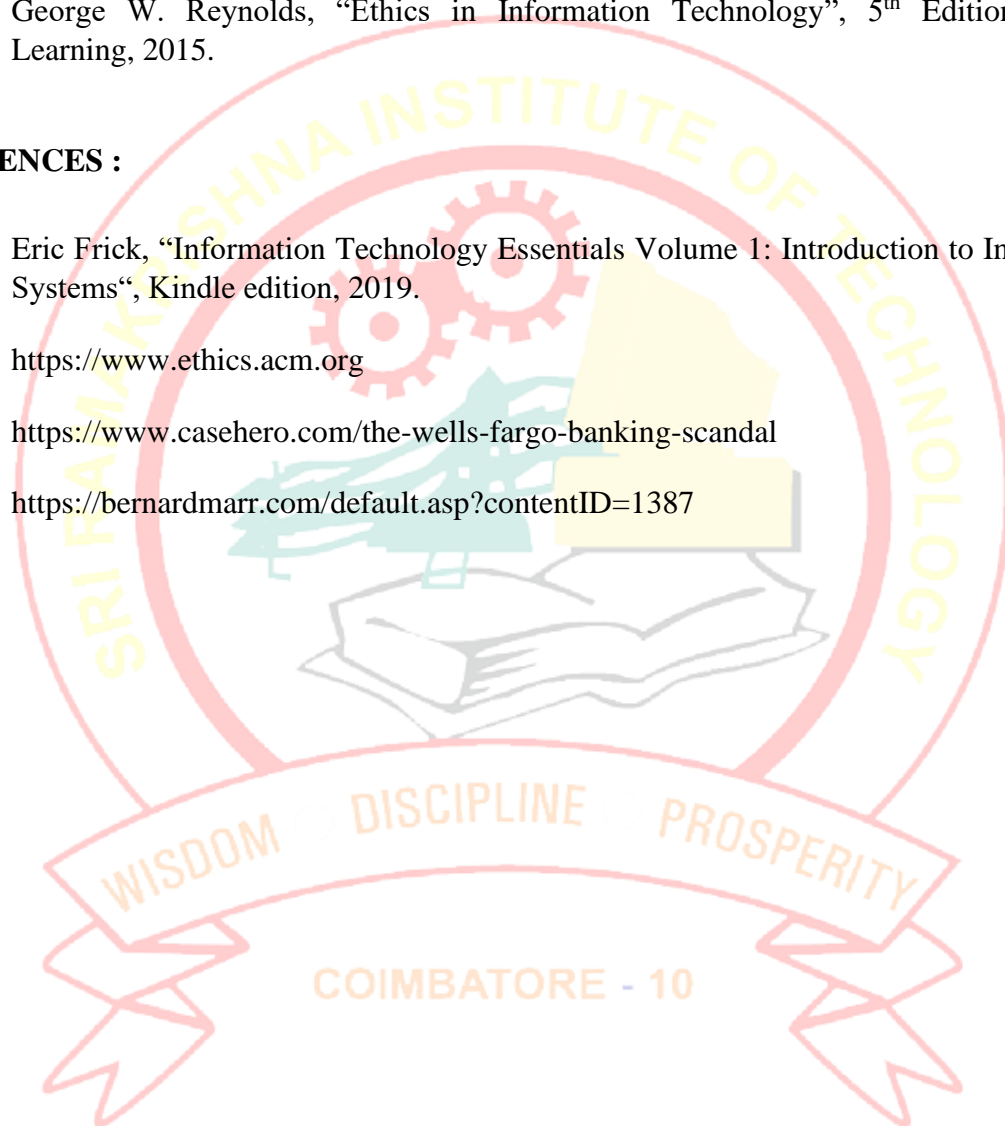


**TEXT BOOK:**

1. “Information Technology Curricula 2017”, Association for Computing Machinery, 2017.
2. George W. Reynolds, “Ethics in Information Technology”, 5<sup>th</sup> Edition, Cengage Learning, 2015.

**REFERENCES :**

1. Eric Frick, “Information Technology Essentials Volume 1: Introduction to Information Systems“, Kindle edition, 2019.
2. <https://www.ethics.acm.org>
3. <https://www.casehero.com/the-wells-fargo-banking-scandal>
4. <https://bernardmarr.com/default.asp?contentID=1387>



<b>20AC001</b>	<b>ENVIRONMENTAL SCIENCE AND ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>

### **COURSE OBJECTIVE:**

To understand the basic knowledge about environment and their chemistry, to apply the knowledge in environmental pollution control and management, to create awareness about various technologies to control/ reduce all environmental related problems.

### **COURSE CONTENT:**

#### **Fundamentals of Environmental Science**

**9**

Introduction- Definition-environment, Environmental science, Environmental engineering- Components of environment - Atmosphere, lithosphere, hydrosphere and biosphere - types of environment – Natural – man – made - Environmental education- objectives, importance and scope - Need for public awareness.

#### **Chemistry of the Environment**

**9**

Hydrological cycle- concept of DO, BOD and COD - chemical and photochemical reactions in the atmosphere - ozone chemistry - formation and depletion of ozone layer - acid rain mechanism of formation and effects - Photochemical smog and sulfurous smog. Greenhouse effect, global warming- causes, effects and control measures.

#### **Renewable energy and environment**

**9**

Introduction - Renewable and non - renewable energy sources - Principles of generation of hydro - power, tidal energy, ocean thermal energy conversion, wind power - wind mill - wind farm geothermal energy and solar energy (solar collectors, photovoltaic modules, solar ponds) - Bioenergy: methods to produce energy from biomass - impact of renewable and non - renewable energy sources on the environment.

## Environmental Pollution and control

9

Introduction - Air pollution – sources - major air pollutants – effects and control - Air Pollution control technologies - cyclone separator and electrostatic precipitator –water pollution – sources - major water pollutants - effects and control of water pollution -waste water treatment - Noise pollution –sources- effects and control- Solid waste management – sources, classification, causes and effects -management and control measures of solid wastes - Hazardous waste management - role of an individual in prevention of pollution.

## Human population and the Environment

9

Population growth - variation among nations - Population explosion – Family Welfare Programme -Environment and human health - Human Rights - Value Education - HIV/AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health.

### COURSE OUTCOMES:

**CO1:** Ability to understand the basics of environment and need for environmental education.

**CO2:** Ability to understand various chemical and photochemical reactions in the environment.

**CO3:** Ability to select suitable renewable resources for domestic and industrial applications to meet the growing energy demand.

**CO4:** Ability to understand the role of an individual in environmental pollution control and management.

**CO5:** understand about population explosion and its impact on environment.

### COs, POs, and PSOs - Articulation matrix

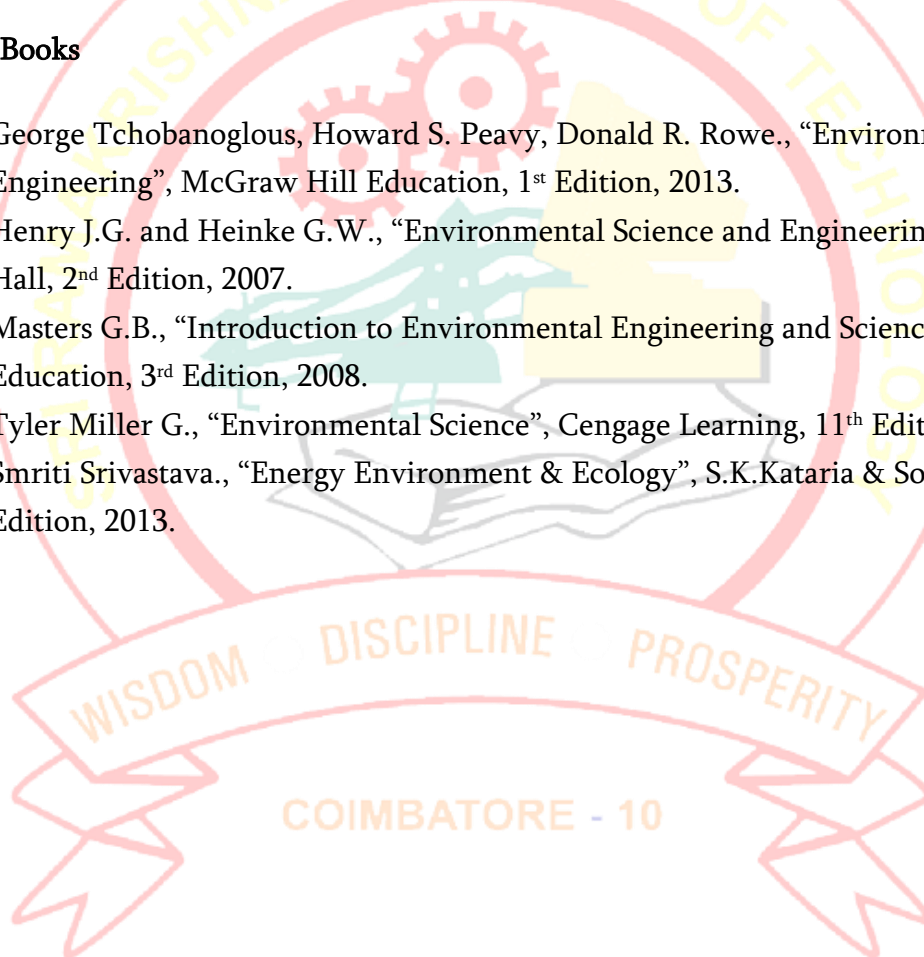
Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	1	-	-	-
CO5	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	1	-	-	-

### Program Articulation matrix

20AC001	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2	
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1			PC2
CO	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	1	-	-	-

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1. George Tchobanoglous, Howard S. Peavy, Donald R. Rowe., "Environmental Engineering", McGraw Hill Education, 1<sup>st</sup> Edition, 2013.
2. Henry J.G. and Heinke G.W., "Environmental Science and Engineering", Prentice Hall, 2<sup>nd</sup> Edition, 2007.
3. Masters G.B., "Introduction to Environmental Engineering and Science", Pearson Education, 3<sup>rd</sup> Edition, 2008.
4. Tyler Miller G., "Environmental Science", Cengage Learning, 11<sup>th</sup> Edition, 2015
5. Smriti Srivastava., "Energy Environment & Ecology", S.K.Kataria & Sons, 2<sup>nd</sup> Edition, 2013.



20MEG02	ENGINEERING WORKSHOP	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

### COURSE OBJECTIVE:

This course aims to make the students understand about various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering by providing practical experience

### COURSE CONTENT:

#### I. Civil Engineering Practice Lab

**Buildings:** Study of plumbing and carpentry components of residential and industrial buildings.

#### PLUMBING WORKS

- Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, and elbows in household fittings.
- Study of pipe connections requirements for pumps and turbines.
- Preparation of plumbing line sketches for water supply and sewage works.

#### Hands-on-exercise:

- Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- Demonstration of plumbing requirements of high-rise buildings.

#### WOOD WORK

Study of the joints in roofs, doors, windows and furniture.

Studying common industrial trusses using models.

#### Hands-on-exercise:

Wood work, joints by sawing, planning and cutting.

## **II. Mechanical Engineering Practice Lab**

### **Welding & Sheet metal**

1. Preparation of arc welding of butt joints, lap joints, tee joints and corner joints.
2. Sign board fabrication by the application of knowledge gained through welding process
3. Forming of simple objects using sheet metal – Trays.

### **Machining practices**

Metal Hammer fabrication using Simple turning, taper turning, drilling tapping practice.

### **Study**

Assembling a centrifugal pump

Assembling a blower

Assembling an air conditioner

### **Demonstration**

1. Demonstration on foundry operations.

## **III. Electrical Engineering Practice Lab**

1. Familiarization of wiring tools, lighting accessories of CFL and incandescent lamps, types and selection of Fuse and MCB.
1. Study of various types of wiring systems
  - a. Wiring of one lamp controlled by one switch.
  - b. Wiring of one lamp controlled by two SPDT Switch and one 3 pin plug socket independently.
  - c. Wiring of fluorescent lamp controlled by one switch from panel with MCB.
2. Study of wiring of different household appliances
  - a. Iron-Box wiring.
  - b. Fan Regulator wiring.
  - c. Emergency Lamp wiring.
3. Familiarization with measuring instruments to measure current, voltage and power in AC/DC circuits.



#### IV. Electronics Engineering Practice Lab

1. Study of Electronic Components and instruments– Resistors, Capacitors, Inductors, Diodes and multimeter.
2. Measurement of AC signal parameters (voltage, period, frequency) using CRO.
3. Measurement of ripple factor of half wave rectifier and full wave rectifier.
4. Study of logic gates –AND, OR, XOR and NOT.
5. Soldering practice using general purpose PCB – Components, Devices and Circuits.

#### COURSE OUTCOMES:

- CO1:** Ability to make various joints in carpentry and select suitable tools for plumbing
- CO2:** Ability to fabricate products by selecting suitable tools for machining, metal joining and sheet metal processes
- CO3:** Ability to understand the fundamental electrical parameters, protective devices, domestic wiring and accessories
- CO4:** Ability to understand the basic principles of electronic components and to apply them in the design of simple electronic circuits on PCB

**TOTAL PERIODS: 60**

#### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

### Program Articulation matrix

20MEG02	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

### REFERENCES:

1. Bawa H.S., “Workshop Practice”, Tata McGraw – Hill Publishing Company Limited, New Delhi, 2009.
2. Chapman, William. Workshop Technology Part 1, Part 2. Routledge, 2019.
3. Uppal S. L., Electrical Wiring & Estimating, Khanna Publishers 5<sup>th</sup> edition, 2003.
4. John H. Watt, Terrell Croft: American Electricians' Handbook: A Reference Book for the Practical Electrical Man - McGraw-Hill, 2002.
5. Thomas L. Floyd and Steve Wetterling, “Laboratory Exercises for Electronic Devices”, Pearson Education Limited, 10<sup>th</sup> Edition, 2017.

COIMBATORE - 10

20PHG02	ENGINEERING PHYSICS LABORATORY	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVE:

The students will be provided with an insight to handle optical instruments like microscope, spectrometer, laser and fibre optic kit. The course also provides an outline of modern instruments such as Ultrasonic interferometer, band gap instruments and CRO.

### COURSE CONTENT:

#### List of Experiments

1. Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
2. Determination of thermal conductivity of a bad conductor using Lee's Disc method.
3. Determination of Young's modulus by non - uniform bending method.
4. Determination of Young's modulus by uniform bending method.
5. Determination of rigidity modulus of a wire and moment inertia of a disc – Torsional pendulum.
6. Determination of dispersive power of prism using spectrometer.
7. Determination of wavelength of a spectral lines using spectrometer grating.
8. Determination of thickness of thin sheet / wire – Air wedge.
9. Determination angle of divergence and wavelength using laser.
10. Determination of Particle size using laser.
11. Determination of acceptance angle and numerical aperture of an optical fiber.
12. Determination of energy band gap of a semiconductor by using p-n junction diode.

**TOTAL PERIODS: 45**

## COURSE OUTCOMES:

**CO1:** Ability to determine the modulus of given material, acceptance angle in optical fiber and velocity of sound.

**CO2:** Ability to determine the thermal conductivity of bad conductors and band gap of a semiconductor.

**CO3:** Ability to determine the angle of divergence, wavelength of laser and spectral lines.

**CO4:** Ability to determine the particle size using laser, dispersive power of material and thickness of thin wire.

## COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	
CO2	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	
CO3	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	
CO4	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	

## Program Articulation matrix

20PHG02	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2				
CO	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	

## REFERENCES

1. Dr. S. Vijayakumar, Engineering Physics I, John Wiley Publications, 2014.
2. Dr. S. Vijayakumar, Engineering Physics II, John Wiley Publications, 2015.

20CSG02	PROGRAMMING IN C++ LABORATORY	L	T	P	C
		0	0	4	2

### COURSE OBJECTIVE:

This course provides a practical experience on the concepts of Object Oriented Programming using C++ programming language.

### COURSE CONTENT:

#### LIST OF EXPERIMENTS

1. Programs using Objects and Classes
2. Programs using Constructors and Destructors
3. Programs using friend function & friend class
4. Programs using Function Overloading
5. Programs to overload unary & binary operators as member function & non-member function
6. Programs using types of inheritance
7. Programs using virtual functions
8. Programs using Function and class templates
9. Programs using Files and Streams
10. Programs using Exception handling

### COURSE OUTCOMES:

- CO1:** Ability to apply the concept related to Classes and Objects in simple programs
- CO2:** Ability to apply the concepts of polymorphism to achieve enhanced functionalities of functions and operator.
- CO3:** Ability to deploy inheritance in simple C++ programs
- CO4:** Ability to design simple applications that support File Processing
- CO5:** Ability to develop programs that are capable of handling Exceptions

**TOTAL PERIODS: 60**

## COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	3	-	2	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	3	-	2	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

## Program Articulation matrix

20CSG01	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

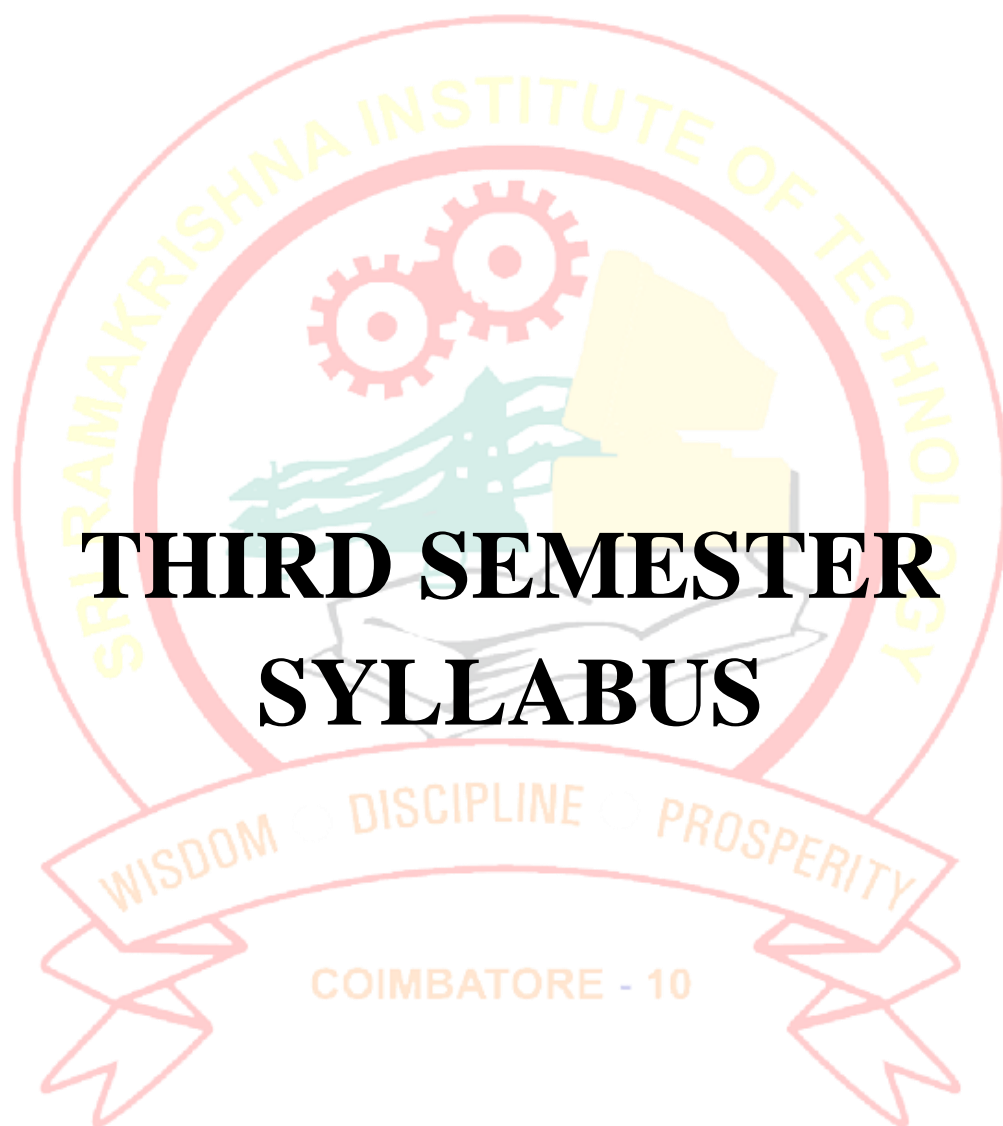
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- Herbert Schildt, "C++ The Complete Reference", 5<sup>th</sup> Edition, Tata McGraw Hill, New Delhi, 2012

### REFERENCES:

- Bjarne Stroustrup, "The C++ Programming Language", 4<sup>th</sup> Edition, Addison-Wesley, 2013.
- Deitel and Deitel, "C++ How to Program", 10<sup>th</sup> Edition, Prentice Hall India Learning Private Limited, 2018.
- Robert Lafore, "Object Oriented Programming in C++", 4<sup>th</sup> edition, Pearson India, 2002.
- Stanley B. Lippman and Josee Lajoie, "C++ Primer", 5<sup>th</sup> Edition, Pearson Education, New Delhi, 2013.
- E.Balagurusamy, "Object Oriented Programming with C++", 6<sup>th</sup> Edition, Tata McGraw Hill, 2013.





# **THIRD SEMESTER SYLLABUS**

20MHG06	PROBABILITY AND STATISTICS	L	T	P	C
		3	1	0	4

### COURSE OBJECTIVES:

- To understand the basics of random variables with emphasis on the standard discrete and continuous distributions.
- To understand the basic probability concepts with respect to two dimensional random variables.
- To know how to apply sampling in small and large samples.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To understand the need of quality control and apply them in engineering fields.

### COURSE CONTENT:

#### Probability and Statistical Distributions

9

Probability – The axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

#### Two Dimensional Random Variables

9

Joint probability distribution – Marginal probability distribution – Conditional probability distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

#### Sampling Theory

9

Sampling distributions – Estimation of parameters – Statistical hypothesis – Large sample tests based on normal distribution for single mean and difference of means – Tests based on t, Chi-square and F distributions for mean, variance and proportion – Contingency table (test for independent) – Goodness of fit.

## Design of Experiments

9

Analysis of Variance – One way classification – Two way classifications – Completely randomized design – Randomized block design – Latin square design –  $2^2$  factorial designs.

## Statistical Quality Control

9

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits – Acceptance sampling.

### COURSE OUTCOMES:

- CO1:** Ability to understand the basic concepts of probability, one- and two-dimensional random variables.
- CO2:** Ability to apply the concepts of probability distributions to solve problems in engineering field.
- CO3:** Ability to apply the concept of testing of hypothesis for small and large samples in real life problems.
- CO4:** Ability to determine the concepts of designing and testing the experiments using ANOVA.
- CO5:** Ability to construct and interpret the control charts for variables and attributes.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-

## Program Articulation matrix

20MHG06	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-

### TEXT BOOKS:

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

### REFERENCES:

1. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
2. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.
3. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.

20IT001	DATA STRUCTURES	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

The course will enable the student to learn basic and advanced concepts related to linear data structures such as lists, stack, queue and non-linear data structures like trees and graphs. It also provides an outline of various sorting, searching and storage techniques.

### COURSE CONTENT:

#### Introduction and Preliminaries of Data Structures

9

Basic Terminology- Elementary Data Organization-Data Structures- Data Structure Operations -Algorithms: Complexity, Time-Space tradeoff – Mathematical Notation and Functions – Algorithmic Notations – Complexity of Algorithms – Asymptotic Notations- String Operations – Word Processing – Pattern Matching Algorithms – Master Theorem.

#### Arrays and Linked Lists

9

Linear Arrays – Traversing Linear Arrays – Inserting and Deleting – Multidimensional Arrays – Pointers – Records, Representation – Matrices – Sparse Matrices – Linked Lists, Memory Representation- Traversal-Search-Memory Allocation, Garbage Collection – Insertion, Deletion – Header Linked List – Two-way Lists.

#### Stacks, Queues and Recursion

9

Stacks: Array Representation, Linked Representation – Arithmetic Expressions – Polish Notation – Applications: Quicksort, Recursion, Tower of Hanoi – Implementation of Recursive procedures by stacks – Queues – Linked Representation of Queues – Dequeues – Priority Queues.

## Trees and Graphs

10

Tree Terminology - Binary Trees: Representation, Traversal – Traversal algorithms using stacks – Header Nodes; Threads – Binary Search Trees: Search, Insertion, Deletion – AVL Search Trees: Insertion, Deletion – *m*-way Search Trees: Search, Insertion, Deletion – B-Trees: Search, Insertion, Deletion – Heap – Heapsort – Path Lengths – Huffman's Algorithm – Graph Terminology – Graph Representations : Adjacency Matrix, Path Matrix – Warshall's Algorithm – Shortest Paths (Dijkstra's Algorithm)- Linked Representation – Operations – Traversal – Posets – Topological Sort – Minimum Spanning Trees (Prim's Algorithm and Kruskal's Algorithm).

## Sorting and Searching

8

Sorting – Insertion Sort – Selection Sort – Merging – Merge Sort – Radix Sort – Searching and Data Modification – Hashing.

## COURSE OUTCOMES:

**CO1:** Ability to describe a simple hash function.

**CO2:** Ability to determine appropriate ADTs and data structures for various sorting and searching algorithms.

**CO3:** Ability to determine time and space requirements of common sorting and searching algorithms.

**CO4:** Ability to apply appropriate data structures and abstract data types (ADT) such as lists, stacks, queues, trees and graphs in problem solving.

**CO5:** Ability to analyze the performance of different implementations of data structures.

## COs, POs, and PSOs - Articulation matrix



Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	2	2	2	-	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	3	-	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	2	3	3	3	-	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	-	3	-	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	2	3	3	3	-	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### Program Articulation matrix

201T001	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	2	3	3	3	-	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### TEXT BOOK:

1. Seymour Lipschutz, "Data Structures with C", McGraw Hill, 1<sup>st</sup> Edition, 2017.
2. John Hubbard, "Data Structures with C++", McGraw Hill, 1<sup>st</sup> Edition, 2017.

### REFERENCES:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education, 2<sup>nd</sup> Edition, 2014.
2. Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum, "Data Structures using C and C++", Pearson, 2<sup>nd</sup> Edition, 2015.
3. Venkatesan R and Lovelyn Rose S, "Data Structures", Wiley, 2<sup>nd</sup> Edition, 2019.

20IT002	JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVE:

The course will enable the students to learn about the syntax and semantics of Java programming language to write programs using concepts such as variables, conditional and iterative execution methods, Java standard API library, Applets, Event Handling, AWT and helps to understand the underlying principles of inheritance, packages and interfaces.

## COURSE CONTENT:

### Introduction to Java, Classes and Objects

9

History and Evolution of Java – Overview – Data Types - Variables - Arrays – Operators - Control Statements – Classes – Fundamentals – Declaring Objects - Assigning Object Reference Variables - Methods – Constructors - this keyword - Garbage collection - finalize method - Stack Class.

### Reusability, Packages, Interfaces and Exception Handling

9

Overloading Methods - Objects as Parameters - Argument Passing - Returning Objects – Recursion -Access Control – Static – Nested and Inner Classes - Command-Line Arguments – Variable Length Arguments. Inheritance – Basics – Super keyword - Multilevel Hierarchy - Method Overriding - Dynamic Method Dispatch - Abstract Classes - final with Inheritance. Packages - Access Protection - Importing Packages – Interfaces. Exception Handling – Multiple catch Clauses- Nested try Statements - Java's Built-in Exceptions –User defined Exception – Chained exceptions.

### Multithreading, I/O, Applet and String Handling

9

Java Thread Model - Creating a Thread - Priorities – Synchronization – Inter thread Communication – Suspending - Resuming, and Stopping Threads – Multithreading - Deadlocks. Enumerations - Wrappers – Auto boxing – Annotations. I/O Basics - Reading

and Writing Console I/O - PrintWriter Class - Reading and Writing Files - Applet – Architecture – Skeleton – Display methods - Repainting – Applet tag – Passing parameters - transient and volatile modifiers. String Handling – String Class – methods – String Buffer Class – Methods – String Builder.

## **Generics, Collections and Event Handling**

**9**

Generics – Example – Parameters - General Form- Bounded Types - Wildcard Arguments - Generic Method and Interfaces – Raw Types and Legacy Code - Generic Class Hierarchies. Collection Classes – Array List – Linked List – Hash Set and Maps. Event Handling – Mechanisms -Delegation Event Model - Event Classes - Sources of Events - Event Listener Interfaces – Mouse and Keyboard events - Adapter Classes - Inner Classes.

## **AWT**

**9**

AWT Classes - Window Fundamentals - Frame Windows - Frame Window in an Applet – Graphics – Color – Fonts - FontMetrics. AWT Controls - Layout Managers - Menu Bars and Menus -Dialog Boxes - FileDialog - Handling Events by Extending AWT Components.

## **COURSE OUTCOMES:**

**CO1:** Ability to apply the concepts of classes and objects to solve specific problems.

**CO2:** Ability to write programs using thread, packages and exception handling.

**CO3:** Ability to write web-based programs using applets.

**CO4:** Ability to construct the GUI based applications with AWT controls.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	-	3	-	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	-	3	-	3	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	-	3	-	3	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	-	3	-	3	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### Program Articulation matrix

20IT002	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	-	3	-	3	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### TEXT BOOK:

- Herbert Schildt, "Java: The Complete Reference", McGraw Hill Professional, 11<sup>th</sup> Edition, 2018.

### REFERENCES:

- Cay S. Horstmann, "Core Java Volume – I Fundamentals", Pearson Education, 11<sup>th</sup> Edition, 2018.
- Deitel and Deitel, "Java How to Program", Pearson Education India, 10<sup>th</sup> Edition 2016.
- Joshua Bloch, "Effective Java", Pearson Education India, 3<sup>rd</sup> Edition, 2018.
- Ken Arnold, David Holmes, James Gosling and Prakash Goteti, "The Java Programming Language", Pearson Education India, 2<sup>nd</sup> Edition, 2009.

20CS001	COMPUTER ORGANIZATION AND ARCHITECTURE	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

The course will enable the student to learn the basic structure, operations, addressing modes of the digital computer. It also gives an insight of the concepts like pipelining, memory organization and parallel processing in a digital computer.

### COURSE CONTENT:

#### Architecture: An Overview

9

Functional units of a Digital Computer – Translation from a High level language to Hardware Language – Technology – Performance – Power wall – Uniprocessor to multiprocessor – Instructions: Operations and Operands – Instruction Set: RISC and CISC - Representing Instructions – Logical Operations – ARM Addressing for 32-bit Immediate and more complex addressing modes.

#### Computer Arithmetic

9

Addition and Subtraction – Arithmetic for Multimedia - Multiplication – Multiplication Algorithm and Hardware – Signed Multiplication - Faster Multiplication in ARM - Division – Division Algorithm and Hardware - Signed Division – Faster Division in ARM - Floating Point Representation – Floating Point Operations: Addition - Multiplication – Floating point instructions in ARM.

#### Processor Design

9

An abstract view of implementation - Logic design Conventions - Building a datapath – Simple implementation scheme – Pipelining – Pipelined Datapath and Control - Hazards – Data Hazards – Control Hazards – Exceptions.

## Memory and I/O Interfacing

9

Memory Technologies – Basics of Caches – Measuring and Improving Cache Performance – Virtual Memory – Transaction- Look aside Buffer (TLB) - Memory Hierarchy - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

## Parallel Processing

9

Parallelism - Instruction-level-parallelism – Parallel processing challenges - Hardware multithreading – SISD, MIMD, SIMD, SPMD and Vector - Multicore processors – Shared memory Multiprocessors – Graphical Processing Units – Multiprocessor Network Topologies.

## COURSE OUTCOMES:

**CO1:** Ability to describe the functioning of computer hardware and instruction set.

**CO2:** Ability to perform fixed point and floating-point arithmetic operations.

**CO3:** Ability to formulate solutions using data path, pipelining and parallelism concepts.

**CO4:** Ability to compare the performances of caches and I/O devices.

## COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-



## Program Articulation matrix

20CS001	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### TEXT BOOK:

1. David A. Patterson and John L. Hennessey, “Computer Organization and Design: The Hardware / Software Interface”, Morgan Kaufman / Elsevier, ARM Edition, 2017.

### REFERENCES:

1. V. Carl Hamacher, Zvonko G Vranesic and Safwat G Zaky, “Computer Organization”, McGraw-Hill Inc, 6<sup>th</sup> Edition, 2012
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, PHI Learning, 9<sup>th</sup> Edition, 2012.
3. Morris Mano M, “Computer System Architecture”, Pearson Education, 1<sup>st</sup> Edition, 2011.
4. Andrew S. Tanenbaum, “Structured Computer Organization”, Pearson Education, 6<sup>th</sup> Edition, 2013.

COIMBATORE - 10

20ECG02	DIGITAL PRINCIPLES AND SYSTEM DESIGN	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

The course will enable the students to learn the basics of binary systems and implementations of logic functions, Karnaugh map minimization, the implementation of combinational and sequential circuits, RAM organization and the types of ROM.

### COURSE CONTENT:

#### Number Systems

9

Review of binary, decimal, octal and hexadecimal number systems – Inter-conversion between number Systems-Number representations- complement's additions, subtraction - Computer codes: BCD, Gray code - Error detection and correction codes - parity codes- Hamming codes.

#### Simplification of Boolean expression

9

Positive and Negative Logic-Implementations of Logic Functions using gates, NAND– NOR implementations. Boolean postulates and laws – Principle of Duality - De- Morgan's Theorem - Truth tables and Boolean expression -Minimization of Boolean expressions – Sum of Products (SOP) Product of Sums (POS) – Karnaugh map Minimization.

#### Combinational Circuits

9

Adder, Subtractor, Encoder, Decoder, Multiplexer and Demultiplexer - Implementation of Combinational circuits, Magnitude Comparator.

#### Sequential Circuits

9

Flip-flops - Triggering, - Master slave configuration- Shift registers - Asynchronous Counters - Ring counter

**Programmable logic devices****9**

Classification and characteristics of memories – RAM organization – Types of ROM, CPLD.

**COURSE OUTCOMES:**

**CO1:** Ability to understand the basics of number systems, logic gates and programmable logic devices.

**CO2:** Ability to apply the concept of Boolean postulates and laws for simplifying Boolean expressions.

**CO3:** Ability to analyze the combinational and sequential logic digital systems.

**CO4:** Ability to analyze the types of RAM, ROM and complex programmable logic devices.

**COs, POs, and PSOs - Articulation matrix**

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	-	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

**Program Articulation matrix**

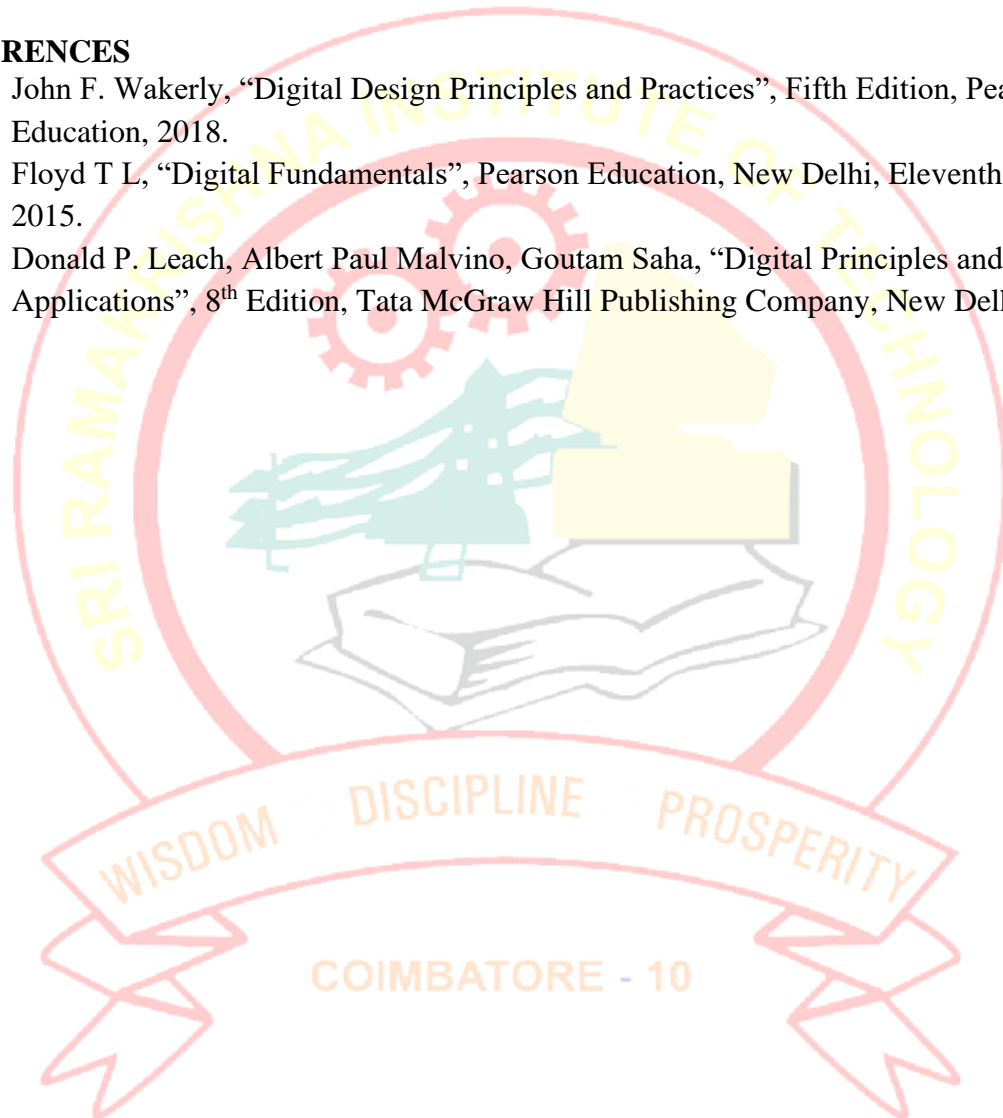
20ECG02	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	3	-	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

**TEXT BOOK:**

1. Charles H. Roth, Larry L Kinney, “Fundamental of Logic Design”, 7<sup>th</sup> Edition – CL Engineering, 2019.
2. Morris Mano M, “Digital Design”, Prentice-Hall of India, New Delhi, Sixth Edition 2018.

**REFERENCES**

1. John F. Wakerly, “Digital Design Principles and Practices”, Fifth Edition, Pearson Education, 2018.
2. Floyd T L, “Digital Fundamentals”, Pearson Education, New Delhi, Eleventh Edition, 2015.
3. Donald P. Leach, Albert Paul Malvino, Goutam Saha, “Digital Principles and Applications”, 8<sup>th</sup> Edition, Tata McGraw Hill Publishing Company, New Delhi, 2014.



20IT003	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVE:

The course will enable the student to undergo a hands-on experience with the concepts related to lists, stack, queue, trees, graphs and over the various sorting, searching and storage techniques.

### COURSE CONTENT:

#### List of Experiments

1. Array implementation of list ADT.
2. Implementation of linked list ADT.
3. Array implementation of stack ADT.
4. Linked list implementation of stack ADT.
5. Array implementation of Queue ADT.
6. Linked list implementation of Queue ADT.
7. Implementation of heaps using priority queues.
8. Implementation of Binary Tree.
9. Implementation of Binary Search Tree.
10. Implementation of AVL Tree.
11. Implementation of Dijkstra's Algorithm.
12. Implementation of Warshall's Algorithm
13. Construction of Minimum Spanning Tree using (i) Prim's Algorithm and (ii) Kruskal's Algorithm
14. Implementation of Sorting techniques – Quick Sort, Insertion Sort, Selection Sort, Merge Sort, Radix Sort (any two)
15. Implementation of Hash table.

**TOTAL PERIODS: 45**

## COURSE OUTCOMES:

**CO1:** Ability to implement stack and queue data structures using array and pointer implementation of lists.

**CO2:** Ability to implement tree-based data structures.

**CO3:** Ability to deploy appropriate algorithms to find the shortest path and minimum spanning tree in a graph.

**CO4:** Ability to apply appropriate sorting technique to sort a given set of values.

**CO5:** Ability to implement hash tables for effective storage of data.

## COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	-	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	2	3	3	-	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	-	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	-	3	3	-	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

## Program Articulation matrix

20T003	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	2	3	3	-	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

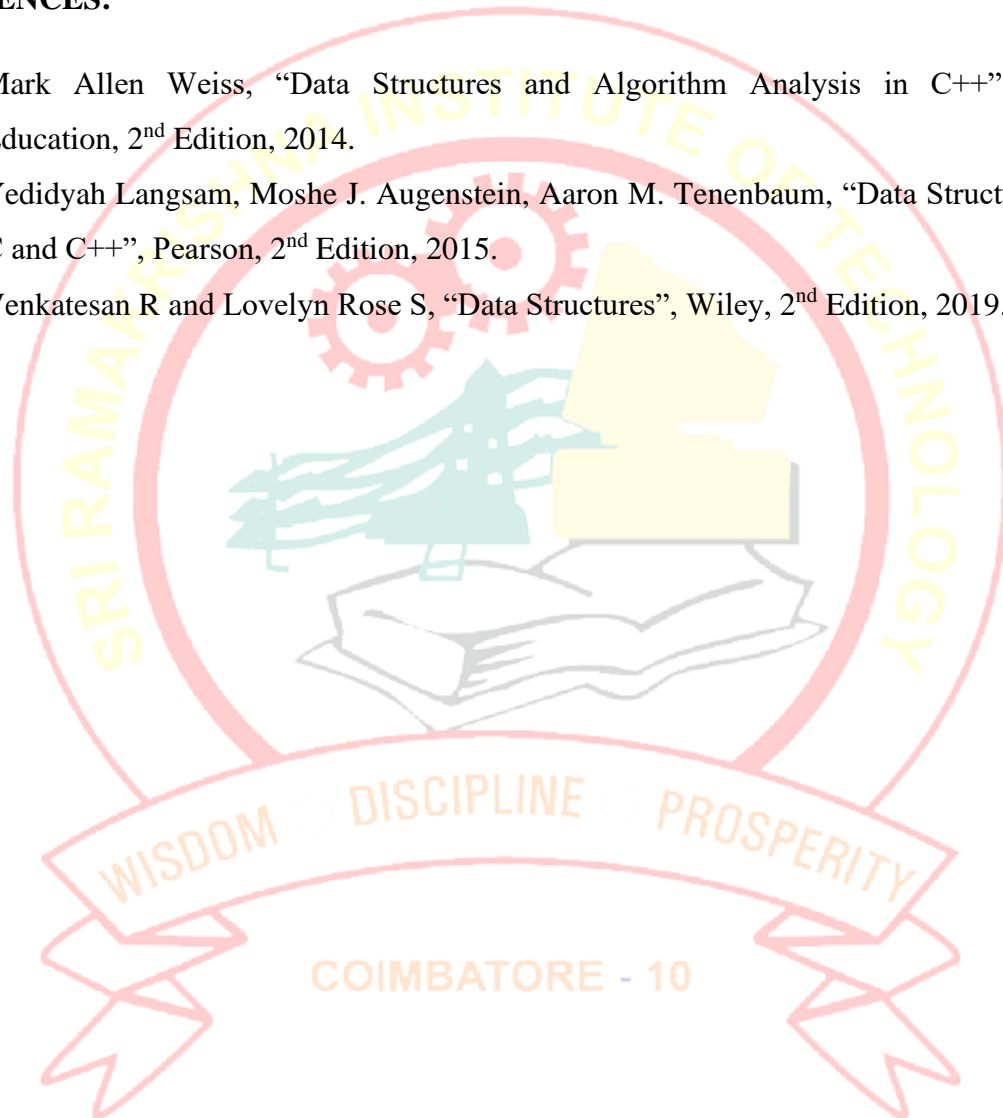


**TEXT BOOK:**

1. Seymour Lipschutz, “Data Structures with C”, McGraw Hill, 1<sup>st</sup> Edition, 2017.
2. John Hubbard, “Data Structures with C++”, McGraw Hill, 1<sup>st</sup> Edition, 2017.

**REFERENCES:**

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education, 2<sup>nd</sup> Edition, 2014.
2. Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum, “Data Structures using C and C++”, Pearson, 2<sup>nd</sup> Edition, 2015.
3. Venkatesan R and Lovelyn Rose S, “Data Structures”, Wiley, 2<sup>nd</sup> Edition, 2019.



20IT004	JAVA PROGRAMMING LABORATORY	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVE:

The course will enable the students to learn the design, implementation, testing, debugging, and documenting of programs using basic data types, I/O statements, conditional and control structures, objects, classes, arrays, strings and functions. It also discusses the principles of inheritance, interface, multithreading, exception handling and packages.

### COURSE CONTENT:

#### List of Experiments

1. Simple java programs using operators, arrays and control statements
2. Develop a stack data structure using class and object
3. Program to demonstrate inheritance & polymorphism
4. Develop an application using interfaces
5. Develop an application using packages
6. Program to illustrate exception handling in java and creation of user defined exception
7. Program to illustrate multithreads and Inter thread Communication
8. Program to implement Deadlock
9. Program to copy the contents of one file into another file.
10. Develop and configure a simple banner applet
11. Program to demonstrate the features of generics types
12. Program to demonstrate the use of ArrayList, LinkedList, HashSet and Map classes.
13. Program to capture the various keyboard and mouse events.
14. Develop a scientific calculator using event-driven programming paradigm of Java
15. Develop a simple text editor with basic file and edit functionalities

**TOTAL PERIODS: 45**

## COURSE OUTCOMES:

**CO1:** Ability to write, debug and document well-structured java applications.

**CO2:** Ability to implement inheritance and polymorphism to solve programming problems.

**CO3:** Ability to implement the interfaces, exception handling, file operations and multithreading to solve problems.

**CO4:** Ability to create applets and event driven programming applications

## COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	2	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	2	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	2	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

## Program Articulation matrix

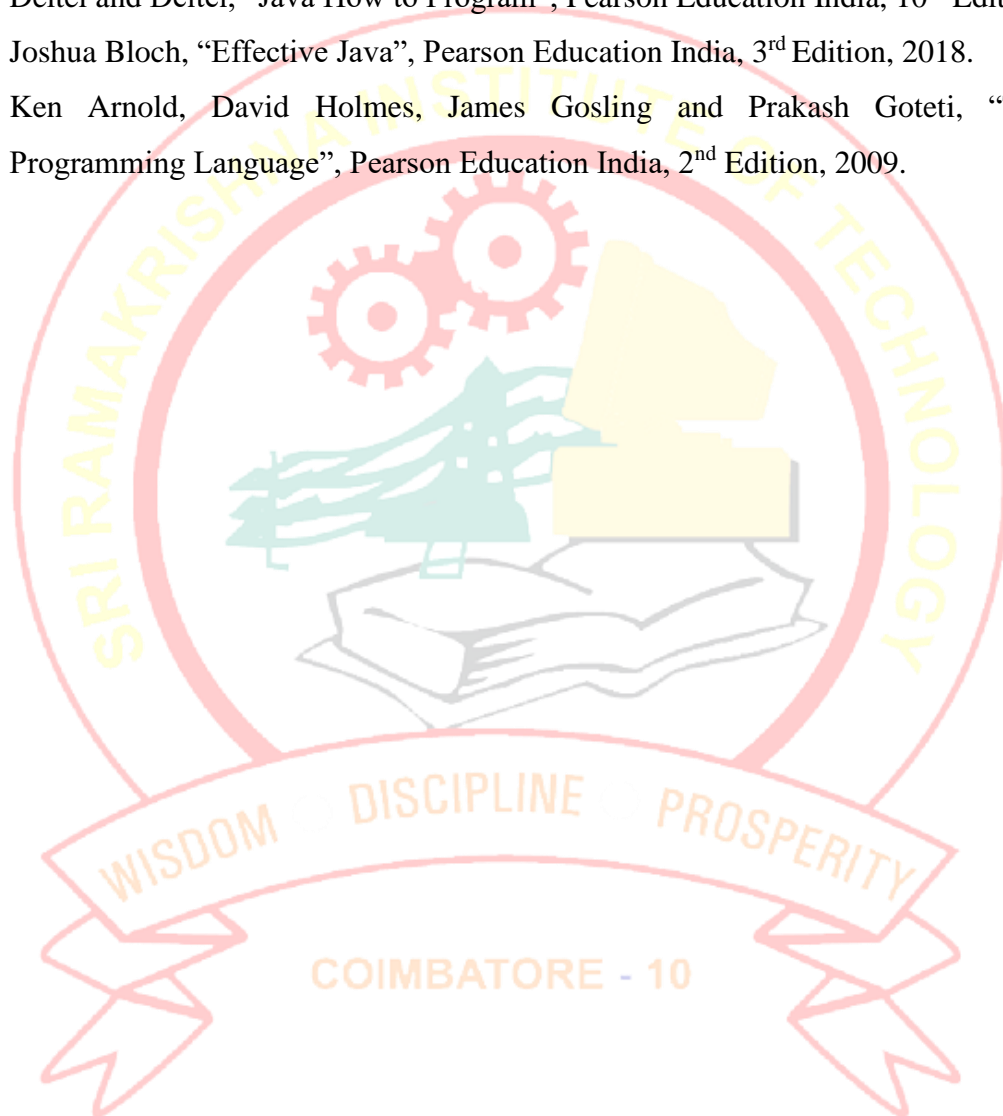
20IT004	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	2	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

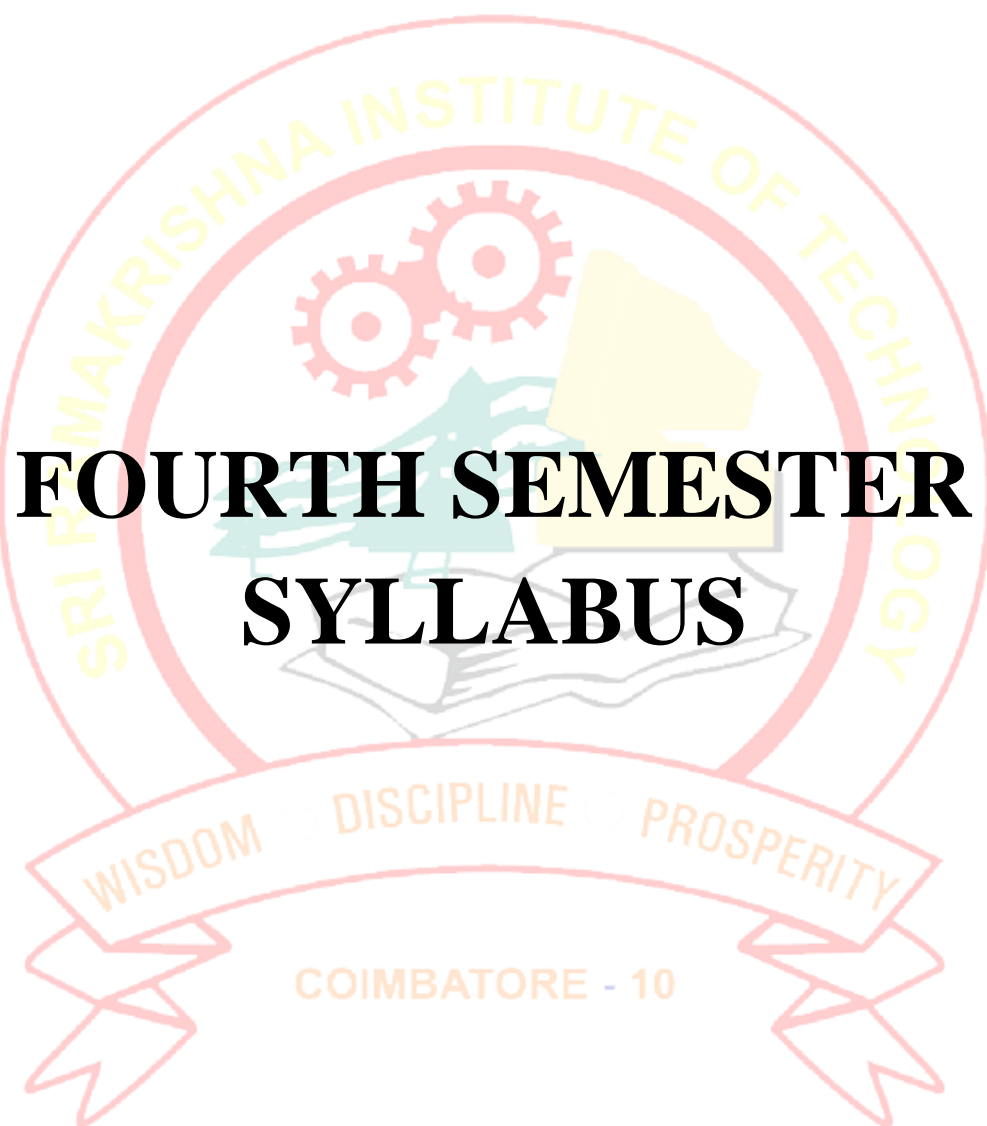
## TEXT BOOK:

- Herbert Schildt, "Java - The Complete Reference", McGraw Hill Professional, 11<sup>th</sup> Edition, 2018.

## REFERENCES:

1. Cay S.Hortmann, “Core Java Volume – I Fundamentals”, Pearson Education, 11<sup>th</sup> Edition, 2018.
2. Deitel and Deitel, “Java How to Program”, Pearson Education India, 10<sup>th</sup> Edition 2016.
3. Joshua Bloch, “Effective Java”, Pearson Education India, 3<sup>rd</sup> Edition, 2018.
4. Ken Arnold, David Holmes, James Gosling and Prakash Goteti, “The Java Programming Language”, Pearson Education India, 2<sup>nd</sup> Edition, 2009.





20IT005	DISCRETE STRUCTURES	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

- To use sets, relation and functions for solving applied problems and investigate their properties.
- To familiarize the fundamental concepts and significance of lattices and Boolean algebra.
- To introduce concepts of mathematical logic for analyzing propositions and proving theorems.
- To explain the fundamental algebraic structures, groups and their algebraic properties.
- To provide exposure to construct efficient program languages.

### COURSE CONTENT:

#### Sets, Relations and Functions

9

Basic concepts- Algebra of sets - The power set - Ordered pairs and Cartesian product - Relations on sets -Types of relations and their properties - Relational matrix and the graph of a relation - Equivalence relations. Functions - Classification of functions-Types of functions- Composition of functions and inverse of a function.

#### Lattices and Boolean Algebra

9

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.

#### Logic and Proofs

9

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.

#### Algebraic Structures

9

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem –codes and group codes.

#### Formal Languages and Automata Theory

9

Introduction – Languages – Phrase Structure grammars – Types of Grammars and Languages – Basic concepts of Information Processing Machine – Finite State Machines –Finite State



Machines as Models of Physical System – Equivalent Machines – Finite State Machines as Language Recognizers – Finite State Languages and Type-3 Languages.

### COURSE OUTCOMES:

**CO1:** Ability to understand the concepts of sets, functions and their properties.

**CO2:** Ability to apply the concepts of POSET and lattice to simplify complex Boolean expressions.

**CO3:** Ability to apply appropriate proof techniques for solving practical problems.

**CO4:** Ability to understand the basic concepts of group theory.

**CO5:** Ability to understand the concepts of grammars, languages and Finite State Machines.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### Program Articulation matrix

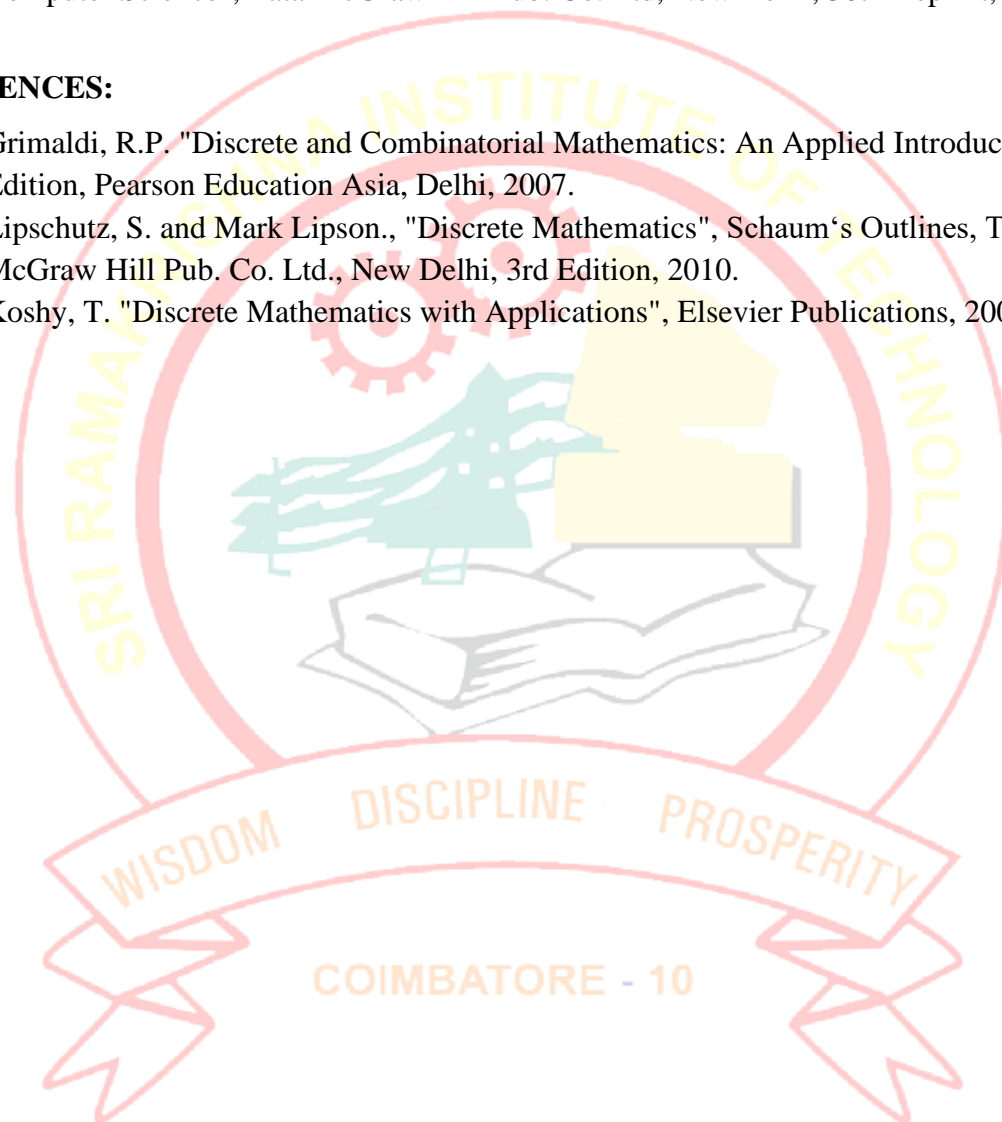
20IT005	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

**TEXT BOOKS:**

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

**REFERENCES:**

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.



20IT006	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

The course will enable the student to learn the layered protocol approach used for communication and to learn the functionalities of various protocols.

### COURSE CONTENT:

#### Introduction and Physical Layer 9

Networks – Network Model – Protocol Layering – OSI Model – TCP/IP Protocol suite – Addressing – Physical Layer: Performance – Transmission media – Guided – Unguided – Switching – Circuit-switched Networks – Packet Switching.

#### Data-Link Layer & Media Access 9

Error Detection and Correction – Error types – Cyclic Codes – Checksum – Data Link Control: Framing – Flow and Error Control – Data-Link Layer Protocols – HDLC – PPP – Media Access Control – Wired LANs: Ethernet – Wireless LANs – IEEE 802.11, Bluetooth – Connecting Devices.

#### Network Layer 9

Logical Addressing – Internetworking – IPV4 Addresses – Classful Addressing – Classless Addressing – IPV6 Addressing – Transition from IPV4 to IPV6 – Address mapping – ICMP – IGMP – ICMPv6 – Unicast Routing Protocols – Multicast Routing Protocols.

#### Transport Layer 9

Process to process delivery – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP – Congestion – Congestion Control – Quality of Service – Techniques to improve QoS.

## Application Layer

9

Domain Name Space – Telnet - Electronic Mail - FTP - WWW and HTTP – SNMP – RTP  
– RTCP – VOIP – Basics of Cryptography.

### COURSE OUTCOMES:

**CO1:** Ability to identify the network components and the types of networks.

**CO2:** Ability to demonstrate the functionality of each network layer

**CO3:** Ability to apply appropriate algorithm for routing and congestion control.

**CO4:** Ability to distinguish between different protocols.

**CO5:** Ability to interpret the working of routing protocols.

**CO6:** Ability to recommend a networking mechanism based on QoS parameters.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO6	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### Program Articulation matrix

201T006	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

**TEXT BOOK:**

1. Behrouz A. Forouzan, “Data Communications and Networking”, McGraw Hill Education, 5<sup>th</sup> Edition, 2013.

**REFERENCES:**

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A Systems Approach”, Morgan Kaufmann Publishers Inc., 5<sup>th</sup> Edition, 2012.
2. William Stallings, “Data and Computer Communications”, Pearson Education, 10<sup>th</sup> Edition, 2013.
3. James F. Kurose, Keith W. Ross, “Computer Networking, A Top-Down Approach Featuring the Internet”, Pearson Education, 6<sup>th</sup> Edition, 2013.
4. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill Publisher, 2011.



20CS004	SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES:

The course will enable the students with the understanding of software engineering processes such as requirement modeling, design, testing etc. and experiential learning opportunities to apply that knowledge to solve real-world problems.

## COURSE CONTENT:

### Software Process and Agile Development

9

Introduction to Software Engineering – Process Model: Perspective process models- Specialized process models- The unified process - Personal and Team Process Models- Agile Process- Extreme Programming- Other Agile Process Models.

### Requirements Modeling

9

Requirements Engineering - Eliciting Requirements - Developing Use Cases - Building the Requirements Model – Validating Requirements – Requirement Analysis – Scenario based Modeling – Data Modeling Concepts – Class based Modeling – Requirements Modeling Strategies – Flow Oriented Modeling – Patterns for Requirements Modeling.

### Design Concepts

9

The Design Process - Design Concepts - The Design Model - Architectural Styles - Architectural Design - Component-Level Design: Designing Class-Based Components- Designing Traditional Components- Component based Development - User Interface Design: The Golden Rules - User Interface Analysis and Design- Interface Analysis - Interface Design Steps - Design Evaluation – Design Patterns.



## Testing

9

Software Testing Fundamentals - Internal and External Views of Testing - White-Box Testing - Basis Path Testing - Control Structure Testing - Black-Box Testing - Software Testing Strategies: Strategic Issues - Test Strategies for Conventional Software - Validation Testing - System Testing - The Art of Debugging.

## Project Management

9

Software Project Estimation - Decomposition Techniques - Empirical Estimation Models- The Make/Buy Decision - Project Scheduling – Scheduling - Earned Value Analysis - Risk Management: Risk Identification - Risk Projection - Risk Refinement - Risk Mitigation, Monitoring, and Management - The RMMM Plan.

## COURSE OUTCOMES:

**CO1:** Ability to understand the various software process models.

**CO2:** Ability to apply the requirement specifications and appropriate software design methodology for a given scenario.

**CO3:** Ability to compare and contrast various testing measures.

**CO4:** Ability to estimate the cost for the scheduled project.

## COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9			PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	-	3	2	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO3	-	3	2	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO4	-	3	2	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3

## Program Articulation matrix

20CS004	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	2	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3

### TEXT BOOK:

1. Roger S Pressman, Bruce R Maxim, “Software Engineering - A Practitioner’s Approach”, McGraw-Hill Education, 8<sup>th</sup> Edition, 2019.

### REFERENCES:

1. Ian Sommerville, “Software Engineering”, Pearson Education Asia, 10<sup>th</sup> Edition, 2017.
2. Rajib Mall, “Fundamentals of Software Engineering”, PHI Learning, 4<sup>th</sup> Edition, 2014
3. Pankaj Jalote, “Software Engineering: A Precise Approach”, Wiley India, 2010.
4. Shari Lawrence Pfleeger, “Software Engineering Theory and Practice”, Pearson Education, 4<sup>th</sup> Edition, New Delhi, 2009.

<b>20IT007</b>	<b>DATABASE MANAGEMENT SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

The course will enable the students to learn the fundamentals of data models, ER diagrams and to get familiarized with the concepts of transaction processing, concurrency control techniques, recovery procedures, file indexing techniques and advanced databases.

### **COURSE CONTENT:**

#### **Introduction to DBMS**

**9**

Overview of DBMS- Data Models- Database Languages- Database Administrator- Database Users- Three Schema architecture of DBMS: Basic concepts- Mapping Constraints- Keys. Relational Algebra – Relational Calculus: Domain relational Calculus – Tuple Relational Calculus.

#### **Database Design and SQL**

**10**

Entity-Relationship Diagram-Design Issues- Weak Entity Sets- and Extended E-R features - Structure of relational Databases- Views- Modifications of the Database- Concept of DDL- DML- TCL - DCL: Basic Structure- Set Operations- Aggregate Functions- Null Values- Domain Constraints- Referential Integrity Constraints- Assertions- Views- Nested Sub Queries- Stored Procedures. Functional Dependency- Different Anomalies in designing a Database.- Normalization using Functional Dependencies- Decomposition- Boyce-Codd Normal Form- 3NF- Normalization using Multi-Valued Dependencies- 4NF- 5NF.

#### **Query Processing and Transactions**

**8**

Database Query Processing - Transactions- Concurrency Control – Recovery System- State Serializability- Lock Based Protocols- Two Phase Locking.

## Storage Management and Indexing

9

Physical Storage Systems: Storage Interfaces – Magnetic Disks – Flash Memory -RAID – Disk block access. Data Storage Structures: Database Storage Architecture - File Organization- Organization of Records in Files – Data Dictionary Storage - Indexing.

## Advances in Database

9

Database System Architectures – Parallel and Distributed Transaction Processing – Complex Data types: Semi structured Data – Spatial Data – Textual Data Big Data – Data Analytics – Blockchain Databases.

### COURSE OUTCOMES:

**CO1:** Ability to describe the components of a database system and give examples of their use.

**CO2:** Ability to understand the various transaction processing, transaction models, storage management techniques and indexing techniques.

**CO3:** Ability to understand the advanced databases that are specific to various domains.

**CO4:** Ability to prepare a relational schema for a conceptual model developed using E-R model.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

## Program Articulation matrix

20IT007	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### TEXT BOOK:

1. Abraham Silberschatz- Henry F. Korth, S. Sudharshan, “Database System Concepts”, Tata McGraw Hill, 7<sup>th</sup> Edition, 2019.

### REFERENCES:

1. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Pearson Education, 7<sup>th</sup> Edition, 2015.
2. C.J. Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Pearson Education, 8<sup>th</sup> Edition, 2006.
3. Raghu Ramakrishnan, “Database Management Systems”, McGraw-Hill College Publications, 4<sup>th</sup> Edition, 2015.
4. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 1<sup>st</sup> Edition, 2018.
5. Atul Kahate, “Introduction to Database Management Systems”, Pearson Education, 1<sup>st</sup> Edition, 2004.
6. Ivan Bayross, “SQL, PL/SQL the Programming Language of Oracle”, BPB Publications, 2010.

20IT008	OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

The course will enable the students to learn the basic components of an operating system, and the interactions among various components in the operating system. The course will cover the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.

### COURSE CONTENT:

#### Operating System Overview

9

Introduction - Computer System Overview - Basic Elements - Instruction Execution – Interrupts - Memory Hierarchy - Cache Memory - Direct Memory Access - Multiprocessor and Multicore Organization. Operating system overview : objectives and functions - Evolution of Operating System.- Computer System Structure – Operating System Structures : System Components – Operating System Services - System Calls - System Programs – System Structure - OS Generation and System Boot.

#### Process Management

9

Process concept – Process Scheduling – Operations on Processes – Inter Process Communication – CPU scheduling – Scheduling criteria – Scheduling algorithms – multi processor scheduling – real time scheduling – Threads overview – multithreading models – threading issues – windows, solaris, linux, android process and thread management – process synchronization – the critical section problem – synchronization hardware – mutex locks – semaphores – classic problems of synchronization – critical regions – monitors- deadlock – system model – deadlock characterization – methods for handling deadlocks – deadlock prevention – deadlock avoidance – deadlock detection – recovery from deadlock.



## **Storage Management**

**9**

Main memory : Memory management requirement – Memory Partitioning - Contiguous memory allocation – paging – segmentation – segmentation with paging – 32 and 64 bit architecture examples-Virtual memory: Hardware and Control structures – Operating System software – demand paging – page replacement algorithms – thrashing – Memory management for UNIX, Solaris, Linux, Windows, Android.

## **File System**

**9**

Mass storage system : overview of mass storage structure – disk structure – disk scheduling and management – swap space management – file system interface – file concept – access methods – directory structure – directory organization – file system mounting – file sharing and protection – file system implementation - file system structure – directory implementation – allocation methods – free space management – efficiency and performance –Recovery.

## **I/O Systems, Protection and Security**

**9**

I/O systems: I/O hardware – application I/O interface – Kernel I/O subsystem – streams – performance- Protection: Goals – Domain of Protection – Access Matrix – Implementation of Access Matrix – Revocation of Access Rights – Capability based systems – Language based Protection-Security: The security problem – User authentication – Program threats- System threats – Securing system and facilities.

## **COURSE OUTCOMES:**

**CO1:** Ability to describe the difference between processes and threads.

**CO2:** Ability to describe the concept of virtual memory and main memory.

**CO3:** Ability to explain the mechanisms in an OS to control access to resources.

**CO4:** Ability to compare and contrast the scheduling algorithms and file organizations.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	2	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### Program Articulation matrix

2017T008	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, John Wiley and Sons Inc., 8<sup>th</sup> Edition, 2017.

### REFERENCES:

1. William Stallings, “Operating Systems - Internals and Design Principles”, Pearson Education India 9<sup>th</sup> Edition, 2018.
2. Andrew S Tanenbaum, “Modern Operating Systems”, PHI, 4<sup>th</sup> Edition, 2016.
3. Ramaz Elmasri, A.Gil Carrick, David Levine, “Operating Systems - A spiral approach”, Tata McGraw Hill, 2010.
4. Achyut S.Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 3<sup>rd</sup> Edition 2010.

<b>20IT009</b>	<b>DATABASE MANAGEMENT SYSTEMS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

### **COURSE OBJECTIVE:**

The course will enable the students to design and maintain tables using SQL, PL/SQL, triggers and functions.

### **COURSE CONTENT:**

1. Creation of a database and write SQL queries to retrieve information from the database.
2. Perform Insertion, Deletion, Modifying, Altering, Updating and Viewing records based on conditions.
3. Creation of a database using views, synonyms, sequences and indexes
4. Creation of a database using Commit, Rollback and Save point.
5. Creation of a database to set various constraints.
6. Creating relationship between the databases.
7. Write PL/SQL block to by accepting input from the user and handling exceptions.
8. Creation of Procedures.
9. Creation of functions.
10. Mini project (Application Development using Oracle/ MySQL)
  - a) Inventory Control System.
  - b) Material Requirement Processing.
  - c) Hospital Management System.
  - d) Railway Reservation System.
  - e) Personal Information System.
  - f) Web Based User Identification System.
  - g) Timetable Management System.
  - h) Hotel Management System

**TOTAL PERIODS: 45**

## COURSE OUTCOMES:

**CO1:** Ability to build a database schema for a given problem.

**CO2:** Ability to perform transactions in a database.

**CO3:** Ability to build and maintain tables using PL/SQL.

**CO4:** Ability to develop an application and generate reports.

## COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	-	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	-	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	-	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

## Program Articulation matrix

201T009	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	-	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

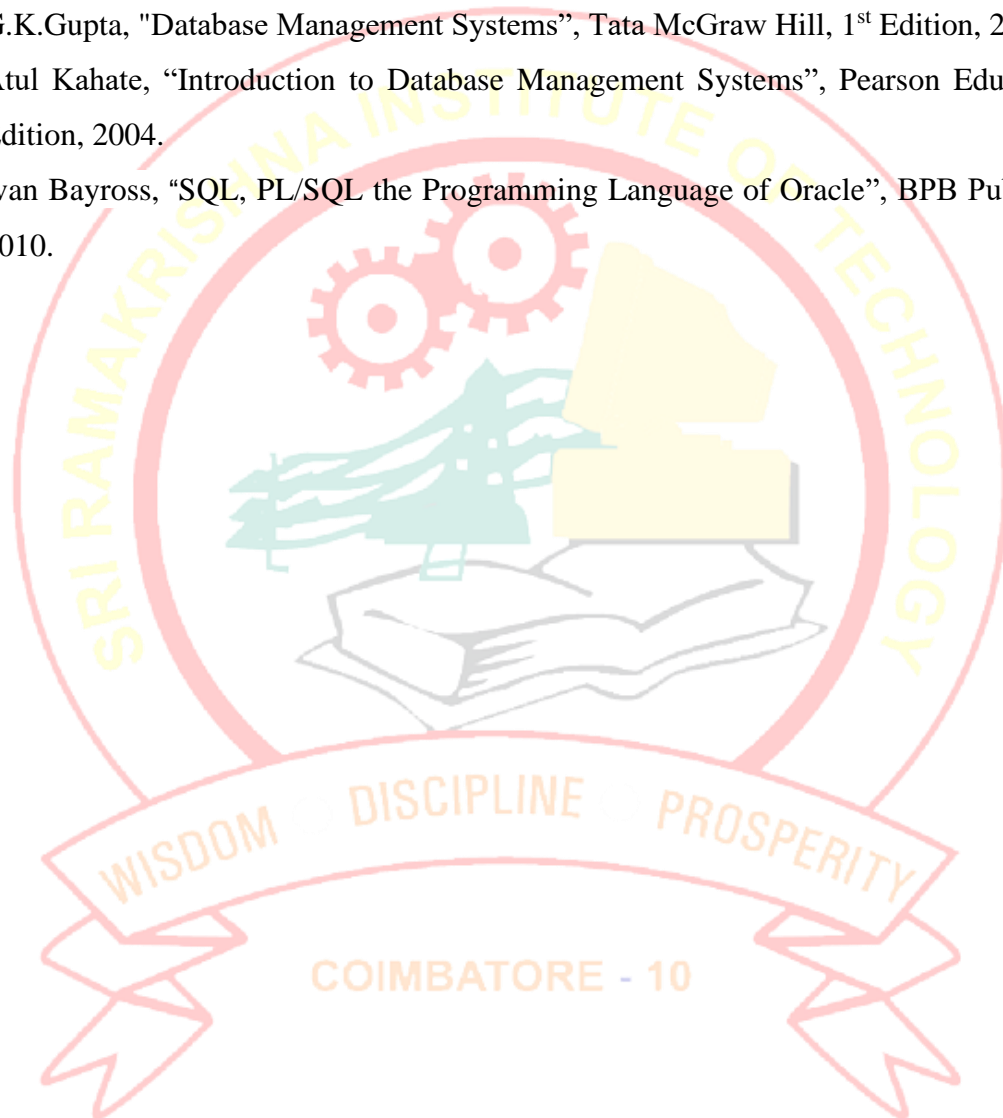
## TEXT BOOK:

1. Abraham Silberschatz- Henry F. Korth, S. Sudharshan, "Database System Concepts", Tata McGraw Hill, 9<sup>th</sup> Edition, 2018.

## REFERENCES:

1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Pearson Education, 7<sup>th</sup> Edition, 2017.

2. C.J. Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Pearson Education, 8<sup>th</sup> Edition, 2006.
3. Raghu Ramakrishnan, “Database Management Systems”, McGraw-Hill College Publications, 4<sup>th</sup> Edition, 2015.
4. G.K.Gupta, "Database Management Systems", Tata McGraw Hill, 1<sup>st</sup> Edition, 2018.
5. Atul Kahate, “Introduction to Database Management Systems”, Pearson Education, 1<sup>st</sup> Edition, 2004.
6. Ivan Bayross, “SQL, PL/SQL the Programming Language of Oracle”, BPB Publications, 2010.



20IT010	OPERATING SYSTEMS LABORATORY	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVE:

The course will enable the students to learn about UNIX commands and shell programming. It also covers the concepts of various CPU Scheduling Algorithms, Processes, Inter-process Communication, Deadlock avoidance and detection, Page Replacement Algorithms, File Organization and File Allocation Strategies

### COURSE CONTENT:

#### List of Experiments:

1. Basics of UNIX commands
2. Write programs using system calls of UNIX operating system.
3. Write C programs to simulate UNIX commands.
4. Shell Programming.
5. Implementation of various CPU Scheduling Algorithms.
6. Implementation of Semaphores.
7. Implementation of Shared memory and IPC.
8. Implementation of Bankers Algorithm for Deadlock Avoidance.
9. Implementation of Deadlock Detection Algorithm.
10. Program to Implement Threading and Synchronization Applications.
11. Implementation of various Memory Allocation Methods for fixed partition.
12. Implementation of Paging Technique of Memory Management.
13. Implementation of the various Page Replacement Algorithms.
14. Implementation of the various File Organization Techniques.
15. Implementation of the various File Allocation Strategies.

**TOTAL PERIODS: 45**

## COURSE OUTCOMES:

**CO1:** Ability to compare the performance of various CPU Scheduling Algorithms

**CO2:** Ability to implement semaphores, deadlock detection and avoidance algorithms.

**CO3:** Ability to analyze the performance of the various Page Replacement Algorithms.

**CO4:** Ability to Implement File Organization and File Allocation Strategies.

## COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	2	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	2	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	2	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	2	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

## Program Articulation matrix

201T010	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	2	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

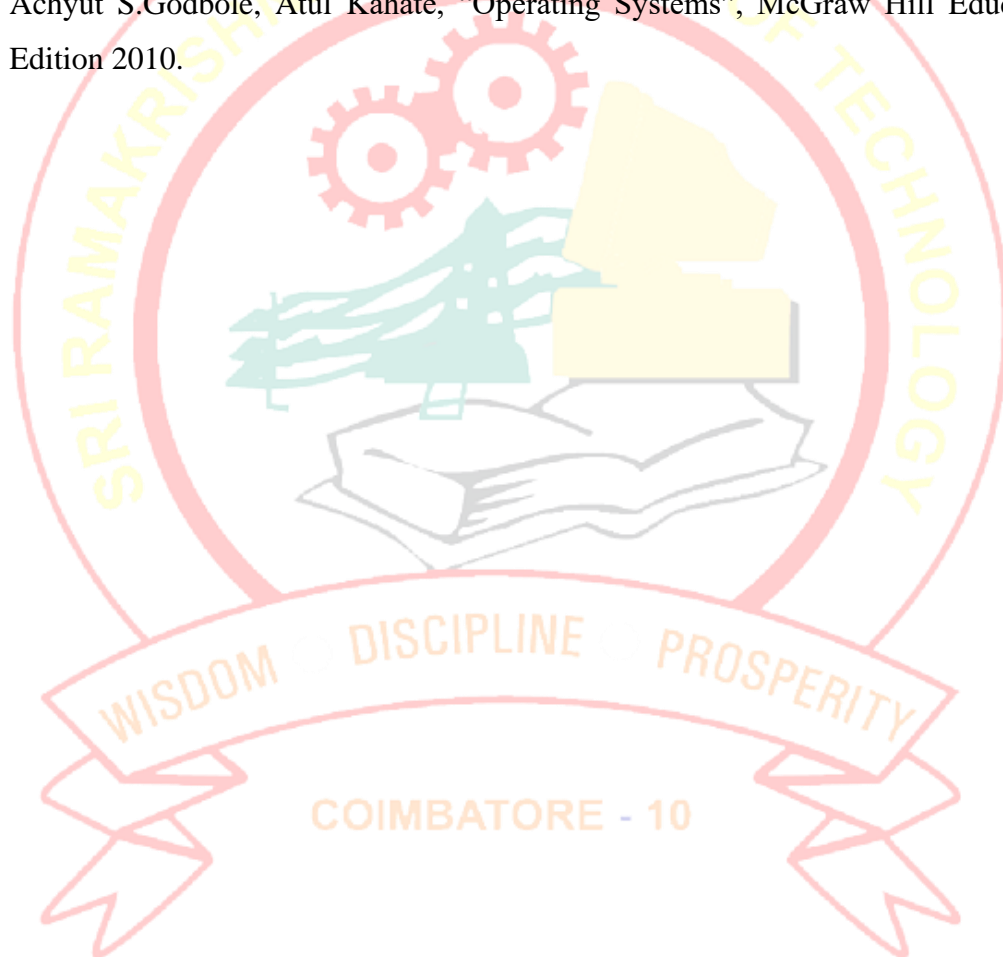
## TEXT BOOK:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", John Wiley and Sons Inc., 8<sup>th</sup> Edition, 2014.



## REFERENCES:

1. William Stallings, “Operating Systems - Internals and Design Principles”, Pearson Education India 9<sup>th</sup> Edition, 2018.
2. Andrew S Tanenbaum, “Modern Operating Systems”, PHI, 4<sup>th</sup> Edition, 2015.
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4. Achyut S.Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 3<sup>rd</sup> Edition 2010.





# **FIFTH SEMESTER SYLLABUS**

20IT011	COMPILER DESIGN	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

The course will enable the student to learn the functions of various phases of a compiler, the intermediate code generation and run-time environment. It also helps to get an insight on Lexical Analyzer Phase, Syntax Analyzer Phase and Intermediate Code Generation.

### COURSE CONTENT:

#### Introduction to Compilers

9

Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.

#### Syntax Analysis

9

Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar – Top Down Parsing – General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser – LR(0) Item Construction of SLR Parsing Table – Introduction to LALR Parser – Error Handling and Recovery in Syntax Analyzer-YACC.

#### Intermediate Code Generation

9

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

## Run-time Environment and Code Generation

9

Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack,  
Heap Management – Issues in Code Generation – Design of a simple Code Generator.

## Code Optimization

9

Principal Sources of Optimization – Peep-hole optimization – DAG – Optimization of  
Basic Blocks – Global Data Flow Analysis – Efficient Data Flow Algorithm.

### COURSE OUTCOMES:

- CO1:** Ability to understand the functionalities of the different phases of compiler.  
**CO2:** Ability to understand syntax-directed translation and run-time environment.  
**CO3:** Ability to implement code optimization techniques.  
**CO4:** Ability to apply different parsing algorithms to develop the parsers for a given grammar.  
**CO5:** Ability to design a scanner and a parser using LEX and YACC tools.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	2	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### Program Articulation matrix

201T011	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	2	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

#### TEXT BOOK:

1. Alfred V Aho, Monica S Lam, Ravi Sethi and Jeffrey D Ullman, “Compilers - Principles, Techniques and Tools”, Pearson Education, 2<sup>nd</sup> Edition, 2018.

#### REFERENCES:

1. Dick Grune, Henri E Bal, Criel J H Jacobs, Koen G. Langendoen,”Modern Compiler Design”, Springer, 1<sup>st</sup> Edition, 2012.
2. Allen I. Holub,” Compiler Design in C”, Pearson Education, 1<sup>st</sup> Edition, 2015.
3. Charles N. Fischer, Richard. J. LeBlanc, “Crafting a Compiler with C”, Pearson Education, 2008.
4. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, 2003.

COIMBATORE - 10

20IT012	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

The course will enable the student to learn the various algorithm design techniques and provides an understanding on the problems that are categorized as NP-class problems and their approximate solutions.

### COURSE CONTENT:

#### Introduction to Algorithm Analysis and Divide-and-Conquer 9

Introduction to Algorithms – Growth of functions – Solving recurrence equations: Substitution method Iteration method and Master method – Finding Maximum and Minimum – Selection – Strassen's Matrix Multiplication – Convex Hull.

#### Greedy Approach and Dynamic Programming 9

Greedy Approach: General Method – Knapsack problem – Minimum cost spanning trees – Single source shortest path problem. Dynamic Programming: Principle of optimality – All pairs shortest path problem – Longest common subsequence – Traveling salesperson problem.

#### Backtracking and Branch-and-bound 9

Backtracking: General method – 8 Queens Problem – Graph coloring – Sum of subset problem – Hamiltonian cycle. Branch and Bound – Knapsack problem –Traveling salesman problem.

#### String Matching and Parallel Algorithms 9

Simple string matching – KMP String matching algorithm – Boyer Moore String matching algorithm. Parallel algorithms: PRAM models – Prefix computation –List ranking – Finding the maximum – Odd-Even merge sort – Sorting on a mesh – Bitonic sort.

## NP-Problems and Approximation Algorithms

9

NP-completeness – Polynomial time verification – Theory of reducibility – Circuit satisfiability - NP-completeness proofs – NP-complete problems: Vertex cover, Hamiltonian cycle and Traveling Salesman problems – Approximation Algorithms – Approximation algorithms to vertex-cover and traveling salesman problems.

### COURSE OUTCOMES:

- CO1:** Ability to illustrate ways to manage algorithmic execution using parallel algorithms.
- CO2:** Ability to use divide-and-conquer method, greedy approach, dynamic programming, backtracking and branch-and-bound method to solve real-time problems.
- CO3:** Ability to apply appropriate heuristics in the context of addressing intractable problems.
- CO4:** Ability to determine the time complexity and the space complexity of simple algorithms.
- CO5:** Ability to determine an appropriate algorithmic approach to a problem.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO1	PSO2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	2	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	2	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-



## Program Articulation matrix

20IT012	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	2	3	3	2	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### TEXT BOOK:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, University Press, 2<sup>nd</sup> Edition, 2018.

### REFERENCES:

1. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education, 3<sup>rd</sup> Edition, 2017.
2. Sridhar S, “Design and Analysis of Algorithms”, Oxford University Press, 1<sup>st</sup> Edition, 2014.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, PHI Learning, 3<sup>rd</sup> Edition, 2010.
4. Kleinberg, “Algorithm Design”, CRC Press, 1<sup>st</sup> Edition, 2013.

COIMBATORE - 10

20CS007	OBJECT ORIENTED ANALYSIS AND DESIGN	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVE

The course will enable the students to learn the fundamentals of object modeling, UML diagrams, software design and requirement specification.

## COURSE CONTENT

### Introduction

9

An overview of Object Oriented Systems Development- Unified Approach – Object basics – Object state and properties – Behavior – Methods – Messages – Encapsulation - Information hiding – Class hierarchy – Relationships – Associations – Aggregations- Identity – Dynamic binding – Persistence – Meta classes – Object oriented system development life cycle – Software development process- Building high quality Software - Object Oriented System Development: A Use case driven approach- Reusability.

### Object-Oriented Methodologies

10

Rumbaugh Methodology – Booch Methodology – Jacobson Methodology – Patterns – Frameworks – Unified Approach – Unified Modeling Language – Use case – class diagram – Interactive Diagram – Package Diagram – Collaboration Diagram – State Diagram – Activity Diagram.

### Object-Oriented Analysis

9

Identifying use cases – Object Analysis – Classification – Noun phrase approach- Common class pattern approach- use case driven approach- Classes, responsibilities and Collaborators-Naming classes-Identifying Object relationships, Attributes and Methods.

### Object-Oriented Design

8

Object oriented Design process and Design axioms – Micro level process-purpose of view layer interface-Prototyping the user interface.

## Software Quality and Reusability

9

Software Quality assurance – Testing strategies – Object orientation testing – Test cases – Test Plan – Debugging principles – Usability – Satisfaction – Usability testing – Satisfaction testing.

### COURSE OUTCOMES:

**CO1:** Ability to decompose a problem domain into classes of objects having related state and behavior.

**CO2:** Ability to draw UML diagrams for applications.

**CO3:** Ability to apply appropriate design patterns.

**CO4:** Ability to compare and contrast various testing techniques

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO2	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO3	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO4	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3

### Program Articulation matrix

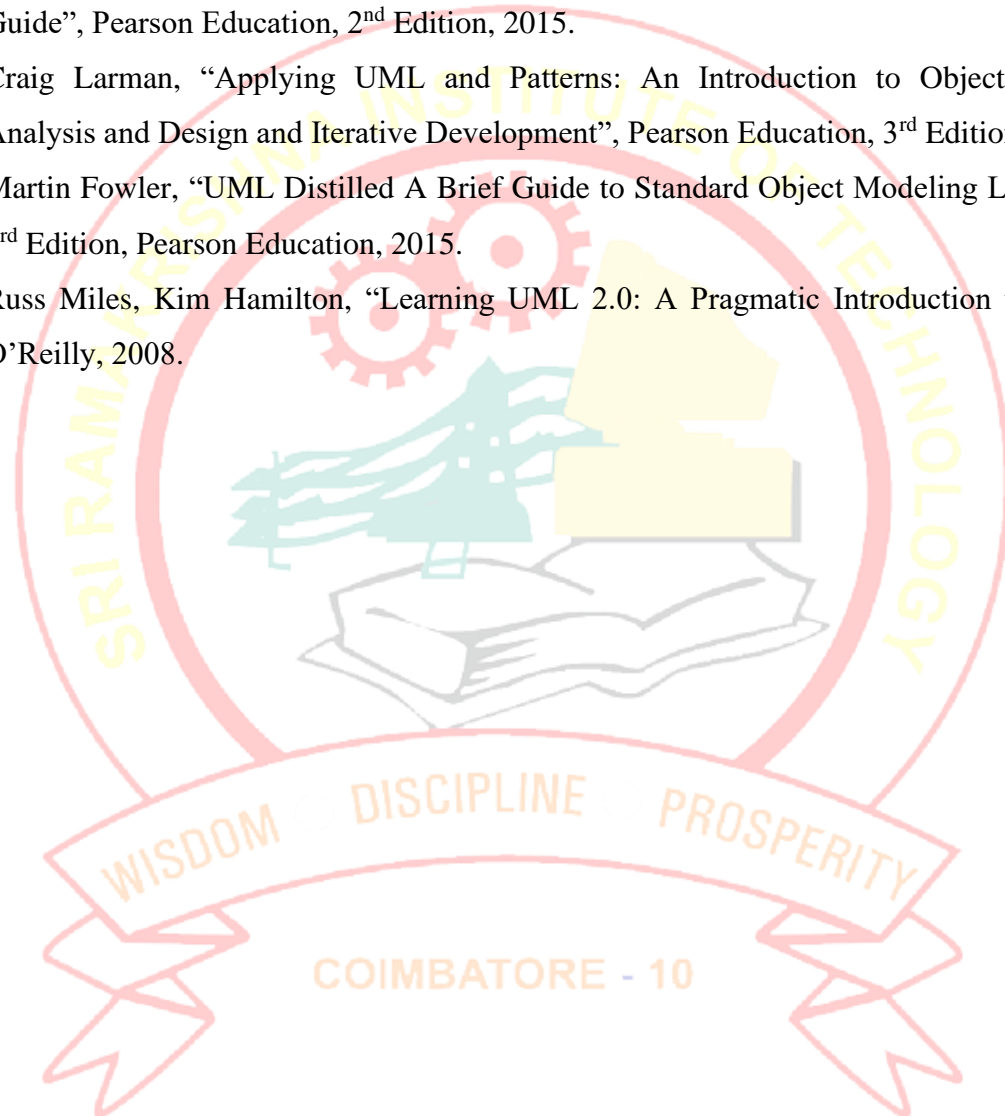
20CS007	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3

**TEXT BOOK:**

1. Ali Bahrami, “Object Oriented System Development”, Tata McGraw Hill Edition, 2017.

**REFERENCES:**

1. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson Education, 2<sup>nd</sup> Edition, 2015.
2. Craig Larman, “Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development”, Pearson Education, 3<sup>rd</sup> Edition, 2017.
3. Martin Fowler, “UML Distilled A Brief Guide to Standard Object Modeling Language”, 3<sup>rd</sup> Edition, Pearson Education, 2015.
4. Russ Miles, Kim Hamilton, “Learning UML 2.0: A Pragmatic Introduction to UML”, O’Reilly, 2008.



<b>20IT013</b>	<b>WEB TECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

The course will enable the students to understand the fundamentals of HTML5 and CSS and learn the fundamentals of client side and server-side programming. The students will be exposed to various website frame works.

### **COURSE CONTENT:**

#### **Introduction to HTML5**

**9**

Web Essentials: History of Internet & WWW - Web System Architecture – Basic Internet Protocols – Markup Language: HTML5 - Introduction - Basic Tags- Lists-Tables - Images - Forms - Links & Navigation - Image Maps – Input and Data List and Page Structure Elements – Canvas.

#### **CSS and Client Side Programming**

**9**

Style Sheets: CSS - Introduction to Cascading Style Sheets – Features - Core Syntax - Style Sheets and HTML Style Rule Cascading and Inheritance - Text Properties - Box Model - Normal Flow Box Layout - Beyond the Normal Flow - Other Properties. Client Side Programming: The Java Script Language - Basics - Control structures - Functions - Arrays - Objects – DOM - Event Handling

#### **XML**

**10**

Representing Web Data: XML - Documents and Vocabularies - Versions and Declaration - Namespaces - JavaScript and XML: Ajax - DOM based XML processing - Event-oriented Parsing: SAX - Transforming XML Documents-Selecting XML Data: XPATH - Template based Transformations: XSLT - Displaying XML Documents in Browsers.

## Server-Side Programming

9

Introduction to PHP: syntax, variables, print, data types, strings, constants, operators. Handling HTML form with PHP: Form Handling, Form Validation, Form Required, Form URL/E-mail, Form Complete. Decisions and Loops: Making Decisions, Repetitive tasks with looping, If else, else if, switch, While loops, for loops. Functions: Definition, Call by value and call by reference, Recursive function. String, Array, Working with files.

## Building Website using Frameworks

8

Introduction to Word press, Joomla, Flask, Django, Angular JS, ASP.NET, Bootstrap.

### COURSE OUTCOMES:

**CO1:** Ability to represent web data using XML.

**CO2:** Ability to express the constraints involved in state management (cookies, query strings, sessions) in the web.

**CO3:** Ability to compare and contrast various web framework concepts.

**CO4:** Ability to develop web-based application using suitable client side and server-side web technologies.

**CO5:** Ability to evaluate the design and architecture of a web system.

**CO6:** Ability to design and implement a simple web page using HTML, CSS and Javascript.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	
CO2	-	3	3	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	
CO3	-	3	3	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	
CO4	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	
CO5	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	
CO6	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	

## Program Articulation matrix

201T013	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1		
CO	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### TEXT BOOKS:

1. Jeffrey C. Jackson, "Web Technologies - A Computer Science Perspective", Pearson Education, 1<sup>st</sup> Edition, 2007.
2. Thomas A Powell, "HTML and CSS: The Complete Reference", 5<sup>th</sup> Edition, Tata McGraw Hill, 2017.

### REFERENCES:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web How to Program", Pearson Higher Education, 5<sup>th</sup> Edition, 2018.
2. Robert. W. Sebesta, "Programming the World Wide Web", 8<sup>th</sup> Edition, Pearson Education, 2020.
3. Steven Holzner, "PHP: The complete Reference", McGraw-Hill Publications, 1<sup>st</sup> Edition, 2017.

COIMBATORE - 10



20CS011	CASE TOOLS LABORATORY	L	T	P	C
		0	0	3	1.5

### **COURSE OBJECTIVE:**

The course will enable the students to learn the basics of object-oriented analysis and design, UML design diagrams and various testing techniques.

### **COURSE CONTENT:**

#### **List of Experiments**

1. To develop a mini-project by following the exercises listed below.
2. Formulate a problem statement.
3. Identify Use Cases and develop the Use Case model.
4. Identify the conceptual classes and develop a domain model with UML Class diagram.
5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence diagrams.
6. Draw relevant state charts, activity diagrams, component and deployment diagrams.
7. Identify the User Interface, Domain objects, and technical services. Draw the partial layered, Logical architecture diagram with UML package diagram notation.
8. Develop and test the technical services layer.
9. Develop and test the Domain objects layer.
10. Develop and test the User interface layer.

#### **Suggested domains for Mini-Project**

- Passport automation system
- Book bank
- Exam Registration
- Stock maintenance system.
- Online course reservation system
- E-ticketing
- Software personnel management system

- Credit card processing
- E-book management system
- Recruitment system
- Foreign trading system
- Conference Management System
- BPO Management System
- Library Management System
- Student Information System

**TOTAL PERIODS: 45**

### **COURSE OUTCOMES:**

**CO1:** Ability to write software requirement specification.

**CO2:** Ability to use the UML analysis and design diagrams.

**CO3:** Ability to apply appropriate design patterns.

**CO4:** Ability to create code from design.

### **COs, POs, and PSOs - Articulation matrix**

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	3	-	3	-	3	-	-	3	3	-	-	-	-	-	-	-	2	-	-	-	-	3	3	-	-	-	3
CO2	-	3	3	2	-	3	-	3	-	-	3	3	-	-	-	-	-	-	-	2	-	-	-	-	3	3	-	-	-	3
CO3	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	2	-	-	-	-	3	3	-	-	-	3
CO4	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	2	-	-	-	-	3	3	-	-	-	3

## Program Articulation matrix

20CS011	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	3	-	3	-	3	-	-	3	3	-	-	-	-	-	-	-	2	-	-	-	-	3	3	-	-	-	3

### TEXT BOOK:

1. Ali Bahrami, “Object Oriented System Development”, Tata McGraw Hill Edition, 2017.

### REFERENCES:

1. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson Education, 2<sup>nd</sup> Edition, 2015.
2. Craig Larman, “Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and Iterative Development”, Pearson Education, 3<sup>rd</sup> Edition, 2017.
3. Martin Fowler, “UML Distilled A Brief Guide to Standard Object Modeling Language”, 3<sup>rd</sup> Edition, Pearson Education, 2015.
4. Russ Miles, Kim Hamilton, “Learning UML 2.0: A Pragmatic Introduction to UML”, O’Reilly, 2008.

COIMBATORE - 10

20IT014	WEB TECHNOLOGY LABORATORY	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVE:

The course will enable the students to obtain a hands-on experience about the development of web pages with HTML5/CSS and development of web applications using client side and server-side programming. It also provides an exposure to various web development frameworks.

### COURSE CONTENT:

#### List of Experiments

1. Create a Survey Form using HTML5
2. Create a webpage using CSS which displays the class time table and apply the following effects on the table:
  - For the table header apply blue as the background colour and white for the colour of the text in the table header.
  - Display day names (Mon, Tue etc...) in bold format with the first letter in the day name in uppercase.
  - Display lunch slightly in bigger font other than the remaining text.
3. Create a webpage to manage personal details like name, class, qualifications, photo, address etc., using tables and other suitable HTML tags. Apply the following style information:
  - Display the heading of the page in Times New Roman font and with 24px size.
  - Align all the field names like Name, Class, Photo etc to right in the table.
  - Apply light blue as background colour for the left side cells in the table which contains field names like Name, Class, etc...
  - Display your college logo as background image in the top right position of the web page.

4. Program using java script

- Write a JavaScript program to create a new string adding "Py" in front of a given string. If the given string begins with "Py" then return the original string.
- Write a JavaScript program to remove a character at the specified position of a given String and return the new string.
- Write a JavaScript program to find a value which is nearest to 100 from two different given integer values.
- Write a JavaScript program to check the total marks of a student in various examinations. The student will get A+ grade if the total marks are in the range 89..100 inclusive, if the examination is "Final-exam." the student will get A+ grade and total marks must be greater than or equal to 90. Return true if the student get A+ grade or false otherwise.

5. Implementation of basic list operation using java script.

6. Given a number from 0 to 999. Spell out that number in English using java script.

7. Write a program to create Chess board in PHP.

8. Write a program to calculate Electricity bill in PHP

- For first 50 units – Rs. 3.50/unit
- For next 100 units – Rs. 4.00/unit
- For next 100 units – Rs. 5.20/unit
- For units above 250 – Rs. 6.50/unit

9. Write PHP program for

- Sum of digits
- Even or odd
- Table number
- Factorial
- Reverse number and String
- Swap two numbers

- Area of triangle
- Star triangle

10. Develop a simple web page using Wordpress

11. Develop a simple web page using Bootstrap

12. Create a navigation menu using Angular js.

13. Develop a simple web page using Joomla

14. Build a Feedback form Using Flask

15. Build a Personal Portfolio Web page Using Django

**TOTAL PERIODS: 45**

### COURSE OUTCOMES:

**CO1:** Ability to design interactive web pages.

**CO2:** Ability to build web applications to solve problems

**CO3:** Ability to develop dynamic web pages.

**CO4:** Ability to use a web framework to develop web applications.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

## Program Articulation matrix

20IT014	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

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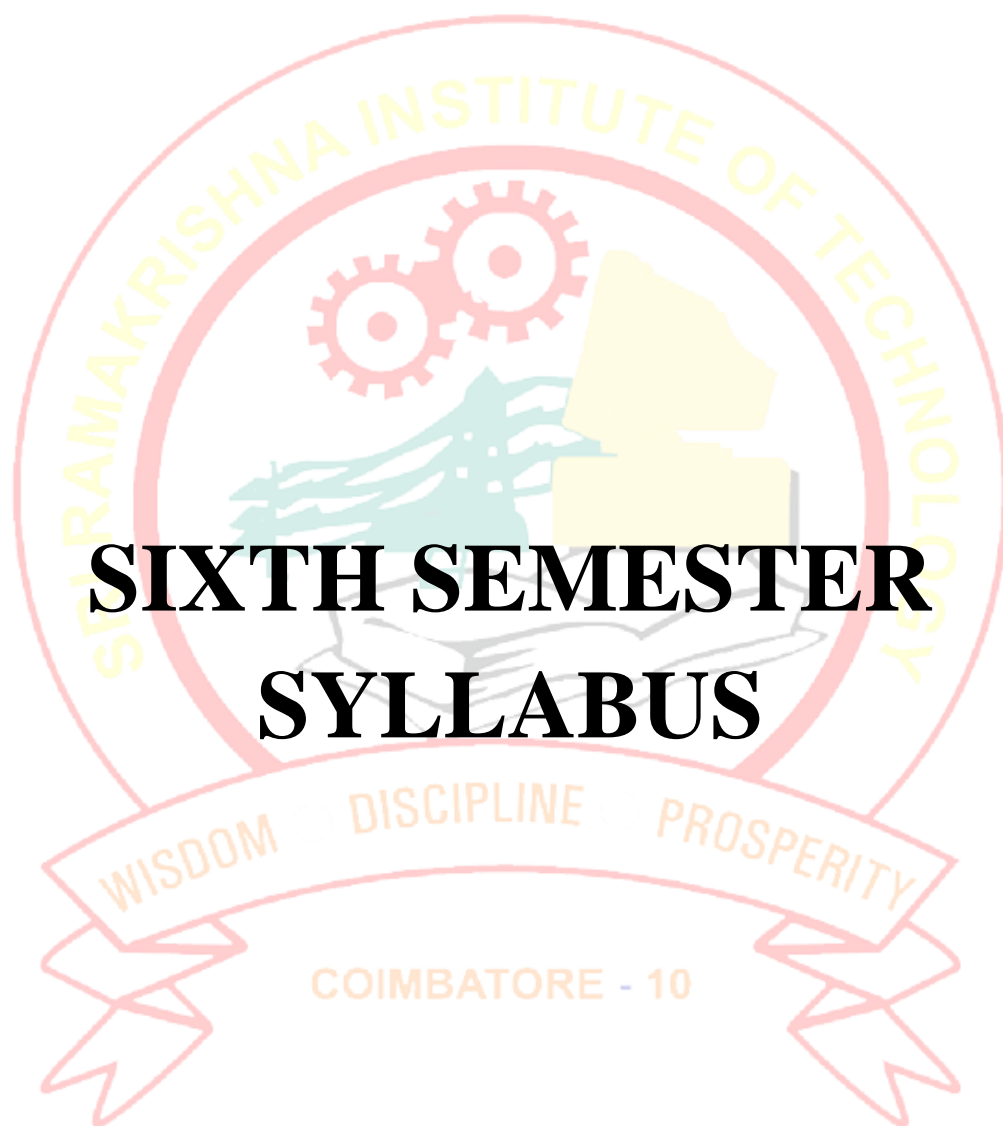
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2. Thomas A Powell, "HTML and CSS: The Complete Reference", 5<sup>th</sup> Edition, Tata Mc Graw Hill, 2017.

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2. Robert. W. Sebesta, "Programming the World Wide Web", 8<sup>th</sup> Edition, Pearson Education, 2020.
3. Steven Holzner, "PHP: The complete Reference", McGraw-Hill Publications, 1<sup>st</sup> Edition, 2017.

COIMBATORE - 10





# **SIXTH SEMESTER SYLLABUS**

<b>20IT015</b>	<b>MACHINE LEARNING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

The course will enable the student to learn the various types of machine learning techniques namely supervised, unsupervised and reinforcement learning by providing an insight on the variants of learning techniques and by correlating them with real-time applications.

### **COURSE CONTENT:**

#### **Introduction**

**9**

Introduction – Models of Neuron- Directed Graphs – Feedback – Network Architectures – Knowledge Representation – Learning Processes - Learning Tasks – Perceptron – Convergence Theorem – Batch Perceptron Algorithm - Linear Regression Model – Minimum-description-length principle –Instrumental variables method – Pattern classification using Rosenblatt’s Perceptron and Linear Regression

#### **Least-Mean-Square Algorithm and Multilayer Perceptron**

**9**

Introduction – filtering structure of LMS Algorithm – Unconstrained Optimization – Wiener Filter – the Least-Mean-Square Algorithm - Markov Model – Langevin Equation – Kushner’s Direct-Averaging Method – Statistical LMS – Limitations – Batch Learning and On-line Learning – Back-Propagation – Optimal Annealing – Generalization – Approximations of Functions – Cross-validation – Complexity Regularization - Network Pruning – Limitations – Convolutional Networks – Nonlinear Filtering

#### **Kernel Methods, Radial-Basis Function Networks and Support Vector Machines**

**9**

Cover’s Theorem – Radial-Basis-Functional Networks – K-means Clustering – Recursive Least-Squares Estimation of Weight Vector – Hybrid Learning– Gaussian Hidden Units –

Kernel Regression – Optimal Hyperplane – Kernel Machine representation – Design of Support Vector machines – XOR Problem – Regression in SVM – The representer theorem - Pattern Classification using RBF Networks and SVM

### **Regularization Theory and Principal-Components Analysis**

**9**

Hadamard's Conditions– Tikhonov's Regularization Theory – Regularization Networks – Generalized RBF Networks –Regularization Parameter – Semi-supervised Learning - Manifold Regularization – Generalized Regularization Theory – Spectral Graph Theory – Generalized Representer Theorem – Laplacian regularized LS Algorithm – Principles of Self-organization – Self-organized Feature Analysis – Principal Component Analysis– Hebbian-based PCA – Kernel PCA – Kernel Hebbian Algorithm – Case Study: Image Coding

### **Self-Organizing Maps, Stochastic Methods and Recurrent Networks**

**9**

Two basic feature-mapping models – Self-organizing Maps – Properties – Contextual Maps – Hierarchical Vector Quantization – Kernel Self-organizing Maps – Statistical Mechanics – Markov Chains – Metropolis Algorithm – Simulated Annealing – Gibb's Sampling – Boltzmann Machine – Logistic Belief Nets – Deep Belief Nets – Deterministic Annealing – Recurrent Network Architectures – Universal Approximation Theorem – Learning Algorithms – Real-time recurrent learning – Vanishing Gradients

### **COURSE OUTCOMES:**

- CO1:** Ability to explain the differences among the three main styles of learning: supervised, reinforcement, and unsupervised.
- CO2:** Ability to identify examples of classification tasks, including the available input features and output to be predicted.

- CO3:** Ability to implement simple algorithms for supervised learning, reinforcement learning, and unsupervised learning.
- CO4:** Ability to compare and contrast neural networks and belief networks.
- CO5:** Ability to apply the simple statistical learning algorithm such as Naive Bayesian Classifier to a classification task and measure the classifier's accuracy.
- CO6:** Ability to evaluate the performance of a simple learning system on a real-world dataset.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	-	3	3	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO6	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### Program Articulation matrix

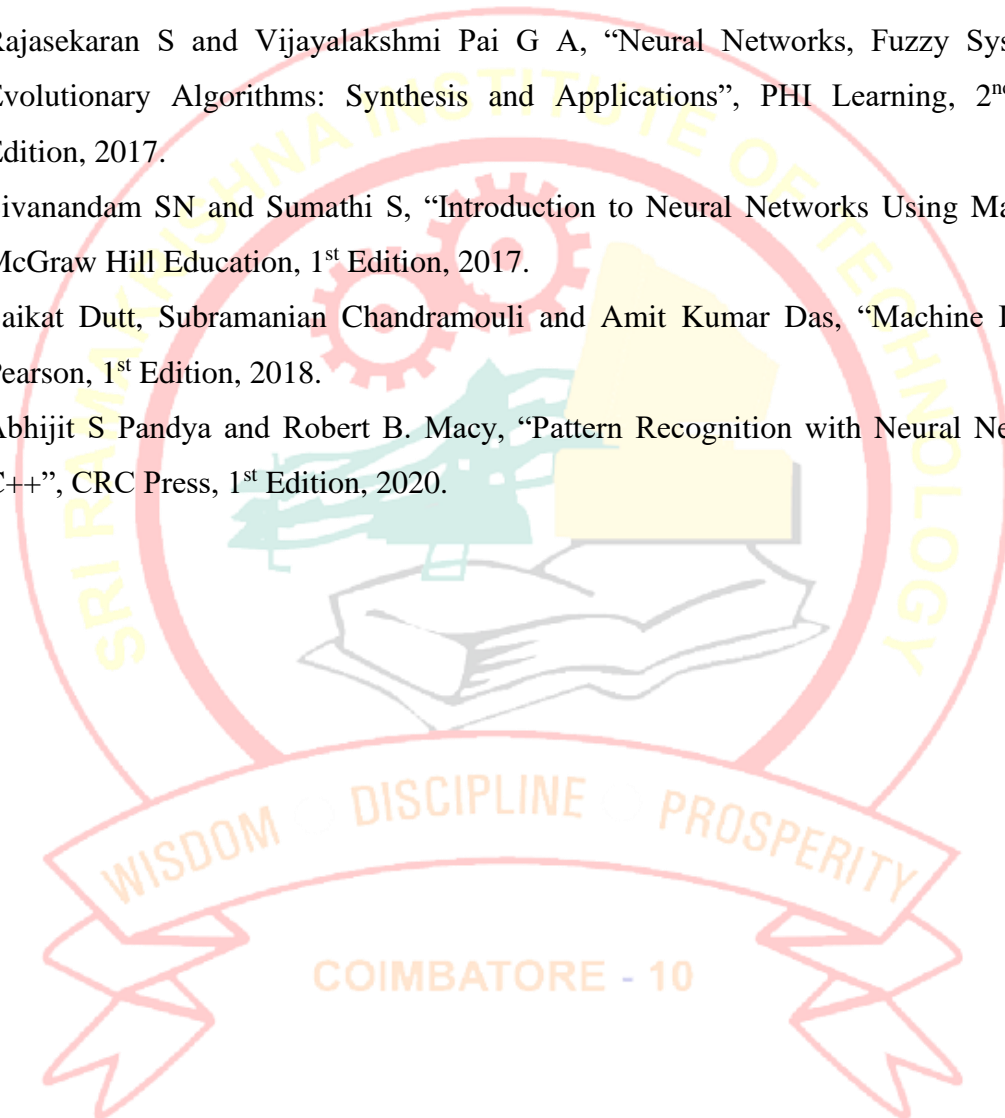
20T015	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

**TEXT BOOK:**

1. Simon Haykin, “Neural Networks and Learning Machines”, Pearson Education India, 3<sup>rd</sup> Edition, 2016.

**REFERENCES:**

1. Rajasekaran S and Vijayalakshmi Pai G A, “Neural Networks, Fuzzy Systems and Evolutionary Algorithms: Synthesis and Applications”, PHI Learning, 2<sup>nd</sup> Revised Edition, 2017.
2. Sivanandam SN and Sumathi S, “Introduction to Neural Networks Using Matlab 6.0”, McGraw Hill Education, 1<sup>st</sup> Edition, 2017.
3. Saikat Dutt, Subramanian Chandramouli and Amit Kumar Das, “Machine Learning”, Pearson, 1<sup>st</sup> Edition, 2018.
4. Abhijit S Pandya and Robert B. Macy, “Pattern Recognition with Neural Networks in C++”, CRC Press, 1<sup>st</sup> Edition, 2020.



<b>20IT016</b>	<b>INTERNET OF THINGS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

The course will enable the student to learn the fundamental concepts of Internet of Things and an exposure towards the development of low-cost embedded systems which could interact with cloud-based applications.

### **COURSE CONTENT:**

#### **Introduction to IoT**

**9**

IoT Definition: Characteristics. Sensing – Actuation - Networking Basics – Communication Protocols - Physical & Logical Design of IoT - Communication models & APIs. IoT enabling technologies – IoT Levels and Deployment Templates – IoT Functional Blocks.

#### **M2M and IoT Architecture**

**9**

Building Architecture – An IoT Architecture Outline – M2M and IoT Technology Fundamentals: Devices and Gateways, Local and Wide Area Networking - Data Management - M2M and IoT Analytics - Knowledge Management - IoT Reference Model.

#### **Developing IoT Applications**

**9**

IoT Platforms Design Methodology – IoT Physical Devices and Endpoints: Introduction to Raspberry Pi – About the Board – Linux on Raspberry Pi – Raspberry Pi Interfaces – Programming Raspberry Pi with Python – IoT Physical Servers and Cloud Offerings.

#### **Cloud for IoT**

**9**

Introduction – IoT with Cloud Challenges – Selection of Cloud service providers for IoT Applications: An overview. Introduction to Fog Computing – Cloud Computing: Security Aspects.

## Security Issues and Case Studies

9

IoT Security issues and Challenges - Real Time Applications of IoT: Weather Monitoring System – Smart Lighting - Air pollution Monitoring System – Smart Plant irrigation System – Forest Fire Detection System.

### COURSE OUTCOMES:

**CO1:** Ability to understand operating principles of IoT Devices.

**CO2:** Ability to understand the integration of Cloud and IoT, Fog computing.

**CO3:** Ability to describe an IoT architecture with respect to M2M Communications.

**CO4:** Ability to demonstrate several security issues and challenges of collaborative data acquisition in IoT.

**CO5:** Ability to develop IoT based solutions for various real time problems.

**CO6:** Ability to design an architectural framework for an IoT environment.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO6	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### Program Articulation matrix

20TT016	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

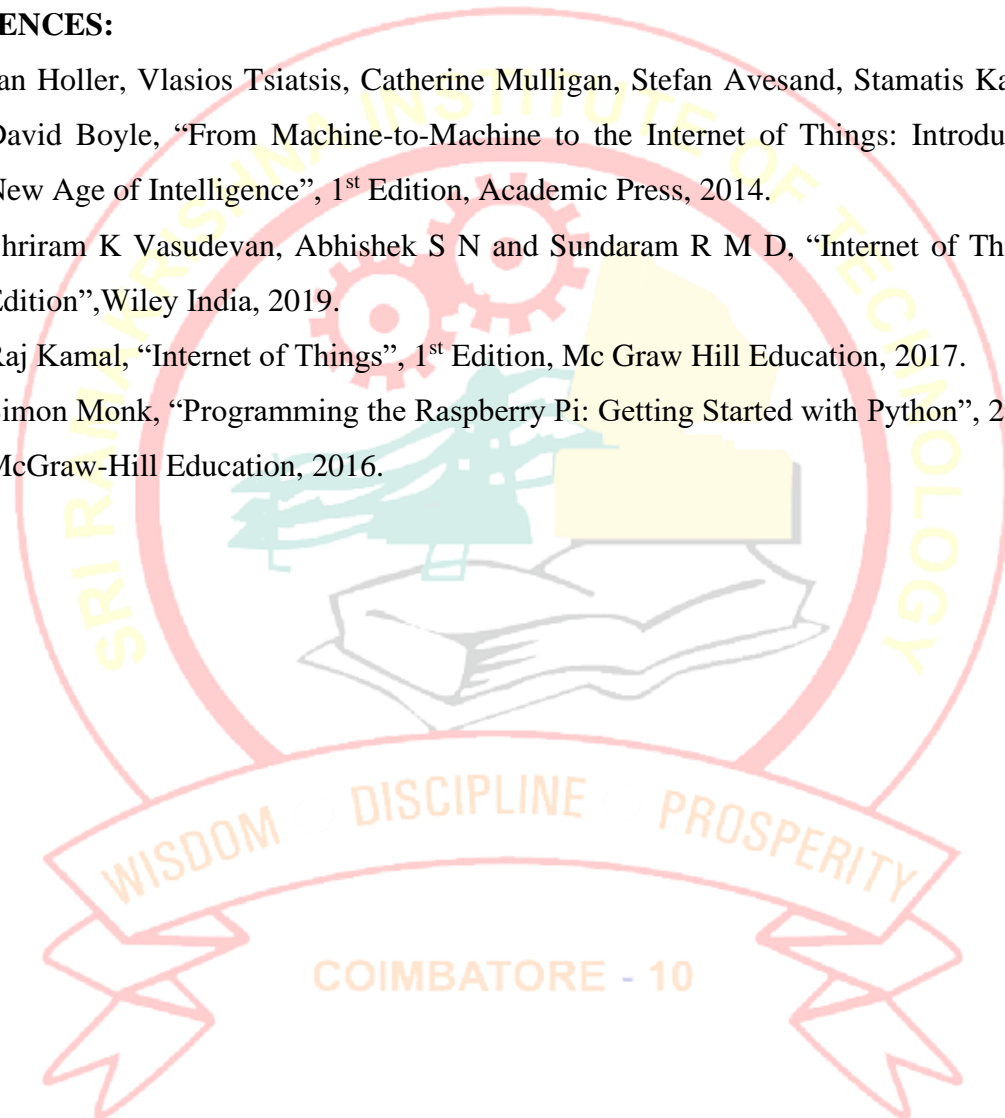


**TEXT BOOK:**

1. Arshdeep Bahga and Vijay Madisetti, “Internet of Things: A Hands-on Approach”, Universities Press, 1<sup>st</sup> Edition, 2015.

**REFERENCES:**

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1<sup>st</sup> Edition, Academic Press, 2014.
2. Shriram K Vasudevan, Abhishek S N and Sundaram R M D, “Internet of Things, First Edition”, Wiley India, 2019.
3. Raj Kamal, “Internet of Things”, 1<sup>st</sup> Edition, Mc Graw Hill Education, 2017.
4. Simon Monk, “Programming the Raspberry Pi: Getting Started with Python”, 2<sup>nd</sup> Edition, McGraw-Hill Education, 2016.



20IT017	DATA ANALYTICS	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVES:**

The course will enable the students to learn different kinds and sources of big data and to learn about the different data analytics techniques.

### **COURSE CONTENT:**

#### **Introduction to Big Data 9**

Characteristics of Data- Evolution of Big Data- Definition of Big Data- Challenges with Big Data-Traditional Business Intelligence (BI) versus Big Data-A Typical Data Warehouse Environment- A Typical Hadoop Environment.

#### **Big Data Analytics 9**

Classification of Analytics-Top Challenges Facing Big Data-Importance of Big Data Analytics-Data Science-Terminologies Used in Big Data Environments-Challenges Facing Big Data-Few Analytics Tools: Apache Spark-Tableau public-Excel-KNIME, Rapid Miner-QlikView- R Programming-Python.

#### **Data Collection, Sampling and Preprocessing 9**

Types of Data Source-Types of Data Elements-Visual data exploration-Exploratory statistical analysis-Missing values-Outlier detection and Treatment-Standardizing data-Categorization-Variable Selection- Data Analytics Lifecycle Overview: Discovery - Data Preparation - Model Planning - Model Building Sampling.

#### **Predictive Analytics Applications 9**

Simple Linear Regression-Salary Forecasting-Lasso Regression - Analyze multiple stress scenarios-Logistic Regression- predict house values in real estate business-Multivariate Regression - find the best combination of factors to increase footfalls in the store. Multiple Regression - determine claim worthiness for insurance industry-Support Vector Machines –Face Detection.

## Descriptive Analytics and Social Network Analytics

9

Association Rules- Market basket analysis- Sequence Rules- Restaurant recommendation- Segmentation-Market Segmentation-Social network metrics-Social Network Learning- Relational Neighbor Classifier- Probabilistic Relational Neighbor Classifier-Relational Logistic Regression-Collective Inferencing- Egonets- Bigraphs.

### COURSE OUTCOMES:

**CO1:** Ability to describe large-scale data challenges of volume, variety, velocity, and veracity.

**CO2:** Ability to compare different data platforms.

**CO3:** Ability to use a statistical programming language such as R or Python.

**CO4:** Ability to apply appropriate data analysis methods to solve real-world problems.

**CO5:** Ability to apply a data analytics lifecycle to a case study scenario.

**CO6:** Ability to perform data preprocessing techniques

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO1	PSO2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO6	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### Program Articulation matrix

2017T01	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2		
CO	-	3	3	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	

### TEXT BOOKS:

1. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley Publication, 1<sup>st</sup> Edition, 2014.
2. Subhashini Chellappan, Seema Acharya, “Big Data and Analytics”, Wiley Publication, 2<sup>nd</sup> Edition, 2019.

### REFERENCES

1. Walter W. Piegorsch, “Statistical Data Analytics Foundations for Data Mining, Informatics, and Knowledge Discovery”, Wiley Publication, 1<sup>st</sup> Edition, 2015.
2. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2<sup>nd</sup> Edition, 2014.
3. Bill Franks,” Taming the Big Data Tidal Wave: Finding opportunities in Huge data Streams with Advanced Analytics”, John Wiley & Sons, 2012.

COIMBATORE - 10

<b>20IT018</b>	<b>CLOUD COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

The course will enable the students to learn the basic concepts, architecture of cloud computing and techniques of virtualization and also get familiarized with the cloud platforms.

### **COURSE CONTENT:**

#### **Introduction to Cloud Computing 9**

Cloud computing at a glance- Historical Developments: Distributed Systems – Virtualization – Web 2.0 – Service-oriented Computing – Utility-oriented Computing – Building cloud computing environments: Application Development – Infrastructure and system development – Computing platforms and technologies.

#### **Virtualization 9**

Introduction – Characteristics of virtualized environments: Increased Security – Managed Execution – Portability – Taxonomy of virtualization techniques – virtualization and cloud computing – Pros and cons of virtualization – Technology examples: Xen – VMware – Microsoft Hyper-V.

#### **Cloud Computing Architecture 9**

Introduction – The cloud reference model- Types of clouds: Public clouds – Private clouds – Hybrid clouds – Community clouds – Economics of the cloud –Open challenges: Cloud interoperability and standards – scalability and fault-tolerance – security, trust and privacy – organizational aspects.

## Cloud Platforms in Industry and Research

9

Amazon Web Services: computer services – storage services – communication services – additional services – Google AppEngine: Architecture – Application life cycle – Cost Model – Observations – Microsoft Azure: Azure core concepts – SQL Azure – Windows Azure platform appliance – Openstack – OpenNebula.

## Applications and Advances in Cloud Computing

9

Scientific Applications – Business and consumer applications – Energy efficiency in clouds – market-based managements of clouds – Federated clouds/ InterCloud-Third-party cloud services.

### COURSE OUTCOMES:

**CO1:** Ability to demonstrate the conceptual terms of cloud computing.

**CO2:** Ability to categorize the different service types within cloud service delivery.

**CO3:** Ability to compare the infrastructure differences between public cloud computing, private cloud computing, and hybrid models.

**CO4:** Ability to explain the advantages and disadvantages of using virtualized infrastructure.

**CO5:** Ability to contrast the advantages and disadvantages of cloud applications.

**CO6:** Ability to contrast the different categories of cloud computing services

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	
CO2	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	
CO3	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	
CO4	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	
CO5	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	
CO6	-	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	



## Program Articulation matrix

CO	2018T018		PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	-	3	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### TEXT BOOK:

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”. McGraw Hill Education, 1<sup>st</sup> Edition, 2017

### REFERENCES:

1. Rajiv Misra, Yashwant Singh Patel, “Cloud and Distributed Computing: Algorithms and Systems”, Wiley, 1<sup>st</sup> Edition. 2020.
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, “Cloud Computing: Principles and Paradigms”. Wiley, 1<sup>st</sup> Edition, 2013.
3. Sandeep Bowmik, “Cloud Computing”, Cambridge University Press, 1<sup>st</sup> Edition. 2017.
4. Dr Gautam Shroff, “Enterprise Cloud Computing: Technology, Architecture, Applications”, Cambridge University Press, USA, 2010.

COIMBATORE - 10



<b>20AC002</b>	<b>CONSTITUTION OF INDIA</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE OBJECTIVES**

To enable the students to understand the Historical Background of Indian constitution as well as to interpret the Fundamental Duties and its legal status. It further enables them to understand the Scope of the Right to Life and Personal Liberty.

## **COURSE CONTENT**

### **Historical perspective of the Constitution of India 9**

Meaning of the constitution law and constitutionalism - Historical perspective of the Constitution of India - Salient features and characteristics of the Constitution of India

### **Fundamental rights and legal status 9**

Scheme of the fundamental rights - The scheme of the Fundamental Duties and its legal status - The Directive Principles of State Policy – Its importance and implementation

### **The constitution powers 9**

Federal structure and distribution of legislative and financial powers between the Union and the States - Parliamentary Form of Government in India – The constitution powers and status of the President of India - Amendment of the Constitutional Powers and Procedure

### **Constitutional amendments 9**

The historical perspectives of the constitutional amendments in India - Emergency Provisions: National Emergency, President Rule, Financial Emergency - Local Self Government – Constitutional Scheme in India

### **Right to Life and Personal Liberty 9**

Scheme of the Fundamental Right to Equality - Scheme of the Fundamental Right to certain Freedom under Article 19 - Scope of the Right to Life and Personal Liberty under Article 21

## COURSE OUTCOMES:

**CO1:** Ability to understand and abide by the rules of the Indian constitution.

**CO2:** Ability to comprehend the constitutional rights & fundamental rights.

**CO3:** Ability to understand the form of Government in India.

**CO4:** Ability to comprehend the Parliamentary System and the Constitutional Scheme in India.

## COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-

## Program Articulation matrix

20AC002	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-

## REFERENCES:

1. Basu D D, Introduction to the Constitution of India, Lexis Nexis, 2015.
2. Busi S N, Ambedkar B R framing of Indian Constitution, First Edition, 2015.
3. Granville Austin, Working Democratic Constitution: The Indian Experience, Oxford Publication. 2003.
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5. The Constitution of India (Bare Act), Government Publication, 1950.

<b>20IT019</b>	<b>DATA ANALYTICS AND CLOUD LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

## **COURSE OBJECTIVES**

The course will enable the students to obtain practical experience with data analytics algorithms and get familiarized with the development of web services and applications in the cloud framework.

## **COURSE CONTENT:**

### **List of Experiments**

1. Find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time.
2. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
3. Install a C compiler in the virtual machine and execute a sample program.
4. Show the virtual machine migration based on the certain condition from one node to the other.
5. Find procedure to install storage controller and interact with it.
6. Find procedure to set up the one node Hadoop cluster.
7. Mount the one node Hadoop cluster using FUSE.
8. Write a word count program to demonstrate the use of Map and Reduce tasks.
9. Implementation of Regression Techniques (Linear, Multiple and Logistic).
10. Implementation of Decision Tree learning.
11. Implementation of Random Forest.
12. Implementation of Clustering (K-Means, Hierarchical).
13. Implementation of Association Rule Mining.
14. Implementation of k-nearest neighbour's algorithm.
15. Implementation of classification using SVM.

**TOTAL PERIODS: 45**

## COURSE OUTCOMES:

**CO1:** To develop the ability to build and assess data-based models.

**CO2:** Data analyses with professional statistical software.

**CO3:** Demonstrate skill in data management.

**CO4:** To use the cloud tool kits.

**CO5:** To design and implement applications on the Cloud.

## COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	3	-	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	-	-	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	-	-	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

## Program Articulation matrix

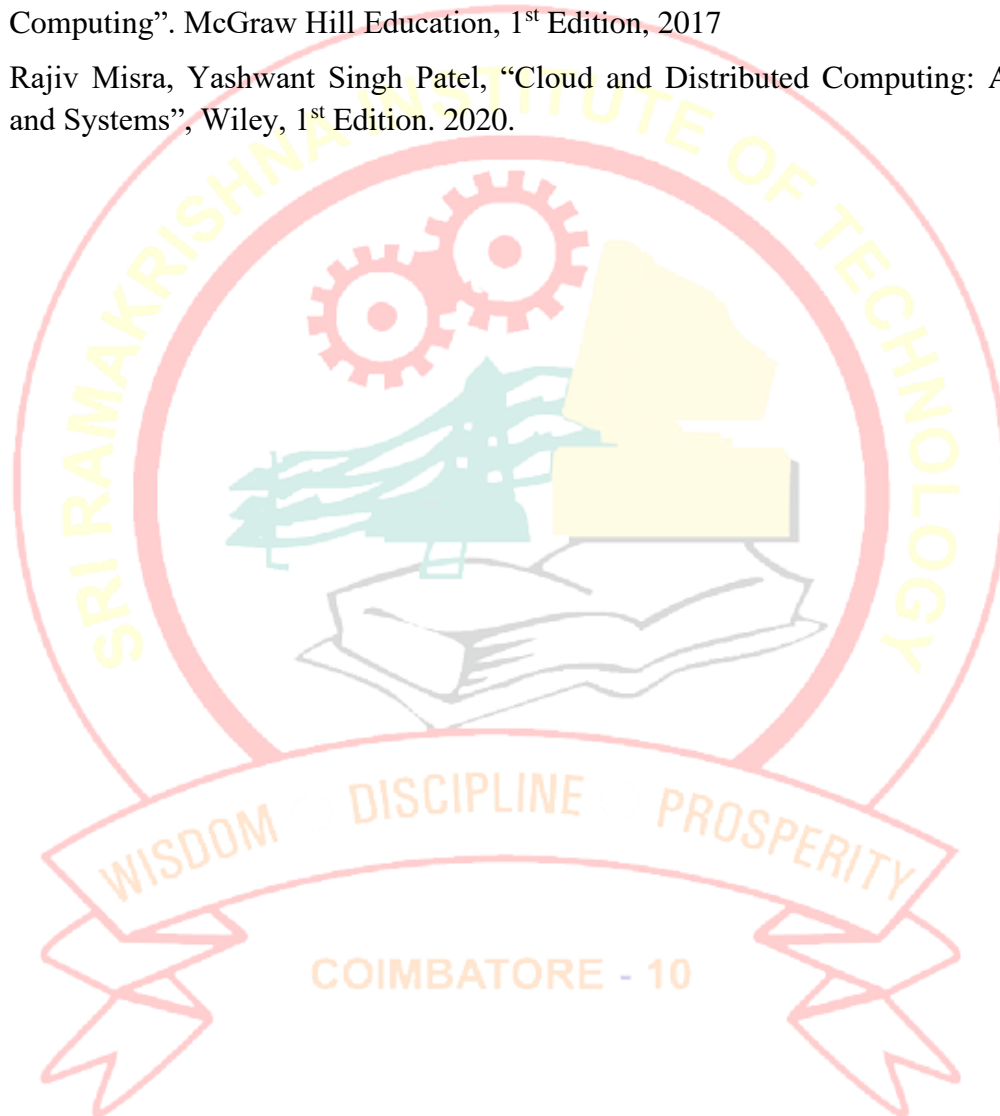
20IT019	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

## TEXT BOOKS:

1. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publication, 1st Edition, 2014.
2. Subhashini Chellappan, Seema Acharya, "Big Data and Analytics", Wiley Publication, 2nd Edition, 2019.

## REFERENCES:

1. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2nd Edition, 2014.
2. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”. McGraw Hill Education, 1<sup>st</sup> Edition, 2017
3. Rajiv Misra, Yashwant Singh Patel, “Cloud and Distributed Computing: Algorithms and Systems”, Wiley, 1<sup>st</sup> Edition. 2020.



20IT020	INTERNET OF THINGS LABORATORY	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVE:

The course will enable the students to avail a hands-on experience on the various development kits, components and sensors used with respect to the deployment of IoT.

### COURSE CONTENT:

#### List of Experiments

1. Introduction to various sensors and various actuators & its Application (Students have to prepare the report for the same).
  - i. PIR Motion Sensor.
  - ii. Moisture Sensor.
  - iii. Temperature Sensor.
  - iv. Touch Sensor.
  - v. Infrared Sensor.
  - vi. RFID Sensor.
  - vii. Bluetooth Module.
  - viii. Wi-Fi Module.
2. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
3. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
4. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
5. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.



8. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
9. To install MySQL database on Raspberry Pi and perform basic SQL queries.
10. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
11. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.
12. Measurement and transmission of room temperature with date and time to the web server using Wi-Fi module.
13. Detection of ethanol and carbon-dioxide in the air using Gas sensors.
14. Detection of obstacles using infrared sensor and measure the distance using ultrasonic sensor.
15. Tracking the location of a particular object through GPS module and to find the speed of a moving object using accelerometer sensor.

**TOTAL PERIODS: 45**

#### **COURSE OUTCOMES:**

**CO1:** Ability to configure IoT development kits (Arduino/ Raspberry Pi)

**CO2:** Ability to interface various sensors and actuators with development kits.

**CO3:** Ability to interface with development kits with communication modules.

**CO4:** Ability to interface the IoT components with a cloud environment.

#### **COs, POs, and PSOs - Articulation matrix**

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	3	-	3	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	3	-	3	-	3	-	-	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	3	-	3	-	3	-	-	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	3	-	3	-	3	-	-	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-



## Program Articulation matrix

20IT020	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	3	-	3	-	3	-	-	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

### TEXT BOOK:

1. Arshdeep Bahga and Vijay Madiseti, "Internet of Things: A Hands-on Approach", Universities Press, 1<sup>st</sup> Edition, 2015.

### REFERENCES:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1<sup>st</sup> Edition, Academic Press, 2014.
2. Shriram K Vasudevan, Abhishek S N and Sundaram R M D, "Internet of Things, First Edition", Wiley India, 2019.
3. Raj Kamal, "Internet of Things", 1<sup>st</sup> Edition, Mc Graw Hill Education, 2017.
4. Simon Monk, "Programming the Raspberry Pi: Getting Started with Python", 2<sup>nd</sup> Edition, McGraw-Hill Education, 2016.

COIMBATORE - 10

20IT901	DESIGN PROJECT	L	T	P	C
		0	0	8	4

### COURSE OBJECTIVE:

This course will enable the students to apply the knowledge and practical skills to solve real life engineering problems

### COURSE OUTCOMES:

At the end of the course, the students will have the

**CO1:** Ability to describe the principles of product design and development in solving engineering problems.

**CO2:** Ability to produce design Specification through experimental works which complies with the design project requirement.

**CO3:** Ability to analyze and demonstrate design specifications through experimental works and communicate effectively with the community.

**CO4:** Ability to demonstrate the ability to collaborate among team members.

### COs, POs, and PSOs - Articulation matrix

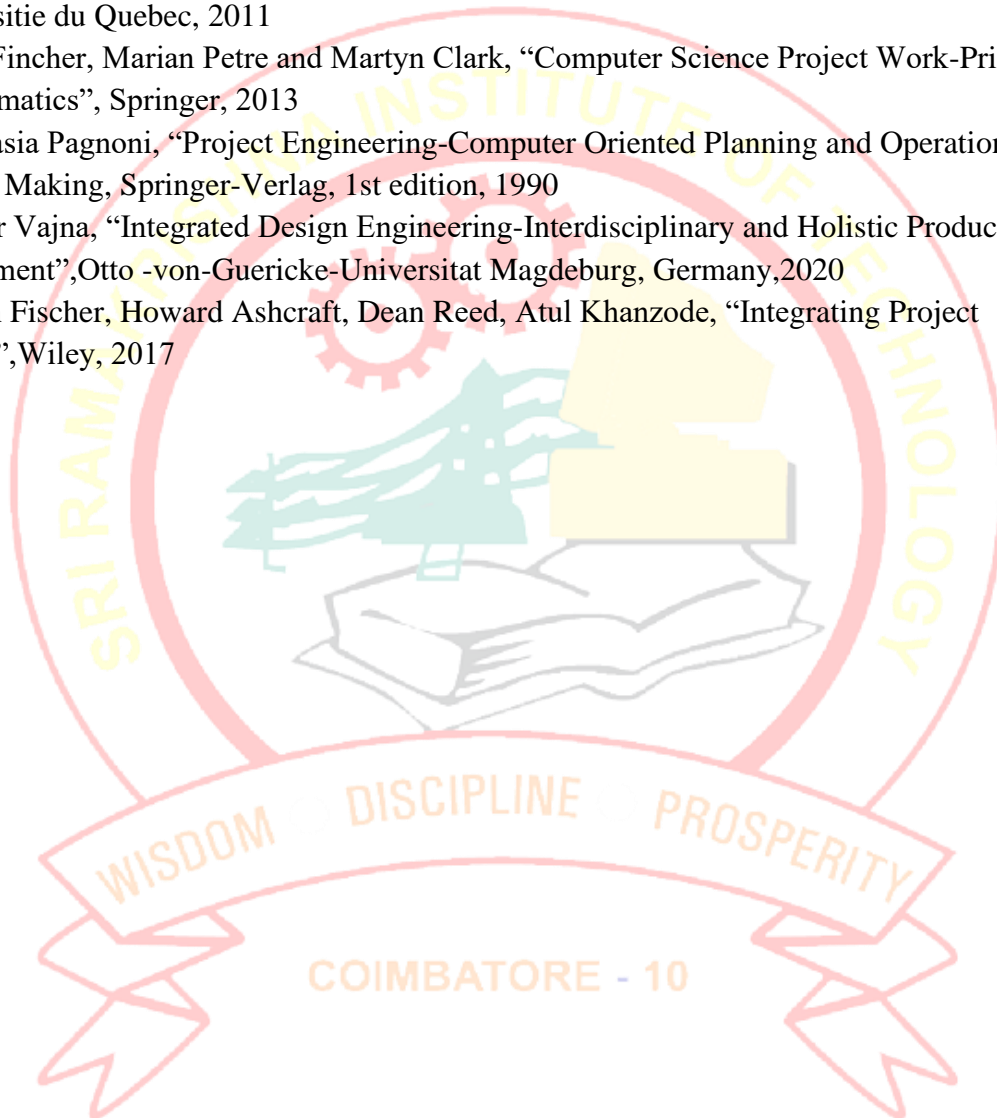
Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	3	2	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
CO2	-	3	3	3	3	3	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3
CO3	-	3	3	3	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3
CO4	-	3	3	3	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3

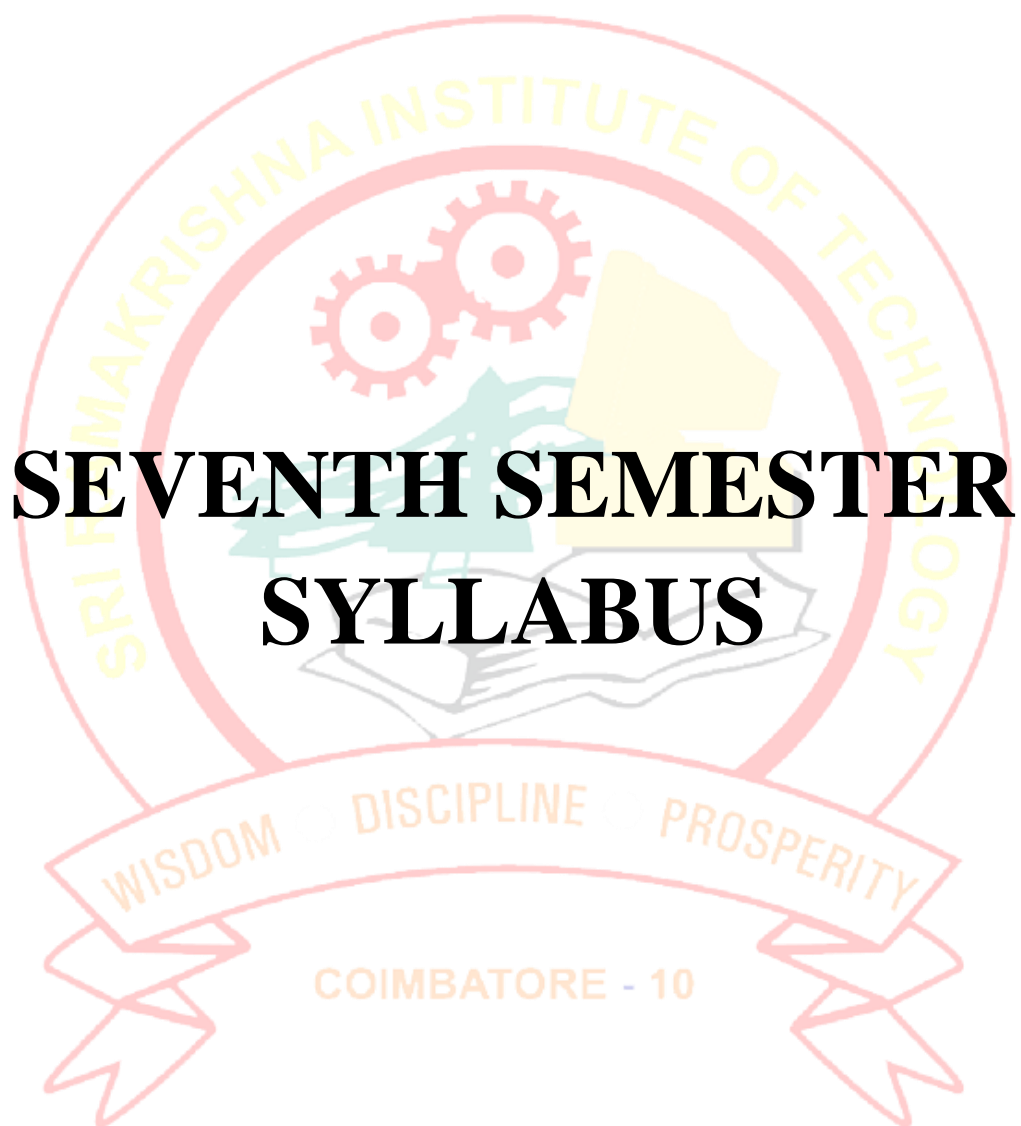
### Program Articulation matrix

UICH001	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	3	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3

## REFERENCES:

1. Harolld Kerzner, “Project Management- A systems approach to planning, Scheduling and Controlling”,10th edition, Wiley
2. Luc Chaput, “Project Design Strategic Information- A Process Approach” Presses de l’Universitie du Quebec, 2011
3. Sally Fincher, Marian Petre and Martyn Clark, “Computer Science Project Work-Principles and Pragmatics”, Springer, 2013
4. Anastasia Pagnoni, “Project Engineering-Computer Oriented Planning and Operational Decision Making, Springer-Verlag, 1st edition, 1990
5. Sandor Vajna, “Integrated Design Engineering-Interdisciplinary and Holistic Product Development”,Otto -von-Guericke-Universitat Magdeburg, Germany,2020
6. Martin Fischer, Howard Ashcraft, Dean Reed, Atul Khanzode, “Integrating Project Delivery”,Wiley, 2017





20IT021	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

The course will enable the student to learn the measures that protect and defend information and information systems by ensuring the various security services related to them. It also provides a deeper insight on the recent techniques and procedures used to safeguard information.

### COURSE CONTENT:

#### Symmetric Ciphers

9

The OSI Security Architecture – Attacks – Services – Security Mechanisms – Model for Network Security – Basic Concepts of Number Theory and Finite Fields - Symmetric Cipher Model: Cryptography, Cryptanalysis – Substitution Cipher: Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One-time Pad – Transposition techniques – Rotor Machines – Steganography – Stream Ciphers and Block Ciphers – The Feistel Cipher – Data Encryption Standard – Block Cipher Design Principles – Advanced Encryption Standard – Multiple Encryption and Triple DES – Block cipher modes of operation.

#### Asymmetric Ciphers

9

Prime Numbers – Fermat's and Euler's Theorem – Test for Primality – Chinese Remainder Theorem – Principles of Public Key Encryption – the RSA Algorithm – Diffie Hellman key exchange – Elgamal Cryptographic System – Elliptic Curve Arithmetic – Elliptic Curve Cryptography

## **Cryptographic Data Integrity Algorithms**

**9**

Hash Functions based on Cipher Block Chaining – Secure Hash Algorithm – SHA-3 – Message Authentication Requirements – Message Authentication Functions – Requirements for Message Authentication Codes – Security of MACs – MACs based on Hash functions: HMAC – MACs based on Block ciphers: DAA, CMAC – Authentication Encryption: CCM, GCM – Digital Signature: Properties, Attacks and Forgeries, Requirements – Elgamal Digital Signature Scheme – Schnorr Digital Signature Scheme – NIST Digital Signature Algorithm – Elliptic Curve Digital Signature Algorithm

## **Mutual Trust**

**9**

Symmetric key distribution using Symmetric and Asymmetric encryption – Distribution of Public keys – X.509 Certificates – Public-key infrastructure - Remote User-Authentication Principles - Remote User-Authentication Using Symmetric Encryption – Kerberos - Remote User-Authentication using asymmetric encryption - Federated Identity Management - Personal Identity Verification

## **Network and Internet Security**

**9**

Network Access Control - Extensible Authentication Protocol - Cloud Security Risks and Countermeasures – Data Protection in Cloud - Cloud Security as a Service - Web Security Considerations - Secure Sockets Layer - Transport Layer Security – HTTPS - Secure Shell (SSH) - Wireless Security - Mobile Device Security - IEEE 802.11i Wireless LAN Security - Pretty Good Privacy - S/MIME – IP Security

## **COURSE OUTCOMES:**

- CO1:** Ability to describe the concepts of risk, threats, vulnerabilities and attack vectors.
- CO2:** Ability to describe the architecture for public and private key cryptography and role of public key infrastructure (PKI) in network security.

**CO3:** Ability to identify the appropriate defense mechanisms and their limitations given a network threat.

**CO4:** Ability to identify the threats faced by non-wired networks.

**CO5:** Ability to apply appropriate known cryptographic techniques for a given scenario.

**CO6:** Ability to deploy data protection and security in a cloud environment.

#### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	-	-	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	-	3	3	-	-	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	-	3	3	-	-	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	-	3	3	-	-	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO5	-	3	3	-	-	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO6	-	3	3	-	-	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

#### Program Articulation matrix

201T021	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	-	-	3	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-

#### TEXT BOOKS:

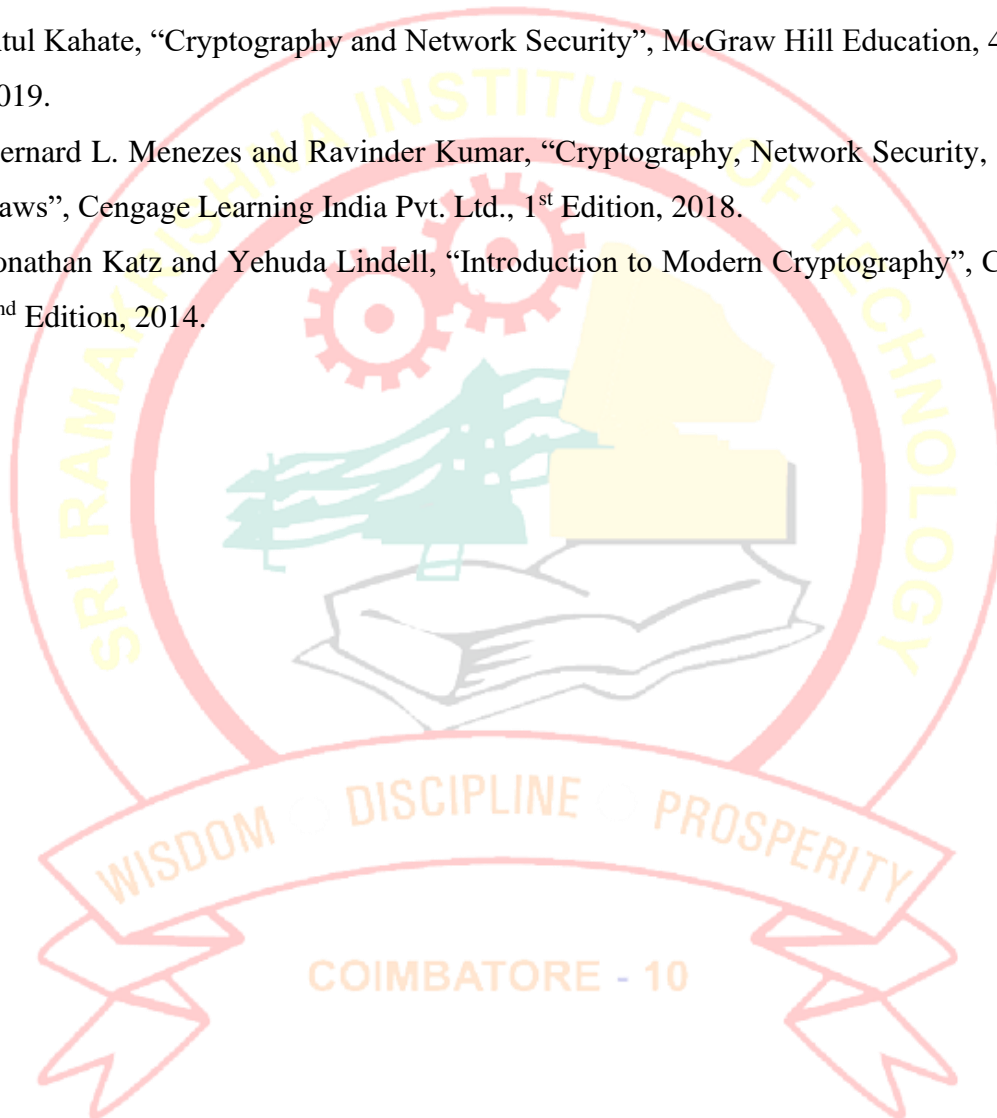
1. William Stallings, "Cryptography and Network Security - Principles and Practice", Pearson Education India, 7<sup>th</sup> Edition, 2017.



2. Behrouz A Forouzan and Debdeep Mukhopadhyay, “Cryptography and Network Security”, McGraw Hill, 3<sup>rd</sup> Edition, 2015.

## REFERENCES:

1. Atul Kahate, “Cryptography and Network Security”, McGraw Hill Education, 4<sup>th</sup> Edition, 2019.
2. Bernard L. Menezes and Ravinder Kumar, “Cryptography, Network Security, and Cyber Laws”, Cengage Learning India Pvt. Ltd., 1<sup>st</sup> Edition, 2018.
3. Jonathan Katz and Yehuda Lindell, “Introduction to Modern Cryptography”, CRC Press, 2<sup>nd</sup> Edition, 2014.



<b>20IT902</b>	<b>PROJECT PHASE - I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>6</b>	<b>3</b>

### **COURSE OBJECTIVE:**

- To allow students to complete research and / or development project via an individual work or team work.
- To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
- To develop the methodology to solve the identified problem.
- To enhance students skills pertaining to scientific and technical report writing and presentation.

### **COURSE CONTENT**

The student individually or in a group of 2 to 3 works on a specific topic approved by the project review committee constituted by the head of the department under the guidance of a faculty member who is familiar in this area of interest. The students can select any topic which is relevant to the area of Information Technology. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The progress of the project is evaluated based on a minimum of three reviews by the project review committee. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

### **COURSE OUTCOMES:**

**CO1:** Ability to understand the various phases in a project life cycle.

**CO2:** Ability to apply project management concepts and techniques for an IT project.

**CO3:** Ability to recommend an appropriate project management strategy.

**CO4:** Ability to apply appropriate cost management technique.

**CO5:** Ability to identify the risks relevant to an IT project.

## COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	3	2	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
CO2	-	3	3	3	3	3	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3
CO3	-	3	3	3	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3
CO4	-	3	3	3	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3
CO5	-	3	3	3	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3

## Program Articulation matrix

201T902	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO	-	3	3	3	3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3



20IT903	FINAL YEAR PROJECT	L	T	P	C
		0	0	16	8

### COURSE OBJECTIVE:

- To solve the identified problem based on the formulated methodology.
- To further develop students' skills to analyse and discuss the test results, and make conclusions.
- To enhance students' skills pertaining to scientific and technical report writing and presentation.

### COURSE CONTENT

The student should continue the Final Year Project Phase I work on the selected topic as per the formulated methodology under the same supervisor. The progress of the project be evaluated based on the report as well as by conducting a minimum of three reviews by the project review committee. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated through based on the report and the viva-voce examination by a panel of examiners including one external examiner.

### COURSE OUTCOMES:

**CO1:** Ability to demonstrate technical knowledge of the selected project topic.

**CO2:** Ability to conduct literature survey to locate for materials and sources relevant to the selected problem area and define problem statement

**CO3:** Ability to deploy the most suitable methodology for data collection and application development.

**CO4:** Ability to analyse the data and findings obtained through theoretical and experimental study.

**CO5:** Ability to evaluate the findings of the research and the achievement of the objectives.

**CO6:** Ability to prepare a scientific report in the form of a thesis to communicate the findings of the research.

### COs, POs, and PSOs - Articulation matrix

Course Outcome	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2		
CO1	-	3	3	3	2	2	-	-	2	-	1	-	-	-	-	3	-	-	3	3	3	3	3	3	2	3	2	-	2	2
CO2	-	3	3	3	3	3	-	-	2	-	3	-	-	2	-	3	-	-	2	3	3	3	3	3	3	3	2	-	2	3
CO3	-	3	3	3	3	3	-	-	3	-	3	-	-	3	-	3	-	3	3	3	3	3	3	3	3	3	2	-	2	3
CO4	-	3	3	3	3	3	-	-	3	-	3	3	-	3	-	3	-	3	3	3	3	3	3	3	3	3	2	-	2	3
CO5	-	3	3	3	3	3	-	-	3	-	3	3	-	3	-	3	-	3	3	3	3	3	3	3	3	3	2	-	2	3
CO6	-	3	3	3	3	3	-	-	3	-	3	3	-	3	-	3	-	3	3	3	3	3	3	3	3	3	2	-	2	3

### Program Articulation matrix

201T903	PO1		PO2		PO3			PO4			PO5			PO6		PO7		PO8		PO9		PO10			PO11		PO12		PSO 1	PSO 2	
	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC3	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC1	PC2	PC3	PC1	PC2	PC1	PC2			
CO	-	3	3	3	3	3	-	-	3	-	3	3	-	3	-	-	3	-	3	3	3	3	3	3	3	3	3	2	-	2	3







20ITP11	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To provide an insight on the basic concepts of python programming
- To obtain exposure on the syntactical representation used in python.
- To gain exposure on the data structures used in python.

## COURSE CONTENT

### Introduction to Python

9

Types and Operations - Introducing Python Statements - Assignments, Expressions - Print Operations - if Tests - while and for Loops

### Numeric and Strings

9

Numeric Type Basics - Numbers in Action - Other Numeric Types - Numeric Extensions - String Fundamentals - String Literals - Basic Operations - Indexing and Slicing - String Conversion Tools - String Methods - String Formatting Expressions - String Formatting Method Calls.

### Lists and Dictionaries

9

Lists - Basic List Operations - Indexing, Slicing, and Matrixes - Changing Lists in Place - Basic Dictionary Operations - Changing Dictionaries in Place - More Dictionary Methods, Tuples.

### File and Text Operations

9

The I/O Module - In-Memory Files - Compressed Files - The OS Module - File system Operations - Text Input and Output - Richer-Text I/O - Internationalization.

## Exceptions

9

The try Statement – With statement and context Managers – Exception propagation – raise statement – Exception objects – Custom exception classes.

## COURSE OUTCOMES:

- CO1:** Develop algorithmic solutions to simple computational problems
- CO2:** Decompose a Python program into functions.
- CO3:** Signify compound data using Python lists, tuples, dictionaries etc.
- CO4:** Read and write data from/to files in Python programs.

## TEXT BOOK:

1. Dusty Phillips, “Python 3 - Object-oriented Programming”, 3<sup>rd</sup> Edition, Packt Publishing Ltd., 2018.

## REFERENCES

1. Mark Alex Martelli, Anna Ravenscroft and Steve Holden, “Python in a Nutshell”, 3<sup>rd</sup> Edition , O’Reilly publishing
2. Mark Lutz, “Learning Python”, 5<sup>th</sup> Edition, O’Reilly publishing, 2013.
3. Vernon L. Ceder , “The Quick Python Book”, 3<sup>rd</sup> Edition, Manning Publications, Jan 2018.
4. Jeffrey Elkner, Peter Wentworth, Allen B. Downey, and Chris Meyers, “Think Python: How to Think Like a Computer Scientist”, 3<sup>rd</sup> Edition, O’Reilly Publishers, 2020.

<b>20ITP12</b>	<b>ADVANCED JAVA PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE OBJECTIVES**

- Provide a complete foundation to the students on the concepts, precepts and practices.
- To study the concepts of server-side programming in java.
- To study the concepts of java database programming in the application.

## **COURSE CONTENT**

### **Java Applets and Beans**

**9**

Applets and HTML – Bean Concepts – Events in Bean Box – Bean Customization and Persistence – JavaScript –Combining Scripts and Applets – Applets over web - Animation techniques – Animating images.

### **Advanced Networking**

**9**

Client- Server computing – Sockets – Content and Protocols handlers – Developing distributed applications –RMI – Remote objects – Object serialization.

### **Server-Side Programming**

**9**

Introduction to Java Servlets – Overview and Architecture – Handling HTTP get & post request –Session Tracking – Multi-tier application - Implicit objects – Scripting – Standard actions – Directives – Custom Tag libraries.

### **Java Database Programming**

**9**

Connecting to Databases – JDBC principles – Database access – Interacting – Database search – Accessing Multimedia databases – Database support in Web applications.

## Related Java Techniques

9

Media Techniques - 3D graphics – JAR file format and creation – Internationalization – Swing Programming – Advanced Java Scripting Technique.

## COURSE OUTCOMES:

**CO1:** Ability to create desktop applications with Database connectivity and Swing

**CO2:** Ability to develop network applications with socket programming.

**CO3:** Ability to demonstrate the RMI architecture and its applications.

**CO4:** Ability to design server side programs with JSP and Servlets.

## TEXT BOOKS:

1. Herbert Schildt, “Java: The Complete Reference”, 11<sup>th</sup> Edition, McGraw-Hill Publications, 2019.
2. Cay S. Horstmann, Gary Cornell, “Core Java Volume –II Advanced Features”, Pearson Education, 11<sup>th</sup> Edition, 2019.

## REFERENCES

1. Deital and Deital, Goldberg, “Internet & World Wide Web, How to Program”, 4<sup>th</sup> Edition, Pearson Education, 2009.
2. Deitel M. and Deitel P.J., “Java how to program” , 11<sup>th</sup> Edition, Pearson Education, 2017.
3. Duane A. Bailey, “Java Structures”, McGraw-Hill Higher Education, 7<sup>th</sup> edition, 2007.

<b>20ITP13</b>	<b>UNIX INTERNALS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE OBJECTIVES**

- To understand UNIX architecture and familiarise with UNIX environment.
- Be able to know the basic internal structure, operations of UNIX OS and develop system programs using system calls.

## **COURSE CONTENT**

### **Introduction to UNIX OS**

**10**

History - System structure – Introduction to the Kernel - Architecture System Concepts - Kernel Data Structures -Internal Representation of Files - System Calls.

### **Buffers**

**12**

Buffers – Buffer header-Structure of buffer pool- Scenarios for retrieval of a buffer, reading and writing disk blocks- System representation – inodes – directories - super block. Implementation of Systems Calls- Open, read, write. File and record locking- Mounting and unmounting of files- Link, unlink, file abstractions, maintenance.

### **UNIX Process Management**

**COIMBATORE - 10**

**12**

The System Representation of Processes – States – Transitions - System Memory - Context of a Process - Saving the Context - Manipulation of a Process Address Space - Sleep Process Control – signals - Process Termination – Awaiting - Invoking other Programs - INIT Process - Process Scheduling - System Calls For Time – Clock.

## Drivers and IPC

11

I/O Subsystem - Driver Interfaces - Disk Drivers - Terminal Drivers – Streams – Inter process Communication - Process Tracing - System V IPC - Network Communications – Sockets.

## COURSE OUTCOMES:

- CO1:** Ability to describe the architecture and features of UNIX Operating System.
- CO2:** Ability to distinguish it from other Operating System.
- CO3:** Ability to Demonstrate UNIX commands for file handling and process control.
- CO4:** Ability to build an application/service over a Unix system.

## TEXT BOOKS:

1. Maurice J. Bach, “Design of the Unix Operating System”, 1<sup>st</sup> Edition, Pearson Education, 2015.
2. Uresh Vahalia, “UNIX Internals: The New Frontiers”, Prentice Hall, 2010.

## REFERENCES

1. Steve D. Pate, “UNIX File systems: Evolution, Design, and Implementation”, John Wiley & Sons, 2013.
2. John Lion, “Lion’s Commentary on UNIX”, 6<sup>th</sup> edition, Peer-to-Peer Communications, 2004.
3. Daniel P. Bovet & Marco Cesati, “Understanding the Linux Kernel”, O’REILLY, Shroff Publishers & Distributors Pvt. Ltd, 2000.



<b>20ITP14</b>	<b>C# AND .NET FRAMEWORK</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE OBJECTIVES**

- Learn the basic programming concepts in C#.
- Study the advanced concepts in data connectivity, WPF, WCF and WWF with C# and .NET 4.5.
- Obtain knowledge on development of mobile applications using .Net compact framework

## **COURSE CONTENT**

### **C# Language Basics**

**15**

Net Architecture - Core C# - Variables - Data Types - Flow control - Objects and Types  
Classes and Structs - Inheritance- Generics - Arrays and Tuples - Operators and Casts -  
Indexers - Delegates - Lambdas - Lambda Expressions - Events - Event Publisher - Event  
Listener - Strings and Regular Expressions.

### **Base Class Libraries and Data Manipulation**

**15**

Diagnostics -Tasks, Threads and Synchronization - .Net Security - Localization -  
Manipulating XML- SAX and DOM - Manipulating files and the Registry- Transactions -  
ADO.NET- Peer-to-Peer Networking - PNRP - Building P2P Applications - Windows  
Presentation Foundation (WPF).

### **. Net Framework and Compact Framework**

**15**

Assemblies - Shared assemblies - Custom Hosting with CLR Objects - Appdomains -  
Core XAML - Bubbling and Tunneling Events- Reading and Writing XAML - .Net  
Compact Framework - Compact Edition Data Stores – Errors, Testing and Debugging –

Optimizing performance – Packaging and Deployment – Networking and Mobile Devices.

### **COURSE OUTCOMES:**

**CO1:** Ability to understand the concept of .NET Framework.

**CO2:** Ability to analyze the basic structure of a C# application

**CO3:** Ability to Design and develop Web based applications on .NET

### **TEXT BOOK:**

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner, “Professional C# 2012 and .NET 4.5”, 1<sup>st</sup> Edition, Wiley, 2012

### **REFERENCES**

1. Harsh Bhasin, Programming in “Programming in C#”, 1<sup>st</sup> Edition, Oxford University Press, 2014.
2. Ian Gariffiths, Mathew Adams, Jesse Liberty, “Programming C# 4.0”, 6<sup>th</sup> Edition, O’Reilly, 2010.
3. Andrew Troelsen, “Pro C# 5.0 and the .NET 4.5 Framework”, 6<sup>th</sup> Edition, Apress publication, 2012.
4. Andy Wigley, Daniel Moth, Peter Foot, “Mobile Development Handbook”, 1<sup>st</sup> Edition, Microsoft Press, 2011.

<b>20ITP15</b>	<b>PROGRAMMING WITH OPEN SOURCE SOFTWARE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE OBJECTIVES**

- Be exposed to the context and operation of the Linux Operating System.
- Learn scripting language like PHP
- Learn some important open source webserver and database tools

## **COURSE CONTENT**

### **Linux Shell Programming**

**9**

Introduction to Linux Shell – Shell commands – passing arguments – decisions – recursion – reading and writing data

### **Apache Web server**

**12**

Introduction to Apache web server – Allowing HTTP server through firewall – Using Non-SSL and SSL installations – configuring httpd.conf – apache virtual hosts – directory listing – local directory configuration using .htaccess.

### **MySQL**

**12**

Flat file system vs Databases – installing MySQL – Creating Database – Creating Tables- SQL Queries – DDL – DML - TCL.

### **PHP**

**12**

PHP – Operators and flow control – strings and arrays – functions- reading data in web pages – browser handling functions- working with forms and databases.

## **COURSE OUTCOMES:**

**CO1:** Ability to create shell programs in the Linux Operating System.

**CO2:** Ability to configure Apache webserver based on enterprise needs.

**CO3:** Ability to design databases and use SQL queries to store and process data in a database management system using MySQL.

**CO4:** Ability to write programs for applications using PHP scripting language.

## **TEXT BOOKS:**

1. Stephen G. Kochan, Patrick, "Shell Programming in Unix, Linux and OS X", 4<sup>th</sup> Edition, Pearson, 2016.
2. Steven Holzner, "PHP: The Complete Reference", McGraw Hill, 2017.
3. Julie C. Meloni, "Sams Teach Yourself PHP, MySQL and Apache All in One", 5<sup>th</sup> Edition, Sams, 2012.
4. Eric Rosebrock, Eric Filson, "Setting up LAMP: Getting Linux, Apache, MySQL, and PHP Working Together", Wiley, 2006.

20ITP16	TRANSLATORS AND SYSTEM SOFTWARE	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

The course will enable the student to learn the various system software and translators that are used for the appropriate functioning of a system.

### **COURSE CONTENT:**

#### **Introduction 9**

System software and machine architecture – The Simplified Instructional Computer (SIC) - Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming.

#### **Assemblers 9**

Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers - Implementation example - MASM assembler.

#### **Loaders and Linkers 9**

Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features – Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker.

## Macro processors

9

Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters-Macro within Macro-Implementation example - MASM Macro Processor – ANSI C Macro language.

## System Software Tools

9

Text editors - Overview of the Editing Process - User Interface – Editor Structure. - Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria.

## COURSE OUTCOMES:

- CO1:** Ability to understand the relationship between system software and machine architecture.
- CO2:** Ability to understand the working of assemblers, linkers, and loaders.
- CO3:** Ability to understand the functionalities of Macro processors and other system software tools.

## REFERENCES:

1. Leland L. Beck, “System Software – An Introduction to Systems Programming”, 3rd Edition, Pearson Education Asia, 2012
2. D. M. Dhamdhere, “Systems Programming and Operating Systems”, Second Revised Edition, Tata McGraw-Hill, 2000.
3. John J. Donovan “Systems Programming”, Tata McGraw-Hill Edition, 2000.
4. John R. Levine, Linkers & Loaders – Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000



20ITP17	INTRODUCTION TO ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

- This course aims to learn and understand the basic fundamentals of Intelligent agents, different strategies in AI, Knowledge in solving AI problems, different ways of designing software agents and various applications in AI

### COURSE CONTENT:

#### Introduction

9

Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

#### Problem-Solving Methods

9

**Problem-solving** Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games.

#### Knowledge Representation

9

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information

#### Software Agents

9

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.



## Applications

9

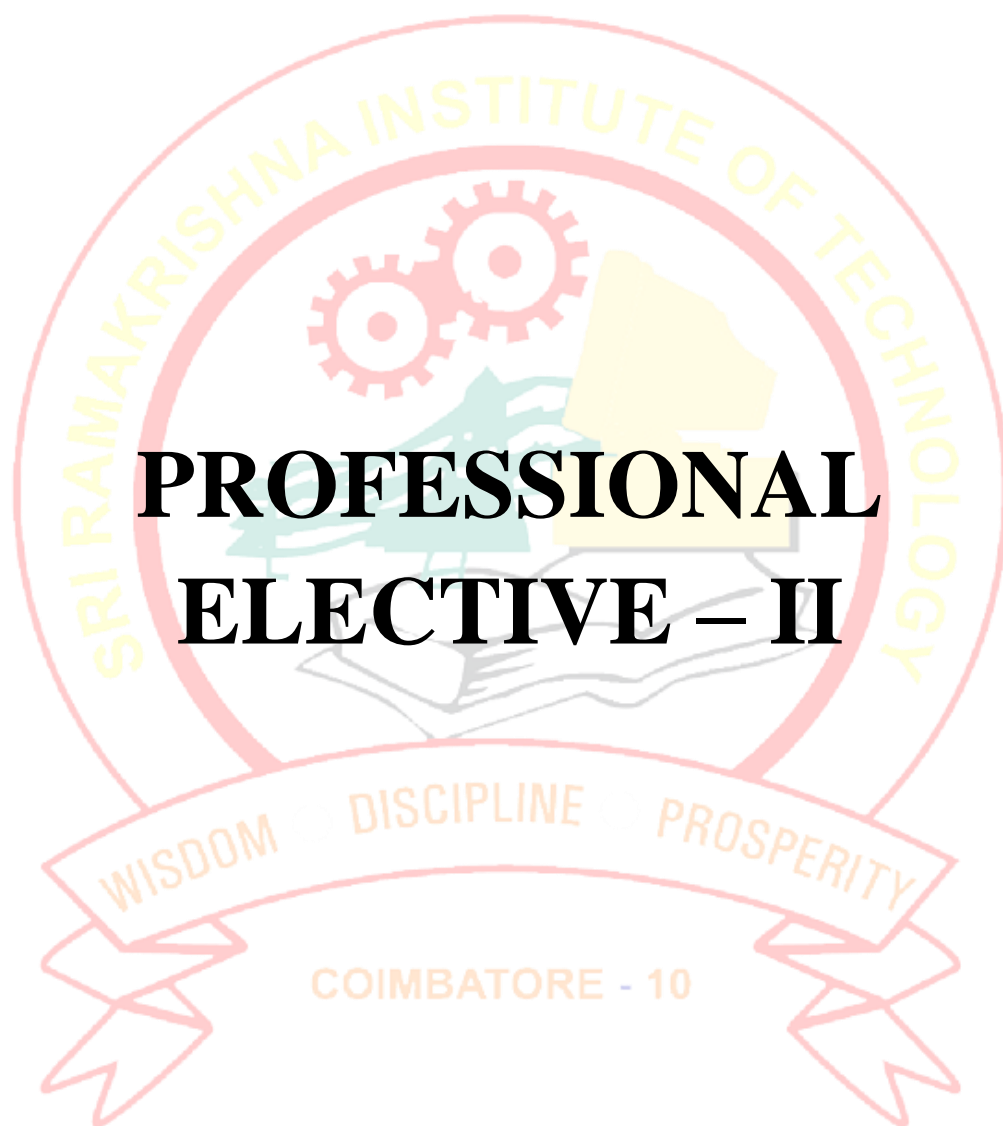
AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving

### TEXT BOOK:

- 1.S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2. I. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

### REFERENCES:

1. M. Tim Jones, "Artificial Intelligence: A Systems Approach(Computer Science)", Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009. 3. William F. Clocksin and Christopher S. Mellish," Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.
4. Gerhard Weiss, "Multi Agent Systems", Second Edition, MIT Press, 2013.
5. David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.



<b>20ITP21</b>	<b>DISTRIBUTED SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE CONTENT:**

### **Introduction and Architectures**

Definition of a Distributed System-Goals -Making Resources -Accessible -Distribution Transparency -Openness -Scalability - Pitfalls - Distributed Computing Systems - Distributed Information Systems - Distributed Pervasive Systems – Architectural styles- System architectures- Centralized Architectures -Decentralized Architectures - Hybrid Architectures.

### **Processes and Communication**

Threads - Introduction to Threads - Threads in Distributed Systems - The Role of Virtualization in Distributed Systems - Architectures of Virtual Machines - Networked User Interfaces -Client-Side Software for Distribution Transparency -General Design Issues -Server Clusters -Managing Server Clusters -Approaches to Code Migration -Migration and Local Resources -Migration in Heterogeneous Systems.

### **Communication**

Layered Protocols - Types of Operation - Parameter Passing -Asynchronous RPC - Example: DCE RPC - Message-Oriented Transient Communication - Message-Oriented Persistent Communication - Example: ffiM's WebSphere Message-Queuing System. - Support for Continuous Media -Streams and Quality of Service -Stream Synchronization -Application-Level Multicasting - Gossip-Based Data Dissemination.

Communication - Basic RPC

### **Synchronization and Distributed file systems**

Clock synchronization -Physical Clocks - Global Positioning System -Clock Synchronization Algorithms – Logical Clocks -Lamport's Logical Clocks - Vector Clocks. - Architecture- Client-Server -Architectures -Cluster-Based Distributed File Systems- Symmetric Architectures.

### **Distributed Web-based Systems**

Architecture -Traditional Web-Based Systems- Web Services -Clients -The Apache Web Server - Web Server Clusters - Hypertext Transfer Protocol - Simple Object Access Protocol – Naming – Synchronization - Web Proxy Caching - Replication for Web Hosting Systems - Replication of Web Applications.

### **TEXT BOOK:**

1. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2<sup>nd</sup> Edition, 2015.

### **REFERENCES:**

1. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, 5<sup>th</sup> Edition, Pearson Education, 2017.
2. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
3. Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.
4. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA, 2003.

20ITP22	MOBILE COMPUTING	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

- Learn the basics of mobile telecommunication system.
- Understand Wireless LAN, Bluetooth and WiFi Technologies.
- Be familiar with the network protocol stack.

### **COURSE CONTENT:**

#### **Introduction**

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies-MAC Protocols – SDMA- TDMA- FDMA- CDMA.

#### **Mobile Telecommunication System**

GSM – Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security –GPRS- UMTS- Architecture.

#### **Wireless Networks**

Wireless LANs and PANs – IEEE 802.11 Standard – Architecture – Services – Blue Tooth- Wi-Fi – WiMAX.

#### **Mobile Network Layer**

Mobile IP – DHCP – AdHoc– Proactive and Reactive Routing Protocols – Multicast Routing Vehicular Ad Hoc networks ( VANET) –MANET Vs VANET – Security.

#### **Mobile Transport and Application Layer**

Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA  
Architecture – WML.

**TEXT BOOK:**

1. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt. Ltd, New Delhi - 2012.

**REFERENCES:**

1. Jochen H. Schller, “Mobile Communications”, 2<sup>nd</sup> Edition, Pearson Education, New Delhi, 2007.
2. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
3. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007. ISBN: 0195686772.
4. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
5. Android Developers : <http://developer.android.com/index.html>
6. Apple Developer : <https://developer.apple.com/>
7. Windows Phone Dev Center : <http://developer.windowsphone.com>
8. BlackBerry Developer : <http://developer.blackberry.com>

20ITP23	COMMUNICATION SWITCHING TECHNIQUES	L	T	P	C
		3	0	0	3

### Course Objectives

- Learn switching, signaling and traffic in the context of telecommunication network.
- Exposure towards the evolution of switching systems from manual and electro mechanical systems to stored-program-controlled digital systems.
- Study signaling, packet switching and networks.

### COURSE CONTENT:

#### Multiplexing

Transmission Systems - FDM - TDM - Line Coding - SONET/SDH: SONET Multiplexing Overview- SONET Frame Formats - SONET Operations - Administration and Maintenance - Payload Framing and Frequency Justification - Virtual Tributaries - DS3 Payload Mapping - E4 Payload Mapping - SONET Optical Standards - SONET Networks - SONET Rings: Unidirectional Path-Switched Ring - Bidirectional Line-Switched Ring.

#### Digital Switching

Switching Functions - Space Division Switching - Time Division Switching - Two - Dimensional Switching: STS Switching - TST Switching - No-4 ESS Toll Switch- Digital Cross - Connect Systems - Digital Switching in an Analog Environment- Elements of SSN07 signaling. Signal Exchanges-State Transition Diagrams- Stored Program Control.

#### Network Synchronization Control and Management

Timing: Timing Recovery: Phase - Locked Loop- Clock Instability - Jitter Measurements - Systematic Jitter -Timing Inaccuracies: Slips - Asynchronous Multiplexing - Network Synchronization - Network Control-Network Management.

#### Digital Subscriber Access



ISDN: ISDN Basic Rate Access Architecture - ISDN U Interface - ISDN D Channel Protocol - High - Data -Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line - VDSL - Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems - Integrated Digital Loop Carrier Systems – Next Generation Digital Loop Carrier - Fiber in the Loop - Hybrid Fiber Coax Systems.

## **Networks**

Introduction-Analog Networks-Integrated Digital Networks-Integrated Services Digital Networks-Cellular Radio Networks-Intelligent Networks-Private Networks-Charging-Routing General-Automatic Alternative Routing.

## **TEXT BOOK:**

1. Flood J.E., 'Telecommunications switching traffic and networks', Pearson education India, 2011.

## **REFERENCES:**

1. John.C. Bellamy, 'Digital Telephony', John Wiley & Sons, 3rd edition, 2009.
2. Behrouz A. Forouzan, "Data Communications and Networking," TMH, 5th Edition, 2012.
3. William Stallings, "Data and Computer Communications", 10th Edition 2014.
4. Viswanathan.T., 'Telecommunication Switching System and Networks', Prentice Hall of India Ltd., 2015.

20ITP24	AD HOC AND SENSOR NETWORKS	L	T	P	C
		3	0	0	3

### Course Objectives:

- To understand the fundamental concepts of Ad-hoc & Sensor Networks.
- To learn different types of protocols pertaining to Network and Transport layers.
- To understand the issues in establishment and efficient management of Ad-hoc and sensor networks.
- To understand the nature and applications of Ad-hoc and sensor networks.

### Introduction

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel- Ad Hoc Networks= Applications of Ad Hoc Wireless Networks- Issues in ad hoc wireless networks.

### MAC Protocols for Ad Hoc Wireless Networks

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols-Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms- Multi Channel MAC Protocol.

### Routing Protocols in Ad Hoc Wireless Networks

Issues in designing a routing protocol for Ad hoc networks- -classification of routing protocols - proactive routing, reactive routing (on-demand), hybrid routing.

### Transport Layer Protocols in Ad Hoc Wireless Networks

Issues in designing a transport layer protocol for Ad hoc networks- - design goals of a transport layer protocol for Ad hoc wireless networks - Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks

### Wireless Sensor Networks (WSNs) and MAC Protocols

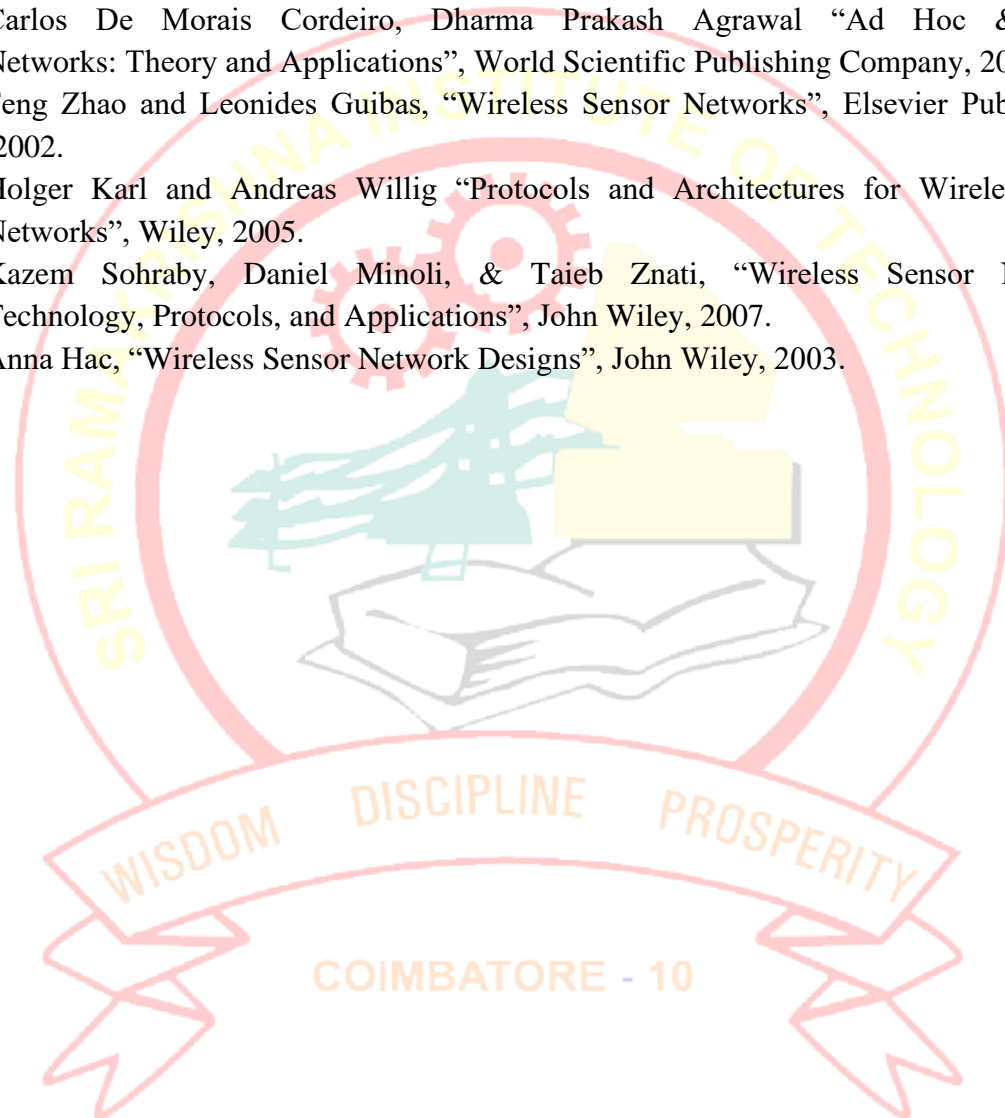
Applications of sensor networks – Issues and challenges in designing a sensor network – sensor network architecture – Data Dissemination – Data Gathering – MAC protocols for sensor networks: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- Location Discovery – Quality of a sensor network.

**TEXT BOOK:**

1. C. Siva Ram Murthy, and B. S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols”, Prentice Hall Professional Technical Reference, 2012.

**REFERENCES:**

1. Carlos De Moraes Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, “Wireless Sensor Networks”, Elsevier Publication – 2002.
3. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005.
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, and Applications”, John Wiley, 2007.
5. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.



20ITP25	SOFTWARE DEFINED NETWORKS	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVES:**

- To learn the fundamentals of software defined networks.
- To understand the separation of the data plane and the control plane.
- To study about the SDN Programming.
- To study about the various applications of SDN

### **COURSE CONTENT:**

#### **Introduction**

History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Data Planes.

#### **Open Flow & SDN Controllers**

Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts.

#### **Data Centers**

Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE.

#### **SDN Programming**

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications.

## **SDN**

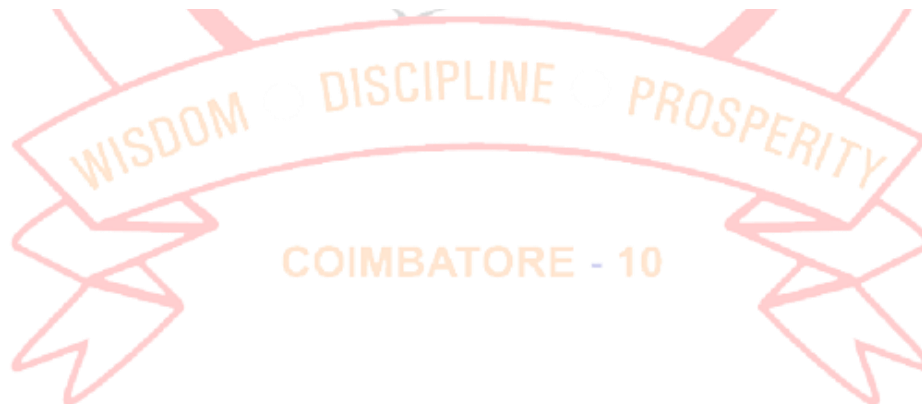
Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration.

### **TEXT BOOK:**

1. Paul Goransson and Chuck Black, —Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.

### **REFERENCES:**

1. Thomas D. Nadeau, Ken Gray, —SDN: Software Defined Networks, O'Reilly Media, 2013.
2. Siamak Azodolmolky, —Software Defined Networking with Open Flow, Packet Publishing, 2013.
3. Vivek Tiwari, —SDN and Open Flow for Beginners, Amazon Digital Services, Inc., 2013.
4. Fei Hu, Editor, —Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.



20ITP26	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

To know the background of classical computing and quantum computing.

- To learn the fundamental concepts behind quantum computation.
- To study the details of quantum mechanics and the relation to computer science.
- To gain knowledge about the basic hardware and mathematical models of quantum computation.
- To learn the basics of quantum information and the theory behind it.

### COURSE CONTENT:

#### Fundamental Concepts

Global Perspectives – Quantum Bits – Quantum Computation – Quantum Algorithms – Experimental Quantum Information Processing – Quantum Information.

#### Quantum Mechanics and Overview of Computational Models

Quantum Mechanics: Linear Algebra – Postulates of Quantum Mechanics – Application: Superdense Coding – Density Operator – The Schmidt Decomposition and Purifications – EPR and the Bell Inequality – Computational Models: Turing Machines – Circuits – Analysis of computational Problems.

#### Quantum Computation

Quantum Circuits: Quantum Algorithms – Universal Quantum Gates – Quantum Circuit- Model of Computation – Simulation – Quantum Fourier Transform and Applications – Quantum Search Algorithms – Quantum Computers.

#### Quantum Information



Quantum Noise and Quantum Operations: Classical Noise and Markov processes –Quantum Operations – Examples – Applications – Distance Measures for Quantum Information – Quantum Error Correction – Entropy.

### **Quantum Information Theory**

Quantum States and Accessible Information – Data Compression – Classical Information over Noisy Quantum Channels – Quantum Information over Noisy Quantum Channels – Entanglement as a Physical Resource – Quantum Cryptography.

### **TEXT BOOK:**

1. Michael A. Nielsen, Issac L. Chuang, “Quantum Computation and Quantum Information”, Tenth Edition, Cambridge University Press, New Delhi , 2014.

### **REFERENCES:**

1. David Memohan, “ Quantum Computing Explained”, Wiley India Pvt Ltd, New Delhi,2017.
2. David J.Griffiths, “Introduction to Quantum Mechanics”, 2nd edition, Cambridge university press, New Delhi, 2016.
3. Scott Aaronson, “Quantum Computing Since Democritus”, Cambridge University Press, 2013.
4. N. David Mermin, “Quantum Computer Science: An Introduction”, Cambridge University Press, 2007.



<b>20ITP42</b>	<b>DATA MINING AND DATA WAREHOUSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques.

### **COURSE CONTENT:**

#### **Data Warehousing and On-Line Analytical Processing**

Introduction - Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Multidimensional Data Model – Data Warehouse Schemas for Decision Support - Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.

#### **Data Mining**

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications - Data Pre-processing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

#### **Frequent Pattern Analysis**

Mining Frequent Patterns, Associations and Correlations – Mining Methods - Pattern Evaluation Method – Pattern Mining in Multilevel, Multi-Dimensional Space – Constraint Based Frequent Pattern Mining.

#### **Classification**

Introduction to Classification - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy.

## **Clustering**

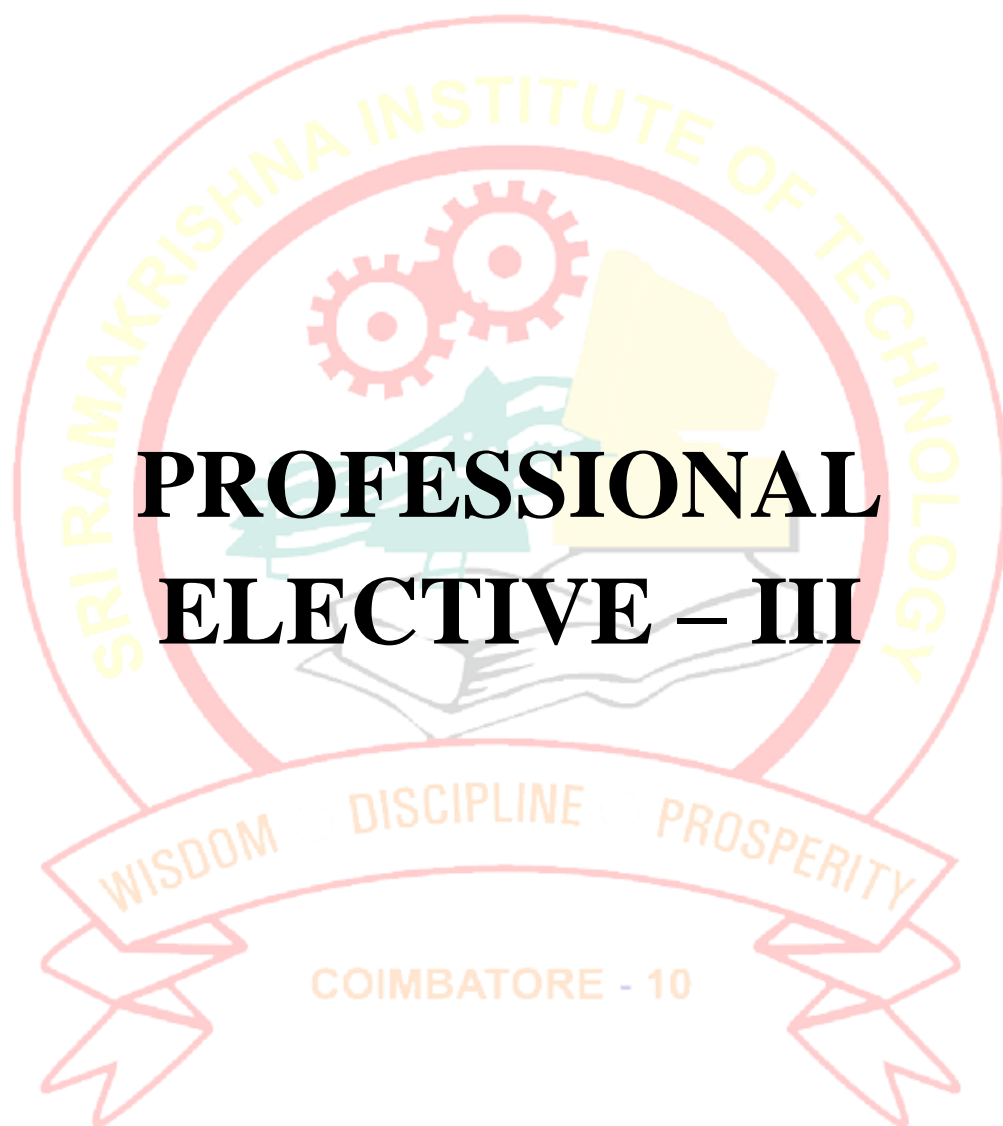
Introduction to Clustering Techniques – Cluster analysis - Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.

### **TEXT BOOK:**

1. Alex Berson and Stephen J.Smith, —Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill Edition, 35th Reprint 2016.

### **REFERENCES:**

1. K.P. Soman, Shyam Diwakar and V. Ajay, —Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.
2. Ian H.Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.
3. Jiawei Han and Micheline Kamber, —Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.



20ITP31	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- To learn concepts of degradation function and restoration techniques.
- To study the image segmentation and representation techniques.
- To become familiar with image compression and recognition methods

### COURSE CONTENT:

#### Digital Image Fundamentals

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms -DFT, DCT.

#### Image Enhancement

Spatial Domain: Gray level transformations – Histogram Equalization-Histogram matching – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering.

#### Image Restoration

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

### **Image Segmentation**

Edge detection, Edge linking via Hough transform – Thresholding – global thresholding- adaptive thresholding – histogram based thresholding selection- Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

### **Image Compression and Recognition**

Need for data compression, Huffman, Run Length Encoding, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature.

### **TEXT BOOK:**

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Pearson, Fourth Edition, 2018.

### **REFERENCES:**

1. Anil K. Jain, 'Fundamentals of Digital Image Processing', Pearson, 2015.
2. Kenneth R. Castleman, 'Digital Image Processing', Pearson, 2006.
3. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, 'Digital Image Processing using MATLAB', Pearson Education, Inc., 2017.
4. William K. Pratt, 'Introduction to Digital Image Processing, CRC press, 2013, John Wiley, New York, 2002
5. S.Jayaram, S.Esakkirajan, T.Veerakumar, "Digital Image Processing", McGrawHill, Second Edition, 2020.

20ITP32	PATTERN RECOGNITION	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

- To learn and understand the basic fundamentals of pattern recognition, classifiers, feature selection algorithms, neural network architectures and support vector machines using real time applications.

### **COURSE CONTENT:**

#### **Introduction**

Overview of Pattern Recognition – Representation: Data Structures for Pattern Representation - Proximity measures – size of pattern – feature selection.

#### **Classifier**

Nearest Neighbour Algorithm - Variants of the NN Algorithm - Bayes Classifier - Naive Bayes Classifier- Bayesian Belief Network.

#### **Feature Extraction and Selection**

Feature extraction: Fisher's Linear Discriminant - Principal Component Analysis (PCA) - Feature Selection - Prototype Selection.

#### **Hidden Markov Models and Support Vector Machines**

Hidden Markov Models - Classification Using HMMs- Decision Tree: Decision Trees for Pattern Classification- Construction of Decision Trees - Support Vector Machines: Linear Discriminant Functions- Learning the Linear Discriminant Function- Neural Networks- SVM for Classification.

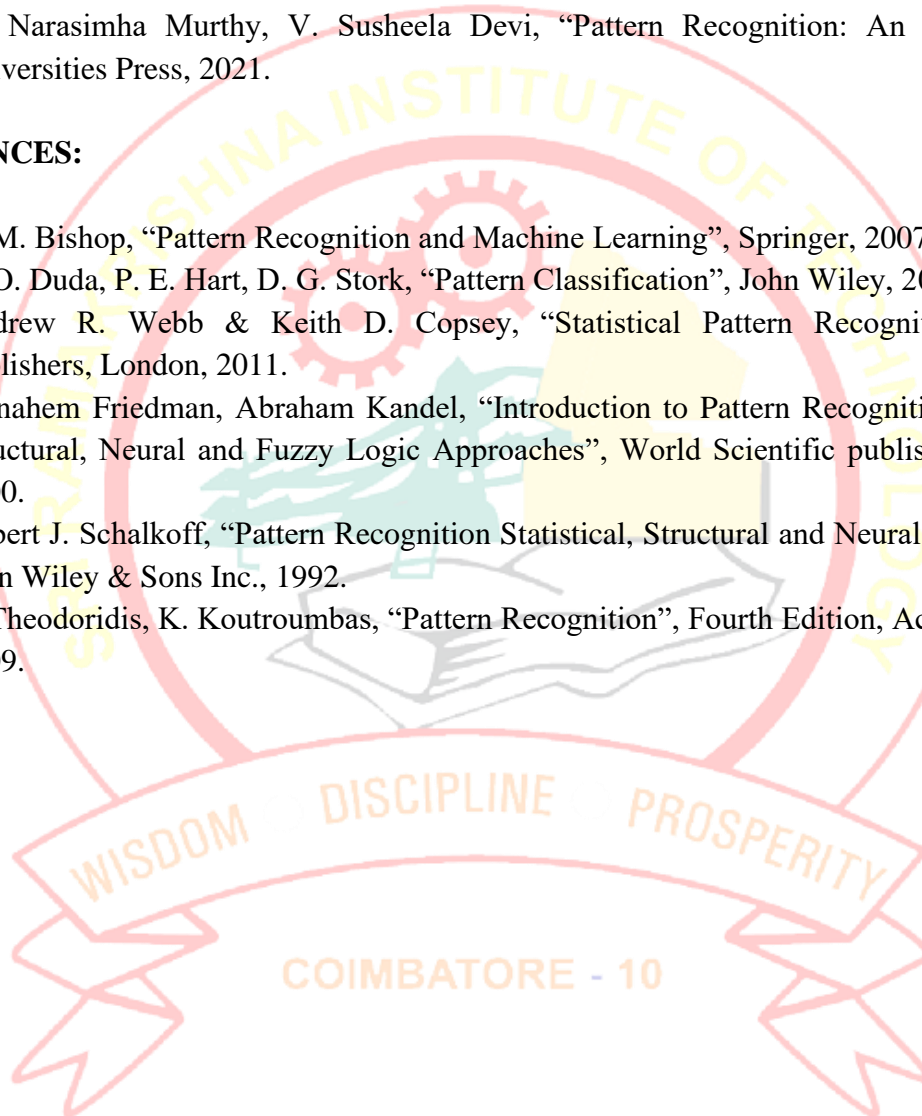
#### **Clustering**

**TEXT BOOK:**

1. M. Narasimha Murthy, V. Susheela Devi, “Pattern Recognition: An Introduction”, Universities Press, 2021.

**REFERENCES:**

1. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2007.
2. R. O. Duda, P. E. Hart, D. G. Stork, “Pattern Classification”, John Wiley, 2001.
3. Andrew R. Webb & Keith D. Copsey, “Statistical Pattern Recognition”, Arnold publishers, London, 2011.
4. Menahem Friedman, Abraham Kandel, “Introduction to Pattern Recognition Statistical, Structural, Neural and Fuzzy Logic Approaches”, World Scientific publishing Co. Ltd, 2000.
5. Robert J. Schalkoff, “Pattern Recognition Statistical, Structural and Neural Approaches”, John Wiley & Sons Inc., 1992.
6. S. Theodoridis, K. Koutroumbas, “Pattern Recognition”, Fourth Edition, Academic Press, 2009.





20ITP33	USER EXPERIENCE DESIGN	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVE:

- To understand the concepts of user experience design skills and applications of specific methods in problem solving.

## COURSE CONTENT:

### Introduction

Rectangular Representation – Intersecting Code and Design - Components and Patterns - Divide and Conquer – Dividing Page – Design Hierarchy - Page Chunks – Sketching to Code – Varying Components – Variation through Pictures and Words.

### Design

Assembling Pages - Common Combos – Implementation – Disadvantages of Embedded Art Work – Dynamic Design - Reuse in Design Software – Linked Files.

### Documentation

9

Unifying Design and Documentation – Need for Documentation – Components of Documentation - Turning Projects into Standards - Need for Library – Discovery Approaches – Scope of Library – Value - Component Catalog – Categories – Variations – Codes – Names – Keywords.

### Tools and Development

Tools – Templates – Styles – Conventions – Roles – Build Files - Pages and Elements – Packaging – Role of Librarian – Life of a Component - Updating the Library – Publishing- Inputs and Feedback - Documenting a Library - Standardizing Components – Planning– Pacing –

Pilots - Live Training - Post-Launch Training Activities – Planning – Preparation - Design and Document – Development – Standardization.

### **User Experience**

Creating more interactive views- Pros and cons of responsive design-making websites mobile-friendly.

### **TEXT BOOK:**

1. Dino Esposito, “Modern Web Development: Understanding domains, technologies, and user experience”, Microsoft Press, 2016.

### **REFERENCES:**

1. Nathan Curtis, “Modular Web Design - Creating Reusable Components for User Experience Design”, Pearson Education, 2010, ISBN: 978-0321601353.
2. Richard Banfield, “Design Leadership”, O'Reilly, 2016, ISBN: 978-9352132935.
3. Buxton, B. Sketching “User Experiences: Getting the Design Right and the Right Design”. Morgan Kaufmann, (2007).

20ITP34	COMPUTER GRAPHICS AND MULTIMEDIA	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

- To become familiar with various software programs used in the creation and implementation of multimedia and design practice. To gain knowledge of 2D, 3D graphics and their transformations.

### **COURSE CONTENT:**

#### **Illumination and Color Models**

Light sources — basic illumination models — halftone patterns and dithering techniques; Properties of light — Standard primaries and chromaticity diagram; Intuitive colour concepts — RGB colour model — YIQ colour model — CMY colour model — HSV colour model — HLS colour model; Colour selection. 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.

#### **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.

#### **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.

## **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.

## **Hypermedia**

Multimedia authoring and user interface — Hypermedia messaging -Mobile messaging – Hypermedia message component – Creating hypermedia message.

## **TEXT BOOK:**

1. Donald Hearn and Pauline Baker M, —Computer Graphics C Version ", Pearson, 2nd Edition,2018.
2. Andleigh, P. K and Kiran Thakrar, —Multimedia Systems and Design, Pearson,2015.

## **REFERENCES:**

1. Judith Jeffcoate, —Multimedia in practice: Technology and Applications, PHI, 1998.
2. Foley, Vandam, Feiner and Hughes, —Computer Graphics: Principles and Practicel, 2nd Edition, Pearson Education, 2003.
3. Jeffrey McConnell, —Computer Graphics: Theory into Practice, Jones and Bartlett Publishers,2006.Hill F S Jr., "Computer Graphics", Maxwell Macmillan , 1990.

20ITP35	GAME PROGRAMMING	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

- To understand the concept of game design and development also to learn the processes, mechanics and issues in game design. To Know about Game programming platforms, frame works and engines. Learn to develop games.

### **COURSE CONTENT:**

#### **3D Graphics for Game Programming**

3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Physics-based Simulation, Scene Graphs.

#### **Game Engine Design**

Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.

#### **Game Programming**

Application layer, Game logic, Game views, managing memory, controlling the main loop, loading and caching game data, User Interface management, Game event management.

#### **Gaming Platforms and Frameworks**

2D and 3D Game development using Flash, DirectX, Java, Python, Game engines - Unity. DX Studio,

#### **Game Development**

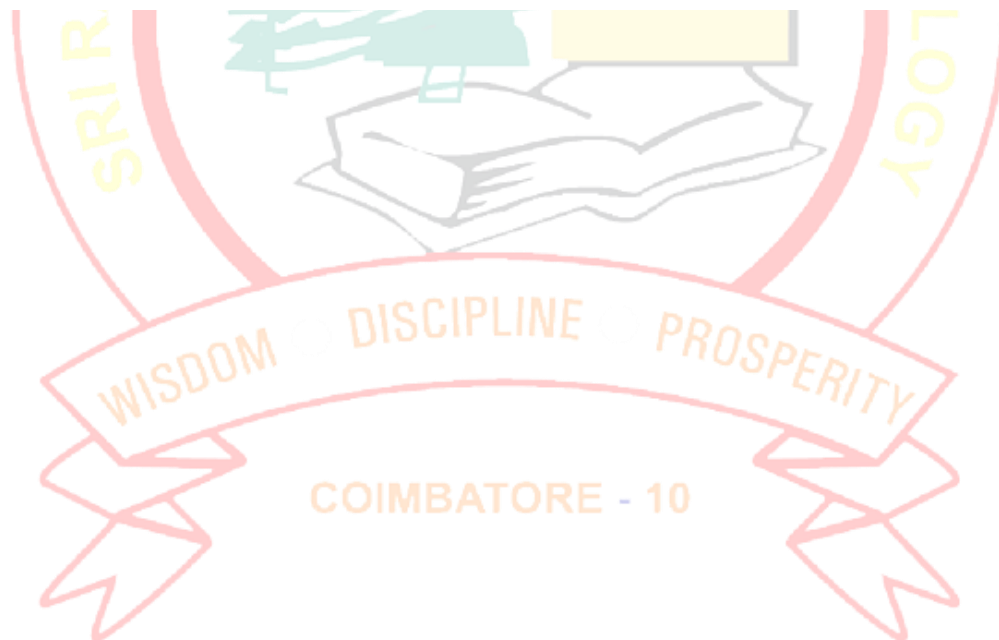
Developing 2D and 3D interactive games using DirectX or Python – Isometric and Tile Based Games, Puzzle games, Single Player games, and Multi-Player games.

**TEXT BOOK:**

1. Ernest Adams “Fundamentals of Game Design”, 3<sup>rd</sup> Edition Prentice Hall, 2015.

**REFERENCES:**

1. Jason Gregory, “Game Engine Architecture”, CRC Press / A K Peters, 2009.
2. David H. Eberly, “3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics” 2<sup>nd</sup> Editions, Morgan Kaufmann, 2006.
3. Eric Lengyel, “Mathematics for 3D Game Programming and Computer Graphics”, 3<sup>rd</sup> Edition, Course Technology PTR, 2011.



20ITP36	INTRODUCTION TO AUGMENTED REALITY	L	T	P	C
		3	0	0	3

## COURSE CONTENT:

### Introduction

History – Scenarios – Future – Applications – Calibration and Registration: Transformation – Coordinate System – Projections – Image Formation basics – Camera Calibration – Calibration setup for AR – Calibration techniques – Calibration Tools.

### Pose Estimation, Tracking and Computer Vision for AR

Pose Estimation – Pose tracking in AR – Classifications of Tracking – Stationery tracking systems – Mobile Sensor-based tracking – Optical tracking – Hybrid tracking – Marker based tracking and AR – Diminished reality – Marker-less tracking and AR – Image Processing – Computer vision – object detection and tracking – spatial mapping – OCR and text recognition for AR.

### 3D Graphics in AR

Basics of 3D Computer Graphics – 3D rendering – 3D model importers and loaders – 3D modeling software – Graphics library dependency for AR – Graphics dependency on AR application performance – Open CV and OpenGL for AR

### Designing AR Systems

Design principles of AR – Designing interactions for AR – Prototyping AR Projects – Software Architecture and Design patterns for AR – Designing AR interfaces – non-programming frameworks – AR programming frameworks – Web-based AR – AR related markup languages.



## **AR Hardware and Mobile AR**

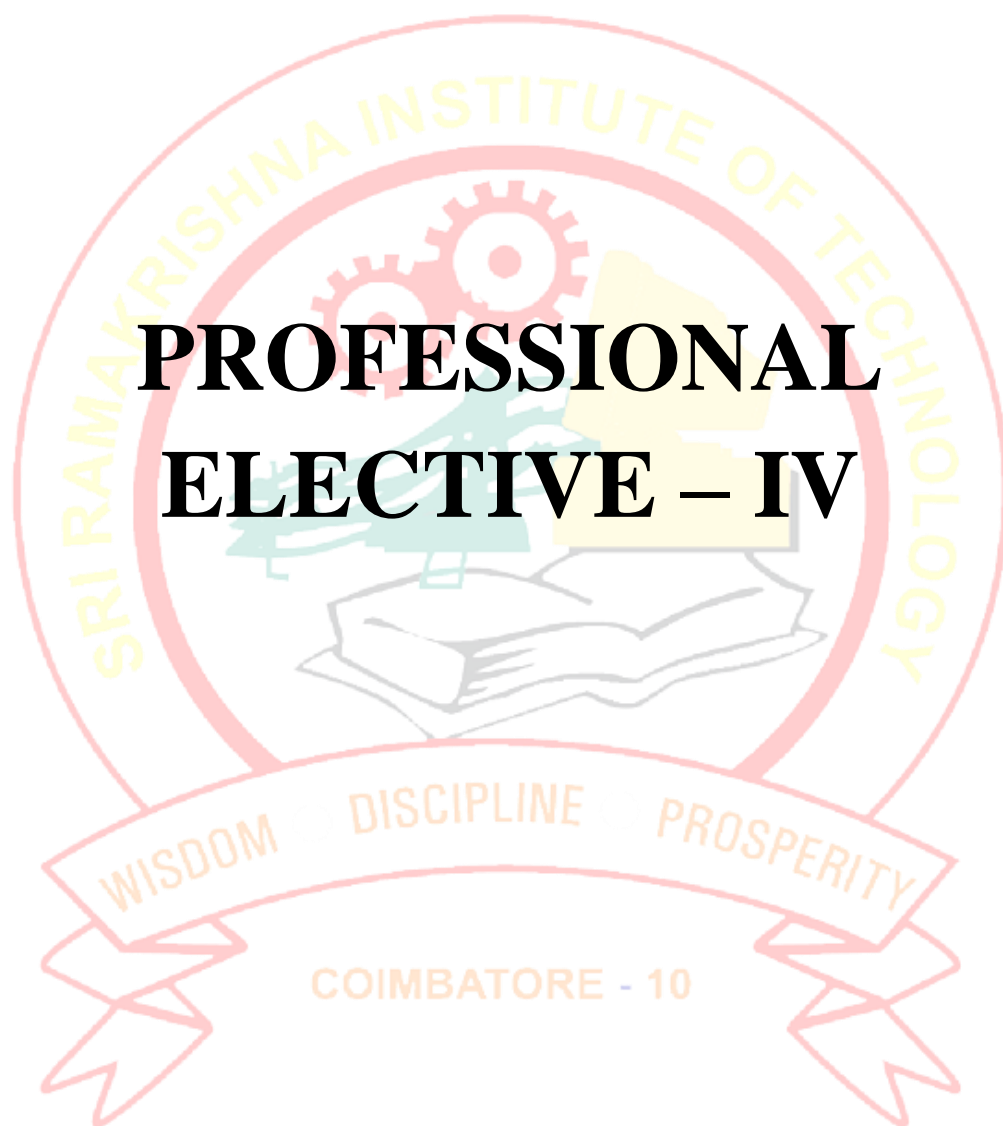
Classification of Visual Display – Developing AR Hardware/ Devices – Multimodal AR – Microsoft Kinect for AR – Types of Mobile Apps – AR browsers for Smartphones – Point of Interests in Mobile AR – AR applications for Android – Developing Mobile AR applications – Developing AR applications for smartphones.

### **TEXT BOOK:**

1. Chetankumar G Shetty, “Augmented Reality: Theory, Design and Development”, McGrawHill Education, 2020. ISBN: 978-93-89949-16-2

### **REFERENCES:**

1. Dieter Schmalstieg & Tobias Hollerer, Augmented Reality: Principles and Practice by Pearson Education (US), Addison-Wesley Educational Publishers Inc, New Jersey, United States, 2016.
2. Tony Parisi, O'Reilly Media, Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile, 1<sup>st</sup> edition, 2015.
3. C. Burdea & Philippe Coiffet, “Virtual Reality Technology”, Second Edition, Gregory, John Wiley & Sons, Inc., 2008.
4. Jason Jerald, The VR Book: Human-Centred Design for Virtual Reality. Association for Computing Machinery and Morgan & Claypool, New York, NY, USA, 2015.



20ITP41	ADVANCED DATABASE TECHNOLOGY	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

- To understand the data models and to conceptualize a database system using ER diagrams to know the concepts of parallel and distributed databases and to gain knowledge about the emerging database technologies.

### COURSE CONTENT:

#### Database Systems and Normalization

System Concepts File systems - Database systems - Database systems architecture - Data Database models - Relational model –Hierarchical model - Network model - Entity-Relationship model-Normalization and database design (1NF, 2NF, 3NF, BCNF.

#### Parallel and Distributed Databases Parallel Databases

I/O parallelism – Inter and Intra query parallelism – Inter and Intra operation parallelism – Distributed database concepts - Distributed data storage – Distributed transactions – Commit protocols – Concurrency control – Distributed query processing-Three tier client-server architecture.

#### Object and Object Relational Databases

Object and Object Relational Databases Concepts for object databases: Object identity – Object structure – Type constructors – Encapsulation of operations – Methods – Persistence – Type and class hierarchies – Inheritance – Complex objects – Object database standards, languages and design: ODMG model – ODL – OQL – Object relational and extended – Relational systems, Object relational features in SQL / Oracle.

## **XML databases**

Enhanced Data Models Active database concepts and triggers – Temporal databases – Spatial databases – Multimedia databases – Deductive databases – XML databases: XML data model – DTD - XML schema - XML querying - Geographic information systems-Genome data management.

## **Emerging Technologies**

Mobile Databases: Location and handoff management - Effect of mobility on data management – Location dependent data distribution - Mobile transaction models -Information retrieval-Web databases.

## **TEXT BOOK:**

1. R. Elmasri, and S. B. Navathe, Fundamentals of Database Systems. New Delhi: Pearson Education/Addison Wesley, 2017.

## **REFERENCES:**

1. Henry F. Korth, Abraham Silberschatz, and S. Sudharshan, Database System Concepts. New Delhi: McGraw Hill, 2006.
2. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design, Implementation and Management”. New Delhi: Pearson Education, 2009.
3. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems. New Delhi: McGraw Hill, 2004.
4. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, 8<sup>th</sup> Edition, Pearson Education, 2006.

20ITP43	PREDICTIVE ANALYTICS	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

- Ability to apply specific statistical and regression analysis methods applicable to predictive analytics
- To identify new trends and patterns, uncover relationships, create forecasts, predict likelihoods, and test predictive hypotheses.
- Ability to develop and use various quantitative and classification predictive models

### **COURSE CONTENT:**

#### **An Introduction to Data Mining**

What is Data Mining? , The Need for Human Direction of Data Mining, The Cross-Industry Standard Practice for Data Mining, Crisp-DM: The Six Phases, Fallacies of Data Mining, What Tasks Can Data Mining Accomplish? , Description, Estimation, Prediction, Classification, Clustering, Association.

#### **Data Preprocessing**

Why do We Need to Pre-process the Data? , Data Cleaning , Handling Missing Data ,Identifying Misclassifications, Graphical Methods for Identifying Outliers , Measures of Centre and Spread, Data Transformation, Min-Max Normalization , Z-Score Standardization, Decimal Scaling

#### **Exploratory Data Analysis**

Hypothesis Testing Versus Exploratory Data Analysis, Getting to Know the Data Set ,Exploring Categorical Variables , Exploring Numeric Variables, Exploring Multivariate Relationships , Selecting Interesting Subsets of the Data for Further Investigation , Using EDA to Uncover Anomalous Fields , Binning Based on Predictive Value

## **Univariate Statistical Analysis**

Data Mining Tasks in Discovering Knowledge in Data, Statistical Approaches to Estimation and Prediction, Statistical Inference, Confidence Interval Estimation of the Mean, Impact of Margin of Error, Confidence Interval Estimation of the Proportion, Hypothesis Testing for the Mean, Assessing the Strength of Evidence Against the Null Hypothesis.

## **Preparing to Model the Data**

Supervised Versus Unsupervised Methods, Statistical Methodology and Data Mining Methodology, Cross-Validation, Overfitting, BIAS–Variance Trade-Off, Balancing the Training Data Set.

## **TEXT BOOK:**

1. Ivo D. Dinov , Data Science and Predictive Analytics – Biomedical and Health Applications using R , Springer , 2018

## **REFERENCES:**

1. Foster Provost and Tom Fawcett, Data Science for Business: What You Need to Know About Data Mining and Data-Analytic Thinking, O'Reilly, 2013.
2. Eric Siegel, Predictive Analytics, Wiley 2016.
3. Daniel T. Larose and Chantal D. Larose, Discovering Knowledge in Data: An Introduction to Data Mining, 2nd Edition, Wiley, 2014.

20ITP44	DEEP LEARNING	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

- Understand the main fundamentals that drive Deep Learning
- Be able to build, train and apply fully connected deep neural networks
- Know how to implement efficient CNN or RNN
- Understand the key features in a neural network's architecture

### **COURSE CONTENT:**

#### **Introduction**

Motivation for deep learning- Machine learning Basics: Learning algorithms - Overfitting - Under fitting -Hyper parameters- Estimators - Challenges in Machine Learning.

#### **Feed Forward Networks**

Deep Feed forward Networks - Gradient based learning - Hidden Units - Architectural design - Back-propagation for MLP

#### **Regularization**

Parameter Regularization - Data Augmentation - Dropout - Optimization algorithms- Adaptive learning rates.

#### **Convolutional Neural Network**

Architecture - Pooling - Convolution and its variants - CNN for Image Recognition.

#### **Sequence Modeling**

Recurrent Neural Networks (RNN) - Bi-directional RNN, Encoder Decoder Architecture - Recursive Nets – LSTM.

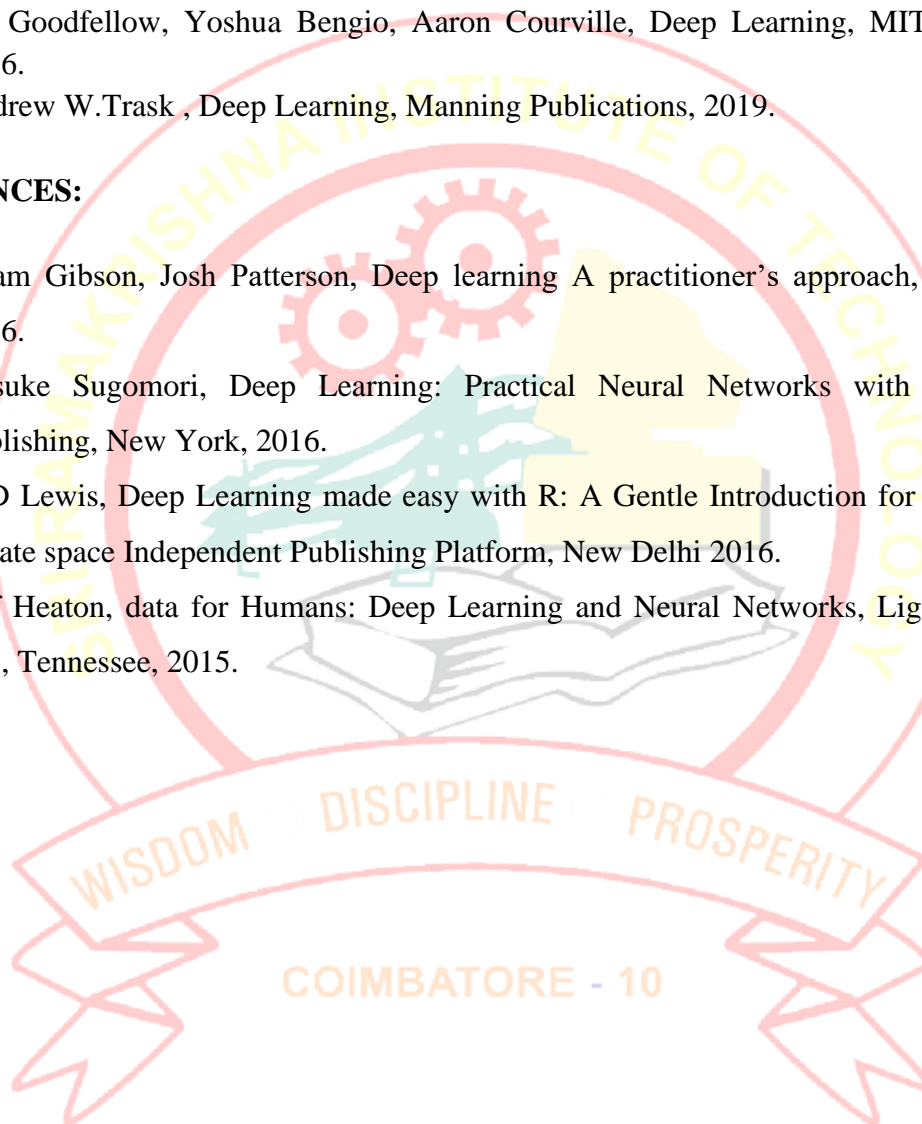


### **TEXT BOOK:**

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, Deep Learning, MIT Press, USA, 2016.
2. Andrew W.Trask , Deep Learning, Manning Publications, 2019.

### **REFERENCES:**

1. Adam Gibson, Josh Patterson, Deep learning A practitioner's approach, Reilly, USA, 2016.
2. Yusuke Sugomori, Deep Learning: Practical Neural Networks with Java, Packet Publishing, New York, 2016.
3. N D Lewis, Deep Learning made easy with R: A Gentle Introduction for Data Science, Create space Independent Publishing Platform, New Delhi 2016.
4. Jeff Heaton, data for Humans: Deep Learning and Neural Networks, Lightning Source Inc., Tennessee, 2015.



20ITP45	PARALLEL COMPUTING	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

- To study the scalability and clustering issues and the technology necessary for them and to understand the technologies enabling parallel computing. To study the different types of interconnection networks also to study the different parallel programming models.

### **COURSE CONTENT:**

#### **Scalability and Clustering**

Evolution of Computer Architecture – Dimensions of Scalability – Parallel Computer Models – Basic Concepts Of Clustering – Scalable Design Principles – Parallel Programming Overview – Processes, Tasks and Threads – Parallelism Issues – Interaction / Communication Issues – Semantic Issues In Parallel Programs.

#### **Enabling Technologies**

System Development Trends – Principles of Processor Design – Microprocessor Architecture Families – Hierarchical Memory Technology – Cache Coherence Protocols – Shared Memory Consistency – Distributed Cache Memory Architecture – Latency Tolerance Techniques – Multithreaded Latency Hiding.

#### **System Interconnects**

Basics of Interconnection Networks – Network Topologies and Properties – Buses, Crossbar and Multistage Switches, Software Multithreading – Synchronization Mechanisms.

#### **Parallel Programming**

Paradigms And Programmability – Parallel Programming Models – Shared Memory Programming.

## **Message Passing Programming**

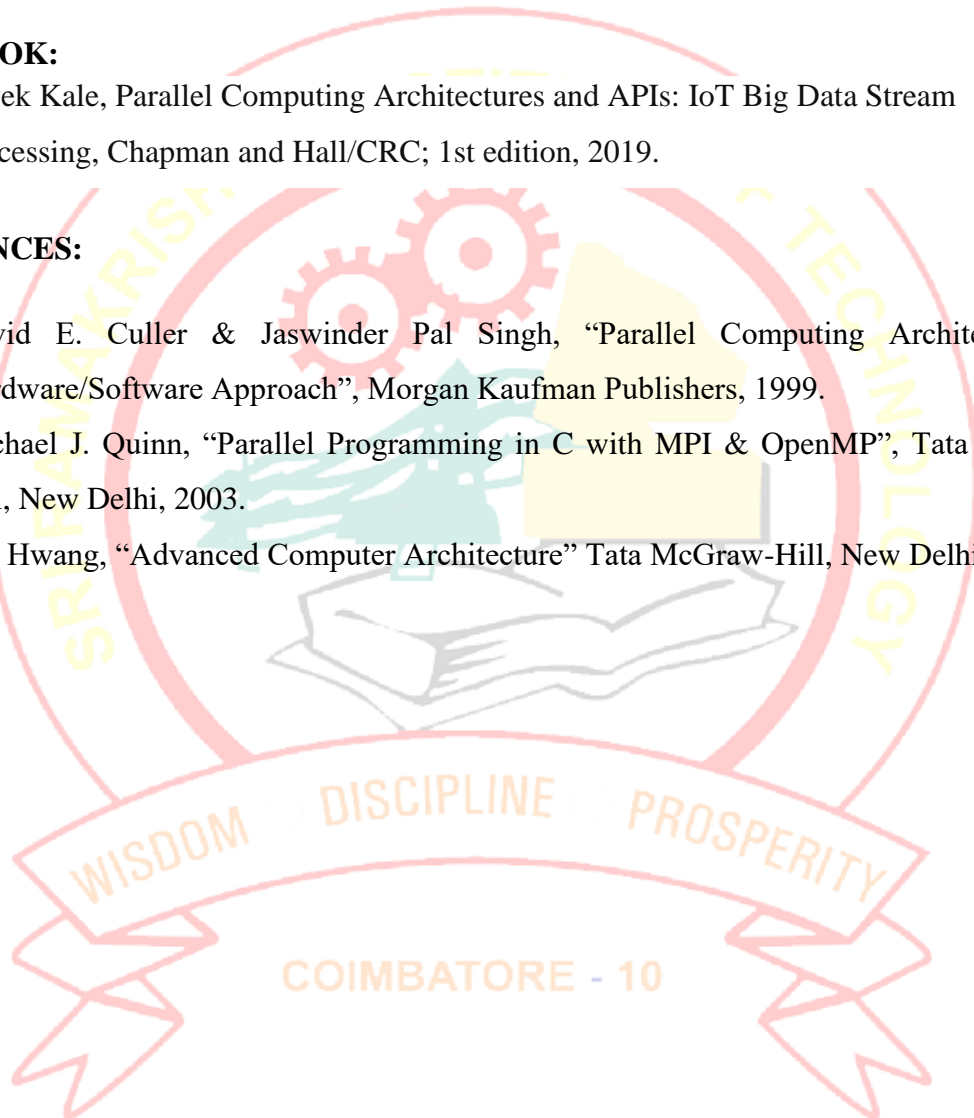
Message Passing Paradigm – Message Passing Interface – Parallel Virtual Machine.

### **TEXT BOOK:**

1. Vivek Kale, Parallel Computing Architectures and APIs: IoT Big Data Stream Processing, Chapman and Hall/CRC; 1st edition, 2019.

### **REFERENCES:**

1. David E. Culler & Jaswinder Pal Singh, “Parallel Computing Architecture: A Hardware/Software Approach”, Morgan Kaufman Publishers, 1999.
2. Michael J. Quinn, “Parallel Programming in C with MPI & OpenMP”, Tata McGraw-Hill, New Delhi, 2003.
3. Kai Hwang, “Advanced Computer Architecture” Tata McGraw-Hill, New Delhi, 2003.



20ITP46	BUSINESS INTELLIGENCE	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

- Be exposed with the basic rudiments of business intelligence system and to understand the modelling aspects behind business Intelligence, and to understand the business intelligence life cycle, techniques used in it and different data analysis tools and techniques.

### **COURSE CONTENT:**

#### **Business Intelligence**

Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.

#### **Knowledge Delivery**

The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

#### **Efficiency**

Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis

#### **Business Intelligence Applications**

Marketing models – Logistic and Production models – Case studies.

### **Future of Business Intelligence**

Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.

### **TEXT BOOK:**

1. Ramesh Sharda, Dursun Delen, Efraim Turban, Business Intelligence and Analytics: Systems for Decision Support, Pearson Education; Tenth edition, 2018.

### **REFERENCES:**

1. Larissa T. Moss, S. Atre, “Business Intelligence Roadmap: The Complete Project Lifecycle of Decision Making”, Addison Wesley, 2003.
2. Carlo Vercellis, “Business Intelligence: Data Mining and Optimization for Decision Making”, Wiley Publications, 2009.
3. David Loshin Morgan, Kaufman, “Business Intelligence: The Savvy Manager’s Guide”, Second Edition, 2012.
4. Cindi Howson, “Successful Business Intelligence: Secrets to Making BI a Killer App”, McGraw- Hill, 2007.
5. Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, “The Data Warehouse Lifecycle Toolkit”, Wiley Publication Inc.,2007



20ITP51	WEB ENGINEERING	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

- To understand the requirements to develop web applications and familiar with the testing techniques for web applications

### **COURSE CONTENT:**

#### **Introduction to Web Engineering and Requirements Engineering**

Motivation, Categories of Web Applications, Characteristics of Web Applications, Product-related Characteristics, Usage related Characteristics, Development-related Characteristic, Evolution of web engineering - Requirements Engineering Activities RE Specifics in Web Engineering, Principles for RE of Web Applications, Adapting RE Methods to Web Application Development, Requirement Types, Notations, Tools.

#### **Web Application Architectures**

Introduction- Categorizing Architectures, Specifics of Web Application Architectures, Components of a Generic Web Application Architecture, Layered Architectures, 2-Layer Architectures, N-Layer Architectures Data-aspect Architectures, Database-centric Architectures, Architectures for Web Document Management.

#### **Modelling Web Applications**

Architectures for Multimedia Data Modeling Specifics in Web Engineering, Levels, Aspects, Phases Customization, Modeling Requirements, Hypertext Modeling, Hypertext Structure Modeling Concepts, Access Modeling Concepts, Relation to Content Modeling, Presentation



Modeling, Relation to Hypertext Modeling, Customization Modeling, Relation to Content, Hypertext, and Presentation Modeling.

### **Web Application Design**

Introduction, Web Design from an Evolutionary Perspective, Information Design, Software Design: A Programming Activity, Merging Information Design and Software Design, Problems and Restrictions in Integrated Web Design, A Proposed Structural Approach, Presentation Design, Presentation of Nodes and Meshes, Device-independent Development, Approaches, Interaction Design, User Interaction User Interface Organization, Navigation Design, Designing a Link Representation, Designing Link Internals, Navigation and Orientation, Structured Dialog for Complex Activities, Interplay with Technology and Architecture, Functional Design.

### **Testing Web Applications**

Introduction, Fundamentals, Terminology, Quality Characteristics, Test Objectives, Test Levels, Role of the Tester, Test Specifics in Web Engineering, Test Approaches, Conventional Approaches, Agile Approaches, Test Scheme, Three Test Dimensions, Applying the Scheme to Web Applications, Test Methods and Techniques, Link Testing, Browser Testing, Usability Testing, Load, Stress, and Continuous Testing, Testing Security, Test-driven Development, Test Automation, Benefits and Drawbacks of Automated Test, Test Tools.

### **TEXT BOOK:**

1. Roger S. Pressman, David Lowe, “Web Engineering”, Tata McGraw Hill Publication, 2017.

### **REFERENCES:**

1. Gerti Kappel, Birgit Proll, “Web Engineering”, John Wiley and Sons Ltd, 2006.
2. Guy W. Lecky-Thompson, “Web Programming”, Cengage Learning, 2008.

3. Chris Bates, “Web Programming: Building Internet Applications”, Third Edition, Wiley India Edition, 2007
4. John Paul Mueller, “Web Development with Microsoft Visual Studio 2005”, Wiley Dream tech, 2006.



20ITP52	ADVANCED WEB PROGRAMMING	L	T	P	C
		3	0	0	3

## **COURSE OBJECTIVE:**

## **COURSE CONTENT:**

### **Frontend**

Introduction to Front-End , Web Request Cycle , HyperText Markup Language , Cascading Style Sheets, JavaScript, JSON, Agile Methodologies , Scrum , Test-Driven Development, Continuous Deployment and Integration , Pair Programming.

### **Backend**

Introduction to Back-End , Node.js , NoSQL and MongoDB , Cloud Computing , HTTP Requests and Responses , RESTful API , Deployment - Deployment to Windows Azure , Deployment to Heroku , Updating and Deleting Messages.

### **jQuery and Bootstrap**

JavaScript Object Notation (JSON), AJAX , Cross-Domain Calls , jQuery Functions , Bootstrap , Useful tools – Compass , SASS , Blueprint , Foundation , Bootswatch, WrapBootstrap , dynamic stylesheet language – LESS .

### **Backbone.js**

Setting Up Backbone.js , Working with Backbone.js , Backbone.js Event Binding , Backbone.js Views and Subviews with Underscore.js , Refactoring Backbone.js

### **Node.js and MongoDB**

Introduction to Node.js , Node.js Core Modules , npm Node Package Manager , MongoDB - MongoDB Shell, BSON , MongoDB Native Driver , MongoDB on Heroku.

### **TEXT BOOK:**

1. Azat Marden , Full Stack Java Script , Second Edition, Apress, 2018.

### **REFERENCES:**

1. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
2. Jeffrey C and Jackson, —Web Technologies A Computer Science Perspective, Pearson Education, 2011
3. UttamK.Roy, Web Technologies , Oxford University Press, 2011.



20ITP53	PHP AND MYSQL	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

- To understand the basics of PHP syntax and constructs, handling of cookies and session with PHP and exposure towards database connectivity with MySQL Study.

### **COURSE CONTENT:**

#### **Introduction to PHP, Decisions and loop**

Evaluation of PHP, Basic Syntax, Defining variable and constant, PHP Data type, Operator and Expression. Making Decisions, Doing Repetitive task with looping, Mixing Decisions and looping with Html.

#### **Function, Strings and Arrays**

Function: Call by value and Call by reference, Recursive function. Creating and accessing, String Searching & Replacing String, Formatting String, String Related Library function. Anatomy of an Array, Creating index based and Associative array Accessing array, Element Looping with Index based array, Looping with associative array using each () and for each(), Some useful Library function.

#### **Handling Html Form with Php**

Capturing Form, Data Dealing with Multi-value filed, and Generating File uploaded form, redirecting a form after submission.

#### **Working with file and Directories**

Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.

#### **Session and Cookie**

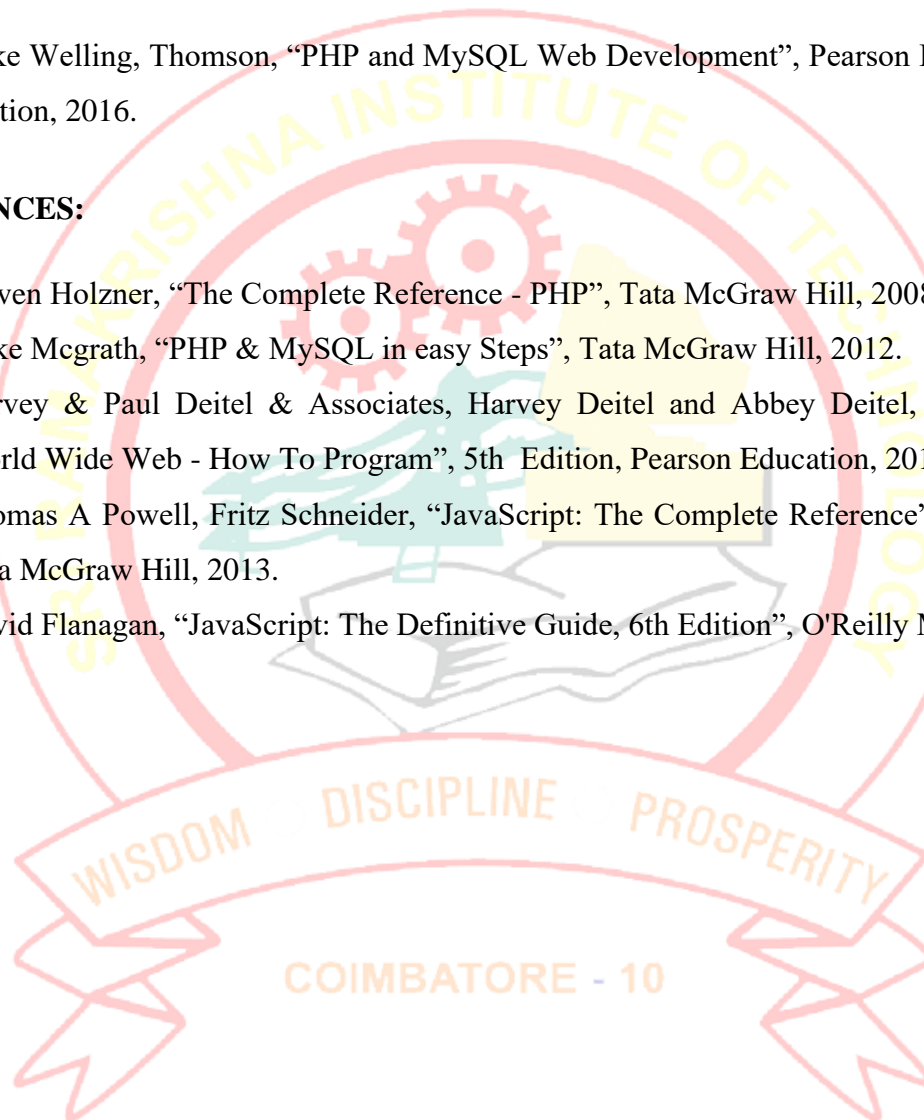
Introduction to Session Control, Session Functionality, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.

**TEXT BOOK:**

1. Luke Welling, Thomson, “PHP and MySQL Web Development”, Pearson Education, 5th Edition, 2016.

**REFERENCES:**

1. Steven Holzner, “The Complete Reference - PHP”, Tata McGraw Hill, 2008.
2. Mike Mcgrath, “PHP & MySQL in easy Steps”, Tata McGraw Hill, 2012.
3. Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, “Internet and World Wide Web - How To Program”, 5th Edition, Pearson Education, 2011.
4. Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, 3rd Edition, Tata McGraw Hill, 2013.
5. David Flanagan, “JavaScript: The Definitive Guide, 6th Edition”, O'Reilly Media, 2011.



<b>20ITP54</b>	<b>MOBILE APPLICATION DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

- To understand the system requirements for mobile applications and to study basic design of Mobile applications also to study about Mobile operating systems such as Android, IOS.

### **COURSE CONTENT:**

#### **Introduction**

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

#### **Basic Design**

Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – user interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

#### **Advanced Design**

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

#### **Technology I - Android**

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment –



Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

## **Technology II - IOS**

Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace.

### **TEXT BOOK:**

1. Girish Kumar, Ajay Shriram Kushwaha, Mobile Application Development using Android, LAP Lambert Academic Publishing, 2019.

### **REFERENCES:**

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
3. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.
4. <http://developer.android.com/develop/index.html>

20ITP55	SERVICE ORIENTED ARCHITECTURE	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

- To learn and understand the basic fundamentals of XML and web service oriented technologies for developing SOA based applications.

### COURSE CONTENT:

#### XML

9

XML documents structures – well-formed and valid documents – DTD – XML Schema – parsing XML using DOM, SAX – Xpath – XML Transformation and XSL – Xquery.

#### SERVICE ORIENTED ARCHITECTURE (SOA) BASICS

9

Characteristics of SOA, Benefits of SOA, comparing SOA with client-server and distributed architecture – principles of service orientation – service layers.

#### WEB SERVICES (WS) AND STANDARDS

9

Web services platform – service description- WSDL – Messaging with SOAP – service discovery – UDDI – service – level interaction patterns – Orchestration and choreography.

#### WEB SERVICE EXTENSIONS

9

WS-Addressing – WS-Reliable Messaging – WS-Policy – WS-Coordination – WS-transactions – WS-security – example.

#### SERVICE ORIENTED ANALYSIS AND DESIGN

9

SOA delivery strategies – Service oriented analysis – service modelling – service oriented design – standards and composition guidelines- service design – business process design – case study.

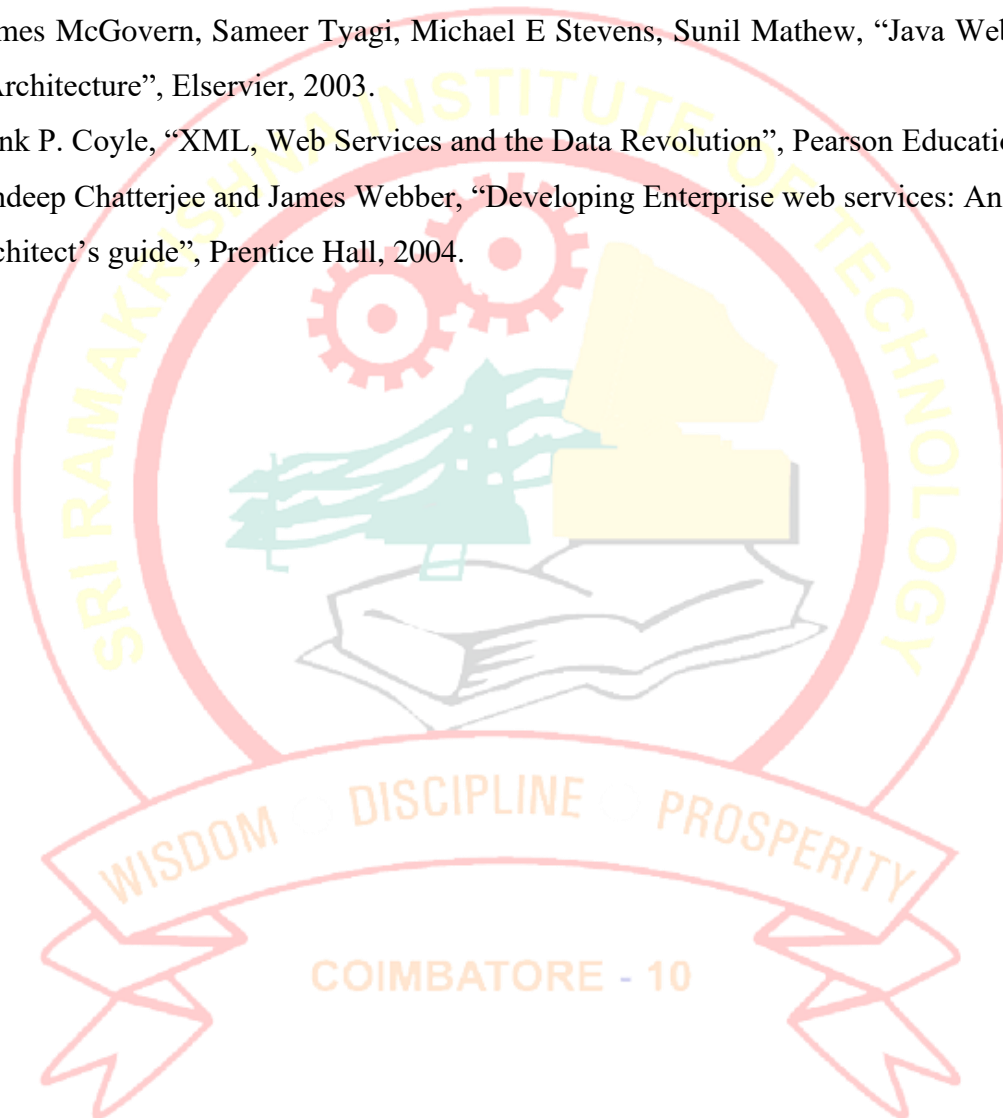
### TEXT BOOKS:

- Ron Schmeizer et al. “XML and Web services”, Pearson Education, 2022.

2. Thomas Erl, “Service Oriented Architecture: Concepts, Technology and Design”, Pearson Education, 2005.

## **REFERENCES:**

1. James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, “Java Web Services Architecture”, Elsevier, 2003.
2. Frank P. Coyle, “XML, Web Services and the Data Revolution”, Pearson Education.
3. Sandeep Chatterjee and James Webber, “Developing Enterprise web services: An Architect’s guide”, Prentice Hall, 2004.



20ITP56	BLOCKCHAIN TECHNOLOGY	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

- To understand the history, types, applications of Blockchain and acquire knowledge about cryptography and consensus algorithms.

### **COURSE CONTENT:**

#### **INTRODUCTION TO BLOCKCHAIN**

**9**

Distributed DBMS – Limitations of Distributed DBMS, Introduction to Block chain – History, Definition, Distributed Ledger, Blockchain Categories – Public, Private, Consortium, Blockchain Network and Nodes, Peer-to-Peer Network, Mining Mechanism, Generic elements of Blockchain, Features of Blockchain, and Types of Blockchain.

#### **BLOCKCHAIN ARCHITECTURE**

**9**

Operation of Bitcoin Blockchain, Blockchain Architecture – Block, Hash, Distributer P2P, Structure of Blockchain- Consensus mechanism: Proof of Work (PoW), Proof of Stake (PoS), Byzantine Fault Tolerance (BFT), Proof of Authority (PoA) and Proof of Elapsed Time (PoET)

#### **BLOCKCHAIN-BASED FUTURES SYSTEM**

**9**

Project presentation- Futures smart contract: Blockchain oracles- Web3j: Setting up the Web3J- Installing web3j- Wallet creation, Java client: The wrapper generator- Initializing web3j- Setting up Ethereum accounts- Deploying the contract

#### **BLOCKCHAINS IN BUSINESS**

**9**

Public versus private and permissioned versus permission less blockchains- Privacy and anonymity in Ethereum- Why are privacy and anonymity important? - The Ethereum Enterprise Alliance- Blockchain as-a-Service.

## **CREATING ICO**

**9**

Initial Coin Offering (ICO): Project setup for ICO implementation- Token contracts- Token sale contracts-Contract security and testing the code.

### **TEXT BOOK:**

1. Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained”, 2nd Edition, Packt Publishing Ltd, March 2018.
2. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, “Blockchain By Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger”, Packt Publishing Limited, 2018.

### **REFERENCES:**

1. Andreas M. Antonopoulos , “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, O’Reilly Media Inc, 2015.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, “Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction”, Princeton University Press, 2016.



<b>20ITE01</b>	<b>BIG DATA ANALYTICS AND ITS APPLICATIONS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

This course will enable the students to understand the basics of big data analytics, Hadoop, and gain knowledge about the different data analytics techniques and its applications.

### **COURSE CONTENT:**

#### **Introduction to Big Data**

**9**

Introduction – distributed computing – Need of distributed computing for Big Data– Evolution of data management–Understanding the data – Defining big data – characteristics of Big Data – Big Data and its importance– Big Data analytics–Traditional and advanced analytics. Big Data Types - Structured data - Unstructured data - Semi structured data.

#### **Introduction to Hadoop**

**9**

Big Data – Apache Hadoop & Hadoop Ecosystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of Map Reduce - Data Serialization.

#### **Introduction to MongoDB**

**9**

What is MongoDB? – Why Mongo DB? – Terms used in RDBMS and MongoDB – Data Types in MongoDB – MongoDB Query Language.

#### **Big Data Trends**

**9**

Data Curators – CDOs are stepping up – Dark data in the cloud – Streaming the IoT for machine learning - Edge Computing – Open Source – chatbots will get smarter – Container Revolution - Commoditization of visualization.

#### **Big Data Applications**

**9**



Big Data in Health care – Big Data contributions to Education - Big Data contributions to Insurance Services - Big Data Contributions to Industrial and Natural Resources - Big Data Contributions to Transportation - Big Data Contributions to Banking Zones and Fraud Detection.

**COURSE OUTCOMES:**

**CO1:** Understand the fundamental concepts of Big Data

**CO2:** Demonstrate the deployment of Hadoop and Map reduce in a Big Data Environment

**CO3:** Ability to understand the usage of Mongo DB in data analytics.

**CO4:** Ability to compare the various data platforms with IoT and Cloud based on evaluation parameters.

**TEXT BOOK:**

1. Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, 2<sup>nd</sup> Edition, Wiley India Pvt Ltd, 2021.

**REFERENCES:**

1. Chris Eaton, Dirk deroos, “Understanding Big data ”, McGraw Hill, 2012.
2. Judith Hurwitz, Alan Nugent et al., ” Big Data for Dummies”, John Wiley & Sons, Inc, 2013
3. Vignesh Prajapati, “Big Data Analytics with R and Haoop”, Packet Publishing, 2013.
4. Tom Plunkett, Brian Macdonald et al, “Oracle Big Data Handbook”, Oracle Press, 2014.

COIMBATORE - 10

<b>20ITE02</b>	<b>CLOUD COMPUTING FUNDAMENTALS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

The course will enable the students to understand the basic concepts, Cloud Models, architecture of cloud computing and techniques of virtualization and also get familiarized with the cloud platforms.

### **COURSE CONTENT:**

#### **Cloud Computing and Cloud Services**

**9**

Introduction to Cloud Computing - History of Cloud computing - Types of Clouds - Characteristics of Cloud Computing - Cloud Architecture - Cloud Storage - Cloud Services - Benefits from Cloud Computing - Pros and Cons of Cloud Computing - Applications of Cloud Computing. Web based applications - Advantages of cloud development - Disadvantages of cloud development - Types of Cloud Service Development: Software as a Service - Platform as a Service - On demand Computing - Discovering Cloud services development services and tools.

#### **Virtualization Technology and Services**

**9**

Introduction - Virtualization Defined - Virtualization benefits - Server Virtualization - Virtualization for x86Architecture - Hypervisor Management Software - Virtual Infrastructure Requirements. Exploring Online Calendar Applications: Google Calendar - Yahoo Calendar - Windows Live Calendar - Apple MobileMe calendar - Exploring Online Scheduling Applications - Exploring Online Planning.

## **Collaborating with Cloud**

**9**

Evaluating Web mail services - Evaluating Instant Messaging Services - Evaluating Web Conferencing Tools – Collaborating via social networks and group ware - Collaborating on budgets.

## **Web Services**

**9**

Introduction - Amazon Web Services - Google App Engine – Microsoft Azure – Cloud computing economics - AJAX and Mashups.

## **Security in Cloud Computing**

**9**

Cloud Computing software security Fundamentals : Cloud Security Services, Cloud Security Design Principles - Security Challenges Concerns, Risk Issues, and Legal Aspects - Security Requirements for the Architecture

## **COURSE OUTCOMES**

- CO1:** Apply cloud computing techniques to solve large scale scientific problems.
- CO2:** Implement virtualization for applications, desktops, servers, and network platforms.
- CO3:** Develop a cloud application with a user interface and understand data components.
- CO4:** Apply the various cloud platforms to develop and deployment for web application.

## **TEXT BOOK:**

1. Rajkumar Buyya, Christian Vacchiola, S Thamarai Selvi, “Mastering Cloud Computing”, First Edition ,McGraw Hill Publications, 2013.

## **REFERENCES:**

1. Michael Miller, “Cloud Computing: Web-Based Applications that Change the way you Work and collaborate Online’, Pearson publications Aug 2008.

2. Kai Hwang, Geoffrey C.Fox, Jack J.Dongarra, “Distributed and Cloud Computing: From Parallel Processing to the Internet of Things”, First Edition Morgan Kaufmann Publisher, an imprint Elsevier 2012.
3. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, Publisher: CRC Press, September 2013.
4. Graham Speake, Vic (J.R.) Winkler, “Securing the Cloud: Cloud Computer Security Techniques and Tactics”, Elsevier, USA, 2011.

<b>20ITE03</b>	<b>FUNDAMENTALS OF INTERNET OF THINGS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

This Course will enable the students to Understand the basic concepts of Internet of Things, Elements involved in Internet of Things, Physical Devices of IoT, Data Analytics in IoT and Explore the various real-time applications which can be automated using Internet of Things.

### **COURSE CONTENT:**

#### **Fundamentals of IoT**

**9**

Introduction - Definition and Characteristics of IoT - Physical design - IoT Protocols - Logical design - IoT communication models, IoT Communication APIs - Enabling technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates - Domain specific IoTs - IoT Architectural view - IoT and M2M- difference between IoT and M2M - IoT systems management – Needs - NETCONF, YANG - IoT design methodology

#### **Elements of IoT**

**9**

Sensors and actuators - Communication modules – Zigbee - LoRa - RFID - Wi-Fi - Power sources-IoT platforms - Cloud Computing in IoT - Cloud Connectivity - Big Data Analytics-Data Visualization.

#### **IoT Physical Devices and Endpoints**

**9**

Basic Building Blocks of IoT Device - Raspberry Pi – About the Board – Linux on Raspberry Pi - Raspberry Pi interfaces – Introduction Django framework – Designing a Web RESTful API - Other IoT devices – Introduction to Arduino.

## **Data Analytics for IoT**

**9**

Introduction – Apache Hadoop – Using Hadoop MapReduce for Batch data analysis – Apache Spark – Apache Storm – using Apache Storm for Real time data analytics.

## **Challenges in IoT and Case Studies**

**9**

Security Concerns and Challenges - Real time applications of IoT – Home automation Cities – Environment – Energy – Agriculture – Industry – Health and Lifestyle.

## **COURSE OUTCOMES**

- CO1:** Understand the fundamental concepts of Internet of Things.
- CO2:** Demonstrate the integration IoT elements with various technologies.
- CO3:** Understand the building blocks of Internet of Things and characteristics
- CO4:** Understand the relationship between IoT and big data

## **TEXT BOOK:**

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015.

## **REFERENCES**

1. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key applications and Protocols", Wiley Publications 2<sup>nd</sup> edition, 2013.
2. Raj Kamal, "Internet of Things – Architecture and Design Principles", Mc Graw Hill Education Pvt. Ltd., 2017.
3. Internet of Things and Data Analytics, HwaiyuGeng, P.E, Wiley Publications, 2017.
4. Adrian McEwen, "Designing the Internet of Things", Wiley Publishers, 2013.

20ITE04	<b>INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

The course will enable the students to learn the basic concepts of DBMS, ER Diagrams, Relational model, transaction processing, and Familiarized with the various queries that can be used for data retrieval.

### **COURSE CONTENT:**

#### **Introduction to DBMS**

**9**

Overview - Purpose of Database System — Views of data – Data Models – Database Languages — Database System Architecture – Database users and Administrator - Data Models – Introduction to relational databases

#### **Relational Model**

**9**

Entity-Relationship Diagram-Design Issues- Weak Entity Sets- and Extended E-R features - Structure of relational Databases- Views- Modifications of the Database – Keys.

#### **SQL Fundamentals**

**9**

Concept of DDL- DML- TCL - DCL: Basic Structure- Set Operations- Aggregate Functions- Null Values- Domain Constraints- Referential Integrity Constraints- CODD's Rule - Functional Dependency- Different Anomalies in designing a Database - Normalization.

#### **Data Storage, Querying and Transaction Management**

**9**

RAID – Indexing – Query optimization and Processing – transaction Concept – ACID Properties – Serializability – Transactions as SQL statements.



Proprietary DBMS vs Open Source DBMS –NoSQL – Databases for Social Networks –  
Introduction to Multimedia Databases.

**COURSE OUTCOMES:**

- CO1:** Describe the most common designs for core database system components
- CO2:** Apply the modeling concepts and notation of the relational data model
- CO3:** Create a relational database schema in SQL that incorporates key, entity integrity, and referential integrity constraints.
- CO4:** Understand the various transaction processing, transaction models, storage management techniques and indexing techniques.

**TEXT BOOK:**

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill Education India Pvt. Ltd., 2016.

**REFERENCES:**

1. Atul Kahate, “Introduction to Database Management Systems”, Pearson Education, New Delhi, 2006.
2. Alexis Leon and Mathews Leon, “Database Management Systems”, Vikas Publishing House Private Limited, New Delhi, 2003.
3. Raghu Ramakrishnan, “Database Management Systems” ,McGraw-Hill, third Edition,2014.
4. Bipin C Desai, “An Introduction to Database Systems”, Galgotia Publications Pvt Limited, Revised edition 2012.

<b>20ITE05</b>	<b>WEB INTERFACE DESIGN AND DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

The course will enable the students to understand the basic concepts of web designing, CSS, Java script, JQuery and familiarized with designing web pages.

### **COURSE CONTENT**

#### **HTML5**

**9**

Introduction, New Elements, Canvas, SVG, Drag/Drop, Geolocation, Video, Audio, Input Types, Form Elements, Attributes, Semantic, Web Storage, App Cache, Web Workers, SSE.

#### **Cascading Style Sheets**

**9**

Introduction, Syntax, Id & Class, Backgrounds, Text, Fonts, Links, Lists, Tables, Box Model, Border, Outline, Margin, Padding, Grouping/Nesting, Dimension, Display, Positioning, Floating, Align, Pseudo-class, Pseudo-element, Navigation Bar.

#### **Radial Gradients of Cascading Style Sheets**

**9**

Image Gallery, Image Opacity, Image Sprites, Media Types, Animations, Attribute Selectors, CSS3 Introduction, Gradients, Text Effects, Fonts, 2D Transforms, 3D Transforms, Transitions, Animations, Multiple Columns.

#### **Javascript**

**9**

Introduction, Comment, Variable, Global Variable, Data Types, Operators, If Statement, Switch, Loop: for and while, Function, Objects, Array, Browser Object Model, Validation.

Introduction, Selectors, Events, CSS Classes, Dimensions.

**COURSE OUTCOMES**

- CO1:** Create and validate HTML/XHTML documents
- CO2:** Use Cascading Style Sheets as a presentation technologies.
- CO3:** Understand the radial gradients of CSS.
- CO4:** Design and implement a simple web pages using Javascript and JQuery.

**TEXT BOOKS:**

1. Harvey Deitel, Abbey Deitel, Internet and World Wide Web: How To Program 5<sup>th</sup> Edition, Pearson Education 2012.
2. DJ Editorial Services, “HTML5 Black Book”, 2<sup>nd</sup> Edition, Dream tech Press 2016.
3. Thomas A.Powell, HTML & CSS: The Complete Reference, 5<sup>th</sup> Edition, Tata McGraw-Hill 2010 .
4. Thomas A.Powell and Fritz Schneider, JavaScript: The Complete Reference, 3<sup>rd</sup> Edition, Tata McGraw-Hill, 2013.
5. Thomas A.Powell, Web Design: The Complete Reference, 2<sup>nd</sup> Edition, Tata McGraw-Hill, 2003.

20ITE06	INTRODUCTION TO DATA STRUCTURES	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

The course will enable the student to learn basic and advanced concepts related to linear data structures such as lists, stack, queue and non-linear data structures like trees and graphs. It also provides an outline of various sorting, searching and storage techniques.

### COURSE CONTENT:

#### Preliminaries of Data Structures

9

Basic Terminology- Algorithms: Complexity, Time-Space tradeoff – Algorithmic Notations – Complexity of Algorithms

#### Arrays and Linked Lists

9

Linear Arrays – Traversing Linear Arrays – Inserting and Deleting – Linked Lists - Traversal - Search- Insertion, Deletion – Two-way Lists

#### Stacks, Queues and Recursion

9

Stacks: Array Representation, Linked Representation – Arithmetic Expressions – Applications: Recursion, Tower of Hanoi – Queues – Linked Representation of Queues – Priority Queues

#### Trees and Graphs

9

Tree Terminology - Binary Trees: Representation – Binary Search Trees: Search, Insertion, Deletion – AVL Search Trees: Insertion, Deletion – Heap – Heapsort – Graph Terminology – Graph Representations: Adjacency Matrix, Path Matrix –Shortest Paths (Dijkstra's Algorithm)- Topological Sort – Minimum Spanning Trees (Prim's Algorithm and Kruskal's Algorithm)

## Sorting and Searching

9

Sorting – Insertion Sort – Selection Sort – Radix Sort – Searching and Data Modification  
- Hashing

### COURSE OUTCOMES:

- CO6:** Apply appropriate data structures and abstract data types (ADT) such as lists, stacks, queues, trees and graphs in problem solving.
- CO7:** Analyze the performance of different implementations of data structures.
- CO8:** Determine appropriate ADTs and data structures for various sorting and searching algorithms.
- CO9:** Determine time and space requirements of common sorting and searching algorithms.

### TEXT BOOK:

3. Seymour Lipschutz, “Data Structures with C”, McGraw Hill, 1<sup>st</sup> Edition, 2017.

### REFERENCES:

1. John Hubbard, “Data Structures with C++”, McGraw Hill, 1<sup>st</sup> Edition, 2017.
2. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education, 2<sup>nd</sup> Edition, 2014.
3. Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum, “Data Structures using C and C++”, Pearson, 2<sup>nd</sup> Edition, 2015.
4. Venkatesan R and Lovelyn Rose S, “Data Structures”, Wiley, 2<sup>nd</sup> Edition, 2019.

20ITE07	PRINCIPLES OF SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVE:

The course will enable the students with the understanding of software engineering processes such as requirement modeling, design, testing etc. and experiential learning opportunities to apply that knowledge to solve real-world problems.

### COURSE CONTENT:

#### Software Process and Agile Development

9

Introduction to Software Engineering – Process Model: Perspective process models- Specialized process models- The unified process - Personal and Team Process Models- Agile Process- Other Agile Process Models.

#### Requirements Modeling

9

Functional and non-functional requirements – User Requirements – System requirements - Interface specification - The software requirements document - Requirements engineering processes

#### Design Concepts

9

Architectural design: Architectural design decisions - System organization - Modular decomposition styles - Control styles - Reference architectures.

#### Testing

9

Software Testing Fundamentals - System testing - Component testing - Test case design - Test automation.



## **Project management**

**9**

Management activities - Project planning - Project scheduling - Risk management.

### **COURSE OUTCOMES:**

**CO1:** Understand the various software process models.

**CO2:** Apply the requirement specifications and appropriate software design methodology for a given scenario.

**CO3:** Understand the various architectural styles of software.

**CO4:** Compare and contrast various testing measures.

### **TEXT BOOK:**

2. Roger S Pressman, Bruce R Maxim, “Software Engineering - A Practitioner’s Approach”, McGraw-Hill Education, 8<sup>th</sup> Edition, 2019.

### **REFERENCES:**

1. Ian Sommerville, “Software Engineering”, Pearson Education Asia, 10<sup>th</sup> Edition, 2017.
2. Rajib Mall, “Fundamentals of Software Engineering”, PHI Learning, 4<sup>th</sup> Edition, 2014
3. Pankaj Jalote, “Software Engineering: A Precise Approach”, Wiley India, 2010.
4. Shari Lawrence Pfleeger, “Software Engineering Theory and Practice”, Pearson Education, 4<sup>th</sup> Edition, New Delhi, 2009.





# **OPEN ELECTIVE**

**OFFERED BY ECE**

20ECE01	<b>Electronic Measurements and Instrumentation</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

This course will enable the students to learn the fundamentals of electrical and electronic instruments, measurement techniques, storage and display devices.

### **COURSE CONTENT:**

#### **Introduction**

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Standards and calibration

#### **Electrical and Electronic Instruments**

Principle and types of analog and digital voltmeters, ammeters, multimeters – Single and three phase wattmeters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss.

#### **Comparative Methods of Measurements**

D.C & A.C potentiometers, D.C & A.C bridges, transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic interference – Grounding techniques.

#### **Storage and display Devices**

Magnetic disk and tape –digital plotters and printers, CRT display, digital CRO, OLED,LED display systems, LCD –USB Data Loggers.

#### **Transducers and Data Acquisition Systems**

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisition system – A/D, D/A converters – Smart sensors.

### **COURSE OUTCOMES:**

At the end of the course, the students will have the

**CO1:** Ability to find electrical parameters using appropriate Electronics Instruments.

**CO2:** Ability to interpret the characteristics and operation of Electrical and Electronic

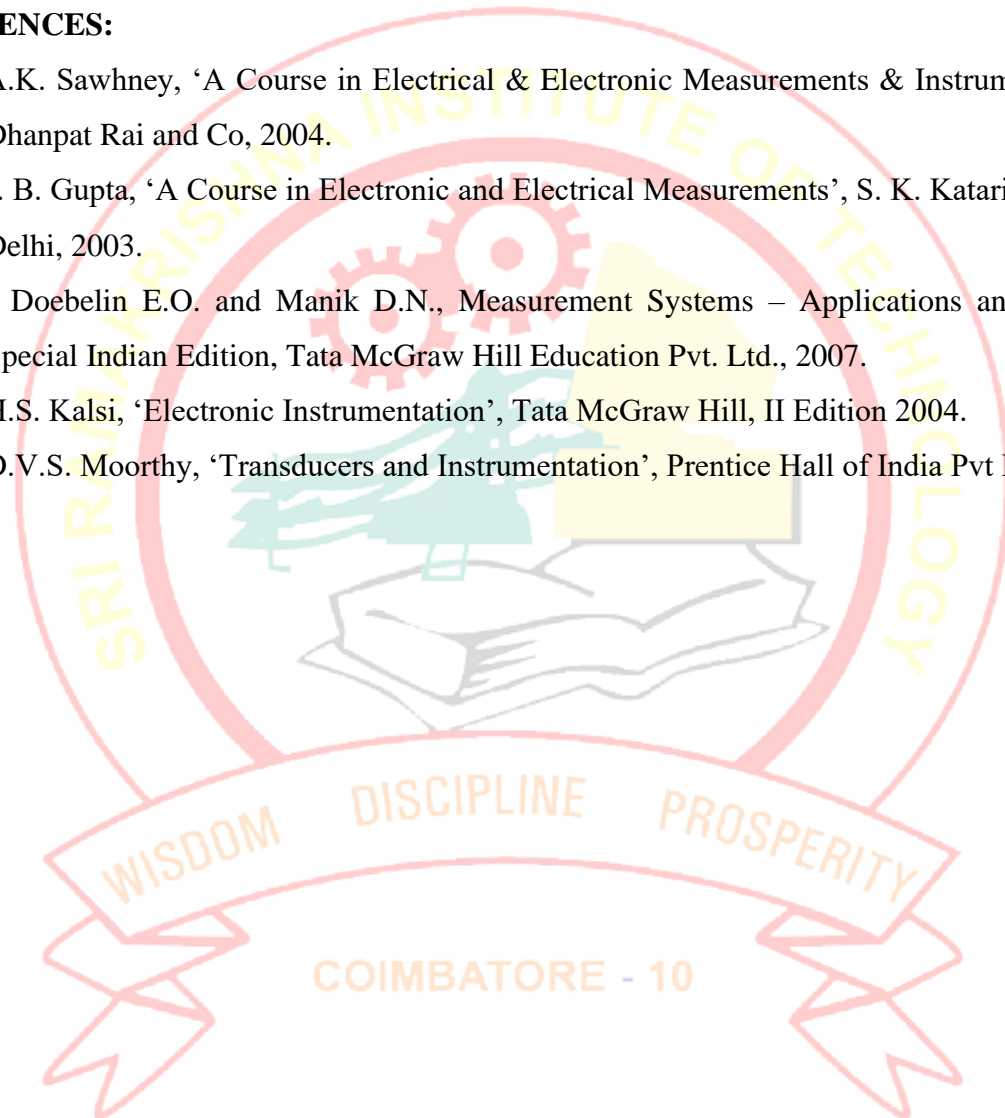
Instruments.

**CO3:** Ability to apply storage and display devices.

**CO4:** Ability to select appropriate sensors in various applications.

**REFERENCES:**

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2004.
2. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2003.
3. J Doebelin E.O. and Manik D.N., Measurement Systems – Applications and Design, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd., 2007.
4. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, II Edition 2004.
5. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2007.



20ECE02	Microcontrollers and its Applications	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

This course will enable the students to learn the primary concept of microcontrollers, hardware usage for programming intelligence and get familiarized with the architecture, instruction set and applications of microcontroller.

### **COURSE CONTENT:**

#### **8051 Microcontroller**

Architecture of 8051 – Register set - I/O Pins, Ports and Circuits - Instruction set - Addressing modes - Assembly language programs for arithmetic and Logical operations.

#### **Interfacing 8051 Microcontroller**

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - Stepper Motor Interfacing –ADC – DAC.

#### **Application of 8051 Microcontroller**

Temperature Controller using ADC – Square and Triangular waveform generation using DAC – Water level controller – Traffic Light Controller.

#### **PIC Microcontroller**

CPU Architecture – Register – I/O pins, Ports -Instruction set – addressing modes - Interrupts

#### **Interfacing PIC Microcontroller**

PIC: Timers- I2C Interfacing –UART- A/D Converter –Pulse Width Modulation

### **COURSE OUTCOMES:**

6. At the end of the course, the students will have the

**CO1:** Ability to interpret the architecture of 8051 and PIC microcontrollers.

**CO2:** Ability to develop Assembly Language Programs (ALP) for arithmetic and Logical operations using microcontrollers.

**CO3:** Ability to build 8051 microcontroller-based systems using peripheral interfaces.

**CO4:** Ability to build PIC microcontroller-based systems using peripheral interfaces.

## REFERENCES:

1. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson Education, 2011
2. Subrata Ghoshal, “8051 Microcontrollers: Internals, Instructions, Programming & Interfacing”, Second Edition, Pearson education, 2014.
3. John. B. Peatman, “Design with PIC Microcontroller”, Prentice Hall, 2011.
4. Gene .H.Miller, “Micro Computer Engineering”, Pearson Education, 2013.
5. Subrata Ghoshal, “8051 Microcontrollers: Internals, Instructions, Programming & Interfacing”, Second Edition, Pearson education, 2014.



20ECE03	Introduction to Embedded Systems	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

This course will enable the students to learn the architecture of embedded systems, design and analysis of embedded computing, basic concepts of real time operating system, programming concepts for embedded systems, system design techniques of embedded hardware and its applications.

### **COURSE CONTENT:**

#### **Architecture of Embedded Systems**

Categories of Embedded Systems – Specifications of Embedded systems – Recent trends in Embedded Systems – Detailed Hardware and Software Design – ARM Processor – CPU: programming input and output - supervisor mode, exceptions and traps – Co-processors – Memory system mechanisms – CPU performance – CPU power consumption.

#### **Embedded Computing Platform Design**

The CPU Bus-Memory devices and systems – Designing with computing platforms – Host and target machines – consumer electronics architecture – platform-level performance analysis - Components for embedded programs – Models of programs – Assembly, linking and loading – compilation techniques – Program level performance analysis

#### **Processes and Operating Systems**

Introduction – Multiple tasks and multiple processes – Multi rate systems – Preemptive real-time operating systems – Priority based scheduling – Inter process communication mechanisms – Semaphores and Shared Data – Message Queues – Mailboxes and Pipes – Interrupt Routines in RTOS Environment – Evaluating operating system performance – power optimization strategies for processes.

#### **Hardware/Software Integration & Programming**

Cross-Compilers – Cross-Assemblers – Linker/Locator – Debugger – Emulator – Simulators – Introduction to Integrated Development Environment (IDE) – Getting Embedded Software into Target System: In-Circuit Emulators –Serial Port Programming and Interrupts Programming.

#### **Embedded System Applications**



Applications of Embedded systems – Case study of Embedded systems like automatic chocolate vending machine, Adaptive Cruise Control Systems in a Car, Digital camera, Smart card and ATM.

### **COURSE OUTCOMES:**

At the end of the course, the students will have the

**CO1:** Ability to understand the architecture of embedded systems.

**CO2:** Ability to understand the concepts of multiple processes and operating systems.

**CO3:** Ability to choose appropriate tools for developing real time embedded systems.

**CO4:** Ability to apply suitable hardware and software architectures to implement embedded system applications.

### **REFERENCES:**

1. Marilyn Wolf, “Computers as Components - Principles of Embedded Computing System Design”, Third Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.
2. Jonathan W. Valvano, “Embedded Microcomputer Systems Real Time Interfacing”, Third Edition Cengage Learning, 2012.
3. Raj Kamal, “Embedded Systems Architecture Programming and Design”, Pearson, 2011.
4. K.V.K.K.Prasad “Embedded /Real-Time Systems: Concepts, Design and Programming” Dream tech, Wiley 2012.
5. Daniel 5.W Lewis, “Fundamentals of Embedded Software” Pearson Education, 2013.



20ECE04	Nano Electronics and Sensors	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

This course will enable the students to learn the overview of nano electronics, basic components of electronic systems, memory devices, sensors and actuators.

### **COURSE CONTENT:**

#### **Overview of Nano-Electronics**

Nano-scale electronics; Foundation of nano-electronics – low dimension transport, quantum confinement, Coulomb blockade and quantum dot; Ballistic transport and Quantum interferences; Landauer formula, quantization of conductance, example of Quantum point contact.

#### **Two-Terminal Junction Transistors**

Basic CMOS process flow; MOS scaling theory; Issues in scaling MOS transistors; Requirements for non-classical MOS transistor; PMOS versus NMOS; Design and construction of MOS capacitor; Integration issues of high-k MOS – interface states, bulk charge, band offset, stability, reliability; MOS transistor and capacitor characteristics.

#### **Gate Transistors**

Metal gate transistors – motivation, basics and requirements; quantum transport in nano MOSFET; Ultrathin body silicon on insulator (SOI) – double gate transistors; Vertical transistors – FinFET and surround gate FET; compound semiconductor MOSFET – Hetero-structures MOSFET.

#### **Characteristics of Sensors and Actuators**

Basics: types and working principles of sensors and actuators; Characteristic features: Range, Resolution, Sensitivity, Error, Repeatability, Linearity and Accuracy, Impedance, Nonlinearities, Static and Coulomb Friction, Eccentricity, Backlash, Saturation, Dead-band, System Response, First Order System Response, Under-damped Second Order System Response, Frequency Response.

#### **Memory Devices and Sensors**

Nano ferroelectrics – Ferroelectric random-access memory –Fe-RAM circuit design – ferroelectric thin film properties and integration – calorimetric -sensors – electrochemical cells – surface and bulk acoustic devices – gas sensitive FETs – resistive semiconductor gas sensors – electronic noses – identification of hazardous solvents and gases – semiconductor sensor array.

## **COURSE OUTCOMES:**

At the end of the course, the students will have the

**CO1:** Ability to understand the concepts of Nano electronics

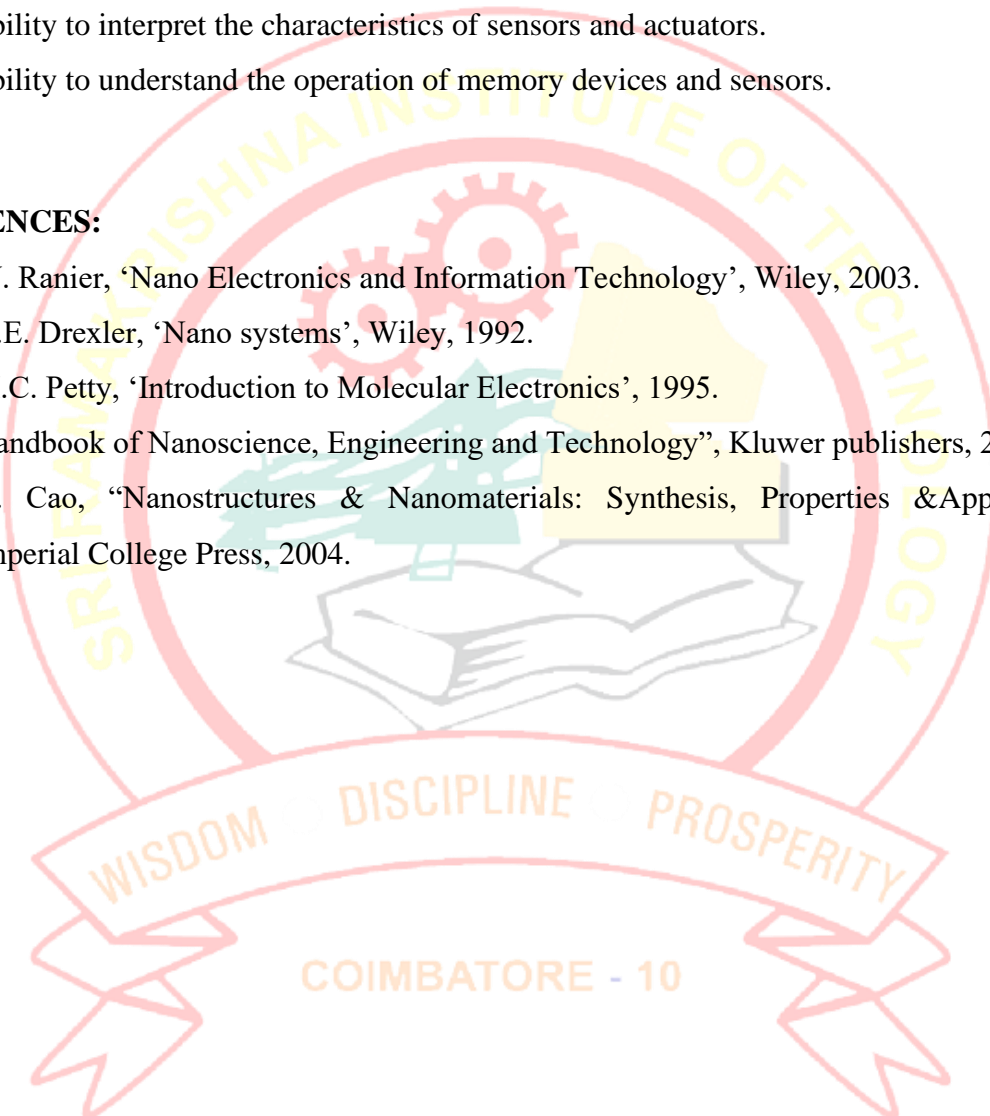
**CO2:** Ability to interpret the characteristics and operation of Gate transistors.

**CO3:** Ability to interpret the characteristics of sensors and actuators.

**CO4:** Ability to understand the operation of memory devices and sensors.

## **REFERENCES:**

1. W. Ranier, 'Nano Electronics and Information Technology', Wiley, 2003.
2. K.E. Drexler, 'Nano systems', Wiley, 1992.
3. M.C. Petty, 'Introduction to Molecular Electronics', 1995.
4. Handbook of Nanoscience, Engineering and Technology", Kluwer publishers, 2002.
5. G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties & Applications", Imperial College Press, 2004.



20ECE05	Principles of VLSI Systems	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

This course will enable the students to learn the principles of MOS transistors, realization of combinational and sequential logic circuits using MOS transistors, arithmetic building blocks and implementation strategies using FPGA.

### **COURSE CONTENT:**

#### **MOS Transistor Principle**

NMOS and PMOS transistor operations, MOS DC Equations, Electrical properties of CMOS circuits and device modeling, scaling principles CMOS inverter, Second Order Effects, Stick diagram.

#### **Combinational Logic Circuits**

MOSFETs as switches, Basic Logic Gates in CMOS, Examples of Combinational Logic Design, RC Delay Model, Linear Delay Model, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design.

#### **Sequential Logic Circuits**

Static and Dynamic Latches and Registers, Timing issues, Memory architecture and memory control circuits.

#### **Arithmetic Building Blocks**

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, Multipliers, speed and area tradeoff

#### **Implementation Strategies**

Full custom and Semi-custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures, Xilinx FPGA.

### **COURSE OUTCOMES:**

At the end of the course, the students will have the

**CO1:** Ability to interpret the characteristics and operation of MOS transistors.

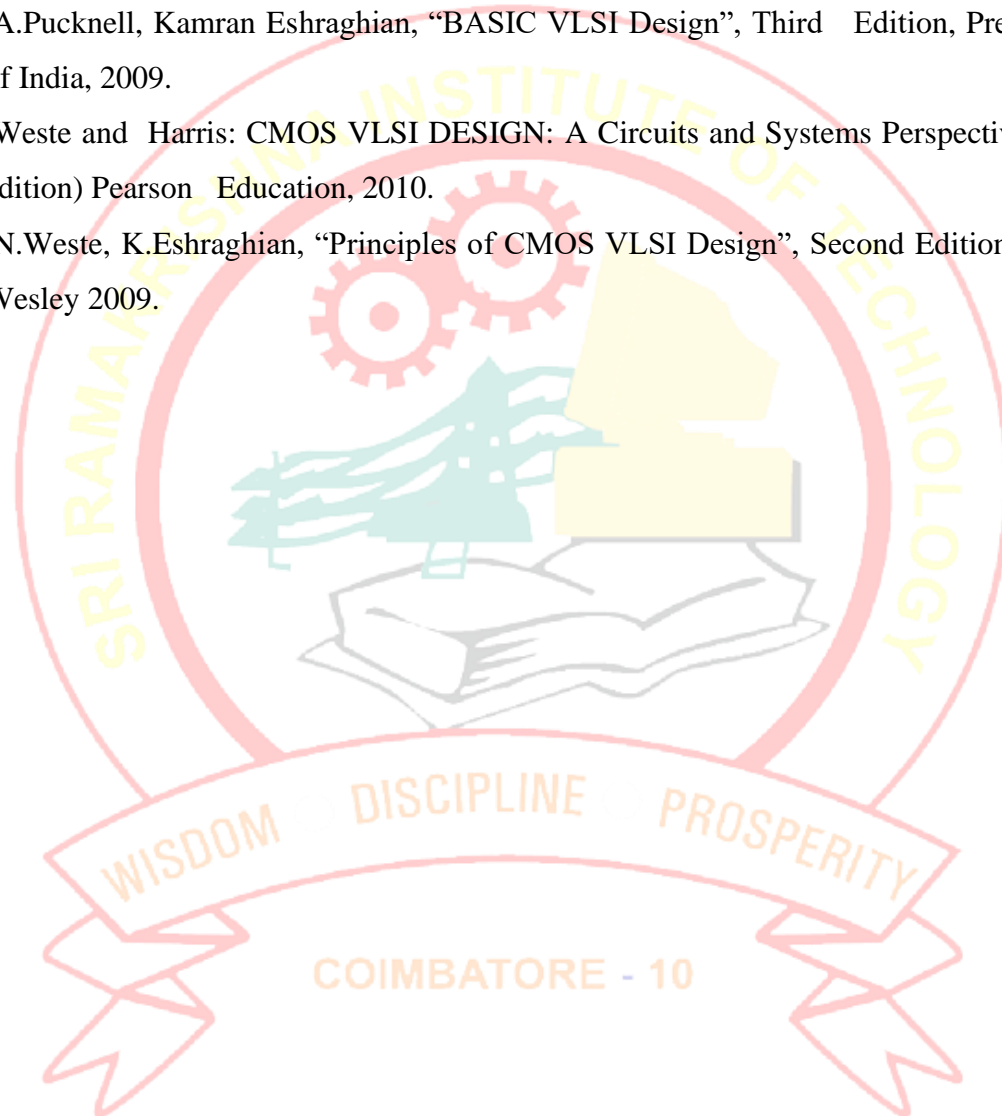
**CO2:** Ability to interpret the operation of VLSI architecture using FPGA.

**CO3:** Ability to build CMOS based arithmetic and logic circuits.

**CO4:** Ability to build CMOS based sequential circuits.

## REFERENCES:

1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, “Digital Integrated Circuits: A Design Perspective”, Second Edition, Prentice Hall of India, 2013.
2. M.J. Smith, “Application Specific Integrated Circuits”, Addison Wesley, 2001.
3. A.Pucknell, Kamran Eshraghian, “BASIC VLSI Design”, Third Edition, Prentice Hall of India, 2009.
4. Weste and Harris: CMOS VLSI DESIGN: A Circuits and Systems Perspective (Fourth edition) Pearson Education, 2010.
5. N.Weste, K.Eshraghian, “Principles of CMOS VLSI Design”, Second Edition, Addison Wesley 2009.





<b>20EEE01</b>	<b>ENERGY MANAGEMENT SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

This course will enable the students to study the concepts behind energy management and auditing, economic analysis and Load management, the energy management on various electrical equipment and metering and to illustrate the concept of lighting systems and cogeneration.

### **COURSE CONTENT:**

#### **Introduction**

Definition for energy management - Need for energy management - energy basics - designing and starting an energy management program - energy accounting -energy monitoring, targeting and reporting - Definition for Energy Audit – Types of energy audit.

#### **Energy Cost and Load Management**

Important concepts in an economic analysis - Economic models-Time value of money - Utility rate structures - cost of electricity - Loss evaluation. Load management: Demand control techniques - Utility monitoring and control system - HVAC and energy management - Economic justification.

#### **Energy Efficiency in Electrical Utilities**

Electricity billing – power factor improvement and benefits – transformers – Distribution losses in industrial system – energy efficient motors and factors affecting motor efficiency – star operations of motor – soft starters with energy saver – standards and labelling for motors.

#### **Metering for Energy Management**

Relationships between parameters - Units of measure - Typical cost factors - Utility meters – Smart meters - Demand meters - Paralleling of current transformers – Instrument transformer burdens-Multitasking solid-state meters - Metering location vs. requirements- Metering techniques and practical examples - Power Balancing & Metering: from grid, Solar to grid

#### **Lighting Systems & Cogeneration**



Concept of lighting systems - The task and the working space -Light sources - Ballasts - luminaries - Lighting controls-Optimizing lighting energy - Power factor and effect of harmonics on power quality - Cost analysis techniques-Lighting and energy standards Cogeneration: Forms of cogeneration – feasibility of cogeneration- Electrical interconnection.

### **COURSE OUTCOMES:**

**At the end of the course student should have the ability to,**

**CO1:** Understand the basics of energy management with respect to economic and social matters.

**CO2:** Apply the concepts of energy management in various electrical energy applications.

**CO3:** Analyze the energy calculation and statistics for improving the efficiency in industries, commercial and domestic applications.

### **REFERENCES:**

1. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, Guide to Energy Management, Fifth Edition, The Fairmont Press, Inc., 2006.
2. IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 196.
3. Amit K. Tyagi, Handbook on Energy Audits and Management, TERI, 2003.
4. Book III - Energy efficiency in electrical utilities, Second Edition 2018, By Bureau of Energy Efficiency, Ministry of Power, India.
5. Reay D.A, Industrial Energy Conservation, 1<sup>st</sup> edition, Pergamon Press, 1977.



<b>20EEE02</b>	<b>MEDICAL INSTRUMENTATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

This course will enable the students to impart knowledge about the basic concepts of bio medical engineering and about sensors, electrodes and their applications in medical fields.

### **COURSE CONTENT:**

#### **Fundamentals of Biomedical Engineering**

Introduction to biomedical Engineering - Development of Bio medical instrumentation – Biometrics – Introduction and Components of man vs Instrument system – physiological system of the body – problems in measuring living system – Sources of biomedical signal – Basic medical instrumentation system – Intelligent Medical Instrumentation system – Regulation of medical devices.

#### **Bio Electric Signals and Electrodes**

Origin of Bio electric signals – ECG – EEG – EMG – Electrodes for ECG - Electrodes for EEG - Electrodes for EMG – Electrical conductivity of Electrode jellies and creams – Micro electrodes – Electrode and Electrolyte interface – polarization.

#### **Physiological Transducers**

Introduction to transducers – classifications of transducers – Performance characteristics of transducer – Displacement transducers – Motion transducers – Position transducers – Pressure transducer – temperature measurement transducer – Photoelectric transducer – Bio sensors – Smart sensors.

#### **Recording Modern Imaging System**

ECG recorder – VCG recorder – PCG recorder – Digital Stethoscope – EEG – Electromyography – Central monitors – Heart and blood pressure measurement - Basis of Diagnostic Radiology – X-ray machine - Visualization of X-Rays - Portable and Mobile X-Ray Units – Digital X-ray System.

#### **Bio Amplifier and Patient Safety**

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers – transformer and optical isolation -

isolated DC amplifier and AC carrier amplifier. Chopper amplifier. Power line interference - Electric Shock Hazards - Leakage Currents - Safety Codes For Electro medical Equipment - Electrical Safety Analyser - Testing Of Biomedical Equipment.

### **COURSE OUTCOMES:**

**At the end of the course student should have the ability to,**

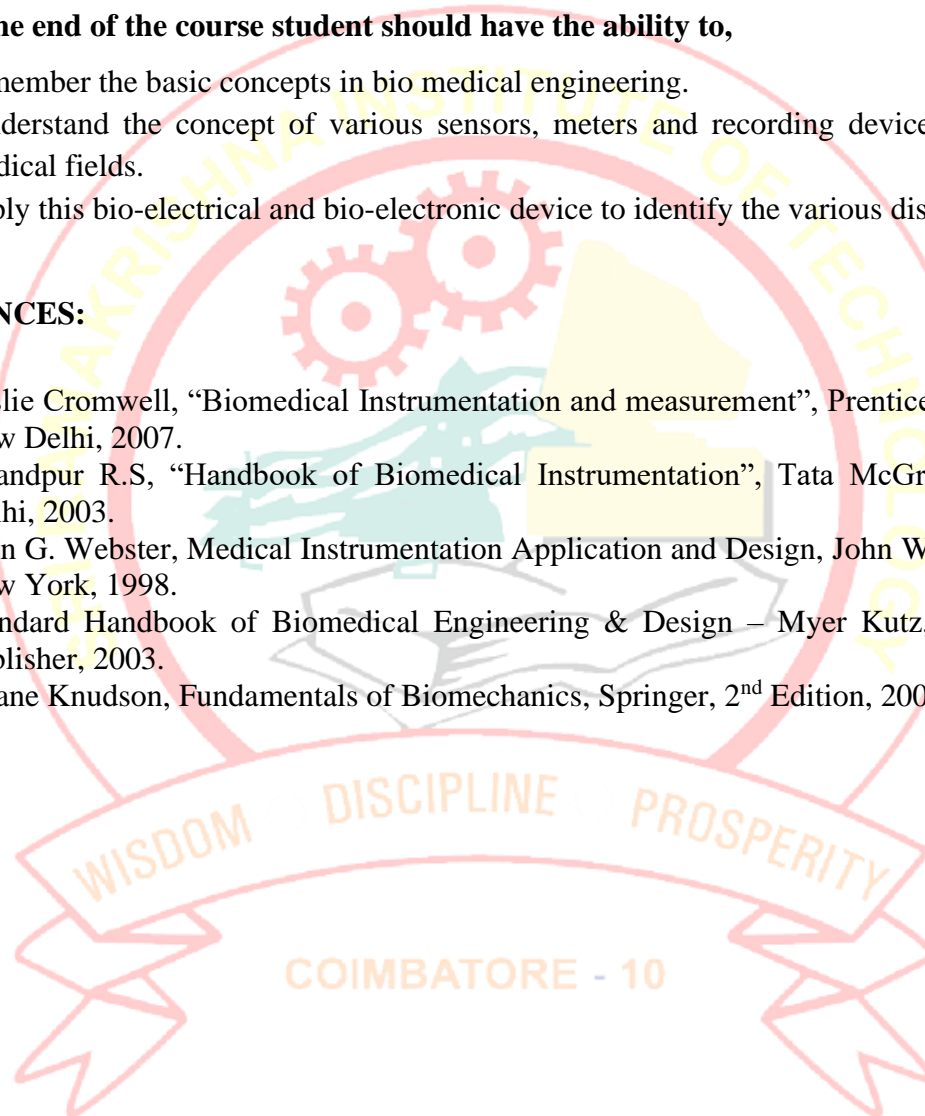
**CO1:** Remember the basic concepts in bio medical engineering.

**CO2:** Understand the concept of various sensors, meters and recording devices used in the medical fields.

**CO3:** Apply this bio-electrical and bio-electronic device to identify the various diseases.

### **REFERENCES:**

1. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.
3. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
4. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGrawHill Publisher, 2003.
5. Duane Knudson, Fundamentals of Biomechanics, Springer, 2<sup>nd</sup> Edition, 2007.



20EEE03	PLC PROGRAMMING	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

The course will enable the students to understand the operating and selection procedures of a PLC for industrial systems and possess knowledge levels to program a small, automated industrial production line.

### **COURSE CONTENT:**

#### **Introduction**

Programmable Logic Controller- History of PLC, Difference between PC & PLC, Architecture of PLC, Advantages and Disadvantages, Overall PLC system, PLC cycle Application.

#### **Programmable Logic Controller**

PLC as a computer, Programming format, PLC Modules - Input on/off Switching Devices, Input Analog Devices, Output on/off Switching Devices, Output Analog Devices.

#### **PLC Programming**

Relay Logic, Coils and Indicators, Ladder Diagram, PLC Input Instructions, PLC Programming Examples, Industrial Process Example.

#### **PLC Functions**

PLC Registers – Input, Output, Holding, Module Addressing, PLC Timer functions, PLC Counter Functions, PLC Arithmetic Functions, and Industrial Application Examples.

#### **Selection, Maintenance and Application**

Factors in Selecting a PLC, Electrical Connections, Troubleshooting malfunctions, Maintenance. Applications – Water Filling Station, Industrial Three-axis Robot Control, PID controller using PLC.

### **COURSE OUTCOMES:**

**At the end of the course student should have the ability to,**

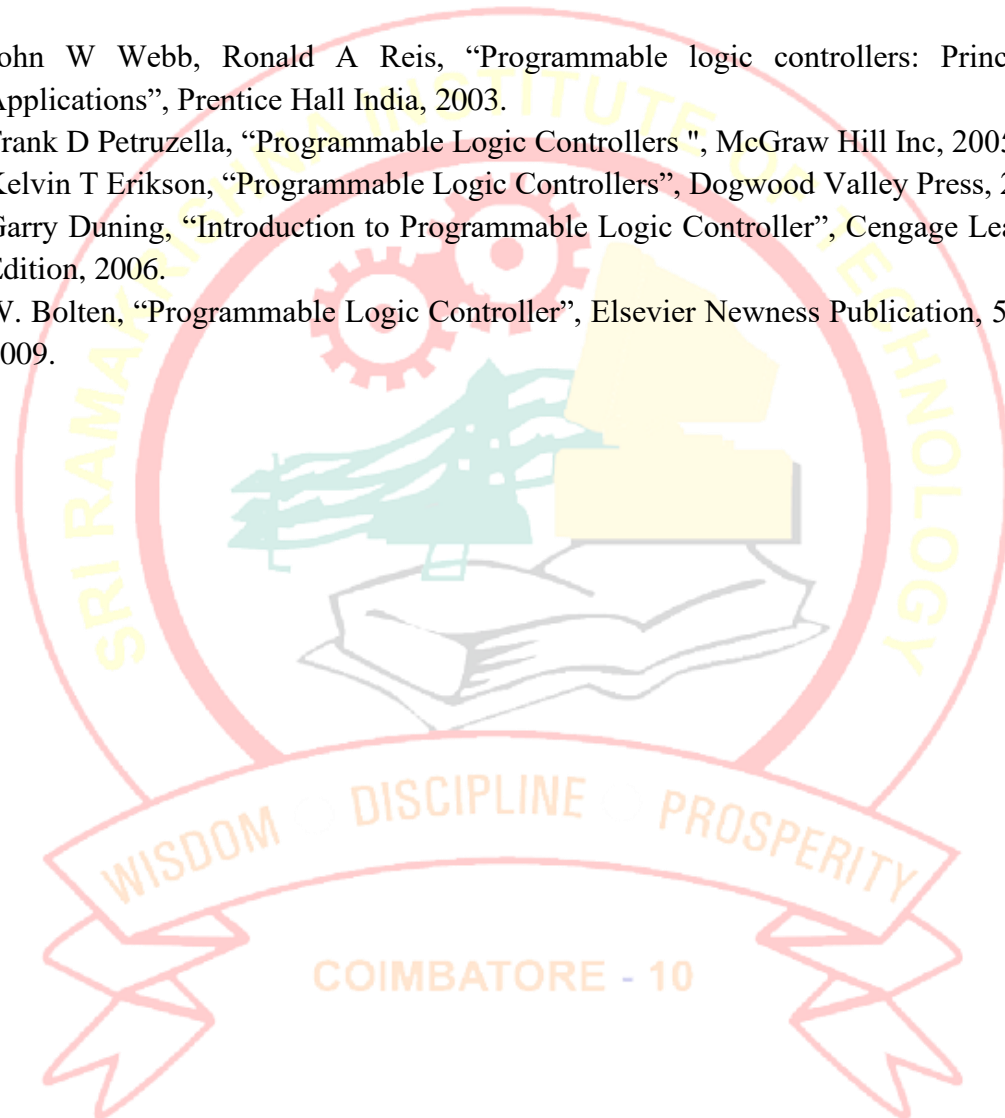
**CO1:** Understand the electrical relay logic and ladder logic.

**CO2:** Identify the correct PLC for an industrial system.

**CO3:** Design ladder logic for small industrial applications.

**REFERENCES:**

2. John W Webb, Ronald A Reis, “Programmable logic controllers: Principles and Applications”, Prentice Hall India, 2003.
3. Frank D Petruzella, “Programmable Logic Controllers ”, McGraw Hill Inc, 2005.
4. Kelvin T Erikson, “Programmable Logic Controllers”, Dogwood Valley Press, 2005.
5. Garry Duning, “Introduction to Programmable Logic Controller”, Cengage Learning, 3<sup>rd</sup> Edition, 2006.
6. W. Bolten, “Programmable Logic Controller”, Elsevier Newness Publication, 5<sup>th</sup> Edition, 2009.



<b>20EEE04</b>	<b>RENEWABLE ENERGY SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

This course will enable the students to study about renewable Energy Sources and technologies, learn adequate inputs on a variety of issues in harnessing renewable Energy and to recognize current and possible future role of renewable energy sources.

### **COURSE CONTENT:**

#### **Renewable Energy (RE) Sources**

Environmental consequences of fossil fuel use - Importance of renewable sources of energy - Sustainable Design and development - Types of RE sources - Limitations of RE sources - Present Indian and international energy scenario of conventional and non-conventional sources.

#### **Wind Energy**

Power in the Wind – Types of Wind Power Plants (WPPs)–Components of WPPs–Working of WPPs - Siting of WPPs - Grid integration issues of WPPs.

#### **Solar PV and Thermal Systems**

Solar Radiation - Radiation Measurement - Solar Thermal Power Plant - Central Receiver Power Plants - Solar Ponds.- Thermal Energy storage system with PCM - Solar Photovoltaic systems - Types of PV Systems - Types of Solar Cells - Cell, module - array - PV Module - I-V Characteristics - series and parallel connections, maximum power point tracking -Applications. Practical usage: Direct supply, Balance Supply Balance Supply needs temporary storage – Batteries fly wheel system (mechanical) based energy optimization

#### **Biomass Energy**

Introduction - Bio mass resources - Energy from Bio mass: conversion processes - Biomass Cogeneration - Environmental Benefits. Geothermal Energy: Basics - Direct Use - Geothermal Electricity - Mini/micro hydro power: Classification of hydropower schemes - Classification of water turbine - Turbine theory - Essential components of hydroelectric system.

#### **Other Energy Sources**

Tidal Energy: Energy from the tides - Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves - wave power devices. Ocean Thermal Energy Conversion (OTEC) - Hydrogen Production and Storage - Fuel cell: Principle of working - various types - construction and applications. Energy Storage System - Hybrid Energy Systems.

### **COURSE OUTCOMES:**

**At the end of the course student should have the ability to,**

- CO1:** Understand the concept of conventional, non-conventional energy sources and solar, wind, biomass, biogas power generation.
- CO2:** Understand the concept of energy conversion of solar, wind, biomass, biogas, hydrogen cell, fuel cell, Geo thermal, Ocean thermal, Tidal and Wave energy.
- CO3:** Apply the concept of energy conversion techniques for the betterment of power generation and power system.

### **REFERENCES:**

1. Joshua Earnest, Tore Wizeliu, 'Wind Power Plants and Project Development', PHI Learning Pvt.Ltd, New Delhi, 2011.
2. D.P.Kothari, K.C Singal, Rakesh Ranjan "Renewable Energy Sources and Emerging Technologies", PHI Learning Pvt., Ltd, New Delhi, 2013.
3. A.K.Mukerjee and Nivedita Thakur, "Photovoltaic Systems: Analysis and Design", PHI Learning Private Limited, New Delhi, 2011.
4. Chetan Singh Solanki, "Solar Photovoltaics : Fundamentals, Technologies and Applications", PHI Learning Private Limited, New Delhi, 2011.
5. Shobh Nath Singh, 'Non-conventional Energy resources' Pearson Education, 2015.



<b>20EEE05</b>	<b>VIRTUAL INSTRUMENTATION AND DATA ACQUISITION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

This course will enable the students to impart the knowledge about software and programming structure of LabVIEW and to introduce various techniques of interfacing with external instruments of PC.

### **COURSE CONTENT:**

#### **Introduction to Virtual Instrumentation**

Introduction - Block diagram and architecture of a virtual instrument - Conventional Instruments versus Virtual Instruments – Data flow techniques, graphical programming in data flow, comparison with conventional programming.

#### **Graphical Programming**

Front panel - Block diagram - VIs - Sub-VIs - Simple examples - Looping: For loop, while loop - Shift registers - case and sequence; structures, formula nodes. Arrays - Clusters, charts and graphs - Local and global variables - Property node, string and file I/O.

#### **Data Acquisition**

DAQ – Components - Buffers - Triggering - Analog I/O - Digital I/O - Counters and timers - DMA, Software and hardware installation, Calibration, Resolution, Data acquisition interface requirements.

#### **Instrument Control**

VI Chassis requirements. Common Instrument Interfaces: Current loop, RS 232C/ RS485, GPIB. Bus Interfaces: USB, PCMCIA, VXI, SCSI, PCI. PXI system controllers - Ethernet control of PXI. Industrial applications- VISA and IVI.

#### **Application of Virtual Instrumentation**



Simulation of systems using VI: Development of Control system - Industrial Communication- Image acquisition and processing - Motion control.

### **COURSE OUTCOMES:**

**At the end of the course student should have the ability to,**

- CO1:** Understand the fundamental programming and dataflow in virtual Instrumentation using various data structures, program structures.
- CO2:** Understand the fundamental programming and dataflow in virtual Instrumentation using various plotting the graphs and charts for system monitoring, processing and controlling.
- CO3:** Apply the concept of network interface for data communication using Data Acquisition systems.
- CO4:** Analyze the tools and to create graphical programming for automation, control applications, real time signal acquisition and analysis

### **REFERENCES:**

1. Jane W. S. Liu, "Real-time Systems", Pearson Education, 2001.
2. Jovitha Jerome, "Virtual Instrumentation using LabVIEW", Prentice Hall of India, New Delhi, 2011.
3. Gary Johnson, "LabVIEW Graphical Programming", McGraw Hill, 1997.
4. Kevin James, "PC Interfacing and Data Acquisition: Techniques for Measurement", Instrumentation and Control, Newnes, 2000.
5. Gupta S and Gupta J P, "PC Interfacing for data acquisition and Process control", Instrument Society of America.

<b>20EEE06</b>	<b>ELECTRIC VEHICLES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

This course will enable the students to impart knowledge about the basic concepts and terminologies, energy storage devices used to drive and power the hybrid electric vehicles, different charging technologies and the control units available in the market area.

### **COURSE CONTENT:**

#### **Introduction**

History of EV – basics of EV - Components in EV – Hybrid Electric Vehicles - Fuel Cell Vehicles - Recent EVs and HEVs – efficiency comparison – pollution comparison – advantages of EV.

#### **Vehicle Mechanics and Regenerative Braking**

General Description of Vehicle Movement - Vehicle Resistance - Dynamic Equation - Tire–Ground Adhesion and Maximum Tractive Effort - Power Train Tractive Effort and Vehicle Speed - Vehicle Power Plant and Transmission Characteristics – EV Vehicle Performance - Tractive Effort in Normal Driving – Energy Consumption – fundamentals of regenerative braking.

#### **Electric Propulsion Systems and Design of Series and Parallel HEV**

DC Motor Drives - Induction Motor Drives – PMBLDC motors – SRM drives – Series HEV: Operation Patterns - Control Strategies - Sizing of the Major Components – Parallel HEV: Control Strategies of Parallel Hybrid Drive Train - Design of Drive Train Parameters - Mild Hybrid Electric Drive Train Design.

#### **Energy Storage System**

Battery Basics – Li-ion Battery - Cell Discharge Operation - Cell Charge Operation – Construction - Alternative Batteries - Battery Parameters - Technical Characteristics - Practical Capacity - Battery Power - Ragone Plots - Targets and Properties of Batteries - Battery Modelling – Ultra capacitors - Ultrahigh-Speed Flywheels - Hybridization of Energy Storages.

## **Charging Station and BMS**

EV charging standards - various methods of charging – battery swapping - V2G - G2V- V2B - V2H - integration of EVs in smart grid – Introduction to BMS

### **COURSE OUTCOMES:**

**At the end of the course student should have the ability to,**

**CO1:** remember the basic concepts in Electric and hybrid electric vehicles.

**CO2:** understand the concept of vehicle dynamics, prime movers, energy storage device and various sensors Electric and hybrid electric vehicles.

**CO3:** apply control units concepts in Electric and hybrid electric vehicles to improve the vehicle efficiency.

### **REFERENCES:**

1. Emadi, A. (Ed.), Miller, J., Ehsani, M., “Vehicular Electric Power Systems” Boca Raton, CRC Press, 2003.
2. Husain, I. “Electric and Hybrid Vehicles” Boca Raton, CRC Press, 2010.
3. Larminie, James, and John Lowry, “Electric Vehicle Technology Explained” John Wiley and Sons, 2012.
4. Tariq Muneer and Irene Illescas García, “The automobile, In Electric Vehicles: Prospects and Challenges”, Elsevier, 2017.
5. Sheldon S. Williamson, “Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles”, Springer, 2013.



# **OPEN ELECTIVE**

**OFFERED BY MECHANICAL ENGINEERING**

<b>20MEE01</b>	<b>AUTOMOTIVE FUNDAMENTALS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

To provide knowledge on IC Engines, braking, transmission, suspension, starting systems along with insights into new combustion techniques used for various fuels and alternative sources.

### **COURSE CONTENT:**

#### **Vehicle Structure, Engine**

Types of automobiles, vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics, IC engines –components function and materials.

#### **Engine Auxiliary Systems**

Electronically controlled gasoline injection system for SI engines and diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system).

#### **Transmission Systems**

Clutch: Types diaphragm clutch, single and multi-plate clutch, centrifugal clutch and construction, Gear box: Types - gear selector and shifting mechanism, transfer box, propeller shaft, slip joints, universal joints, Differential and rear axle.

#### **Brakes and Suspension Systems**

Braking system: Types of brakes, Mechanical, and Air brakes, Disc & Drum brakes, Engine brakes, anti-lock braking system (ABS). Suspension system: Types of Suspension Systems-front and rear suspension.

#### **Alternative Energy Sources and Emission Control**

Use of Natural Gas, Liquefied Petroleum Gas, and Hydrogen in Automobiles. Electric and Hybrid Vehicles, Fuel Cell. Engine emission, Engine emission control system, Emission norms (Euro and BS).

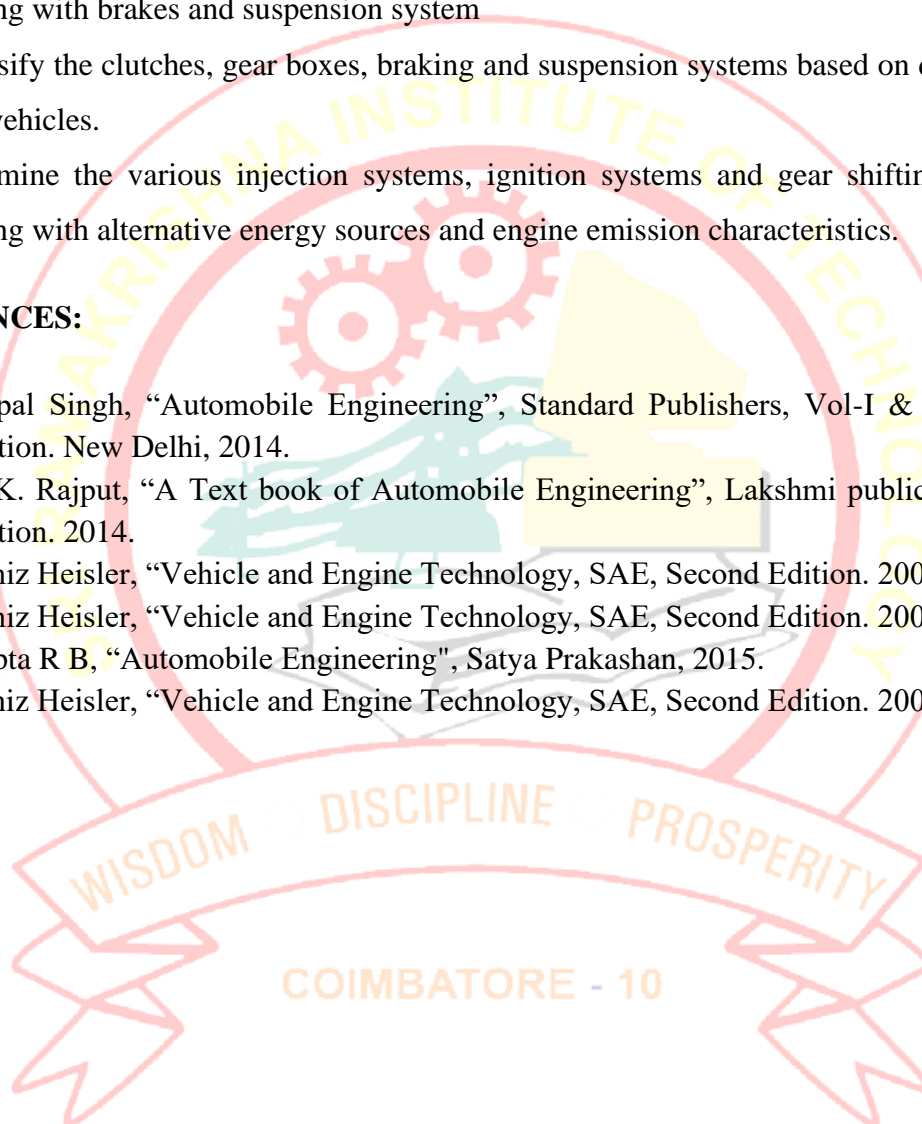
## **COURSE OUTCOMES:**

**At the end of the course the students will have the ability to**

- CO1:** Identify the fundamental components of automobile structures, engine auxiliary systems, along with brakes and suspension system
- CO2:** Classify the clutches, gear boxes, braking and suspension systems based on different types of vehicles.
- CO3:** Examine the various injection systems, ignition systems and gear shifting mechanism along with alternative energy sources and engine emission characteristics.

## **REFERENCES:**

1. Kirpal Singh, "Automobile Engineering", Standard Publishers, Vol-I & II. Thirteenth Edition. New Delhi, 2014.
2. R. K. Rajput, "A Text book of Automobile Engineering", Lakshmi publication, Second Edition. 2014.
3. Heniz Heisler, "Vehicle and Engine Technology, SAE, Second Edition. 2009.
4. Heniz Heisler, "Vehicle and Engine Technology, SAE, Second Edition. 2009.
5. Gupta R B, "Automobile Engineering", Satya Prakashan, 2015.
6. Heniz Heisler, "Vehicle and Engine Technology, SAE, Second Edition. 2009.





20MEE02	COMPUTER AIDED DESIGN	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

To provide an overview of how computers are being used in engineering component designs and make the students understand different CAD standards used in Industries

### **COURSE CONTENT:**

#### **Fundamentals of Computer Graphics**

Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations homogeneous coordinates - Line drawing -Clipping- viewing transformation

#### **Geometric Modeling**

Geometry and topology -representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves-Techniques for surface modeling – surface patch- Coons and bicubic patches. Solid modeling techniques- CSG

#### **Assembly of Parts**

Assembly modelling – interferences of positions and orientation – tolerance analysis-mass property calculations – mechanism simulation and interference checking.

#### **CAD Standards**

Standards for computer graphics- Graphical Kernel System (GKS) - standards for exchange images- Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CALS etc., Communication standards.



## **COURSE OUTCOMES:**

**At the end of the course the students will have the ability to**

**CO1:** Identify the fundamental components of computer graphics such as product cycle, CAD system and architecture, computer graphics, homogeneous coordinates, geometry, topology along with assembly of parts and CAD standards

**CO2:** Classify the types of Coordinate systems, representation of different curves, surface modeling techniques and the various standards used in computer graphics such as GKS, open, IGES, STEP, and CALS.

**CO3:** Examine the assembly modeling with interferences of position and orientation, tolerance analysis and communication standards

## **REFERENCES:**

1. Ibrahim Zeid “Mastering CAD CAM” Tata McGraw-Hill Publishing Co.2007
2. Chris McMahon and Jimmie Browne “CAD/CAM Principles”, "Practice and Manufacturing management “ Second Edition, Pearson Education, 1999.
3. William M Neumann and Robert F.Sproul, “Principles of Computer Graphics”, McGraw Hill Book Co. Singapore, 1989.
4. Donald Hearn and M. Pauline Baker , “Computer Graphics”, Prentice Hall, Inc, 1992.
5. Foley, Wan Dam, Feiner and Hughes - "Computer graphics principles & practice" Pearson Education - 2003.

20MEE03	<b>INTRODUCTION TO POWER PLANT ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

To providing an overview of power plants and detailing the role of Engineers in their operation and maintenance of renewable power sources,

### **COURSE CONTENT:**

#### **Layout of Power Plants**

Layout of Steam, Hydel, Diesel, Nuclear and Gas Turbine Power Plants - Combined Power Cycles – Comparison and Selection

#### **Nuclear and Hydro Power Plants**

Nuclear Energy – Fission, Fusion Reaction, Types of Reactors, Waste Disposal and safety. Hydroelectric power plants – runoff storage and pumped storage type.

#### **Diesel and Gas Power Plants**

Types of Diesel Plants, Components, Selection of Engine Type, Applications, environmental hazards- Gas Turbine Power Plant – Fuels - Gas Turbine Material – Regeneration and Intercooling.

#### **Solar, Tidal, Wind Power Plants and Economic Issues Of Power Plants**

Tidal - Solar thermal central receiver system – wind power plants -Cost of Electric Energy – Fixed and operating Costs – Energy Rates – Types of Tariffs.

### **COURSE OUTCOMES:**

**At the end of the course the students will have the ability to**

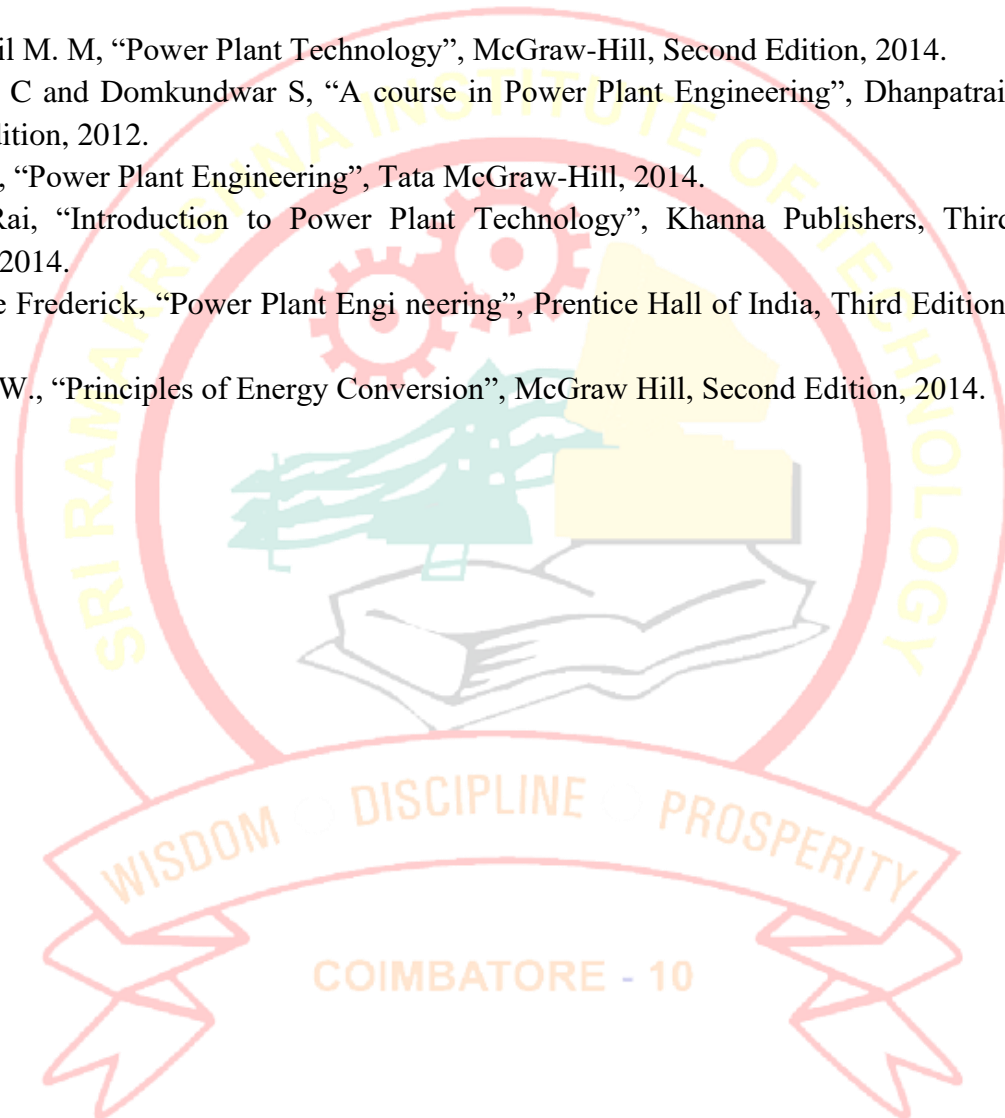
**CO1:** Identify the fundamental components of power plant layouts along with the selection procedure.

**CO2:** Classify the types of power plant layouts, reactors based on the type of fuel energy utilized.

**CO3:** Examine the various components and systems of different power plants such as nuclear, hydro, diesel, gas. Solar, tidal, wind and to determine the economical issues associated with them.

**REFERENCES:**

1. EI- Wakil M. M, “Power Plant Technology”, McGraw-Hill, Second Edition, 2014.
2. Arora S. C and Domkundwar S, “A course in Power Plant Engineering”, Dhanpatrai, Third Edition, 2012.
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5. T. Morse Frederick, “Power Plant Engineering”, Prentice Hall of India, Third Edition, 2014.
6. Culp A. W., “Principles of Energy Conversion”, McGraw Hill, Second Edition, 2014.



<b>20MEE04</b>	<b>INTRODUCTION TO ROBOTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE:**

To impart knowledge about automation, various sensors and their applications in robots. Along with Robot Programming methods & Languages used by robots.

### **COURSE CONTENT:**

#### **Introduction**

Automation and robotics –History of robotics - Definition of a Robot - Basic Concepts - Robot configurations - Types of Robot drives - Basic robot motions - Point to point control - Continuous path control.

#### **Components And Operations**

Basic control system concepts - control system analysis - robot actuation and fed back, Manipulators Coordinate transformation - Brief Robot dynamics. Types of Robot and effectors - Grippers - Tools as end effectors - Robot/End - effort interface.

#### **Sensing and Machine Vision**

Range sensing - Proximity sensing - Touch sensing - Force and Torque sensing. Introduction to Machine vision - Sensing and digitizing - Image processing and analysis.

#### **Robot Programming**

Methods - languages - Capabilities and limitation - Artificial intelligence - Knowledge representation - Search techniques - AI and Robotics.

#### **Industrial Applications**

Application of robots in machining - Welding - Assembly - Material handling - Loading and unloading - CIM - Hostile and remote environments

### **COURSE OUTCOMES:**

**At the end of the course the students will have the ability to**

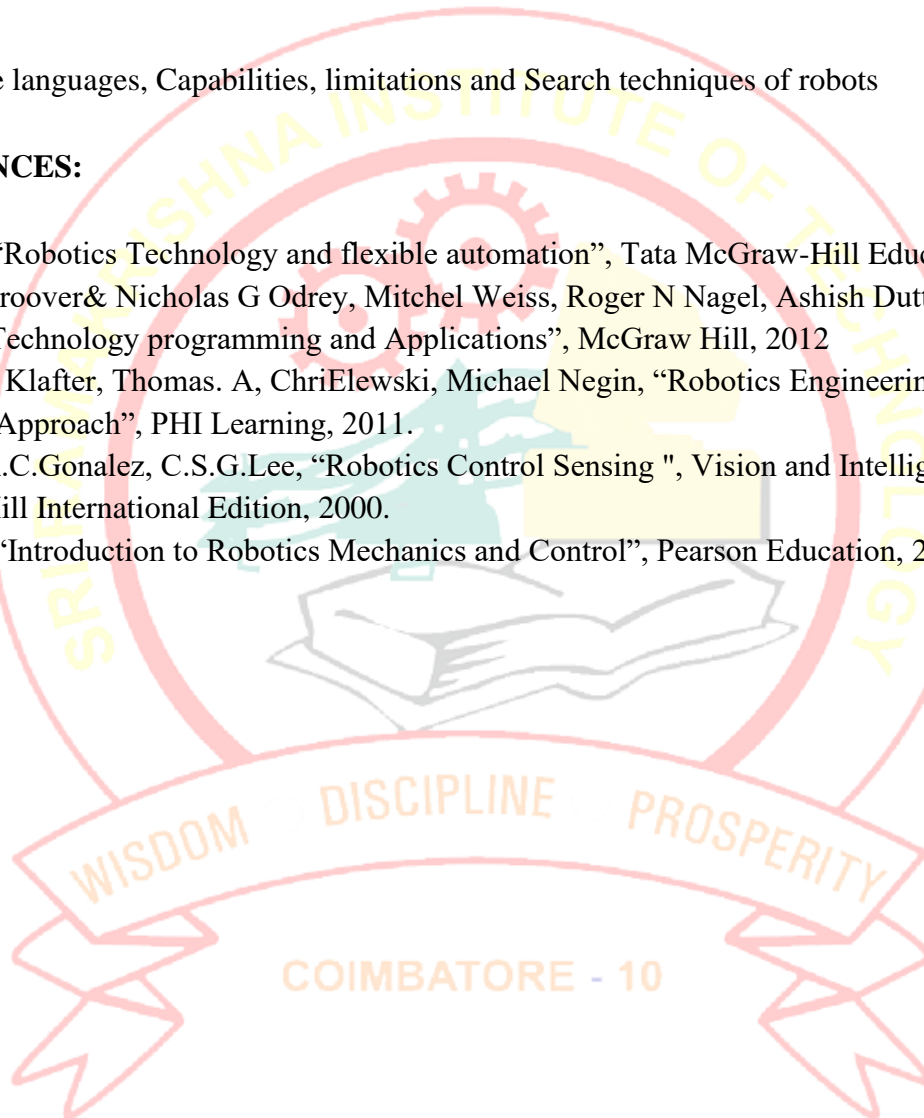
**CO1:** Identify the basic control system concepts, manipulator coordinate transformation, robot dynamics, range sensing, Artificial intelligence and industrial applications of robot such as in Welding, Assembly, Material handling, Loading and unloading,

**CO2:** Classify the types of robots, end effectors, grippers, sensing techniques and robot programming methods,

**CO3:** Examine the languages, Capabilities, limitations and Search techniques of robots

#### **REFERENCES:**

1. S.R. Deb, "Robotics Technology and flexible automation", Tata McGraw-Hill Education., 2010
2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, "Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012
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20MEE05	3D PRINTING	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVE:**

To understand the various RPT processes adopted to produce parts and to impart knowledge on three-dimensional printing, reverse engineering, current technologies and their influence in manufacturing.

### **COURSE CONTENT:**

#### **Fundamentals of RPT**

Development of RP systems, Rapid Tooling, Rapid Manufacturing- Principle –Fundamental – File format – Other translators – medical applications of RP- Materials for Rapid Prototyping Systems

#### **Liquid Based Rapid Prototyping Systems**

Liquid based system – Stereolitho graphy Apparatus (SLA), details of SL process, products, Advantages, Limitations, Applications and Uses.

#### **Solid Based Rapid Prototyping Systems**

Solid based system - Fused Deposition Modeling, principle, process, products, advantages, applications and uses - Laminated Object Manufacturing

#### **Powder Based Rapid Prototyping Systems**

Selective Laser Sintering – principles of SLS process, principle of sinter bonding process, Laser sintering materials, products, advantages, limitations, applications and uses.

#### **Reverse Engineering And New Technologies**

Reverse Engineering - Introduction, measuring device- contact type and non-contact type, CAD model creation, medical data processing - types of medical imaging, software for making medical models, medical materials, and other applications.



## **COURSE OUTCOMES:**

**At the end of the course the students will have the ability to**

- CO1:** Identify the development of RP systems such as liquid, solid and powder based systems, Rapid Tooling, Rapid Manufacturing principle and Fundamentals, File format, translators and medical applications of RP, Materials for Rapid Prototyping Systems along with the concept of reverse engineering.
- CO2:** Classify the advantages, disadvantages and limitations of liquid, solid and powder based rapid prototyping systems along with the types of measuring devices utilized in reverse engineering.
- CO3:** Examine the Stereo lithography Apparatus (SLA), Fused Deposition Modeling, Selective Laser Sintering, Laminated Object Manufacturing based on principles, process and products,
- CO4:** Analyze the concept of reverse engineering, medical data processing and software for making medical models, medical materials, and other applications.

## **REFERENCES:**

1. Douglas Bryden, "CAD and Rapid Prototyping for Product Design", Laurence King, 2014.
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  3. Chee Kai Chua, Kah Fai Leong, Chu Sing Lim "Rapid Prototyping: Principles and Applications" World Scientific Publication Pvt., Ltd, 2011.
  4. Chua C. K, Leong K. F and Lim C. S, "Rapid Prototyping: Principles and Applications", World Scientific, second edition, 2010.
- Ian Gibson, "Advanced Manufacturing Technology for Medical applications: Reverse Engineering, Software conversion and Rapid Prototyping", Wiley, 2006