



Sri

**SAI RAM**  
ENGINEERING COLLEGE

An Autonomous Institution

West Tambaram, Chennai - 44

[www.sairam.edu.in](http://www.sairam.edu.in)

Approved by AICTE, New Delhi  
Affiliated to Anna University



DEPARTMENT OF  
**COMPUTER SCIENCE & ENGINEERING**  
M.TECH. - 5 years Integrated Programme

REGULATIONS  
**2020**

Academic Year 2021-22 onwards

**AUTONOMOUS**  
CURRICULUM AND

**SYLLABUS**  
**I - VI**  
SEMESTERS

## SRI SAIRAM ENGINEERING COLLEGE



### VISION

To emerge as a "Centre of excellence " offering Technical Education and Research opportunities of very high standards to students, develop the total personality of the individual and instil high levels of discipline and strive to set global standards, making our students technologically superior and ethically stronger, who in turn shall contribute to the advancement of society and humankind.



### MISSION

We dedicate and commit ourselves to achieve, sustain and foster unmatched excellence in Technical Education. To this end, we will pursue continuous development of infra-structure and enhance state-of-the-art equipment to provide our students a technologically up-to date and intellectually inspiring environment of learning, research, creativity, innovation and professional activity and inculcate in them ethical and moral values.



### QUALITY POLICY

We at Sri Sai Ram Engineering College are committed to build a better Nation through Quality Education with team spirit. Our students are enabled to excel in all values of Life and become Good Citizens. We continually improve the System, Infrastructure and Service to satisfy the Students, Parents, Industry and Society.

## DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING - 5 YEARS INTEGRATED



### VISION

To be a pioneer in providing industry and research focused integrated curriculum in computer science & engineering and to transform young minds to sustain technically and compete globally with enriched, ethical and moral values to serve the nation & beyond.



### MISSION

Department of Computer Science & Engineering - 5 years Integrated Course, Sri Sairam Engineering College is committed to

- M1** Accelerate the learning process by collaborating undergraduate fundamentals & postgraduate focused learning & research
- M2** Tie-up with industries to facilitate advanced real time projects & internships to bridge gaps between industry & academics
- M3** Impart research mindset to provoke innovative thoughts and be responsible for inventions benefitting society
- M4** Inculcate moral and ethical values as a part of curriculum to enable interpersonal skills.

## AUTONOMOUS CURRICULA AND SYLLABI

### Regulations 2020

#### SEMESTER I

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
<b>THEORY</b>							
1	20BSMA101	Engineering Mathematics-I	3	1	0	4	4
2	20HSEN101	Technical English-I	3	0	0	3	3
3	20BSPH101	Engineering Physics	3	0	0	3	3
4	20BSCY101	Engineering Chemistry	3	0	0	3	3
5	20ESCS101	Problem Solving and Programming in C	3	0	0	3	3
6	20ESGE101	Engineering Graphics	1	2	0	3	3
<b>PRACTICALS</b>							
7	20BSPL101	Physics and Chemistry Laboratory	0	0	3	3	1.5
8	20ESPL101	Programming in C Laboratory	0	0	3	3	1.5
<b>VALUE ADDITIONS - I</b>							
9	20TPHS101	Skill Enhancement	0	0	2	2	1
10	20HSMG101	Personal Values	2	0	0	2	0
<b>TOTAL</b>						<b>29</b>	<b>23</b>

#### SEMESTER II

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
<b>THEORY</b>							
1	20BSMA204	Discrete Structures	3	1	0	4	4
2	20HSEN201	Technical English – II	2	0	2	4	3
3	20BSPH203	Physics for Information Science	3	0	0	3	3
4	20BSCY201	Environmental Science and Engineering	3	0	0	3	3
5	20ESIT202	Python Programming	3	0	0	3	3
6	20ESIT203	Digital Principles and System Design	2	1	0	3	3
<b>PRACTICALS</b>							
7	20ESPL201	Python Programming Laboratory	0	0	3	3	1.5
8	20ESPL202	Digital Laboratory	0	0	3	3	1.5
9	20ESGE201	Engineering Practices Laboratory	0	0	3	3	1.5
<b>VALUE ADDITIONS - II</b>							
10	20TPHS201	Skill Enhancement	0	0	2	2	1
11	20HSMG201	Interpersonal Values	2	0	0	2	0
<b>TOTAL</b>						<b>33</b>	<b>24.5</b>

## AUTONOMOUS CURRICULA AND SYLLABI Regulations 2020

### SEMESTER III

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
<b>THEORY</b>							
1	20BSMA304	Statistics and Linear Algebra	3	1	0	4	4
2	20CJPC301	Object Oriented Programming Using Java and UML	2	1	0	3	3
3	20ITPC301	Data Structures	3	0	3	3	3
4	20ITPC303	Computer Organization & Architecture	3	0	0	3	3
5	20CBPC303	Software Engineering	3	0	0	3	3
<b>PRACTICALS</b>							
6	20ITPL301	Data Structures Laboratory	0	0	3	3	1.5
7	20CJPL301	Object Oriented Analysis and Design Laboratory	0	0	3	3	1.5
<b>VALUE ADDITIONS - III</b>							
8	20CJTE301	Live in Lab- I	0	0	2	2	1
9	20CJTP301	Skill Enhancement	0	0	2	2	1
10	20MGMC301	Constitution of India	2	0	0	2	0
<b>TOTAL</b>						<b>28</b>	<b>21</b>

### SEMESTER IV

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
<b>THEORY</b>							
1	20BSMA402	Probability and Queueing Theory	3	1	0	4	4
2	20CSPC401	Operating Systems	3	0	0	3	3
3	20CSPC402	Database Management Systems	3	0	0	3	3
4	20CJPC401	Core Java Programming	3	0	0	3	3
5	20ITPC401	Design and Analysis of Algorithms	2	1	0	3	3
<b>PRACTICALS</b>							
6	20CSPL401	Operating Systems Laboratory	0	0	3	3	1.5
7	20CSPL402	Database Management Systems Laboratory	0	0	3	3	1.5
8	20CJPL401	Java Programming Laboratory	0	0	3	3	1.5
<b>VALUE ADDITIONS - IV</b>							
9	20CJTE401	Live in Lab- II	0	0	2	2	1
10	20CJTP401	Skill Enhancement	0	0	2	2	1
<b>TOTAL</b>						<b>29</b>	<b>22.5</b>

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#### SEMESTER V

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
<b>THEORY</b>							
1	20CJPC501	Data Warehousing and Data Mining	3	0	0	3	3
2	20CJPC502	Agile Methodologies	3	0	0	3	3
3	20CSPC502	Theory of Computation	3	0	0	3	3
4	20CJPW501	JEE Framework with laboratory	3	0	2	5	4
5	20CJPC503	Web Technology Foundation	3	0	0	3	3
6	20CSPW401	Computer Networks with Laboratory	3	0	2	5	4
<b>PRACTICALS</b>							
7	20CJPL501	Web Technology Laboratory	0	0	3	3	1.5
<b>VALUE ADDITIONS - V</b>							
8	20CJTE501	Live in Lab - III	0	0	2	2	1
9	20CJTP501	Skill Enhancement (DB)	0	0	2	2	1
		<b>TOTAL</b>				<b>29</b>	<b>23.5</b>

#### SEMESTER VI

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
<b>THEORY</b>							
1	20CSPC601	Artificial Intelligence	3	0	0	3	3
2	20CJPC601	Cloud Computing Technologies	3	0	0	3	3
3	20CJPW601	Mobile Application Development (with laboratory)	3	0	2	5	4
4	20XXOLXXX	Open Elective-I	3	0	0	3	3
5	20XXELXXX	Professional Elective I	3	0	0	3	3
<b>PRACTICALS</b>							
6	20CSPL601	Artificial Intelligence Laboratory	0	0	3	3	1.5
7	20CSPL602	Cloud Computing Laboratory	0	0	3	3	1.5
8	20HSP501	Communication and Soft skills Laboratory	0	0	2	2	1
<b>VALUE ADDITIONS - VI</b>							
9	20CJTP601	Skill Enhancement	0	0	2	2	1
10	20CJTE601	Live in Lab IV	0	0	2	2	1
		<b>TOTAL</b>				<b>29</b>	<b>22</b>

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#### SEMESTER VII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
<b>THEORY</b>							
1	20CSPC702	Machine Learning Techniques	3	0	0	3	3
2	20ITPC701	Cryptography and Network Security	3	0	0	3	3
3	20XXELXXX	Professional Elective -II	3	0	0	3	3
4	20XXELXXX	Professional Elective -III	3	0	0	3	3
5	20XXOEXXX	Open Elective -II	3	0	0	3	3
<b>PRACTICALS</b>							
6	20CJPL701	Machine Learning Laboratory	0	0	3	3	1.5
7	20ITPL701	Cryptography & Network Security Laboratory	0	0	3	3	1.5
8	20CJPJ701	Innovative Design Project-I	0	0	4	4	2
<b>VALUE ADDITIONS - VII</b>							
9	20CSTP701	Skill Enhancement	0	0	2	2	1
<b>TOTAL</b>						<b>27</b>	<b>21</b>

#### SEMESTER VIII

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
<b>THEORY</b>							
1	20CJPW801	Front End Framework Engineering with Laboratory	3	0	2	5	4
2	20CSPC701	Big Data Analytics	3	0	0	3	3
3	20CJPW802	Computer Vision with Laboratory	3	0	2	5	4
4	20XXELXXX	Professional Elective -IV	3	0	0	3	3
5	20XXELXXX	Professional Elective -V	3	0	0	3	3
<b>PRACTICALS</b>							
6	20CSPL701	Big Data Analytics Laboratory	0	0	3	3	1.5
7	20CJPJ801	Innovative Design Project II	0	0	4	4	2
<b>TOTAL</b>						<b>26</b>	<b>20.5</b>

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#### SEMESTER IX

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
<b>THEORY</b>							
1	20XXELXXX	Professional Elective-VI	3	0	0	3	3
<b>PRACTICAL</b>							
2	20CJPJ901	Project Phase – I(Internship )	0	0	32	32	12
<b>TOTAL</b>						<b>35</b>	<b>15</b>

#### SEMESTER X

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			TOTAL CONTACT HOURS	CREDITS
			L	T	P		
<b>PRACTICAL</b>							
1	20CJPJ1001	Project Phase – II	0	0	40	40	12
<b>TOTAL</b>						<b>40</b>	<b>12</b>

**PROFESSIONAL ELECTIVES - I**

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20ESEC502	Microprocessors and Microcontrollers	3	0	0	3	Internet of Things
2	20CSEL503	Distributed Systems	3	0	0	3	Cloud Computing & Security
3	20CSEL505	NoSQL Database	3	0	0	3	Data Science
4	20ITEL706	Computer Graphics and Multimedia	3	0	0	3	Software Engg. & Computing
5	20MGEL501	Intellectual Property Rights	3	0	0	3	Management
6	20CJEL601	Foundation of Cyber Security	3	0	0	3	Cyber security
7	20CSPC602	Compiler Design	3	0	0	3	Software Engg. & Computing
8	20CSEL608	Soft Computing	3	0	0	3	Artificial Intelligence
9	20CSEL703	Information Retrieval Techniques	3	0	0	3	Artificial Intelligence

**PROFESSIONAL ELECTIVES - II**

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20ITEL607	Embedded Systems	3	0	0	3	Internet of Things
2	20CSPC701	Network Design and Technologies	3	0	0	3	Cloud Computing & Security
3	20CSEL604	Bio Informatics	3	0	0	3	Data Science
4	20ITEL601	Software Testing	3	0	0	3	Software Engg. & Computing
5	20MGEL601	Total Quality Management	3	0	0	3	Management
6	20CSEL502	Cyber Forensics	3	0	0	3	Cyber security
7	20CJEL701	R Programming	3	0	0	3	Software Engg. & Computing
8	20CSEL805	Speech Processing	3	0	0	3	Artificial Intelligence
9	20CSEL806	Cognitive Science	3	0	0	3	Software Engg. & Computing

**PROFESSIONAL ELECTIVES - III**

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20ITEL709	Internet of Things	3	0	0	3	Internet of Things
2	20ITEL702	Wireless AdHoc and Sensor Networks	3	0	0	3	Cloud Computing & Security
3	20CSEL605	Predictive Modeling	3	0	0	3	Data Science
4	20CSEL601	Software Project Management	3	0	0	3	Software Engg. & Computing
5	20MGEL701	Foundation Skills in Integrated Product Development	3	0	0	3	Management
6	20CJEL702	Cyber Security Principles	3	0	0	3	Cyber security
7	20ITEL701	C# and .Net Programming with Laboratory	2	1	0	3	Software Engg. & Computing
8	20ITPC501	Web Technology	3	0	0	3	Software Engg. & Computing
9	20CJEL703	Human Computer Interaction	3	0	0	3	Artificial Intelligence

**PROFESSIONAL ELECTIVES - IV**

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20CSEL606	IoT Architecture, Network & Security	3	0	0	3	Internet of Things
2	20CJEL801	Fundamentals of Open Source Systems	3	0	0	3	Cloud Computing & Security
3	20CSEL701	Social Network Analysis	3	0	0	3	Data Science
4	20ITEL804	Digital Image Processing	3	0	0	3	Software Engg. & Computing
5	20MGEL801	Professional Ethics and Values	3	0	0	3	Management
6	20CSEL803	Block Chain and Crypto Currency Technologies	3	0	0	3	Cyber security
7	20CJELL802	Performance Analysis of Computer Systems	3	0	0	3	Artificial Intelligence
8	20CJEL803	Web Analytics	3	0	0	3	Software Engg. & Computing
9	20CJEL804	Advanced Machine Learning	3	0	0	3	Data Science

**PROFESSIONAL ELECTIVES - V**

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20CSEL706	Multi-core Architectures and Programming	3	0	0	3	Internet of Things
2	20PCNEL308	Information Storage Management	3	0	0	3	Cloud Computing & Security
3	20CSEL802	Deep Learning Principles & Practices	3	0	0	3	Data Science
4	20CSEL806	Cognitive Science	3	0	0	3	Software Engg. & Computing
5	20HSMG601	Principles of Engineering Management	3	0	0	3	Management
6	20CJEL805	Applied Cryptography	3	0	0	3	Cyber security
7	20CJEL806	Service Oriented Architecture	3	0	0	3	Cloud Computing & Security
8	20CJEL807	Reconfigurable Computing	3	0	0	3	Software Engg. & Computing
9	20CSEL808	Natural Language Processing	3	0	0	3	Artificial Intelligence

**PROFESSIONAL ELECTIVES - VI**

S. NO	COURSE CODE	COURSE TITLE	WEEK HOURS			CREDIT	STREAM
			L	T	P		
1	20CJEL901	Security in Internet of Thing	3	0	0	3	Internet of Things
2	20CSEL801	Green Computing	3	0	0	3	Cloud Computing & Security
3	20CSEL808	Scientific Visualization Techniques	3	0	0	3	Data Science
4	20CSEL804	Software Quality Assurance	3	0	0	3	Software Engg. & Computing
5	20CBMG502	Business Strategy	3	0	0	3	Management
6	20CJEL902	Digital Forensics & Malware Analysis	3	0	0	3	Cyber security
7	20CSEL707	Game Programming	3	0	0	3	Internet of Things
8	20ITEL802	Virtual & Augmented Reality	3	0	0	3	Internet of Things
9	20CJEL903	Agent Based Intelligent System	3	0	0	3	Artificial Intelligence

**HONOURS DATA SCIENCE**

<b>S. NO</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>
1	20CSEL505	NoSQL Database
2	20CSEL604	Bio Informatics
3	20CSEL605	Predictive Modeling
4	20CSEL701	Social Network Analysis
5	20CSEL802	Deep Learning Principles & Practices
6	20CJEL804	Advanced Machine Learning
7	20CSEL808	Scientific Visualization Techniques

**HONOURS ARTIFICIAL INTELLIGENCE**

<b>S. NO</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>
1	20CSEL608	Soft Computing
2	20CSEL805	Speech Processing
3	20CJEL703	Human Computer Interaction
4	20CJELL802	Performance Analysis of Computer Systems
5	20CSEL808	Natural Language Processing
6	20CJEL903	Agent Based Intelligent System

**PROGRAM EDUCATIONAL OBJECTIVES (PEOs)**

- PEO 1** Graduates will have solid and sound basics in Mathematics, Scientific and Engineering fundamentals necessary to understand and analyze any problems and design a computer based solution.
- PEO 2** Graduates will have the capability to work effectively as Computer Science Engineers, including supportive and leadership roles in multi disciplinary domain and research.
- PEO 3** Graduates will have the potential to participate in life-long learning through the successful completion of higher degrees, continuing education, certifications and/or other professional developments.
- PEO 4** Graduates will have the ability to apply the gained knowledge to improve the society ensuring ethical and moral values.

**PROGRAM SPECIFIC OUTCOMES (PSOs)**

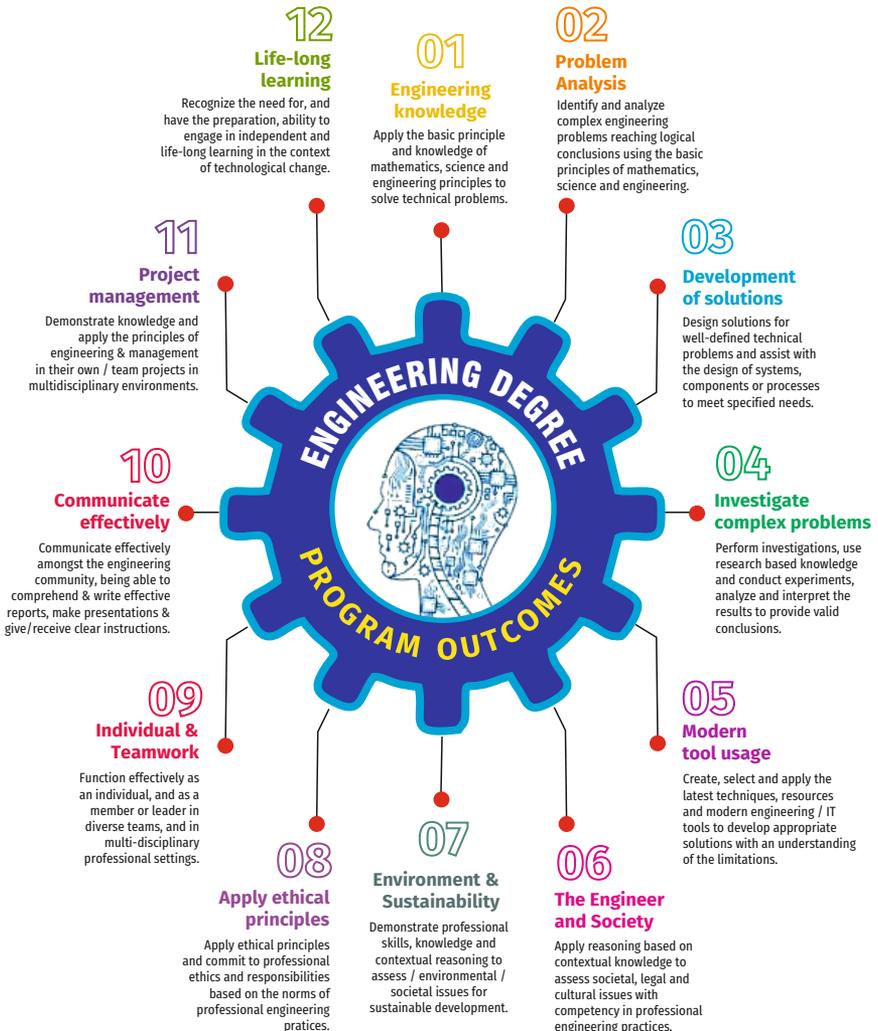
- PSO 1** The Computer Science and Engineering graduates are able to analyze, design, develop, test and apply management principles, mathematical foundations in the development of computational solutions, make them to expert in designing the computer software and hardware.
- PSO 2** Develop their skills to solve problems in the broad area of programming concepts and appraise environmental and social issues with ethics and manage different projects in inter-disciplinary field.

**COMPONENTS OF THE CURRICULUM (COC)**

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total Number of credits
Basic Sciences(BS)	14.39	31	29.5
Engineering Sciences(ES)	8.78	24	18
Humanities and Social Sciences (HS)	3.41	09	07
Professional Electives(EL)	8.78	18	18
Program Core+Program Lab (PC+PL)	32.93	84	67.5
Program theory with Lab (PW)	9.76	25	20
Open Electives (OE)	2.93	06	06
Talent Enhancement (TE)	1.95	08	04
Project (PJ)	13.66	80	28
Training & Placement (TP)	3.41	14	07
Internships/Seminars (IS)	0.00	NA	NA
Mandatory Courses (MC)	0.00	06	NA
Total number of Credits		305	205

## PROGRAMME OUTCOMES(POs)

PROGRAM OUTCOME REPRESENTS THE KNOWLEDGE, SKILLS AND ATTITUDES THAT THE STUDENTS WOULD BE EXPECTED TO HAVE AT THE END OF THE 4 YEAR ENGINEERING DEGREE PROGRAM



**SEMESTER - I**

<b>20BSMA101</b> <b>SDG NO. 4 &amp; 9</b>	<b>ENGINEERING MATHEMATICS-I</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>

**OBJECTIVES:**

The intent of the course is

- To understand and gain the knowledge of matrix algebra.
- To introduce the concepts of limits, continuity, derivatives and maxima and Minima
- To acquaint the concept of improper integrals and the properties of definite integrals.
- To provide understanding of double integration, triple integration and their application.
- To introduce the concept of sequence and series and impart the knowledge of Fourier series.

**UNIT I MATRICES****12**

Symmetric, skew symmetric and orthogonal matrices; Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem (excluding proof) – Diagonalization of a Quadratic form using orthogonal transformation - Nature of Quadratic forms.

**UNIT II DIFFERENTIAL CALCULUS****12**

Limits, continuity, Differentiation rules - Maxima and Minima of functions of one variable, partial derivatives (first and second order – basic problems), Taylor's series for functions of two variables, Jacobian, Maxima & Minima of functions of several variables, saddle points; Method of Lagrange multipliers.

**UNIT III INTEGRAL CALCULUS****12**

Evaluation of definite integrals - Techniques of Integration-Substitution rule - Integration by parts, Integration of rational functions by partial fraction, Integration of irrational functions. Applications of definite integrals to evaluate surface area of revolution and volume of revolution. Evaluation of improper integrals.

**UNIT IV MULTIPLE INTEGRALS****12**

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.

**UNIT V SEQUENCES AND SERIES**

Introduction to sequences and series – power series – Taylor's series – series for exponential, trigonometric, logarithmic, hyperbolic functions – Fourier series – Half range Sine and Cosine series – Parseval's theorem.

**TOTAL: 60 PERIODS****TEXTBOOKS:**

1. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7<sup>th</sup> Edition, New Delhi, 2015.
2. B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 11<sup>th</sup> Reprint, 2010.

**REFERENCES:**

1. G.B. Thomas and R.L. Finney, "Calculus and Analytic Geometry", 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
3. T. Veerarajan, "Engineering Mathematics for first year", Tata McGraw-Hill, New Delhi, 2008.
4. N.P. Bali and Manish Goyal, "A text-book of Engineering Mathematics", Laxmi Publications, Reprint, 2008.
5. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40<sup>th</sup> Edition, 2014.

**WEB REFERENCES:**

1. <https://math.mit.edu/~gs/linearalgebra/ila0601.pdf>
2. <http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter30/>
3. <https://ocw.mit.edu/courses/mathematics/18-02sc-multivariable-calculus-fall-2010/2.-partial-derivatives/>
4. <http://ocw.mit.edu/ans7870/18/18.013a/textbook/HTML/chapter31/>

**ONLINE RESOURCES:**

1. <https://www.khanacademy.org/math/linear-algebra/alternate-bases/eigen-everything/v/linear-algebra-introduction-to-eigenvalues-and-eigenvectors>
2. <https://www.khanacademy.org/math/differential-calculus>

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Diagonalize the matrix using orthogonal transformation and apply Cayley Hamilton Theorem to find the inverse and integral powers of a square matrix. (K3)

2. Evaluate the limit, examine the continuity and use derivatives to find extreme values of a function. (K3)
3. Evaluate definite and improper integrals using techniques of integration. (K3)
4. Apply double and triple integrals to find the area of a region and the volume of a surface. (K3)
5. Compute infinite series expansion of a function. (K3)

**CO - PO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	-	-	-	-	-	-	1
CO2	3	3	2	1	1	-	-	-	-	-	-	1
CO3	3	3	2	1	1	-	-	-	-	-	-	1
CO4	3	3	2	1	1	-	-	-	-	-	-	1
CO5	3	3	2	1	1	-	-	-	-	-	-	1

**SEMESTER - I**

<b>20HSEN101</b> SDG NO. 4	<b>TECHNICAL ENGLISH - I</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>

**OBJECTIVES:**

- To develop the basic LSRW skills of the students
- To encourage the learners to adapt to listening techniques
- To help learners develop their communication skills and converse fluently in real contexts
- To help learners develop general and technical vocabulary through reading and writing tasks
- To improve the language proficiency for better understanding of core subjects

**UNIT I INTRODUCTION**

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**Listening** - short texts - formal and informal conversations - **Speaking** - basics in speaking - speaking on given topics & situations - recording speeches and strategies to improve - **Reading** - critical reading - finding key information in a given text - shifting facts from opinions - **Writing** - free writing on any given topic - autobiographical writing - **Language Development** - tenses - voices- word formation: prefixes and suffixes - parts of speech - developing hints

**UNIT II READING AND LANGUAGE DEVELOPMENT**

9

**Listening** - long texts - TED talks - extensive speech on current affairs and discussions - **Speaking** - describing a simple process - asking and answering questions - **Reading** comprehension - skimming / scanning / predicting & analytical reading - question & answers - objective and descriptive answers - identifying synonyms and antonyms - process description - **Writing** instructions - **Language Development** - writing definitions - compound words.

**UNIT III SPEAKING AND INTERPRETATION SKILLS**

9

**Listening** - dialogues & conversations - **Speaking** - role plays - asking about routine actions and expressing opinions - **Reading** longer texts & making a critical analysis of the given text - **Writing** - types of paragraph and writing essays - rearrangement of jumbled sentences - writing recommendations - **Language Development** - use of sequence words - cause & effect expressions - sentences expressing purpose - picture based and newspaper based activities - single word substitutes

**UNIT IV VOCABULARY BUILDING AND WRITING SKILLS**

9

**Listening** - debates and discussions - practicing multiple tasks - self introduction - **Speaking** about friends/places/hobbies - **Reading** - Making inference from the reading passage - Predicting the content of the reading passage - **Writing** - informal letters/e-mails - **Language Development** - synonyms & antonyms - conditionals - if, unless, in case, when and others - framing questions.

**UNIT V LANGUAGE DEVELOPMENT AND TECHNICAL WRITING**

9

**Listening** - popular speeches and presentations - **Speaking** - impromptu speeches & debates - **Reading** - articles - magazines/newspapers **Writing** - essay writing on technical topics - channel conversion - bar diagram/ graph - picture interpretation - process description - **Language Development** - modal verbs - fixed / semi-fixed expressions - collocations

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Board of Editors. Using English: A Coursebook for Undergraduate Engineers and Technologists. Orient Blackswan Limited, Hyderabad: 2015.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai, 2011.

**REFERENCES:**

1. Anderson, Paul V. Technical Communication: A Reader – Centered Approach. Cengage, New Delhi, 2008.
2. Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason, USA, 2007.
3. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford, 2007.
4. Chauhan, Gajendra Singh and et.al. Technical Communication (Latest Revised Edition). Cengage Learning India Pvt. Limited, 2018.

**WEB REFERENCES:**

1. [https://swayam.gov.in/nd1\\_noc19\\_hs31/preview](https://swayam.gov.in/nd1_noc19_hs31/preview)
2. <http://engineeringvideolectures.com/course/696>

**ONLINE RESOURCES:**

1. <https://www.pearson.com/english/catalogue/business-english/technical-english.html>
2. <https://www.cambridgeenglish.org/learning-english/free-resources/>

**OUTCOMES:****Upon completion of the course, the student should be able to**

1. Express and explain short texts on different topics with key information applying suitable vocabulary (K2)
2. Interpret and dramatize fluently in informal and formal contexts (K2)
3. Choose and apply the right syntax in comprehending diversified general and technical articles (K3)
4. Analyze and write technical concepts in simple and lucid style (K3)
5. Construct informal letters and e-mails thoughtfully (K2)
6. Demonstrate technical concepts and summaries in correct grammar and vocabulary (K2)

**CO - PO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	1	-	2	3	1	1
CO2	-	-	-	-	-	-	-	1	2	3	2	1
CO3	-	-	-	-	-	-	-	-	1	3	3	2
CO4	-	2	-	-	-	-	-	1	2	3	1	1
CO5	-	-	-	-	-	-	-	2	-	3	2	1
CO6	-	-	-	-	-	-	3	-	-	3	2	1

**SEMESTER - I**

<b>20BSPH101</b> SDG NO. 4	<b>ENGINEERING PHYSICS</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>

**OBJECTIVES:**

- To educate and enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology

**UNIT I CRYSTAL PHYSICS****9**

Single crystalline, Polycrystalline and Amorphous materials - single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal - Miller indices - Interplanar distance - Powder diffraction method - Debye Scherer formula - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - packing factor for SC, BCC, FCC and HCP structures - Polymorphism and allotropy - Diamond and Graphite structure (qualitative) - Growth of single crystals: Solution and Melt growth Techniques.

**UNIT II PROPERTIES OF MATTER****9**

Elasticity - Stress - strain diagram and its uses - Poisson's ratio - Relationship between three moduli of elasticity (qualitative) - Factors affecting elastic modulus and tensile strength - Twisting couple - shaft - Torsion pendulum: theory and experiment - bending of beams - bending moment - cantilever: theory and experiment - uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

**UNIT III QUANTUM PHYSICS****9**

Black body radiation - Planck's theory (derivation) - Compton effect: theory -

wave particle duality - electron diffraction - progressive waves - wave equation - concept of wave function and its physical significance - Schrödinger's wave equation - Time independent and Time dependent equations - particle in a box (one dimensional motion) - Tunneling (qualitative) - scanning tunneling microscope.

#### UNIT IV LASERS AND FIBER OPTICS

9

**Lasers:** population of energy levels, Einstein's A and B coefficients derivation - pumping methods - resonant cavity, optical amplification (qualitative) - three level and four level laser - CO<sub>2</sub> laser - Semiconductor lasers: Homojunction and Heterojunction.

**Fiber optics:** Principle, Numerical aperture and Acceptance angle - Types of optical fibers (material, refractive index, mode) - Losses associated with optical fibers - Fiber Optical Communication system (Block diagram) - Fiber optic sensors: pressure and displacement.

#### UNIT V THERMAL PHYSICS

9

Transfer of heat energy - thermal expansion of solids and liquids - bimetallic strips - thermal conduction, convection and radiation - heat conduction in solids (qualitative) - thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) - thermal insulation - applications: heat exchangers, refrigerators and solar water heaters.

**TOTAL : 45 PERIODS**

#### TEXT BOOKS:

1. D.K. Bhattachary & T.Poonam, "Engineering Physics". Oxford University Press, 2015.
2. R.K. Gaur & S.L. Gupta, "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. B.K. Pandey & S.Chaturvedi, "Engineering Physics", Cengage Learning India, 2017.
4. V. Rajendran, "Engineering Physics", Mc Graw Hill Publications Ltd. New Delhi, 2014.
5. M.N. Avadhanulu & P.G. Kshirshagar, "A textbook of Engineering Physics", S. Chand & Co Ltd. 2016.

#### REFERENCES:

1. D. Halliday, . Resnick & J. Walker, "Principles of Physics", Wiley, 2015.
2. R.A. Serway, & J.W. Jewett, "Physics for Scientists and Engineers", Cengage Learning, 2010.
3. N.K. Verma, "Physics for Engineers", PHI Learning Private Limited, 2014.

4. P.A. Tipler & G. Mosca "Physics for Scientists and Engineers", W.H.Freeman, 2020.
5. Brijlal and Subramanyam, "Properties of Matter", S. Chand Publishing, 2018.
6. Shatendra Sharma & Jyotsna Sharma, "Engineering Physics", Pearson, 2018.

### OUTCOMES:

#### Upon completion of the course, the student should be able to

1. To understand the crystal systems and elastic properties of Materials (K2)
2. To distinguish different crystal structures and heat conduction in conductor and insulators (K4)
3. To explain powder diffraction method-deformation of materials in response to action load, quantum mechanics to understand wave particle dualism (K2)
4. To apply quantum theory to set up one dimensional Schrodinger's wave equation and applications to a matter wave system and principle of laser action (K3)
5. To analyze bending of beams, types of optical fiber and modes of heat transfer (K4)
6. To discuss light propagation in optical fibers and transfer of heat energy in different measures and its applications (K2)

### CO - PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	-	-	-	-	-	-	-	1
CO2	3	2	3	3	-	-	2	-	-	-	-	3
CO3	3	3	3	2	-	-	3	-	-	-	-	2
CO4	3	3	3	3	-	-	-	-	-	-	-	3
CO5	3	3	3	3	-	-	3	-	-	-	-	3
CO6	3	3	3	3	-	-	3	-	-	-	-	3

# SEMESTER - I

<b>20BSCY101</b> SDG NO. 4,6&7	<b>ENGINEERING CHEMISTRY</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>

## OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques
- To illustrate the principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials
- To categorize types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels
- To demonstrate the principles and generation of energy in batteries, nuclear reactors, solar cells, windmills and fuel cells
- To recognize the applications of polymers, composites and nano-materials in various fields

## UNIT I WATER TECHNOLOGY AND SURFACE CHEMISTRY 9

**Water Technology :** Introduction – Hard water and Soft water. Hardness of water – types – expression of hardness (numerical problems). Boiler troubles – scale and sludge, priming and foaming, caustic embrittlement and boiler corrosion. Treatment of boiler feed water – Internal treatment (carbonate, phosphate, calgon, colloidal and sodium aluminate conditioning). External treatment – Ion exchange process, Zeolite process – Domestic water treatment (break point chlorination) – Desalination of brackish water – Reverse Osmosis.

**Surface Chemistry:** Adsorption – types – adsorption of gases on solids – adsorption of solutes from solution – applications of adsorption – role of adsorbents in catalysis and pollution abatement.

## UNIT II ELECTROCHEMISTRY AND CORROSION 9

**Electrochemistry:** Cells – types (electrochemical and electrolytic cell) Redox reaction – single electrode potential (oxidation potential and reduction potential) – measurement and applications – Nernst equation (derivation and problems) – electrochemical series and its significance.

**Corrosion:** Causes, factors and types – chemical and electrochemical corrosion (galvanic, differential aeration). Corrosion control – material selection and design aspects, cathodic protection methods (sacrificial anodic and impressed current cathodic method) and corrosion inhibitors. Paints: Constituents and its functions. Electroplating of Copper and electroless plating of Nickel.

**UNIT III FUELS AND COMBUSTION****9**

**Fuels:** Introduction – classification of fuels – Coal – analysis of coal (proximate and ultimate). Carbonization – manufacture of metallurgical coke (Otto Hoffmann method) – Petroleum – manufacture of synthetic petrol (Bergius process). Knocking – octane number and cetane number – Gaseous fuels – Compressed natural gas (CNG), Liquefied petroleum gases (LPG). Biofuels – Gobar gas and Biodiesel.

**Combustion of Fuels:** Introduction – calorific value – higher and lower calorific values- theoretical calculation of calorific value – flue gas analysis (ORSAT Method).

**UNIT IV ENERGY SOURCES AND STORAGE DEVICES****9**

**Energy sources:** Nuclear fission – nuclear fusion – differences between nuclear fission and fusion – nuclear chain reactions – nuclear energy – light water nuclear power plant – breeder reactor – solar energy conversion – solar cells – wind energy.

**Storage devices:** Batteries – types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery), fuel cells – H<sub>2</sub> -O<sub>2</sub> fuel cell and super capacitors.

**UNIT V POLYMERS AND NANOMATERIALS****9**

**Polymers:** Classification – types of polymerization – mechanism (Free radical polymerization) –Engineering polymers: Nylon-6, Nylon-6,6, Teflon, Kevlar and PEEK – preparation, properties and uses – Plastic and its types – Conducting polymers – types and applications. Composites – definition, types, polymer matrix composites – FRP.

**Nanomaterials:** Introduction – Nanoparticles, Nanoclusters, Nanorods, Nanotubes (CNT: SWNT and MWNT) and Nanowires – Properties (surface to volume ratio, melting point, optical and electrical), Synthesis (precipitation, thermolysis, hydrothermal, electrodeposition, chemical vapour deposition, laser ablation, sol-gel process) and Applications.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015.
2. P. C. Jain and Monika Jain, "Engineering Chemistry" DhanpatRai Publishing Company (P) LTD, New Delhi, 2015.
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.
4. Ravikrishnan A, 'Engineering Chemistry', Sri Krishna Hitech Publishing Company Pvt. Ltd, New Edition 2021.

**REFERENCES:**

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

**OUTCOMES****Upon completion of the course, the student should be able to**

1. Identify the origin of water resources and develop innovative methods to produce soft water for industrial use and potable water at cheaper cost and recognize the basic design of adsorption systems and its industrial applications. (K2)
2. Recognize the basic concepts of electrochemistry and apply the principles of electrochemistry to corrosion process and the applications of protective coatings to overcome the corrosion. (K2)
3. Disseminating the importance of chemistry of fuels and combustion to enhance the fuel efficiency. (K2)
4. Acquire the basics of non-conventional sources of energy and illustrate the principles and the reaction mechanism of batteries and fuel cells. (K2)
5. Explain the synthesis and applications of polymers, composites and nano-materials. (K2)

**CO – PO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	1	2	-	-	-	-	1
CO2	3	2	3	2	2	1	2	-	-	-	-	3
CO3	3	2	3	2	-	1	2	-	-	-	-	1
CO4	3	2	3	2	-	1	2	-	-	-	1	3
CO5	3	2	3	1	2	1	1	-	-	-	1	3

# SEMESTER - I

20ESCS101 SDG NO. 4&9	PROBLEM SOLVING AND PROGRAMMING IN C	L	T	P	C
		3	0	0	3

## OBJECTIVES:

- To understand about the programming language
- To develop C Programs using basic Programming Constructs, Loops Arrays and Strings
- To develop applications in C using Functions, Pointers and Structures
- To perform I/O operations and File Handling in C

## UNIT I INTRODUCTION TO PROGRAMMING AND ALGORITHMS FOR PROBLEM SOLVING 10

The Basic Model of Computation, Programming Paradigms- Program Development Life Cycle - Algorithm –Pseudo Code – Flow Chart - Programming Languages - Compilation - Linking and Loading - Testing and Debugging - Documentation - Control Structures – Algorithmic Problem Solving- Problems Based on Sequential, Decision Making - Branching and Iteration.

## UNIT II BASICS OF C PROGRAMMING 8

Structure of C program - C programming: Data Types – Storage Classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions – Input / Output Statements - Assignment Statements – Decision making Statements - Switch Statement - Looping Statements – Pre-Processor Directives - Compilation Process

## UNIT III ARRAYS AND STRINGS 9

**Introduction to Arrays:** Declaration, Initialization – One Dimensional Array – Example Program: Computing Mean, Median and Mode - Two Dimensional Arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String Operations: Length, Compare, Concatenate - Copy – Selection Sort - Linear and Binary Search.

## UNIT IV FUNCTIONS AND POINTERS 9

**Introduction to Functions:** Function Prototype, Function Definition, Function Call, Built-in Functions (String Functions, Math Functions) – Recursion – Example Program: Computation of Sine Series - Scientific Calculator using Built-in Functions - Binary Search using Recursive Functions – Pointers – Pointer Operators – Pointer Arithmetic – Arrays and Pointers –

Array of Pointers – Example Program: Sorting of Names – Parameter Passing: Pass by Value - Pass by Reference – Example Program: Swapping of Two Numbers using Pass by Reference.

## **UNIT V STRUCTURES and FILE PROCESSING**

**9**

Structure - Nested Structures – Pointer and Structures – Array of Structures – Example Program using Structures and Pointers – Self Referential Structures – Dynamic Memory Allocation - Singly Linked List – Typedef.

**Files – Types of File Processing:** Sequential Access, Random Access – Sequential Access File - Example Program: Finding Average of Numbers stored in Sequential Access File - Random Access File - Example Program: Transaction Processing Using Random Access Files – Command Line Arguments.

**TOTAL: 45 PERIODS**

### **TEXT BOOKS:**

1. Reema Thareja, “Programming in C”, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie, D.M, “The C Programming language”, Second Edition, Pearson Education, 2012.

### **REFERENCES:**

1. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh edition, Pearson Publication, 2015.
2. Jeri R. Hanly & Elliot B. Koffman, “Problem Solving and Program Design in C”, Pearson Education, 2013.
3. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009.
4. Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996.
6. Kanetkar Y, “Let us C”, BPB Publications, 2007.
7. Hanly J R & Koffman E.B, “Problem Solving and Programme design in C”, Pearson Education, 2009.

### **WEB REFERENCES:**

1. <https://www.learn-c.org/>
2. <https://codeforwin.org/>
3. <https://www.cprogramming.com/>

**ONLINE RESOURCES:**

1. [https://www.linuxtopia.org/online\\_books/programming\\_books/gnu\\_c\\_programming\\_tutorial](https://www.linuxtopia.org/online_books/programming_books/gnu_c_programming_tutorial)
2. <https://nptel.ac.in/courses/106105171>
3. [https://swayam.gov.in/nd1\\_noc19\\_cs42/preview](https://swayam.gov.in/nd1_noc19_cs42/preview)

**OUTCOMES:****Upon completion of the course, the student should be able to**

1. Understand the concepts of algorithms for solving a problem. (K2)
2. Illustrate the various constructs in C to develop simple applications. (K3)
3. Understand the concepts of Array & Strings. (K2)
4. Demonstrate the usage of Functions and Pointers. (K3)
5. Explain the Structure and union concepts. (K2)
6. Describe the file manipulation and its organisation. (K2)

**CO- PO, PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	3	3	2	1	1	-	2	2	-	3	2	3
C02	3	3	3	3	2	-	1	1	2	2	3	3	2	3
C03	3	3	3	3	2	1	1	1	2	-	3	-	3	2
C04	3	3	3	3	2	1	-	1	2	2	3	3	1	2
C05	3	3	3	3	2	1	1	1	2	2	3	3	2	1
C06	3	3	3	3	2	1	1	1	2	2	3	3	3	2

**SEMESTER - I**

<b>20ESGE101</b> SDG NO. 4,6,7, 9, 12,14 &15	<b>ENGINEERING GRAPHICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>1</b>	<b>2</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products
- To visualize the job in three dimensions
- To have a clear conception and appreciation of the shape, size, proportion and design
- To expose the student community to existing national standards related to technical drawings

**CONCEPTS AND CONVENTIONS (Not for Examination) 3**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning- Projection of Points

**UNIT I PLANE CURVES AND FREEHAND SKETCHING 6+9**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid on Horizontal Surfaces – construction of involutes of circle for one complete revolution – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects.

**UNIT II PROJECTION OF LINES AND PLANE SURFACE 6+9**

Orthographic projection- principles-Principal planes- 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-Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT III PROJECTION OF SOLIDS 6+9**

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

**UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6+9**

Sectioning of prisms, pyramids, cylinder and cone in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and truncated solids in vertical position – Prisms, pyramids cylinder and cone.

**UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+9**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinder, cone- Perspective projection of simple solids-Prisms, pyramids and cylinder by visual ray method.

**TOTAL: 78 PERIODS**

**TEXT BOOKS:**

1. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.
2. T. Jeyapooan, "Engineering Graphics using AUTOCAD", Vikas Publishing House Pvt Ltd, 7th Edition.

**REFERENCES:**

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
3. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
4. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
5. 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, 2005.
6. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
7. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.

**WEB REFERENCES:**

1. <https://nptel.ac.in/courses/112/103/112103019/>

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/105/104/105104148/>

**PUBLICATION OF BUREAU OF INDIAN STANDARDS:**

1. IS10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Relate thoughts and ideas graphically in a neat fashion and ability to perform sketching of engineering curves used in engineering practices, multiple views of objects. (K1)
2. Understand the concepts of orthographic projections for basic geometrical constructions. (K2)
3. Acquire the knowledge of orthographic projection in three dimensional object. (K2)
4. Develop knowledge about Sectioning and apply interior shapes of solids. (K3)
5. Analyze the concepts of design in developing various 3 dimensional projections. (K4)
6. Build a strong foundation to analyze the design in various dimensions. (K4)

**CO - PO, PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO2	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO3	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO4	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO5	3	2	2	-	-	-	-	-	2	2	-	2	2	2
CO6	3	2	2	-	-	-	-	-	2	2	-	2	2	2

**SEMESTER - I**

<b>20BSPL101</b> SDG NO. 4	<b>PHYSICS AND CHEMISTRY</b> <b>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>

**PHYSICS LABORATORY****OBJECTIVES:**

- To acquaint the students with practical knowledge of physics principles in various fields such as optics, thermal physics and properties of matter for developing basic experimental skills
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis

**LIST OF EXPERIMENTS (Any 5 Experiments)**

1. Determination of Young's modulus by non-uniform bending method.
2. Determination of rigidity modulus -Torsion pendulum.
3. Determination of velocity of sound and compressibility of liquid - Ultrasonic Interferometer.
4. (a) Determination of wavelength and particle size using Laser.  
(b) Determination of acceptance angle in an optical fiber.
5. Determination of thermal conductivity of a bad conductor - Lee's Disc method.
6. Determination of specific resistance of a given coil of wire - Carey Foster's bridge.
7. Determination of wavelength of mercury spectrum - spectrometer grating.
8. Determination of band gap of a semiconductor.
9. Determination of Hall coefficient by Hall Effect experiment.
10. Determination of solar cell characteristics.

**LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS /  
6 (max.) STUDENTS PER EXPERIMENT**

- |  |           |
|--|-----------|
| 1. Young's modulus by non-uniform bending method-<br>experimental set-up                             | - 12 sets |
| 2. Rigidity modulus - Torsion pendulum experimental<br>set-up  | - 12 sets |
| 3. Ultrasonic Interferometer to determine velocity of sound<br>and compressibility of liquid         | - 6 sets  |
| 4. (a) Experimental set-up to find the wavelength of light,<br>and to find particle size using Laser | - 6 sets  |
| (b) Experimental set-up to find acceptance angle in an<br>optical fiber                              | - 6 sets  |
| 5. Lee's disc method- experimental set up to find thermal<br>conductivity of a bad conductor         | - 6 sets  |
| 6. Experimental set-up to find specific resistance of a coil<br>of wire-Carey Foster's Bridge        | - 6 sets  |
| 7. Experimental set-up to find the wavelength of mercury<br>spectrum-spectrometer grating            | - 6 sets  |
| 8. Experimental set-up to find the band gap of a semiconductor                                       | - 12 sets |
| 9. Experimental set-up to find the Hall coefficient by<br>Hall Effect Experiment                     | - 6 sets  |
| 10. Experimental set-up to study characteristics of solar cells                                      | - 6 sets  |

**TEXTBOOKS:**

1. J.D. Wilson & C.A. Hernandez Hall "Physics Laboratory Experiments" Houghton Mifflin Company, New York, 2010.
2. M.N. Srinivasan, S. Balasubramanian & R. Ranganathan, "Practical Physics", S. Chand & Sons educational publications, New Delhi, 2011.
3. R. Sasikumar, "Practical Physics", PHI Learning Pvt. Ltd., New Delhi, 2011.

**CHEMISTRY LABORATORY****(Any five experiments to be conducted)****OBJECTIVES:**

- To acquaint the students with practical knowledge of the basic concepts of chemistry, the student faces during the course of their study in the industry and engineering field
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis
- To understand and develop experimental skills for building technical competence

**LIST OF EXPERIMENTS (Any five experiments to be conducted)**

1. Estimation of HCl using  $\text{Na}_2\text{CO}_3$  as primary standard and Determination of alkalinity in water samples.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Determination of strength of given hydrochloric acid using pH meter.
6. Conductometric titration of strong acid vs strong base.
7. Estimation of iron content of the given solution using potentiometer.
8. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
9. Estimation of sodium and potassium present in water using flame photometers.
10. Determination of molecular weights of polymers using Ostwald's Viscometer.

**LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS /**

**6 (MAX.) STUDENTS PER EXPERIMENT.**

- |   |          |
|---|----------|
| 1. Estimation of HCl using $\text{Na}_2\text{CO}_3$ as primary standard and Determination of alkalinity in water sample | - 6 sets |
| 2. Determination of total, temporary & permanent hardness of water by EDTA method                                       | - 6 sets |
| 3. Determination of DO content of water sample by Winkler's method  | - 6sets  |
| 4. Determination of chloride content of water sample by argentometric method  | - 6 sets |
| 5. Determination of strength of given hydrochloric acid using pH meter  | - 6 sets |
| 6. Conductometric titration of strong acid vs strong base   | - 6 sets |
| 7. Estimation of iron content of the given solution using potentiometer   | - 6 sets |
| 8. Estimation of iron content of the water sample using spectrophotometer (1,10- Phenanthroline / thiocyanate method)   | - 2 sets |
| 9. Estimation of sodium and potassium present in water using flame photometer   | - 2 sets |
| 10. Determination of molecular weights of polymer using Ostwald's Viscometer.   | - 6 sets |

**TOTAL: 30 PERIODS****TEXT BOOKS:**

1. Vogel's Textbook of Quantitative Chemical Analysis (8th edition, 2014).

**OUTCOMES:****Upon completion of the course, the student should be able to**

1. Apply the principles of thermal physics and properties of matter to evaluate the properties of materials and to determine the physical properties of liquid using ultrasonic interferometer. (K1)
2. Understand measurement technique and usage of new instruments in optics for real time application in engineering. (K2)
3. Apply the knowledge of semiconductor materials to evaluate the band gap and Hall coefficient of materials and to study the characteristics of solar cell for engineering solutions. (K3)
4. Interpret quantitative chemical analysis to generate experimental skills in building technical competence. (K3)
5. Analyze the quality of water for domestic and industrial purpose. (K3)

6. Standardize the solutions using volumetric titrations, conductivity, pH, redox potential and optical density measurements. (K3)

**CO- PO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	3	3	2	2	1	1	3
CO2	3	3	3	3	3	3	3	2	2	2	2	3
CO3	3	3	3	3	3	3	3	2	1	1	2	3
CO4	3	2	3	3	1	1	2	2	2	2	3	2
CO5	3	2	3	3	1	1	2	2	2	2	3	2
CO6	3	2	3	3	1	1	2	2	2	2	3	2

**SEMESTER - I**

<b>20ESPL101</b> <b>SDG NO. 4&amp;9</b>	<b>PROGRAMMING IN C 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>

**OBJECTIVES:**

- To develop programs in C using basic Programming Constructs
- To develop applications in C using Arrays and Strings
- To design and implement applications in C using Functions, Structures
- To develop applications in C using Files

**LIST OF EXPERIMENTS**

1. Write a program using I/O statements and expressions.
2. Write programs using decision-making constructs.
3. Write a program to find whether the given year is leap year or not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)
4. Write a program to perform the Calculator operations, namely, addition, subtraction, multiplication, division and square of a number.
5. Write a program to check whether a given number is Armstrong number or not?

6. Write a program to check whether a given number is odd or even?
7. Write a program to find the factorial of a given number.
8. Write a program to find out the average of 4 integers.
9. Write a program to display array elements using two dimensional arrays.
10. Write a program to perform swapping using function.
11. Write a program to display all prime numbers between two intervals using functions.
12. Write a program to reverse a sentence using recursion.
13. Write a program to get the largest element of an array using the function.
14. Write a program to concatenate two string.
15. Write a program to find the length of String.
16. Write a program to find the frequency of a character in a string.
17. Write a program to store Student Information in Structure and Display it.
18. The annual examination is conducted for 10 students for five subjects. Write a program to read the data and determine the following:
  - (a) Total marks obtained by each student.
  - (b) The highest marks in each subject and the marks of the student who secured it.
  - (c) The student who obtained the highest total marks.
19. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
20. Count the number of account holders whose balance is less than the minimum balance using sequential access file.

**TOTAL: 45 PERIODS**

#### **LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

Standalone desktops with C compiler 30 Nos.  
(or)  
Server with C compiler supporting 30 terminals or more.

#### **OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Solve some simple problems leading to specific applications. (K3)
2. Demonstrate C programming development environment, compiling, debugging, linking and executing a program. (K3)
3. Illustrate C programs for simple applications making use of basic constructs, arrays and strings. (K3)
4. Construct C programs involving functions and recursion. (K3)

5. Demonstrate C programs involving pointers, and structures. (K3)
6. Interpret applications using sequential and random access file. (K3)

**CO- PO, PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	1	-	2	2	-	3	2	3
CO2	3	3	3	3	2	-	1	1	2	2	3	3	2	3
CO3	3	3	3	3	2	1	1	1	2	-	3	-	3	2
CO4	3	3	3	3	2	1	-	1	2	2	3	3	1	2
CO5	3	3	3	3	2	1	1	1	2	2	3	3	2	1
CO6	3	3	3	3	2	1	1	1	2	2	3	3	3	2

**SEMESTER - I**

<b>20TPHS101</b> <b>SDG NO. 4&amp;5</b>	<b>SKILL ENHANCEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**OBJECTIVES:**

- To enrich social network ethics
- To develop and enhance browsing culture
- To understand the concepts of networking
- To promote self professionalism
- To acquire knowledge about various digital identification procedures

**UNIT I SOCIAL NETWORK ETIQUETTES****6**

Introduction to social network – Social Networking Etiquettes - Pros and Cons - Usage of Facebook, Instagram, WhatsApp, Telegram, Youtube, Evolution of Android and IOS, Introduction to LinkedIn & Benefits. (Practicals – Official Mail id- LinkedIn Id Creation, LinkedIn Profile Building, Facebook Id and Creation and Modifying the existing FB ID)

**UNIT II BROWSING CULTURE****6**

Introduction to browsing – Search Engines-Google - Bing -Yahoo!-AOL -MSN -DuckDuckGo, browsers, phishing – Cookies - URL – https:// extensions, browsing history, Incognito mode- VPN – Pros and Cons – Book mark.

**UNIT III NETWORKING****6**

Basics of networking - LAN, MAN, WAN, Introduction to network topologies, Protocols , IP Commands (Command line prompt), Define online compiler and editor (Practicals – Find Your System IP, Ping Command, Firewall Fortinet, Basic DOS Commands)

**UNIT IV PROFESSIONALISM****6**

Dress Code, Body Language, Appropriate Attire ,Communication Skills, Interview preparation – Introducing yourself - How to greet Superiors, Importance of Eye Contact During conversation.

**UNIT V DIGITAL IDENTIFICATION****6**

Introduction to NAD - Importance of Aadhar, PAN Card, Passport, Bank Account, Bar Code, QR scan, Payment Gateway (Gpay, Phone Pe, UPI, BHIM, Paytm), Mobile Banking (Practicals - NAD registration Step by Step, Linking bank account with netbanking, Register for payment gateway).

**TOTAL : 30 PERIODS****WEB REFERENCES :****Unit I: Social Network Etiquettes:**

1. <https://sproutsocial.com/glossary/social-media-etiquette/>
2. <https://www.shrm.org/resourcesandtools/tools-and-samples/hr-qa/pages/socialnetworkingsitespolicy.aspx>
3. <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.02711/full>
4. <https://medium.com/@sirajea/11-reasons-why-you-should-use-telegram-instead-of-whatsapp-ab0f80fbfa79>
5. <https://buffer.com/library/how-to-use-instagram/>
6. <https://www.webwise.ie/parents/what-is-youtube/>
7. <https://www.androidauthority.com/history-android-os-name-789433/>
8. <https://www.mindtools.com/pages/article/linkedin.htm>

**Unit II: Browsing Culture:**

1. <https://sites.google.com/site/bethanycollegeofteacheredn/unit-ict-connecting-with-world/national-policy-on-information-and-communication-technology-ict/accessing-the-web-introduction-to-the-browser-browsing-web>
2. <https://www.wordstream.com/articles/internet-search-engines-history>
3. <https://www.malwarebytes.com/phishing/>
4. <https://www.adpushup.com/blog/types-of-cookies/>

5. <https://www.eff.org/https-everywhere>
6. <https://www.sciencedirect.com/topics/computer-science/browsing-history>
7. <https://www.vpnmentor.com/blog/pros-cons-vpn/>
8. <https://www.tech-wonders.com/2016/10/use-hush-private-bookmarking-extension-chrome.html>

### **Unit III: Networking**

1. <https://www.guru99.com/types-of-computer-network.html>
2. <https://www.studytonight.com/computer-networks/network-topology-types>
3. <https://www.cloudflare.com/learning/network-layer/what-is-a-protocol/>
4. <https://www.howtogeek.com/168896/10-useful-windows-commands-you-should-know/>
5. <https://paiza.io/en>

### **Unit IV : Professionalism**

1. <https://career.vt.edu/develop/professionalism.html>
2. <https://englishlabs.in/importance-dress-code/>
3. <https://www.proschoolonline.com/blog/importance-of-body-language-in-day-to-day-life>
4. <https://www.thespruce.com/etiquette-of-proper-attire-1216800>
5. <https://shirleytaylor.com/why-are-communication-skills-important/>
6. <https://www.triad-eng.com/interview-tips-for-engineers/>
7. <https://www.indeed.co.in/career-advice/interviewing/interview-question-tell-me-about-yourself>
8. <https://toggl.com/track/business-etiquette-rules/>

### **Unit V: Digital Identification**

1. <https://nad.ndml.in/nad-presentation.html>
2. <https://www.turtlemint.com/aadhaar-card-benefits/>
3. <https://www.bankbazaar.com/pan-card/uses-of-pan-card.html>
4. <https://www.passportindex.org/passport.php>
5. <https://consumer.westchestergov.com/financial-education/money-management/benefits-of-a-bank-account>
6. [https://en.wikipedia.org/wiki/QR\\_code](https://en.wikipedia.org/wiki/QR_code)

7. <https://www.investopedia.com/terms/p/payment-gateway.asp>
8. <https://www.paisabazaar.com/banking/mobile-banking/>

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Learn and apply social network ethics. (K3)
2. Understand the browsing culture. (K2)
3. Analyze the networking concepts. (K4)
4. Develop self professionalism. (K3)
5. Gain hands-on experience in various digital identification procedures. (K2)
6. Analyse and apply the different digital payment gateway methods. (K4)

**CO- PO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	3	2	-	3	2	3	-	2
CO2	-	-	-	-	3	2	-	3	2	3	-	2
CO3	-	-	-	-	3	2	-	-	1	3	-	2
CO4	-	-	-	-	3	2	-	3	3	3	-	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2

**SEMESTER - I**

20HSMG101 SDG NO. 4&5	<b>PERSONAL VALUES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>

**OBJECTIVES:**

- Values through Practical activities

**UNIT I SELF CONCEPT****6**

Understanding self Concept – Identify Yourself – Who am I – an individual, engineer, citizen – Attitude – Measuring Behaviour – Change of Behaviour – Personality – Characteristics in personal, professional life.

**UNIT II INDIVIDUAL VALUES****6**

Personal Values – Attributes –Courage – Creativity, Honesty, Perfection, Simplicity, Responsibility – Measuring personal values

**UNIT III MORAL VALUES****6**

Moral – Understanding right and wrong – Positive thoughts – Respect to others – Doing good to society.

**UNIT IV PHYSICAL AND MENTAL WELL-BEING****6**

Health – Physical fitness –Mental vigour – Diet management – Yoga – Meditation – Peaceful life – Happiness in life

**UNIT V DECISION MAKING****6**

Goal Setting – Decision making skill – Overcome of Barriers – Success – Mental strength and weakness

**TOTAL: 30 PERIODS****Note:**

Each topic in all the above units will be supplemented by practice exercises and classroom activities and projects.

**REFERENCE BOOKS:**

1. Barun K. Mitra, “Personality Development and Soft Skills”, Oxford University Press, 2016.
2. B.N.Ghosh, “Managing Soft Skills for Personality Development” McGraw Hill India, 2012.

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Become an individual in knowing the self. (K4)
2. Acquire and express Personal Values, Spiritual values and fitness. (K4)
3. Practice simple physical exercise and breathing techniques. (K2)
4. Practice Yoga asana which will enhance the quality of life. (K1)
5. Practice Meditation and get benefitted. (K1)
6. Understanding moral values and need of physical fitness. (K2)

**CO – PO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	-	-	-	-	-	2	2	3	3	1	1	1
C02	-	-	-	-	-	2	2	3	3	1	1	1
C03	-	-	-	-	-	2	2	3	3	1	1	1
C04	-	-	-	-	-	2	2	3	3	1	1	1
C05	-	-	-	-	-	2	2	3	3	1	1	1
C06	-	-	-	-	-	2	2	3	3	1	1	1

**SEMESTER - II**

<b>20BSMA204</b> SDG NO. 4	<b>DISCRETE STRUCTURES</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>

**OBJECTIVES:**

- To learn the basic concepts of Relations and Functions
- To learn the concepts of Mathematical induction, Permutation and Combination
- To understand the concepts of Logic, Rules of inference and Quantifiers
- To impart the knowledge on Groups, Normal subgroups, Rings and Fields
- To develop Graph Algorithms by using the concepts of Graphs and Trees

**UNIT I RELATION AND FUNCTION 12**

Binary Relation, Partial Ordering Relation, Equivalence Relation – Sum and Product of functions – Bijective functions – Inverse and composite functions.

**UNIT II COMBINATORICS 12**

The Principles of Mathematical Induction-The Well-Ordering Principle – Recursive definition – Basic counting techniques – Inclusion and exclusion , Pigeonhole principle – Permutation – Combination.

**UNIT III LOGICS AND PROOFS 12**

Basic Connectives – Truth Tables – Logical Equivalence: The Laws of Logic, Logical Implication – Rules of Inference – The use of Quantifiers – Proof Techniques: Some Terminology – Proof Methods and Strategies – Forward Proof – Proof by Contradiction – Proof by Contraposition.

**UNIT IV ALGEBRAIC STRUCTURES 12**

Algebraic Structures with One Binary Operation – Semi Groups, Monoids, Groups, Permutation Groups – Subgroups – Normal subgroups – Algebraic Structures with two Binary Operations - Definition and Examples of Rings and Fields – Boolean Algebra – Identities of Boolean Algebra.

**UNIT V GRAPHS AND TREES 12**

Graphs and their properties – Degree, Connectivity, Path, Cycle – Sub Graph – Isomorphism – Eulerian and Hamiltonian Walks – Rooted Trees, Trees and Sorting.

**TOTAL: 60 PERIODS**

**TEXT BOOKS:**

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications: with Combinatorics and Graph Theory", 7th Edition, Tata McGraw -Hill Education Pvt. Ltd., 2015.
2. J.P. Tremblay and R. Manohar, "Discrete Mathematical Structure with Applications to Computer Science", Tata Mc Graw Hill Education (India) Edition 1997.
3. Narsingh Deo, "Graph theory with applications to Engineering and Computer Science", Prentice Hall Inc., Englewood Cliffs,N.J., 1974.

**REFERENCES:**

1. Susanna S. Epp, "Discrete Mathematics with Applications", 4th edition, Brooks/Cole, Cengage Learning, 2010.
2. Norman L. Biggs, "Discrete Mathematics", 2nd Edition, Oxford University Press, 2002.
3. Seymour Lipschutz, Marc Lipson, "Discrete Mathematics, Schaum's Outlines Series", 3rd edition, McGraw-Hill Education, 2009.
4. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics: A Computer Oriented Approach", 4th Edition, Tata McGraw-Hill Education Pvt. Ltd, 2012.

**WEB REFERENCES :**

1. <https://web.stanford.edu/class/cs103x/cs103x-notes.pdf>
2. <https://www.cs.cornell.edu/~rafael/dismath.pdf>
3. <http://home.iitk.ac.in/~aralal/book/mth202.pdf>

**ONLINE RESOURCES:**

1. [https://www.youtube.com/watch?v=h\\_9WjWENWV8&list=PL3o9D4Dl2FJ9q0\\_gtFXPh\\_H4POI5dK0yG](https://www.youtube.com/watch?v=h_9WjWENWV8&list=PL3o9D4Dl2FJ9q0_gtFXPh_H4POI5dK0yG)
2. <https://www.youtube.com/watch?v=xlUFkMKS3Y&list=PL0862D1A947252D203>.
3. [https://www.youtube.com/watch?v=4LITmsfDS4Y&list=PLEAYkSg4uSQ2Wfc\\_l4QEZUSRdx2ZcFziO&index=13](https://www.youtube.com/watch?v=4LITmsfDS4Y&list=PLEAYkSg4uSQ2Wfc_l4QEZUSRdx2ZcFziO&index=13)
4. <https://www.youtube.com/watch?v=jBsEKyx6Rj0&list=PLwdnzlV3ogoVxVxCTII45pDVM1aoYoMHf>
5. <https://www.youtube.com/watch?v=rdXw7Ps9vxc&list=PLHXZ90QGMqxersk8fUxiUMSIx0DBqsKZS>

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Classify the relations and functions defined on a set. (K2)
2. Apply counting principle and mathematical induction to solve combinatorial problems. (K3)
3. Construct mathematical arguments using logical connectives, quantifiers and verify the correctness of an argument using symbolic logic, truth tables and proof strategies. (K3)
4. Explain the fundamental concepts of algebraic structures such as groups, rings, fields and Boolean algebra. (K3)
5. Illustrate the concepts of graphs and sorting in trees. (K3)

**CO-PO MAPPING**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	-	-	-	-	-	-	-	1
CO2	3	3	1	2	-	-	-	-	-	-	-	1
CO3	3	3	1	2	-	-	-	-	-	-	-	1
CO4	3	3	1	2	-	-	-	-	-	-	-	1
CO5	3	3	1	2	-	-	-	-	-	-	-	1

**SEMESTER - II**

20HSEN201 SDG NO. 4	TECHNICAL ENGLISH - II	L	T	P	C
		3	0	0	3

**OBJECTIVES:**

- To strengthen the listening skills for comprehending and critically analyzing passages
- To enhance students' ability with multiple strategies and skills for making technical presentations
- To participate in group discussions for developing group attitude
- To develop skills for preparing effective job application
- To write effective technical reports

**UNIT I LANGUAGE DEVELOPMENT**

9

**Listening** – Listening conversations involving two participants – multiple participants – **Speaking** – conversation methods in real life occurrences using expressions of different emotions and imperative usages – **Reading** passages and short stories - **Writing** – preparation of checklist – extended definition – **Language Development** – tenses - subject - verb agreement

**UNIT II VOCABULARY BUILDING**

9

**Listening** – listening formal and informal conversation and participative exercises – **Speaking** - creating greetings/wishes/excuses and thanks – **Reading** – articles/novels-**Writing** summary of articles and concise writing identifying new words – homonyms, homophones, homographs – one-word substitutions – easily confused words - creating SMS and using emoticons - sharing information in social media. **Language Development** - reported speeches – regular and irregular verbs - idioms & phrases

**UNIT III WRITING TECHNICAL REPORTS**

9

**Listening** – listening conversation – effective use of words and their sound aspects, stress, intonation & pronunciation – **Speaking** - practicing telephonic conversations – observing and responding. **Reading** – regular columns of newspapers/magazines - **Writing** – reports – feasibility, accident, survey and progress - preparation of agenda and minutes – **Language Development** - using connectives – discourse markers

**UNIT IV TECHNICAL WRITING**

9

**Listening** – Model debates & documentaries - **Speaking** – expressing agreement/disagreement, assertiveness in expressing opinions – **Reading** biographies/autobiographies – **Writing** – note-making – formal letters – inviting guests – acceptance/declining letters - **Language Development** – degrees of comparison - numerical adjectives – embedded sentences

**UNIT V GROUP DISCUSSION AND JOB APPLICATION**

9

**Listening** – Listening - classroom lectures – recommending suggestions & solutions – **Speaking** – participating in group discussion – learning GD strategies – **Reading** – journal articles - **Writing** – Job application – cover letter - résumé preparation – **Language Development** – purpose statement – editing – verbal analogies.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. Board of editors. Fluency in English: A Course book for Engineering and Technology. Orient Blackswan, Hyderabad 2016.

2. Ashraf Rizvi. M, Effective Technical Communication. 2nd ed. McGraw Hill, New Delhi, 2018.

## REFERENCES

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. Routledge, New York, 2011.
2. Raman, Meenakshi and Sharma, Sangeetha. Technical Communication Principles and Practice. Oxford University Press, New Delhi, 2014.
3. Muralikrishnan & Mishra Sunitha, Communication skills for Engineers 2nd ed. Pearson, Tamilnadu, India 2011. P. Kiranmai and Rajeevan, Geetha. Basic Communication Skills, Foundation Books, New Delhi, 2013.
4. Suresh Kumar, E. Engineering English. Orient Blackswan, Hyderabad, 2015
5. Richards, Jack C. Interchange Students' Book – 2. Cambridge University Press, New Delhi, 2015.

## WEB REFERENCES :

1. [https://swayam.gov.in/nd1\\_noc20\\_hs21/preview](https://swayam.gov.in/nd1_noc20_hs21/preview)
2. [https://nptel.ac.in/content/storage2/nptel\\_data3/html/mhrd/ict/text/109106122/lec1.pdf](https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/109106122/lec1.pdf)
3. <https://freevidelectures.com/course/3250/introduction-to-film-studies/10>

## ONLINE RESOURCES

1. <https://www.ef.com/wwen/english-resources/>
2. [https://www.smilesforlearning.org/gclid=EA1aIQobChMI49DF9bnd6AIVSY6PCh1d\\_gV9EAAYASAAEgIBPvD\\_BwE](https://www.smilesforlearning.org/gclid=EA1aIQobChMI49DF9bnd6AIVSY6PCh1d_gV9EAAYASAAEgIBPvD_BwE).

## OUTCOMES:

### Upon completion of the course, the student should be able to

1. Define technical terms with the correct use of grammar (K1)
2. Identify new words, phrases, idioms and summarize articles/ write ups effectively (K2)
3. Pronounce words correctly, speak fluently and share opinions and suggestions effectively in conversations, debates and discussions (K3)
4. Construct reports convincingly and write official letters emphatically (K3)
5. Communicate confidently while speaking and writing by employing language strategies (K2)

- 6 Adapt group behavior, execute their role as a contributing team member and prepare winning job applications (K3)

**CO - PO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	3	1	2
CO2	-	2	-	-	-	-	-	-	2	3	1	1
CO3	-	-	-	1	-	-	-	2	2	3	1	1
CO4	-	-	-	-	-	2	-	3	2	3	2	2
CO5	-	-	-	-	-	-	-	-	2	3	2	2
CO6	-	-	-	-	-	-	-	2	2	3	1	2

**SEMESTER - II**

<b>20BSPH203</b> SDG NO. 4	<b>PHYSICS FOR INFORMATION SCIENCE</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>

**OBJECTIVES:**

- To understand the essential principles of physics of conducting materials, superconducting and optical properties of materials
- To educate the basic principles of semiconductor device and electron transport properties
- To become proficient in magnetic materials
- To acquire the basic working of nanoelectronic devices

**UNIT I CONDUCTING MATERIALS****9**

Classical free electron theory - Expression for electrical conductivity - Thermal conductivity expression - Wiedemann-Franz law - Success and failures - Electrons in metals - Motion of a particle in a three dimensional box (Quantum Mechanical Approach) - degenerate states - Fermi- Dirac statistics - Density of energy states - Electron in periodic potential - Energy bands in solids - Tight binding approximation - Electron effective mass - Concept of hole.

**UNIT II SEMICONDUCTOR MATERIALS****9**

Intrinsic Semiconductors - Direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors - extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors - Variation of carrier concentration with temperature - Variation of Fermi level with temperature

and impurity concentration - Carrier transport in Semiconductor: random motion, drift, mobility and diffusion - Hall effect and devices - Ohmic contacts - Schottky diode.

### **UNIT III MAGNETIC PROPERTIES OF MATERIALS**

**9**

Magnetic dipole moment - atomic magnetic moments - magnetic permeability and susceptibility - Magnetic material classification: diamagnetism - paramagnetism - ferromagnetism - antiferromagnetism - ferrimagnetism - Ferromagnetism: origin and exchange interaction - Domain Theory - M versus H behaviour - Hard and soft magnetic materials - applications - Magnetic principle in computer data storage - Magnetic hard disc - GMR sensor.

### **UNIT IV SUPERCONDUCTING & OPTICAL PROPERTIES OF MATERIALS**

**9**

Super conductivity - Type-I and Type-II superconductors - Properties and applications - Classification of optical materials - Carrier generation and recombination processes - Photo current in a P-N diode - Solar cell - LED - Organic LED - Optical data storage techniques and devices.

### **UNIT V NANO DEVICES**

**9**

Introduction - Size dependence of Fermi energy - Quantum confinement - Quantum structures - Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterials - Tunneling: single electron phenomena and single electron transistor - Quantum dot laser - Carbon nanotubes: Properties and applications.

**TOTAL: 45 PERIODS**

#### **TEXT BOOKS:**

1. Jasprit Singh, "Semiconductor Devices: Basic Principles", Wiley 2012.
2. Kasap, S.O., "Principles of Electronic Materials and Devices", McGraw-Hill Education, 2017.
3. Kittel, C., "Introduction to Solid State Physics", Wiley, 2018.
4. S.O.Pillai, "Solid State Physics, New Academic Science", 2017.
5. D.K.Bhattacharya & Poonam Tandon., "Physics for Information Science and Electronics Engineering", Oxford Higher Education", 2017.

#### **REFERENCES:**

1. Garcia, N. & Damask, A., "Physics for Computer Science Students", Springer-Verlag, 2012.
2. Hanson, G.W., "Fundamentals of Nanoelectronics", Pearson Education, 2009.
3. Rogers, B., Adams, J. & Pennathur, S., "Nanotechnology: Understanding Small Systems", CRC Press, 2014.

**OUTCOMES:****At the end of the course, the students should able to**

1. Understand the basic concepts of free electron theory of solids and apply it to determine the conducting properties, carrier concentration and effective mass of an electron in conductors (K2)
2. Illustrate the various types of semiconductors based on band gap energy and doping, expression for carrier concentration, Fermi energy and their variations (K2)
3. Apply the suitable semiconducting materials for Hall device, Schottky and tunnel diode fabrication and acquire the basic knowledge of magnetic materials and its classification (K3)
4. Gain the knowledge on the types of superconducting and optical materials, properties of superconductors, mechanism of carrier generation and recombination in optical data storage devices (K2)
5. Apply the semiconducting, ferrimagnetic and superconducting materials in optical devices, data storage devices and magnetic levitation (K3)
6. Understand the basics of 1D, 2D, 3D quantum structures, single electron transport, carbon nanotubes and its applications (K3)

**CO - PO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	3	-	-	-	-	-	-	1
CO2	3	3	-	-	3	-	2	-	-	-	-	3
CO3	3	3	-	2	3	-	3	-	-	-	-	2
CO4	3	3	3	2	3	-	3	-	-	-	-	3
CO5	3	3	3	3	3	-	3	-	-	-	-	3
CO6	3	3	3	2	3	-	-	-	-	-	-	1

## SEMESTER - II

<b>20BSCY201</b>	<b>ENVIRONMENTAL SCIENCE AND ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
SDG NO. 4,17		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### OBJECTIVES:

- To study the nature and facts about environment
- To find and implement scientific, technological, economic and political solutions to environmental problems
- To study the interrelationship between living organism and environment
- To provide the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

### UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

9

Definition, scope and importance of environment – need for public awareness – Ecosystem: concept of an ecosystem – structure and functions of an ecosystem – Biotic and abiotic components – Biogeochemical cycle (C, N & P) – energy flow in the ecosystem – food chains, food webs and ecological pyramids – ecological succession - keystone species. Introduction to biodiversity definition: genetic, species and ecosystem diversity – values of biodiversity – IUCN Red list species classification - endemic, endangered, rare, vulnerable, extinct and exotic species – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity – man-wildlife conflicts. Conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of Terrestrial (Forest, Grassland, Desert) and Aquatic ecosystem (Pond, Lake, River, Estuary and Marine)

### UNIT II ENVIRONMENTAL POLLUTION

9

Definition – causes, effects and control measures of: Air pollution, Water pollution, Soil pollution Marine pollution, Noise pollution, Thermal pollution and Nuclear pollution – solid waste management: causes, effects and control measures of municipal solid wastes (MSW) – role of an individual in prevention of pollution – Case studies related to environmental pollution. Disaster management: floods, earthquake, cyclone and landslides – nuclear holocaust – Case studies.

**UNIT III NATURAL RESOURCES****9**

Forest resources: Use and over – exploitation, deforestation – Land resources: land degradation, man induced landslides, soil erosion and desertification – Water resources: Use and over- utilization of surface and groundwater – dams- benefits and problems, conflicts over water – Mineral resources: Environmental effects of extracting and using mineral resources – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture – fertilizer – pesticide problems, water logging and salinity. Energy resources: Renewable energy (Solar energy, Wind energy, Tidal energy, Geothermal energy, OTE, Biomass energy) and non renewable energy (Coal, Petroleum, Nuclear energy) sources. – role of an individual in conservation of natural resources. Case studies – timber extraction, mining, dams and their effects on forests and tribal people.

**UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT****10**

Atmospheric Chemistry - Composition and structure of atmosphere. Climate change - greenhouse effect- role of greenhouse gases on global warming. Chemical and photochemical reactions in the atmosphere - Formation of smog, PAN, acid rain (causes, effect and control measures). Oxygen and ozone chemistry - Ozone layer depletion (causes, effect and control measures). environmental ethics: Issues and possible solutions – Green chemistry - 12 principles of green chemistry.

Urbanisation - Urban problems related to energy - Water conservation: rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns - case studies. Environment Legislations and Laws : Environment (protection) act – 1986. Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act. Biomedical Waste(Management and Handling rules):1998 and amendments- scheme of labelling of environmentally friendly products (Ecomark) - Issues involved in enforcement of environmental legislation - central and state pollution control boards, role of non-governmental organization – Public awareness - Environmental Impact Assessment (EIA).

**UNIT V HUMAN POPULATION AND THE ENVIRONMENT****8**

Population growth, variation among nations – population explosion – family welfare programme – women and child welfare environment and human health – HIV / AIDS – Role of Information Technology in environment and Human health – Case studies – human rights – value education – Sustainable Development – Need for sustainable development – concept – 17 SDG goals – 8 Millennium Development Goals(MDG).

**TOTAL: 45 PERIODS**

**TEXTBOOKS:**

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.
3. Ravikrishnan A, 'Environmental Science and Engineering', Sri Krishna Hitech Publishing Company Pvt. Ltd, Revised Edition 2020.

**REFERENCES :**

1. Dharmendra S. Sengar, "Environmental law", Prentice hall of India Pvt Ltd, New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) Pvt Ltd., Hydrabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India Pvt. Ltd., Delhi, 2014.
4. Rajagopalan. R, "Environmental Studies-From Crisis to Cure", Oxford University Press, 2005.

**OUTCOMES:****Upon successful completion of this course, student should be able to**

1. Explain the different components of environment, structure and function of an ecosystem, importance of biodiversity and its conservation. (K1)
2. Aware about problems of environmental pollution, its impact on human and ecosystem, control measures and basic concepts in Disaster Management. (K2)
3. Disseminate the need for the natural resources and its application to meet the modern requirements and the necessity of its conservation. (K2)
4. Illustrate the various aspects of atmospheric chemistry with a focus on climate change and recognize the principles of green chemistry. Describe suitable scientific, technological solutions and Protection Acts to eradicate social and environmental issues. (K2)
5. Recognize the need for population control measures and the environmental based value education concepts to achieve the Sustainable Development Goals. (K2)

**CO - PO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	-	-	1	2	-	1	1	-	2
CO2	2	2	2	-	2	2	3	1	2	2	-	2
CO3	1	1	1	1	-	1	1	-	1	2	-	1
CO4	2	2	2	2	1	1	1	-	1	1	1	1
CO5	2	2	1	-	-	1	1	-	-	-	1	-
CO6	1	1	1	1	1	1	1	1	1	1	1	1

**SEMESTER - II**

<b>20ESIT202</b> SDG NO. 4&9	<b>PYTHON 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>

**OBJECTIVES:**

- To develop simple Python programs with conditionals and loops
- To define Python functions and to implement lists, tuples, dictionaries and sets
- To perform file operations and understand OO concepts in Python
- To understand NumPy, Pandas and Matplotlib

**UNIT I BASICS OF PYTHON PROGRAMMING****9**

Introduction to Python – Literals – Variables and Identifiers – Data Types – Input Operation – Comments – Reserved words – Indentation – Operators and Expressions - Conditionals: Boolean values and operators - conditional if - alternative if - chained conditional - Iteration - Illustrative programs: Evaluation of expressions - String Operations - Circulate the values of n variables - Square root (Newton's method) - GCD - Sum an Array of Numbers.

**UNIT II STRING, LISTS, TUPLES, DICTIONARIES, SETS****9**

**Strings:** String slices - Immutability - String functions and methods - String module - Lists: List operations - List slices - List methods - List loop - Mutability - Aliasing - Cloning lists - List parameters - Tuples: Tuple assignment - Tuple as return value.

**Dictionaries:** Operations and Methods - Advanced list processing - List comprehension - Sets: Creating Sets – Operations and methods – Set comprehension - Illustrative programs: Linear search - Binary search - Selection sort - Insertion sort - Merge sort.

**UNIT III FUNCTIONS, MODULES, PACKAGES****9**

Functions - definition and use - Flow of execution - Parameters and arguments - Fruitful functions: Return values - Parameters - Local and global scope - Function composition - Recursion - Modules – from import statement – Name of Module – Making your own modules - Packages - Packages in Python – Standard Library Modules – Globals(), Locals() and Reload(); Illustrative programs: Fibonacci series using functions - Arithmetic operations using module - Area of different shapes using packages.

**UNIT IV FILES, EXCEPTIONS, CLASSES AND OBJECTS****9**

Files and exception: Text files - Reading and writing files - Format operator - Command line arguments - Errors and exceptions - Handling exceptions - Classes and Objects: Defining classes - Creating Objects – Data abstraction – Class constructor – Class variables and Object variables – Public and Private data members – Private Methods; Illustrative programs: Word count - Copy file - Creating user defined exception - Creating student class and object.

**UNIT V NUMPY, PANDAS, MATPLOTLIB****9**

Introduction - Basics of NumPy - N-dimensional Array in NumPy - Methods and Properties - Basics of SciPy - Broadcasting in NumPy Array Operations - Array Indexing in NumPy, Pandas - Introduction - Series - DataFrame - Matplotlib - Basics - Figures and Axes - Method subplot() - Axis container Illustrative Programs: Multiplying a Matrix by a Vector, Solving Linear System of Equations - Using Pandas to Open CSV files - Creating a Single plot.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. Reema Thareja, "Python Programming Using Problem Solving Approach", Oxford University Press 2018.
2. Anurag Gupta, G.P. Biswas, "Python Programming: Problem Solving, Packages and Libraries", McGrawHill, 2020.

**REFERENCES:**

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2", Network Theory Ltd., 2011.
3. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India

Education Services Pvt. Ltd., 2016.

5. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
6. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
7. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus", Wiley India Edition, 2013.
8. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

### WEB REFERENCES:

1. <http://greenteapress.com/wp/think-python/>
2. [www.docs.python.org](http://www.docs.python.org)
3. <https://nptel.ac.in/courses/106/106/106106182/>

### OUTCOMES:

**Upon completion of the course, the student should be able to**

1. Understand the syntax and semantics, string operations of python programming language (K2)
2. Develop python programs using control flow statements.(K3)
3. Construct various Data structures to develop python programs. (K3)
4. Illustrate the concepts of Functions, Modules and Packages in Python.(K3)
5. Understand the concepts of Object Oriented Programming, files and Exception handling.(K2)
6. Examine various problem solving concepts in python to develop real time applications.(K4)

### CO-PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	1	1	0	0	1	0	1	2	2
CO2	3	3	3	3	3	1	0	0	0	0	0	1	2	2
CO3	3	3	3	3	3	2	1	0	0	0	0	1	2	2
CO4	3	3	3	3	3	2	1	0	0	0	0	1	2	2
CO5	3	3	3	3	3	2	2	1	0	2	0	2	3	3
CO6	3	3	3	3	3	3	3	2	3	2	3	2	3	3

**SEMESTER - II**

<b>20ESIT203</b> <b>SDG NO. 4 &amp; 9</b>	<b>DIGITAL PRINCIPLES AND</b> <b>SYSTEM DESIGN</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>

**OBJECTIVES:**

- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

**UNIT I BOOLEAN ALGEBRA AND LOGIC GATES****9**

Number Systems – Arithmetic Operations – Binary Codes- Boolean Algebra and Logic Gates – Theorems and Properties of Boolean Algebra – Boolean Functions – Canonical and Standard Forms – Simplification of Boolean Functions using Karnaugh Map – Logic Gates – NAND and NOR Implementations.

**UNIT II COMBINATIONAL LOGIC****9**

Combinational Circuits – Analysis and Design Procedures – Binary Adder-Subtractor – Decimal Adder – Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers – Introduction to HDL – HDL Models of Combinational circuits.

**UNIT III SYNCHRONOUS SEQUENTIAL LOGIC****9**

Sequential Circuits – Storage Elements: Latches , Flip-Flops – Analysis of Clocked Sequential Circuits – State Reduction and Assignment – Design Procedure – Registers and Counters – HDL Models of Sequential Circuits.

**UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC****9**

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race-free State Assignment – Hazards.

**UNIT V MEMORY AND PROGRAMMABLE LOGIC****9**

RAM – Memory Decoding – Error Detection and Correction – ROM – Programmable Logic Array – Programmable Array Logic – Sequential Programmable Devices.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog", 6th Edition, Pearson Education, 2017.

**REFERENCES:**

1. G. K. Kharate, "Digital Electronics", Oxford University Press, 2010
2. John F. Wakerly, "Digital Design Principles and Practices", Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, "Fundamentals of Logic Design", Sixth Edition, CENGAGE Learning, 2013
4. Donald D. Givone, "Digital Principles and Design", Tata Mc Graw Hill, 2003.

**ONLINE RESOURCES:**

1. <https://ocw.mit.edu/courses/online-textbooks/>
2. <https://nptel.ac.in/courses/117105080/>

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Understanding Boolean algebra, number systems and simplify Boolean functions using Kmap. (K2)
2. Understand the Combinational and sequential Circuits. (K2)
3. Demonstrate the use of Combinational Circuits and Sequential circuits (K3)
4. Interpret the designs using Programmable Logic Devices. (K3)
5. Apply HDL code for combinational and Sequential Circuits. (K3)
6. Interpret and troubleshoot logic circuits. (K3)

**CO – PO, PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	2	-	-	-	-	-	-	-	-	3	1	-	-
CO3	-	2	3	-	-	-	-	-	-	-	3	1	-	-
CO4	-	-	-	-	-	-	-	-	-	-	3	-	-	-
CO5	-	-	-	-	1	-	-	-	-	-	-	2	-	-
CO6	-	-	-	-	-	-	-	-	-	-	3	-	-	-

**SEMESTER - II**

<b>20ESPL201</b> SDG NO. 4	<b>PYTHON PROGRAMMING</b> <b>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>

**OBJECTIVES:**

- Develop Python programs with conditionals, loops and functions
- Represent compound data using Python lists, tuples, dictionaries
- Read and write data from/to files in Python
- Implement NumPy, Pandas, Matplotlib libraries

**LIST OF EXPERIMENTS :**

- 1 Compute the GCD of two numbers
- 2 Find the maximum and minimum of a list of numbers
- 3 Linear search and Binary search
- 4 Selection sort, Insertion sort
- 5 Merge sort, Quick Sort
- 6 First n prime numbers
- 7 Multiply matrices
- 8 Programs that take command line arguments (word count)
- 9 Find the most frequent words in a text read from a file
- 10 Exception Handling – License Process
- 11 Classes and Objects – Student class
- 12 Solving Linear System of Equations
- 13 Using Pandas to Open csv files
- 14 Creating a Single plot
- 15 Creating Scatter plot, Histogram

**TOTAL: 45 PERIODS****LAB REQUIREMENTS**

Python 3

**OUTCOMES****On completion of the laboratory course, the student should be able to**

1. Illustrate simple programs for describing the syntax, semantics and control flow statements. [K3]
2. Describe the core data structures like String, lists, dictionaries, tuples and sets in Python to store, process and sort the data. [K2]
3. Interpret the concepts of functions, modules and packages in Python. [K3]
4. Illustrate the applications of python libraries. [K3]

5. Describe the file manipulation and its operations. [K2]
6. Demonstrate exceptions and classes and objects for any real time applications. [K3]

**CO- PO, PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	-	1	2	1	2	-	-	-	1	-	3	3	-	1
C02	1	2	3	3	3	2	1	1	1	1	1	3	1	2
C03	-	1	3	3	2	1	-	-	-	-	1	3	-	1
C04	1	2	3	3	2	-	-	-	-	-	1	3	1	2
C05	-	-	3	3	2	-	-	1	-	-	2	3	-	-
C06	-	-	3	3	2	-	-	1	-	-	2	3	-	-

**SEMESTER - II**

<b>20ESPL202</b> SDG NO. 4 & 9	<b>DIGITAL 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>

**OBJECTIVES:**

- To design and implement the various combinational circuits
- To design and implement combinational circuits using MSI devices
- To design and implement sequential circuits
- To understand and code with HDL programming

**LIST OF EXPERIMENTS**

1. Verification of Boolean Theorems using basic gates
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters
3. Design and implement Half/Full Adder and Subtractor
4. Design and implement combinational circuits using MSI devices:
  - a) 4 bit binary adder/subtractor
  - b) Parity generator/checker
  - c) Magnitude comparator
5. Application using multiplexers
6. Design and implement shift-registers

7. Design and implement synchronous counters
8. Design and implement asynchronous counter
9. Coding combinational circuits using HDL
10. Coding sequential circuits using HDL
11. Design and implementation of a simple digital system (Mini Project)

### LAB REQUIREMENTS:

#### HARDWARE:

DIGITAL TRAINER KITS

DIGITAL IC's required for the experiments in sufficient numbers

#### SOFTWARE:

HDL, Verilog simulator

**TOTAL: 45 PERIODS**

### OUTCOMES

**On completion of the laboratory course, the student should be able to**

1. Implement simplified combinational circuits using basic logic gates. (K6)
2. Implement combinational circuits using MSI devices. (K6)
3. Implement sequential circuits like registers and counters.(K6)
4. Simulate combinational and sequential circuits using HDL.(K4)
5. Implement designs using Programmable Logic Devices. (K6)
6. Design and implementation of a simple digital system.(K6)

### CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	3	3	2	2	1	1	-	2	2	-	2	1	1
C02	3	3	3	2	3	2	1	1	2	2	2	3	1	1
C03	2	3	3	3	3	2	2	1	2	2	2	3	1	1
C04	3	3	3	3	3	2	2	1	3	3	3	3	1	1
C05	2	3	3	2	2	-	-	2	-	2	2	2	1	1
C06	2	3	3	2	2	1	-	-	2	2	3	2	1	1

**SEMESTER - II**

<b>20ESGE201</b> SDG NO. 4,9,12	<b>ENGINEERING PRACTICES</b> <b>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</b>

**OBJECTIVES:**

- To provide exposure to the students with hands on experience on various basic engineering practices in Electrical and Electronics Engineering, Civil and Mechanical Engineering

**ELECTRICAL ENGINEERING PRACTICE**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring.
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

**ELECTRONICS ENGINEERING PRACTICE**

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components, Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

**CIVIL ENGINEERING PRACTICE****Buildings:**

Study of plumbing and carpentry components of residential and industrial buildings, safety aspects.

**Plumbing Works:**

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

4. Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
5. Demonstration of plumbing requirements of high-rise buildings.

### **Carpentry using Power Tools only:**

1. Study of the joints in roofs, doors, windows and furniture.
2. Hands-on-exercise: Wood work, joints by sawing, planing and cutting.

## **MECHANICAL ENGINEERING PRACTICE**

### **Welding:**

1. Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
2. Gas welding practice.

### **Basic Machining:**

1. Simple Turning and Taper turning.
2. Drilling Practice.

### **Sheet Metal Work:**

1. Forming & Bending.
2. Model making – Trays and funnels.
3. Different type of joints.

### **Machine assembly practice:**

1. Study of centrifugal pump.
2. Study of air conditioner.

### **Demonstration on:**

1. Smithy operations, upsetting, swaging, setting down and bending.  
Example – Exercise – Production of hexagonal headed bolt.
2. Foundry operations like mould preparation for gear and step cone pulley.
3. Fitting – Exercises – Preparation of square fitting and V – fitting models.

**Total : 45 PERIODS**

## **LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

### **1. Electrical**

- |   |   |         |
|---|---|---------|
| 1 | Assorted electrical components for house wiring | 15 Sets |
| 2 | Electrical measuring instruments                | 10 Sets |
| 3 | Study purpose items:                            |         |

	Iron box, fan and regulator, emergency lamp	1 Each
4	Megger (250V/500V)	1 No
5	Power Tools:	
	Range Finder	2 Nos
	Digital Live-wire detector	2 Nos

## 2. Electronics

1	Soldering guns	10 Nos
2	Assorted electronic components for making circuits	50 Nos
3	Small PCBs	10 Nos
4	Multimeters	10 Nos

## 3. Civil

1	Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets
2	Carpentry vice (fitted to work bench)	15 Nos
3	Standard woodworking tools	15 Sets
4	Models of industrial trusses, door joints, furniture joints	5 each
5	Power Tools:	
	Rotary Hammer	2 Nos
	Demolition Hammer	2 Nos
	Circular Saw	2 Nos
	Planer	2 Nos
	Hand Drilling Machine	2 Nos
	Jigsaw	2 Nos

## 4. Mechanical

1	Arc welding transformer with cables and holders	5 Nos
2	Welding booth with exhaust facility	5 Nos
3	Welding accessories like welding shield, chipping hammer, wire brush, etc	5 Sets
4	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos
5	Centre lathe	2 Nos
6	Hearth furnace, anvil and smithy tools	2 Sets
7	Moulding table, foundry tools	2 Sets
8	Power Tool: Angle Grinder	2 Nos
9	Study-purpose items: centrifugal pump, air-conditioner	1 each

**OUTCOMES:**

**Upon completion of the course, the students should be able to**

1. Elaborate on the components, gates, soldering practices. Calculate electrical parameters such as voltage, current, resistance and power. (K1)
2. Design and implement Rectifier and Timer circuits (K2)
3. Measure the electrical energy by single phase and three phase energy meters. (K2)
4. Prepare the carpentry and plumbing joints. (K2)
5. Perform different types of welding joints and sheet metal works (K2)
6. Perform different machining operations in lathe and drilling. (K2)

**CO - PO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2	1	-	-	1	1	1	1
CO2	3	2	1	1	2	1	-	-	1	1	1	1
CO3	2	2	1	1	1	1	-	-	1	1	1	1
CO4	1	1	1	-	-	2	-	-	1	1	1	2
CO5	2	1	1	-	-	1	1	1	1	1	1	2
CO6	2	1	1	-	-	1	-	1	1	1	1	2

**SEMESTER - II**

<b>20TPHS201</b> <b>SDG NO. 4&amp;5</b>	<b>SKILL ENHANCEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**OBJECTIVES:**

- To understand the nuances in resume building
- To explore various virtual meeting tools
- To gain knowledge about online certification courses
- To develop knowledge in Google Suite products
- To enhance presentation skills

**UNIT I RESUME BUILDING****6**

Your Strength, Projects, Internship, Paper Presentation, uploading your coding in github, Introduction to HackerRank, HackerEarth virtual online

assessment (Auto Proctored) (Practicals - Construct a resume, Register for a online MockAssessment / Contest)

## **UNIT II VIRTUAL MEETINGS**

**6**

Basic Etiquette of virtual meeting – Introduction to Skype - Zoom - Webex - Google Meet - Gotowebinar - Jio meet – Screen Share - Jamboard - Feedback polling - Chatbox

(Practicals - Accept and Register for a mock class to attend - How to host a meeting).

## **UNIT III ONLINE LEARNING**

**6**

Online Certification - Coursera – Udemy – Edx – Cisco – Online Practice Platforms - SkillRack – Myslate - FACEprep - BYTS - aptimithra - Contest Registrations - TCS Campus Commune - HackwithInfy, InfyTQ - Virtusa NurualHack - Mindtree Osmosis – Online assessment - AMCAT-PGPA.

(Practicals - Campus Commune Registration , Coursera registration - Mock Registration (KAAR Technologies as sample).

## **UNIT IV GOOGLE SUITE**

**8**

Define google suite - Benefits of google suite - Google Search - Sheet - Docs - Forms - Calender - Drive - Slide - Translate - Duo - Earch - Maps - Hangouts- Sites - Books - Blogger

(Practicals – Create google sheets and share - Create google Forms and share, Create Google Slide and share , Google drive creation and share (Knowledge of Rights), Create poll and share.

## **UNIT V PRESENTATION SKILLS**

**4**

Email Writing – Group Discussion - Power Point Presentation

(Practicals- Create a self SWOT Analysis report. A PowerPoint Slide Preparation)

**TOTAL : 30 PERIODS**

### **WEB REFERENCES :**

#### **Unit I: Resume Building:**

1. <https://zety.com/blog/resume-tips>
2. <https://resumegenius.com/blog/resume-help/how-to-write-a-resume>
3. <https://www.hackerearth.com/recruit/>
4. <https://www.hackerrank.com/about-us>

#### **Unit – II: Virtual Meetings**

1. <https://www.claphamschool.org/our-community/blog/online->

learning-etiquette-guide-14-principles-to-guide-students

2. [https://online.hbs.edu/blog/post/virtual-interview-tips?c1=GAW\\_SE\\_NW&source=IN\\_GEN\\_DSA&cr2=search\\_-\\_nw\\_\\_in\\_-\\_dsa\\_-\\_general&kw=dsa\\_-\\_general& cr5=459341920955&cr7=c&gclid=Cj0KQCjw8fr7BRDSARIsAK0Qqr4dRRbboL3kltrwDsr7hm8oIHtN5dfjD3NIFZULuzNwEXxhjpNFQ2caApn5EALw\\_wcB](https://online.hbs.edu/blog/post/virtual-interview-tips?c1=GAW_SE_NW&source=IN_GEN_DSA&cr2=search_-_nw__in_-_dsa_-_general&kw=dsa_-_general& cr5=459341920955&cr7=c&gclid=Cj0KQCjw8fr7BRDSARIsAK0Qqr4dRRbboL3kltrwDsr7hm8oIHtN5dfjD3NIFZULuzNwEXxhjpNFQ2caApn5EALw_wcB)
3. <https://hygger.io/blog/top-10-best-group-meeting-apps-business/>
4. <https://www.zdnet.com/article/best-video-conferencing-software-and-services-for-business/>

### **Unit - III: Online Learning**

1. <https://www.coursera.org/browse>
2. <https://support.udemy.com/hc/en-us/articles/229603868-Certificate-of-Completion>
3. <https://www.edx.org/course/how-to-learn-online>
4. <https://www.cisco.com/c/en/us/training-events/training-certifications/certifications.html>
5. <https://campuscommune.tcs.com/en-in/intro>
6. <https://www.freshersnow.com/tcs-campus-commune-registration/>
7. <https://www.infosys.com/careers/hackwithinfy.html>
8. <https://www.mindtree.com/blog/osmosis-2013-my-experiences>
9. <https://www.myamcat.com/knowning-amcat>
10. <https://www.admitkard.com/blog/2020/02/06/amcat/>

### **Unit IV: Google Suite**

1. <https://www.inmotionhosting.com/blog/what-is-g-suite-and-why-should-i-consider-using-it/>
2. [https://en.wikipedia.org/wiki/G\\_Suite](https://en.wikipedia.org/wiki/G_Suite)
3. <https://blog.hubspot.com/marketing/google-suite>
4. <https://kinsta.com/blog/g-suite/>

### **Unit V: Presentation Skills**

1. <https://www.mindtools.com/CommSkll/EmailCommunication.htm>
2. <https://www.grammarly.com/blog/email-writing-tips/>
3. <https://business.tutsplus.com/articles/how-to-write-a-formal-email-cms-29793>
4. <https://www.softwaretestinghelp.com/how-to-crack-the-gd/>
5. <https://www.mbauniverse.com/group-discussion/tips>
6. <https://slidemodel.com/23-powerpoint-presentation-tips-creating->

engaging-interactive-presentations/

7. <https://business.tutsplus.com/articles/37-effective-powerpoint-presentation-tips--cms-25421>
8. <https://blog.prezi.com/9-tips-on-how-to-make-a-presentation-a-success/>
9. <http://www.garrreynolds.com/preso-tips/design/>

### OUTCOMES:

**On completion of this course, the student should be able to**

1. Construct a suitable resume and registration procedure for online mock assessments. (K1)
2. Handle various virtual meeting tools. (K3)
3. Acquire exposure about online certification courses. (K4)
4. Get involved and work in a collaborative manner. (K2)
5. Gain knowledge in various presentation methodologies. (K1)
6. Apply knowledge to practice Google suite features and SWOT analysis. (K3)

### CO - PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	3	2	-	3	2	3	-	2
CO2	-	-	-	-	3	2	-	3	2	3	-	2
CO3	-	-	-	-	3	2	-	-	1	3	-	2
CO4	-	-	-	-	3	2	-	3	3	3	-	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2

## SEMESTER - II

20HSMG201 SDG NO. 4 & 5	INTERPERSONAL VALUES	L	T	P	C
		2	0	0	0

### OBJECTIVES:

- Values through Practical activities

### UNIT I INTERPERSONAL VALUES

6

Interpersonal Relationships and Values – Importance and Barriers – Building and maintain relationships – Mutual understanding – Respect to others.

**UNIT II EFFECTIVE COMMUNICATION****6**

Communication skills –Importance and Barriers - Impressive formation and management – Public speaking

**UNIT III GROUP DYNAMICS****6**

Group formation –Teamwork – Identify others attitude and behaviour – Formation of relationship – Personal and professional.

**UNIT IV MUTUAL RELATIONSHIP****6**

Building mutual understanding and cooperation – Enhancing decision making skills – Problem solving skills – Comparative Appraisal – Interpersonal needs.

**UNIT V POSITIVE ATTITUDE****6**

Fostering trust and cooperation – Developing and maintain positive attitude – Improving socialization – Development of security and comfort.

**TOTAL: 30 PERIODS**

**Note:** Each topic in all the above units will be supplemented by practice exercises and classroom activities and projects.

**REFERENCE BOOKS:**

1. Barun K. Mitra, "Personality Development and Soft Skills", Oxford University Press, 2016.
2. B.N.Ghosh, "Managing Soft Skills for Personality Development", McGraw Hill India, 2012.

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Develop a healthy relationship & harmony with others. (K1)
2. Practice respecting every human being. (K3)
3. Practice to eradicate negative temperaments. (K3)
4. Acquire Respect, Honesty, Empathy, Forgiveness and Equality. (K4)
5. Manage the cognitive abilities of an Individual. (K5)
6. Understanding the importance of public speaking and teamwork. (K2)

**CO – PO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	-	-	-	-	-	2	2	3	3	1	1	1
C02	-	-	-	-	-	2	2	3	3	1	1	1
C03	-	-	-	-	-	2	2	3	3	1	1	1
C04	-	-	-	-	-	2	2	3	3	1	1	1
C05	-	-	-	-	-	2	2	3	3	1	1	1
C06	-	-	-	-	-	2	2	3	3	1	1	1

**SEMESTER - III**

20BSMA304 SDG NO. 4	<b>STATISTICS AND LINEAR ALGEBRA</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>

**OBJECTIVES:**

- The main objective of this course is to provide students with the foundations of statistics and linear algebra mostly used in varied applications in engineering.

**UNIT I BASIC STATISTICS****12**

Measures of Central tendency: Moments, Skewness and Kurtosis - Probability distributions - Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation

**UNIT II TESTING OF HYPOTHESIS****12**

Sampling distributions - Estimation of parameters - Statistical hypothesis - Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means - Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independence) - Goodness of fit.

**UNIT III VECTOR SPACES****12**

Vector spaces – Subspaces – Linear combinations– Linear independence and linear dependence – Bases and dimensions.

**UNIT IV LINEAR TRANSFORMATION AND DIAGONALIZATION****12**

Linear transformation - Null spaces and ranges - Dimension theorem - Matrix of a linear transformation - Eigenvalues and eigenvectors - Diagonalizability.

**UNIT V INNER PRODUCT SPACES****12**

Inner product, norms - Gram Schmidt orthogonalization process - Adjoint of linear operations - Least square approximation.

**TOTAL: 60 PERIODS**

**TEXT BOOKS:**

1. Michael Baron, "Probability and Statistics for Computer Scientists" second edition, CRC press, USA (Unit-I&II)
2. Howard Anton, Chris Rorres, "Elementary Linear Algebra", Wiley Publications, 11th edition, 2014 (Unit-III, IV&V)

**REFERENCES:**

1. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics", Tata McGraw Hill Edition, 2004.
2. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson Education, Asia, 2007.
3. Kapur J. N., Saxena H.C., "Mathematical Statistics", 18th Edition, S. Chand & Company Ltd., 1997.
4. Friedberg A.H., Insel A.J. and Spence L., "Linear Algebra", Prentice Hall of India, New Delhi, 2014.
5. Strang G., "Linear Algebra and its applications", Thomson (Brooks/Cole), New Delhi, 2005.
6. Kumaresan S., – "Linear Algebra – A Geometric Approach", Prentice – Hall of India, New Delhi, Reprint, 2010.
7. E. Kreyszig, "Advanced Engineering Mathematics", 8th Edition, John Wiley, 1999.

**WEB REFERENCES:**

1. <https://people.richland.edu/james/lecture/m113/>
2. <https://nptel.ac.in/courses/111105041/>
3. <https://www.imsc.res.in/~svis/Algebra/Sunder-LinearAlg-notes.pdf>

**ONLINE RESOURCES:**

1. <https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/video-lectures/>
2. <https://www.khanacademy.org/math/statistics-probability/significance-tests-one-sample/more-significance-testing-videos/v/hypothesis-testing-and-p-values>

**OUTCOMES:****Upon completion of the course, the student should be able to**

1. Evaluate the statistical parameters of standard distributions using the concepts of probability. (K3)
2. Apply tests of hypotheses for large and small samples. (K3)
3. Compute correlation coefficient, regression, Chi –square statistic and least square approximation. (K3)

4. Compute basis, dimension, null space, range, matrix of linear transformation (K3)
5. Construct the diagonal form of the linear transformation and find the adjoint of linear operators. (K3)
6. Apply the concept of inner product to compute the orthonormal basis using Gram Schmidt orthogonalization process. (K3)

**CO – PO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	-	-	-	1
CO2	3	3	2	1	-	-	-	-	-	-	-	1
CO3	3	3	2	1	-	-	-	-	-	-	-	1
CO4	3	3	2	1	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	1
CO6	3	3	2	1	-	-	-	-	-	-	-	1

**SEMESTER - III**

<b>20CJPC301</b> SDG NO. 4,9	<b>OBJECT ORIENTED PROGRAMMING</b> <b>USING JAVA AND UML</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>

**OBJECTIVES:**

- To understand the object-oriented approach to analyzing and designing systems and software solutions.
- To employ the UML notation and symbols to create effective and efficient system designs.
- To understand Object Oriented programming concepts like Data Abstraction, Encapsulation, constructor and inheritance.
- To analyse different types of constructor and inheritance.
- To design the system using dynamic models

**UNIT I INTRODUCTION TO OBJECT ORIENTED TECHNOLOGIES AND THE UML METHOD****9**

Description of the real world using the Objects Model - Classes, inheritance and multiple configurations - Introduction to the UML Language. Analysis of system requirements - Actor definitions - Writing a case goal. Use Case

Diagram - Use Case Relationships - Requirements Analysis Using Case Modeling Analysis of system requirements

## **UNIT II INTRODUCTION TO OBJECT ORIENTED PROGRAMMING 10**

Object Oriented Programming Features - Benefits of Object Oriented Methodology – Overview of Object oriented programming Languages - JAVA: Introduction to Java Programming –Features of Java- Classes and Objects - Arrays – Methods -Constructor-Access Specifier – Package, Inheritance. Method Overloading - Method Overriding - Nested Classes-Inner Classes - Inheritance Types- Interfaces

## **UNIT III STATIC UML DIAGRAMS 9**

Class Diagram - Elaboration - Domain Model - Finding conceptual classes and description classes - Associations - Attributes - Domain model refinement - Finding conceptual class Hierarchies - Aggregation and Composition - Relationship between sequence diagrams and use cases - When to use Class Diagrams

## **UNIT IV DYNAMIC UML DIAGRAMS 9**

Dynamic Diagrams - UML interaction diagrams - System sequence diagram - Collaboration diagram - When to use Communication Diagrams - State machine diagram and Modeling - When to use State Diagrams - Activity diagram - When to use activity diagrams Implementation Diagrams - UML package diagram - When to use package diagrams - Component and Deployment Diagrams - When to use Component and Deployment diagrams

## **UNIT V DESIGN PATTERNS 8**

Design Pattern - Describing Design Patterns - How design patterns solve design problems - Selecting a design Pattern - Using a design pattern - Case Study: Designing a Document Editor

**TOTAL : 45 PERIODS**

### **TEXT BOOKS:**

1. Bernd Bruegge and Allen H. Dutoit, "Object-Oriented Software Engineering using UML, Patterns, and Java", Third Edition, Prentice Hall, 2010.
2. Herbert Schildt, "Java : The Complete Reference", 9th edition, Tata McGraw Hill, 2014.

**REFERENCES:**

1. Erich Gamma, Richard Helm, Ralph Johnson, and John M. Vlissides, "Design Patterns: Elements of Reusable Object-Oriented Software" Addison-Wesley Professional, 1994.
2. Ali Bahrami, "Object Oriented Systems Development", McGraw Hill Edition, 2017.
3. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Pearson Education, 3rd Edition, 2005.
4. Martin Fowler, Kendall Scott, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Addison Wesley, 3rd Edition, 2003.
5. Y. Daniel Liang, "Introduction to Java Programming", 9th Edition, Prentice Hall Publications, 2015.

**WEB REFERENCES:**

1. <http://www.uml.org/>
2. <http://modeling-languages.com/uml-tutorial-online>
3. <http://www.javaworld.com>
4. <http://www.nptel.ac.in>

**ONLINE RESOURCES:**

1. <https://www.coursera.org/uml-approach>
2. <https://www.coursera.org/learn/object-oriented-java>

**OUTCOMES:****At the end of the course, the students should be able to**

1. Understand the various steps involved in Software Development, design with UML diagrams. (K2)
2. Understand and analyze the fundamentals oops concepts of java programming. (K3)
3. Demonstrate real time applications by utilizing different methodologies of static UML diagrams. (K3)
4. Select and apply the appropriate static UML diagram for real time problems. (K3)
5. Illustrate the interaction diagram and Activity diagram for real time problems. (K3)
6. Explain the design pattern and implement package diagram, component diagram, deployment diagrams. (K3)

**CO - PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	3	-	2	2	2	-	-	-	-	1	1	-
CO2	3	1	3	-	2	-	-	-	-	-	2	2	2	1
CO3	2	2	3	-	2	-	-	-	-	-	-	2	2	2
CO4	1	1	2	-	3	-	-	-	-	-	-	-	1	-
CO5	1	1	2	-	2	-	-	-	-	-	-	1	1	2
CO6	2	2	3	3	2	-	-	-	-	-	3	2	2	2

**SEMESTER - III**

<b>20ITPC301</b> <b>SDG NO. 4</b>	<b>DATA STRUCTURES</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>

**OBJECTIVES:**

- To understand the concepts of ADT's
- To learn Linear Data Structures – Lists, Stacks, and Queues
- To understand Sorting, Searching and Hashing Algorithms
- To learn Dynamic Data Structures - Tree and Graph

**UNIT I LINEAR DATA STRUCTURES – I****9**

**Stacks and Queues :** Abstract Data Types (ADTs) – Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to Postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue – Dequeue – Applications of Queues.

**UNIT II LINEAR DATA STRUCTURES – II****9**

**Linked List:** List ADT – Array-Based Implementation – Linked List Implementation -- Singly Linked Lists- Circularly Linked Lists- Doubly-Linked Lists – Applications of Lists –Polynomial Manipulation – All Operations (Insertion, Deletion, Merge, Traversal).

**UNIT III NON LINEAR DATA STRUCTURES – I****9**

**Trees :** Tree ADT – Tree Traversals - Binary Tree ADT – Expression Trees – Applications of Trees – Binary Search Tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree -Heap – Applications of Heap.

**UNIT IV NON LINEAR DATA STRUCTURES – II****9**

**Graphs:** Definition – Representation of Graph – Types of Graph – Breadth First Traversal – Depth First Traversal – Topological Sort – Bi-Connectivity – Cut Vertex – Euler Circuits – Dijkstra’s algorithm – Bellman-Ford algorithm – Floyd’s Algorithm - minimum spanning tree – Prim’s and Kruskal’s algorithms – Applications of Graphs.

**UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES****9**

Searching- Linear Search - Binary Search - Sorting - Bubble Sort - Selection Sort - Insertion Sort - Shell Sort – Radix Sort – Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education Asia, 2002.
2. Reema Thareja, “Data Structures Using C”, Second Edition, Oxford University Press, 2011.

**REFERENCES:**

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, “Introduction to Algorithms”, Second Edition, Mcgraw Hill, 2002.
2. Stephen G. Kochan, “Programming in C”, 3rd edition, Pearson Education.
3. Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008.

**WEB REFERENCES:**

1. <https://www.programiz.com/dsa>
2. <http://masterraghu.com/subjects/Datastructures/ebooks/remathareja.pdf>

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Recognize the concepts of ADT for linear data structures. (K1)
2. Recognize ADT for non-linear data structure. (K1)
3. Understand linear and non-linear data structures to problem solutions. (K2)
4. Understand the various sorting and searching algorithms. (K2)
5. Apply appropriate ADT to problems involving Graph, Trees and Heap. (K3)

6. Apply appropriate data structures to solve real world problems efficiently.(K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
C01	2	2	1	2	1	1	1	0	2	2	3	3	1	1
C02	2	2	1	2	1	1	1	0	2	2	3	3	1	1
C03	3	3	2	3	3	1	1	1	2	2	3	3	1	1
C04	2	2	1	2	3	2	1	0	1	1	2	1	1	2
C05	2	2	1	2	3	0	0	1	2	1	2	2	1	2
C06	3	3	3	3	1	0	0	0	1	1	2	1	2	2

**SEMESTER - III**

<b>20ITPC303</b> SDG NO. 4,9	<b>COMPUTER ORGANIZATION AND ARCHITECTURE</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>

**OBJECTIVES:**

- To learn the basic structure and operations of a Computer
- To study the implementation of Fixed-Point and Floating Point Arithmetic unit
- To understand Parallelism and Multi-core processors using Pipelined execution
- To understand the Cache memories, Virtual memories and Communication of I/O devices

**UNIT I BASIC STRUCTURE OF A COMPUTER SYSTEM****7**

Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – Decision Making – MIPS Addressing.

**UNIT II ARITHMETIC OPERATIONS IN PROCESSORS****11**

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Subword Parallelism.

**UNIT III PROCESSOR AND CONTROL UNIT****11**

A Basic MIPS implementation – Building a Datapath – Control Implementation

Scheme – Pipelining – Pipelined Datapath and Control – Handling Data Hazards & Control Hazards – Exceptions.

#### **UNIT IV PARALLELISM**

**7**

Parallel Processing Challenges – Flynn's classification – SISD, MIMD, SIMD, SPM and Vector Architectures – Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors – Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

#### **UNIT V MEMORY AND I/O SYSTEMS**

**9**

Memory Hierarchy – memory technologies – Cache Memory – Measuring and Improving Cache Performance – Virtual Memory, TLB's – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus Operation – Arbitration – Interface circuits – USB.

**TOTAL: 45 PERIODS**

#### **TEXT BOOKS:**

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.

#### **REFERENCES:**

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 2012.
3. John L. Hennessy and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

#### **WEB REFERENCES:**

1. <https://nptel.ac.in/courses/106/106/106106147/>

#### **OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Describe the physical, logical and functional aspects of Computer System- (K2)
2. Demonstrate the basic fixed point and floating point operations (addition,

subtraction, multiplication and Division) carried out by the processor. (K2)

3. Explain the significance and hazards associated with the pipelined datapath and control unit of computer system (K2)
4. Express the significance of the parallel processing architectures (K2)
5. Discuss the various multicore architectures and multiprocessor architectures (K2)
6. Elucidate the significance of Memory and I/O hierarchy. (K2)

### CO- PO, PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	1	-	1	-	2	1	1	-	-	-	-	-	2	2
C02	3	3	3	3	2	1	1	-	-	-	-	1	1	2
C03	2	3	3	3	1	-	-	-	-	-	-	1	1	2
C04	3	2	3	3	3	2	2	1	-	-	1	2	3	1
C05	3	2	3	3	3	2	2	1	-	-	-	1	1	1
C06	2	1	1	3	3	1	1	1	-	-	-	2	1	1

## SEMESTER - III

20CBPC303 SDG NO. 4	SOFTWARE ENGINEERING				L	T	P	C
					3	0	0	3

### OBJECTIVES:

- To understand the phases in a software project.
- To recognize the Cost estimation, risk and mitigation of Software project
- To understand fundamental concepts of requirements engineering and Analysis Modelling.
- To analyze the various software design methodologies, testing and maintenance measures.
- To Study the quality and Reliability of software products

### UNIT I INTRODUCTION

6

Programming in the small vs. Programming in the large - Software project failures and importance of software quality and timely availability - Engineering approach to software development - Role of software engineering towards successful execution of large software projects - Emergence of software engineering as a discipline - Basic concepts of life cycle models - Different models and milestones.

**UNIT II SOFTWARE PROJECT MANAGEMENT AND ESTIMATION TECHNIQUES****11**

Software Project Management: Software project planning – Identification of activities and resources – Concepts of feasibility study - Techniques for estimation of schedule and effort - Introduction to the concepts of risk and its mitigation - configuration management. Estimation Techniques: Software cost estimation models and concepts of software engineering economics - techniques of software project control and reporting - Introduction to measurement of software size - Software metrics and metrics - Based control methods- Measures of code and design quality.

**UNIT III SOFTWARE REQUIREMENTS & OBJECT ORIENTED ANALYSIS, DESIGN AND CONSTRUCTION****10**

Software Requirements Analysis - Design and Construction: Introduction to SRS and requirement elicitation techniques - Requirement modeling techniques – Decision tables- Event tables - State transition tables - Petri nets OOAD and Construction: Introduction to UML - Use cases - Concepts – The principles of Abstraction – Modularity – Specification - Encapsulation and Information hiding - Concepts of abstract data type - Class Responsibility Collaborator (CRC) model - Quality of design - Design measurements - Design patterns – Refactoring - Object-oriented construction principles - Object oriented metrics.

**UNIT IV SOFTWARE TESTING****9**

Introduction to faults and failures - Basic testing concepts - Concepts of verification and validation - Black box and white box tests - White box test coverage – Code coverage, Condition coverage, Branch coverage - Basic concepts of black-box tests – Equivalence classes - Boundary value tests - Usage of state tables - Testing use cases - Transaction-based testing - Testing for non-functional requirements – Volume, performance and efficiency - Concepts of inspection.

**UNIT V SOFTWARE QUALITY AND RELIABILITY****9**

Internal and external qualities - Process and product quality - Principles to achieve software quality – Introduction to different software quality models like McCall, Boehm, FURPS / FURPS+, Dromey, ISO – 9126 - Introduction to Capability Maturity Models (CMM and CMMI) - Introduction to software reliability, reliability models and estimation.

**TOTAL: 45 PERIODS**

**TEXT BOOK:**

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, McGraw-Hill International Edition, 2010.
2. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.

**REFERENCES:**

1. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Private Limited, 2009.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R. Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited, 2007.

**ONLINE RESOURCES:**

1. <http://nptel.ac.in/>.
2. <http://infolab.stanford.edu/~burback/watersluice/watersluice.html>.

**WEB RESOURCES:**

1. [https://www.vssut.ac.in/lecture\\_notes/lecture1428551142.pdf](https://www.vssut.ac.in/lecture_notes/lecture1428551142.pdf).
2. [http://www.darshan.ac.in/Upload/DIET/Documents/CE/2160701\\_Software%20Engineering%20Study%20Material%20GTU\\_23042016\\_032444AM.pdf](http://www.darshan.ac.in/Upload/DIET/Documents/CE/2160701_Software%20Engineering%20Study%20Material%20GTU_23042016_032444AM.pdf).
3. <https://jnec.org/lab-manuals/cse/te/se.pdf>.

**OUTCOMES:****At the end of the course, the students should be able to**

1. Define the key approaches of engineering that yield the importance of software project quality. (K1)
2. Understand the different activities in software project plan, activities, management and cost estimation techniques. (K2)
3. Understand the software requirement specifications and the principles of unified modelling language to model the business requirements. (K2)
4. Select and apply the various testing concepts in software projects to maintain stable software products. (K3)
5. Compare and contrast the reliability and quality metrics of a software product. (K2)

6. Implement different software quality models to manage process and product quality.(K3)

**CO - PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	1	-	-	2	2	-	1	2	3	2	1	2
C02	3	3	2	1	2	-	-	-	2	1	3	1	1	2
C03	2	2	2	1	2	3	2	-	-	-	3	-	2	-
C04	-	3	3	-	-	-	-	-	-	1	3	-	3	2
C05	2	2	2	1	2	-	-	-	-	-	2	-	2	2
C06	-	-	-	-	2	2	2	-	-	-	1	1	2	1

**SEMESTER - III**

<b>20ITPL301</b> SDG NO. 4	<b>DATA STRUCTURES 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>

**OBJECTIVES:**

- To implement Linear and Non-linear Data Structures
- To understand the different operations of Search Trees
- To implement Graph Traversal algorithms
- To get familiarized to Sorting and Searching algorithm

**LIST OF EXPERIMENTS :**

1. Array implementation of Stack and Queue ADTs
2. Array implementation of List ADT
3. Linked list implementation of List, Stack and Queue ADTs
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues
9. Graph representation and Traversal algorithms
10. Applications of Graphs- Implementation of searching and sorting algorithms

## 11. Implementation of any two Collision Techniques in Hashing

**TOTAL: 45 PERIODS****LAB REQUIREMENTS:**

Turbo C/Dev C++, Borland C

**OUTCOMES:****On completion of this laboratory course, the student should be able to**

1. Write functions to implement linear and non-linear data structure operations. [K1]
2. Suggest appropriate linear / non-linear data structure operations for solving a given problem. [K2]
3. Design and analyze the time and space efficiency of data structure. [K2]
4. Apply sorting and searching techniques. [K3]
5. Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval. [K3]
6. Choose and implement efficient data structures and apply them to solve problems. [K3]

**CO- PO, PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	1	2	1	1	-	-	-	-	2	2	2	2
CO2	2	3	2	2	2	1	-	-	-	-	2	3	2	2
CO3	3	3	2	2	1	1	-	-	-	-	2	2	2	2
CO4	3	3	2	2	1	1	-	-	-	-	2	3	2	2
CO5	1	2	2	1	2	1	-	-	-	-	1	1	2	2
CO6	1	2	2	1	1	-	-	-	-	-	1	1	2	2

<b>20CJPL301</b> SDG NO. 4,9	<b>OBJECT-ORIENTED ANALYSIS AND DESIGN LAB</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>

### OBJECTIVES:

- Understand the object-oriented software development process, fundamentals Java
- Design suitable pattern to develop software models
- Analyse requirements to create requirements design model
- Apply business modelling and modelling languages to design software
- Develop correct and robust software deployment models

### LIST OF EXPERIMENTS:

1. Write a java program to find the largest among three numbers
2. Sort the strings in ascending order using constructors.
3. Design a package to perform bank accounting transactions.
4. Payroll processing using Inheritance for n employees.
5. To develop a mini-project by following the 4 exercises listed below.
  - Identify a software system that needs to be developed.
  - Document the Software Requirements Specification (SRS) for the identified system.
  - Identify use cases and develop the Use Case model.
  - Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
  - Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
  - Draw relevant State Chart and Activity Diagrams for the same system.
  - Implement the system as per the detailed design
  - Test the software system for all the scenarios identified as per the use case diagram

### Suggested domains for Mini-Project:

1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. Online course reservation system
6. E-ticketing

7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system

**TOTAL: 45 PERIODS**

### LAB REQUIREMENTS:

#### Hardware:

Desktop Systems - Pentium IV with 2 GB RAM 160 GB HARD Disk  
Monitor 1024x768 color

#### Software:

Windows operating system JDK .8, Rational Rose Enterprise version

### OUTCOMES:

**On completion of this laboratory course, the student should be able to**

1. Understand the object-oriented software development process , fundamentals in Java (K1)
2. Design suitable pattern to develop software models(K2)
3. Analyze requirements to create requirements design model
4. Apply business modeling and modeling languages to design software
5. Elicit requirements and design a user interface model. (K6)
6. Create a deployment model ,Apply object-oriented design to develop a software. (K3)

### CO - PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
C01	3	2	1	1	3	-	-	-	-	-	-	-	1	-
C02	3	2	1	1	3	-	-	-	-	-	-	-	1	-
C03	3	2	1	1	3	-	-	-	-	-	-	-	2	2
C04	3	2	1	1	3	-	-	-	-	-	-	-	1	-
C05	3	2	1	1	3	-	-	-	-	-	-	-	2	-
C06	3	2	2	-	-	-	-	-	-	-	-	-	2	-

# SEMESTER - III

Syllabus / M.Tech. - CSE

20CSTE301 SDG NO. 4,11,15	LIVE-IN-LAB – I	L	T	P	C
		0	0	2	1

## OBJECTIVES:

- To understand the engineering aspects of design with reference to simple products
- To foster innovation in design of products
- To develop design that add value to products and solve technical problems.
- To create awareness among the students of the characteristics of several domain areas where IT can be effectively used

## COURSE PLAN :

**Study:** Take minimum three simple products, processes or techniques in the area of specialization, study, analyze and present them. The analysis shall be focused on functionality, construction, quality, reliability, safety, maintenance, handling, sustainability, cost etc. whichever are applicable. Each student in the group has to present individually; choosing different products, processes or techniques.

**Design:** The project team shall identify an innovative product, process or technology and proceed with detailed design. At the end, the team has to document it properly and present and defend it. The design is expected to concentrate on functionality; design for strength is not expected.

**Note:** The one hour/week allotted for tutorial shall be used for discussions and presentations. The project team (not exceeding four) can be students from different branches, if the design problem is multidisciplinary.

## EVALUATION:

1. First evaluation (Immediately after first internal examination): 20 marks
2. Second evaluation (Immediately after second internal examination): 20 marks
3. Final evaluation (Last week of the semester): 60 marks

**Note:** All the three evaluations are mandatory for course completion and for awarding the final grade.

**OUTCOMES:****Upon completion of the course, the student should be able to**

1. List the problems and conduct literature survey to identify the gap and come up with an application oriented research problem in the specific domain.(K1)
2. Understand the project characteristics and explore necessary tools and components needed at various stages of the project(K2)
3. Design and validate the proposed system using simulation.(K3)
4. Develop the Prototype of the proposed system by adapting Industrial safety standards and best financial management practices(K5)
5. Analyze the obtained results and prepare a technical report.(K4)
6. Evaluate the project and go for journals and patents publication.(K5)

**CO- PO, PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	2	2	2	2	2	2	3	2	2	3	3	3
C02	3	3	3	2	3	3	2	2	3	3	3	3	3	3
C03	3	3	3	2	3	3	2	2	3	3	3	3	3	3
C04	2	2	2	1	2	1	1	1	3	2	3	3	3	2
C05	2	2	2	1	2	1	1	1	3	2	3	3	3	2
C06	2	2	2	1	2	1	1	1	3	2	3	3	3	2

**SEMESTER - III**

<b>20CJTP301</b> <b>SDG NO. 4&amp;5</b>	<b>SKILL ENHANCEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**APTITUDE & COGNITIVE SKILLS – PHASE 1****OBJECTIVE:**

- To educate and enrich the students on quantitative ability, reasoning ability, and verbal ability.
- Improve their quantitative ability.
- Improve the ability of arithmetic reasoning
- Enhance their verbal ability through vocabulary building and grammar
- Equip with creative thinking and problem solving skills

**UNIT I QUANTITATIVE ABILITY – I 10**

Problems on Trains - Time and Distance - Height and Distance - Time and Work

**UNIT II QUANTITATIVE ABILITY – II 10**

Problems on Ages - Alligation or Mixture - Chain Rule - Simple Interest - Simple Equation - Theory Of Equation.

**UNIT III REASONING ABILITY – I 8**

Analytical Reasoning - Pipes and Cistern - Logical Problems - Logical Games - Logical Deduction - Data Sufficiency - Arithmetic Reasoning

**UNIT IV VERBAL ABILITY – I 10**

Idioms & Phrases - Synonyms - Antonyms - Classification

**UNIT V CREATIVITY ABILITY – I 7**

Venn Diagrams - Cube and Cuboids - Dice - Cubes and Dice - Figure Matrix.

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun sharma

**PROBLEM SOLVING USING C PROGRAMMING - PHASE 2****OBJECTIVES:**

- To provide exposure to problem-solving through programming.
- To train the student to the basic concepts of the C-programming language.
- To provide exposure to problem-solving through programming.
- To give the student hands-on experience with the concepts

**UNIT I INTRODUCTION TO PRINCIPLES OF PROGRAMMING 9**

Introduction to Programming, Programming Domain : Scientific Application, Business Applications, Artificial Intelligence, Systems Programming, Web Software Categories of Programming Languages: Machine Level Languages, Assembly Level Languages, High Level Languages Programming Design Methodologies : Top Down and Bottom UP Program Development Cycle with case study, Program Execution and Translation Process, Problem solving using Algorithms and Flowcharts, Performance Analysis and Measurements: Time and Space complexity.

**UNIT II INTRODUCTION TO C PROGRAMMING 9**

Features of C and its Basic Structure, Simple C programs, Constants, Integer Constants, Real Constants, Character Constants, String Constants, Backslash Character Constants, Concept of an Integer and Variable, Rules for naming Variables and assigning values to variables, Floating-point Numbers, Converting Integers to Floating-point and vice-versa, Mixed-mode Expressions, The type cast Operator, The type char, Keywords, Character Input and Output, Formatted input and output, The gets() and puts() functions, Interactive Programming.

**UNIT III OPERATORS, EXPRESSIONS AND CONTROL STATEMENTS 9**

Arithmetic Operators, Unary Operators, Relational and Logical Operators, The Conditional Operator, Library Functions, Bitwise Operators, The Increment and Decrement Operators, The Size of Operator, Precedence of operators, The goto statement, The if statement, The if-else statement, Nesting of if statements, The conditional expression, The switch statement, The while loop, The do...while loop, The for loop, The nesting of for loops, The break statement and continue statement.

**UNIT IV ARRAYS, STRINGS AND POINTERS 9**

One Dimensional Arrays, Passing Arrays to Functions, Multidimensional Arrays, Strings, Basics of Pointers, Pointers and One-dimensional Arrays,

Pointer Arithmetic, Pointer Subtraction and Comparison, Similarities between Pointers and One-dimensional Arrays, Null pointers, Pointers and Strings, Pointers and two-dimensional arrays, Arrays of Pointers.

## **UNIT V STRUCTURES, UNIONS AND FUNCTIONS**

**9**

Basics of Structures, Arrays of Structures, Pointers to Structures, Self-referential Structures, Unions, Function Philosophy, Function Basics, Function Prototypes, and Passing Parameters: Passing Parameter by value and Passing Parameter by reference, passing string to function, Passing array to function, Structures and Functions Recursion.

**TOTAL : 45 PERIODS**

### **REFERENCES:**

1. Programming in ANSI C - Balagurusamy - Tata McGraw-Hill Education, 2008
2. Programming in C (3rd Edition), by Stephen G. Kochan, Sams, 2004
3. Programming in C - Stephen G. Kochan, III Edition, Pearson Education.

### **COURSE OUTCOMES :**

**Upon completion of this course, the students should be able to:**

1. Analyze their quantitative ability. (K3)
2. Understand the ability of arithmetic reasoning along with creative thinking and problem solving skills. (K2)
3. Create their verbal ability through vocabulary building and grammar. (K3)
4. Evaluate the situations to analyze the computational methods in order to identify and abstract the programming task involved. (K3)
5. Analyze tasks in which the numerical techniques are applicable in order to apply them to write, edit, compile, debug, correct, recompile and run programs. (K3)
6. Analyze and Design applications using Arrays, Strings, Pointers, Structures and Unions. (K3)

**CO- PO & PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO2	-	-	-	-	3	2	-	3	2	3	-	2	-	-
CO3	-	-	-	-	3	2	-	-	1	3	-	2	-	-
CO4	-	-	-	-	3	2	-	3	3	3	-	2	2	2
CO5	-	-	-	-	3	2	-	-	2	3	-	2	2	2
CO6	-	-	-	-	3	2	-	-	2	3	-	2	2	2

**SEMESTER - III**

<b>20MGMC301</b> SDG NO. 4	<b>CONSTITUTION OF INDIA</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>

**OBJECTIVES:**

**At the end of the course, the student is expected to**

- To know about Indian constitution
- To know about central government functionalities in India
- To know about state government functionalities in India
- To know about Constitution function
- To Know about Constitutional remedies

**UNIT I INTRODUCTION****6**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties

**UNIT II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT****6**

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India.

**UNIT III STRUCTURE AND FUNCTION OF STATE GOVERNMENT****6**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

**UNIT IV CONSTITUTION FUNCTIONS****6**

Indian Federal System – Centre – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries.

**UNIT V CONSTITUTIONAL REMEDIES****6**

Enforcement of fundamental rights - Power of parliament to modify the rights the conferred by this part in their application to forces.

**TOTAL: 30 PERIODS****TEXT BOOKS:**

1. Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. R.C. Agarwal, (1997) "Indian Political System", S. Chand and Company, New Delhi.
3. M.V. Pyle (2019), "An Introduction to The Constitution of India, 5/e", Vikas Publishing, New Delhi.
4. P.M. Bakshi, (2018), "Constitution of India", Universal Law Publishing, New Delhi.

**REFERENCES:**

1. Sharma, Brij Kishore, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System", New Academic Publishing House, Jalandhar.

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Explain the Constitution and Fundamental rights of citizens (K2)
2. Discuss the structure, hierarchy and functions of Central Government (K2)
3. Explain the functions of Supreme Court and Judiciary Systems in the state (K2)
4. Discuss the structure, hierarchy and functions of State Government (K2)
5. Recall the Centre-State relationship, constitutional amendments and functionaries (K1)
6. Discuss the remedies and rights available to India Citizens (K2)

**CO – PO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01	-	-	-	-	-	1	1	-	-	-	-	-
C02	-	-	-	-	-	1	1	-	-	-	-	-
C03	-	-	-	-	-	1	1	-	-	-	-	-
C04	-	-	-	-	-	1	1	-	-	-	-	-
C05	-	-	-	-	-	2	1	3	-	-	-	-
C06	-	-	-	-	-	2	1	2	3	-	-	-

**SEMESTER - IV**

<b>20BSMA402</b> SDG NO. 4	<b>PROBABILITY AND QUEUEING THEORY</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>

**OBJECTIVES:**

- To impart necessary basic knowledge in Probability theory, Random Processes and Queueing models which are invariably used in Computer science courses

**UNIT I PROBABILITY AND RANDOM VARIABLES 12**

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

**UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 12**

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear Regression – Transformation of Random Variables – Central Limit Theorem (for independent and identically distributed random variables).

**UNIT III RANDOM PROCESSES 12**

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.

**UNIT IV QUEUEING MODELS 12**

Markovian queues – Birth and Death processes – Single and multiple server Queueing models – Little's formula - Queues with finite waiting rooms –Self-service model.

**UNIT V ADVANCED QUEUEING MODELS 12**

Finite source models - M/G/1 queue – Pollaczek-Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.

**TOTAL: 60 PERIODS**

**TEXT BOOKS:**

1. Ibe, O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007. (1.1-1.3, 1.6, 1.7 - 1.7.1, 1.8, 1.13 - Exercise problems in the above sections ; 2.1 - 2.8, 3.1 - 3.5, 3.9, 4.1 - 4.3, 4.4 - 4.4.2, 4.7 - 4.11, 5.1 - 5.7, 6.1 - 6.3, 6.8, 6.10, 8.1 - 8.5, 10.5 (10.5.1 - 10.5.6), 10.6, 10.7 - 10.7.1-10.7.5) (Units I, II & III).
2. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014. (1.1 - 1.5, 1.7, 2.1 - 2.7, 4.1, 4.2, 5.1 - 5.1.1) (Units IV and V)

**REFERENCES:**

1. Hwei Hsu, "Schaum's Outline Theory and Problems of Probability, Random variables and Random Processes", Tata Mcgraw Hill Edition, New Delhi, 2004.
2. Taha, H.A., " Operations Research", 9th Edition , Pearson India Education Services, Delhi, 2016.
3. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.
4. Yates, R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.
5. Veerarajan T, "Probability and Statistics, Random Processes and Queueing Theory", TataMc-Graw Hill Education Pvt. Ltd., New Delhi

**WEB REFERENCES:**

1. <https://nptel.ac.in/courses/117103017/>
2. <https://nptel.ac.in/courses/111105041/>
3. <http://home.iitk.ac.in/~skb/ee679/ee679.html>

**ONLINE RESOURCES:**

1. <https://freevideolectures.com/course/3066/performance-evaluation-of-computer-systems/5>
2. <https://freevideolectures.com/course/3066/performance-evaluation-of-computer-systems/6>

**OUTCOMES:****Upon completion of the course, the student should be able to**

1. Apply the knowledge of basic concepts of probability, one dimensional random variables and standard distributions in real life situations. (K3)
2. Study the relationship between two random variables and transformation by applying its basic concepts. (K3)

3. Apply the concepts of random processes in engineering disciplines. (K3)
4. Acquire the skills in analyzing Markovian queuing models. (K3)
5. Analyze the behavior of Non-Markovian queuing models, series queues and open networks. (K3)

**CO- PO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	1
CO2	3	3	2	-	-	-	-	-	-	-	-	1
CO3	3	3	2	-	-	-	-	-	-	-	-	1
CO4	3	3	2	-	-	-	-	-	-	-	-	1
CO5	3	3	2	-	-	-	-	-	-	-	-	1

**SEMESTER - IV**

<b>20CSPC401</b> SDG NO. 4,9	<b>OPERATING 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>

**OBJECTIVES:**

- To understand the basic concepts, functions of Operating Systems, Processes and Threads
- To analyze Scheduling algorithm and understand the concept of Deadlock
- To analyse various Memory Management schemes and understand I/O management and File Systems
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android

**UNIT I OPERATING SYSTEM OVERVIEW****7**

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 Organization Operating System Structure and Operations - System Calls - System Programs - OS Generation and System Boot.

**UNIT II PROCESS MANAGEMENT****11**

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication - CPU Scheduling - Scheduling Criteria - Scheduling Algorithms- Multiple - Processor Scheduling - Real Time Scheduling - Threads - Overview - Multithreading Models - Threading Issues - 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.

**UNIT III STORAGE MANAGEMENT****9**

Main Memory – Background, Swapping, Contiguous Memory Allocation - Paging - Segmentation - Segmentation with Paging - 32 and 64 Bit Architecture Examples - Virtual Memory – Background - Demand Paging - Page Replacement - Allocation - Thrashing - Allocating Kernel Memory - OS Examples.

**UNIT IV FILE SYSTEMS AND I/O SYSTEMS****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 – I/O Hardware - Application I/O Interface - Kernel I/O Subsystem - Streams - Performance.

**UNIT V CASE STUDY****9**

Linux System - Design Principles - Kernel Modules - Process Management - Scheduling - Memory Management - Input-Output Management - File System - Inter-Process Communication - Mobile OS - iOS and Android - Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

**TOTAL : 45 PERIODS****TEXT BOOK:**

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2012.
2. William Stallings, “Operating Systems – Internals and Design Principles”, 7th Edition, Prentice Hall, 2011

**REFERENCES :**

1. Ramez Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. Achyut S. Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Pearson Education, 2004.
4. Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004.
5. Harvey M. Deitel, "Operating Systems", Third Edition, Pearson Education, 2004.

**WEB REFERENCES :**

1. <https://nptel.ac.in/courses/106/106/106106144/>
2. <https://www.coursera.org/courses?query=operating%20system>
3. <https://www.computerhope.com/jargon/o/os.html>
4. <https://www.os-book.com/OS9/slide-dir/>
5. <http://web.iitd.ac.in/~minati/MTL458.html>

**ONLINE RESOURCES:**

1. <https://www.udacity.com/course/introduction-to-operating-systems-ud923>
2. <https://freevidelectures.com/course/3670/introduction-to-operating-systems>

**OUTCOMES:****Upon the completion of the course, the students should be able to**

1. Understand the basic concepts and functions of the operating system. (K2)
2. Analyze various scheduling algorithms. (K4)
3. Understand deadlock, prevention and avoidance algorithms. (K2)
4. Compare and contrast various memory management schemes. (K4)
5. Understand the functionality of file systems (K2)
6. Understand the performance of administrative tasks on Linux servers. (K2)

**CO-PO, PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	1	-	1	-	1	1	-	-	-	1	2	2
C02	3	3	3	2	2	-	1	1	-	-	-	1	2	2
C03	3	3	2	2	2	-	1	1	-	-	-	1	2	2
C04	2	2	3	2	2	-	1	1	-	-	-	1	2	2
C05	3	3	3	2	2	-	1	1	-	-	-	1	2	2
C06	3	3	2	2	2	-	1	1	-	-	-	1	2	2

**SEMESTER - IV**

<b>20CSPC402</b> SDG NO. 4,9	<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>

**OBJECTIVES:**

- To design a database using ER diagrams, convert them to Relational Databases and to write SQL Queries
- To understand the fundamental concepts of Transaction Processing, Concurrency Control techniques and Recovery procedures
- To understand the Internal Storage structures and about the Query Processing Techniques
- To have an introductory knowledge about the Object Databases, XML Databases and NoSQL Databases

**UNIT I DATABASE DESIGN****7**

Purpose of Database System – Views of Data – Database System Architecture – Data Models – Entity Relationship Model – ER Diagrams – Enhanced ER Model.

**UNIT II RELATIONAL DATABASES****11**

Introduction to Relational Databases – Relational Model-ER-to-Relational Mapping – Keys – Relational Algebra – SQL Fundamentals – Advanced SQL features – Embedded SQL – Dynamic SQL – Functional Dependencies – Non-loss

Decomposition – First – Second - Third Normal Forms - Dependency Preservation – Boyce/Codd Normal Form – Multi Valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

### **UNIT III TRANSACTIONS**

**9**

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery – Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

### **UNIT IV IMPLEMENTATION TECHNIQUES**

**9**

RAID – File Organization – Organization of Records in Files – Indexing and Hashing – Ordered Indices – B+ Tree Index Files – B Tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics - Cost Estimation.

### **UNIT V ADVANCED TOPICS**

**9**

Distributed Databases – Architecture - Data Storage - Transaction Processing – Object Based Databases - Object Database Concepts – Object Relational Features - ODMG Object Model – ODL - OQL – XML Databases - XML Hierarchical Model – DTD - XML Schema – Xquery.

**TOTAL: 45 PERIODS**

#### **TEXT BOOKS:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Seventh Edition, Tata McGraw Hill, 2020.
2. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, 2016.

#### **REFERENCES:**

1. C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, “Database Management Systems”, Fourth Edition, McGraw-Hill Education, 2015.
3. G.K.Gupta, “Database Management Systems”, Tata McGraw Hill, 2011.

#### **WEB REFERENCES:**

1. [https://swayam.gov.in/nd1\\_noc19\\_cs46/](https://swayam.gov.in/nd1_noc19_cs46/)
2. <http://www.nptelvideos.in/2012/11/database-management-system.html>

3. <https://www.classcentral.com/course/swayam-database-management-system-9914>
4. <http://learnsql.com>
5. <https://www.w3schools.com/sql/default.asp>
6. <https://www.khanacademy.org/computing/computer-programming/sql>

### OUTCOMES:

#### Upon completion of the course, the student should be able to

1. Discuss the concepts of database to apply the Relational, ER model for design and SQL for implementation of the database. (K2)
2. Recognize and identify the use of normalization and functional dependencies to rene the database system. (K1)
3. Demonstrate various SQL queries for the Transaction Processing & Locking using concept of Concurrency control. (K2)
4. Build the query processing techniques for the optimization of SQL queries. (K3)
5. Implement the indexing and hashing techniques for the organisation of database records. (K3)
6. Illustrate how the advanced databases differ from the traditional databases. (K2)

### CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	1	1	1	2	1	0	0	0	0	0	0	2	2
C02	2	2	2	2	1	1	0	0	0	0	0	0	2	2
C03	2	1	2	1	2	1	0	0	0	0	0	0	2	2
C04	2	2	2	2	1	1	0	0	0	0	0	0	2	2
C05	2	2	2	2	1	1	0	0	0	0	0	0	2	2
C06	2	2	2	1	2	1	0	0	0	0	0	0	2	2

# SEMESTER - IV

20CJPC401 SDG NO. 4,9	CORE JAVA PROGRAMMING	L	T	P	C
		3	0	0	3

## OBJECTIVES:

- To explain the features of java programming, Inheritance and Interfaces
- To illustrate the use of file system, JDBC.
- To define Exceptions and use I/O streams
- To develop a Java application with threads and generic classes, GUI

## UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 10

JVM-Internals, JVM Architecture, JDK, JRE, JVM Memory. Class fundamentals: Declaring objects, Assigning object reference variable, Methods & Method Signatures, Method returning Values, Method with parameters, Variable argument, Input / Output Basics – Streams – Byte Streams and Character Streams – Reading and Writing Console – Reading and Writing Files.

## UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Superclasses– Subclasses –Protected Members – Constructors in SubClasses– The Object Class – Abstract Classes and Methods – Final Methods and Classes – Interfaces – Defining an Interface - Implementing Interface - Differences between Classes and Interfaces and Extending Interfaces – Object Cloning- Inner Classes -Array Lists -Strings.

## UNIT III EXCEPTION, CONCURRENCY, ENUMERATION 12

Exceptions – Exception Hierarchy– Throwing and Catching Exceptions – Built-in Exceptions- Creating own Exceptions - Thread Life Cycle - Creating Threads, Inter Thread Communication, Synchronization of threads using Synchronized keyword and lock method. Thread pool and Executors framework, Futures and callable, Fork-Join in Java. Deadlock conditions. Enumeration - usage

## UNIT IV MULTI-THREADING AND GENERIC PROGRAMMING 8

Basics , Generic Programming – Generic Classes – Generic Methods ,Generics and type safety Collections Interfaces –Collection, Set, List, Queue, Collections Classes – Array List, Hash Set, Tree Set. Accessing a Collection via Iterators. MapInterfaces. MapClasses– AbstractMap, HashMap, TreeMap - Generic Programming.

**UNIT V EVENT-DRIVEN PROGRAMMING**

Graphics programming – Frame – Components – working with 2D shapes – Using color, fonts, and images – Basics of event handling – event handlers – adapter classes–actions– mouse events –AWT event hierarchy– buttons – layout management

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. Herbert Schildt, “Java - The Complete Reference”, 8th Edition, McGrawHill Education, 2011.
2. E.Balagurusamy- “Programming with Java”, 6th Edition, McGrawHill Education, 2019.
3. Cay S. Horstmann and Gary Cornell, “Core Java: Volume I – Fundamentals”, Eighth Edition, Sun Microsystems Press, 2008.

**REFERENCES:**

1. Paul Deitel, Harvey Deitel, “Java SE 8 for Programmers”, 3rd Edition, Pearson, 2015.
2. Steven Holzner, “Java 2 Blackbook”, Dream Tech Press, 2011.
3. Timothy Budd, “Understanding Object-Oriented Programming with Java”, Updated Edition, Pearson Education, 2000.

**WEB REFERENCES:**

1. <https://www.geeksforgeeks.org/java/>
2. <https://www.tutorialspoint.com/java/>
3. <https://www.javatpoint.com/java-tutorial>
4. <https://www.w3schools.com/java/>
5. <http://www.javaworld.com>

**ONLINE RESOURCES:**

1. <https://www.coursera.org/specializations/object-oriented-programming>
2. <https://www.udemy.com/topic/java-certification/>
3. <https://www.edx.org/learn/java>

**OUTCOMES:**

**Upon completion of the course, students should be able to**

1. Explain the features of java programming, Inheritance and Interfaces (K2)
2. Illustrate the purpose of packages, Java documents and Analyse the various types of Inheritance. (K4)

3. Apply the Object Oriented Programming Concepts to develop the reusable Applications. (K3)
4. Illustrate the java applications using Java Exceptions and I/O Streams. (K4)
5. Understand the concept of Multithreading and Generic Classes in Java. (K2)
6. Design and implement the solution for real time problems using Event driven programming. (K3)

**CO - PO, PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	1	2	2	-	2	-	-	-	-	-	2	3	2
C02	3	1	3	2	-	2	-	-	2	-	-	2	3	2
C03	3	1	3	2	-	2	-	-	-	-	-	2	3	3
C04	3	1	3	2	-	2	-	-	-	-	-	2	3	2
C05	3	1	3	2	3	2	-	-	-	-	-	2	3	2
C06	3	1	3	2	3	2	-	-	1	-	-	2	3	2

**SEMESTER - IV**

<b>20ITPC401</b> SDG NO. 4	<b>DESIGN AND ANALYSIS OF ALGORITHMS</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
					<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To understand and apply the algorithm analysis techniques
- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To understand different algorithm design techniques
- To understand the limitations of Algorithmic power

**UNIT I INTRODUCTION****10**

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithmic Efficiency – Asymptotic Notations and their properties - Analysis Framework – Empirical analysis - Mathematical analysis for Recursive and Non-recursive algorithms – Visualization.

**UNIT II BRUTE FORCE AND DIVIDE-AND-CONQUER 9**

Brute Force – Computing an – String Matching - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment Problem.

Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers – Closest-Pair and Convex - Hull Problems.

**UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUES 9**

Dynamic programming – Principle of optimality - Coin Changing Problem - Computing a Binomial Coefficient – Floyd's Algorithm – Multi Stage Graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions - Greedy Technique – Container Loading Problem - Prim's Algorithm and Kruskal's Algorithm – 0/1 Knapsack Problem - Optimal Merge pattern - Huffman Trees.

**UNIT IV ITERATIVE IMPROVEMENT 8**

The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs - Stable Marriage problem.

**UNIT V COPING WITH THE LIMITATIONS OF ALGORITHM POWER 9**

Lower - Bound Arguments - P, NP, NP - Complete and NP-Hard Problems- Backtracking – n-Queen Problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO Search - Assignment Problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Travelling Salesman Problem – Knapsack Problem.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. AnanyLevitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms/ C++", Second Edition, Universities Press, 2007.

**REFERENCES:**

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

2. Alfred V.Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2016.
4. S. Sridhar, "Design and Analysis of Algorithms", Oxford university press, 2014.

**WEB REFERENCES:**

1. <https://nptel.ac.in/courses/106101060>
2. [https://www.cse.iitm.ac.in/course\\_details.php?arg=OTI](https://www.cse.iitm.ac.in/course_details.php?arg=OTI)
3. [https://swayam.gov.in/nd1\\_noc19\\_cs47/previ](https://swayam.gov.in/nd1_noc19_cs47/previ)

**ONLINE RESOURCES:**

1. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/>
2. <http://www.learnalgorithms.in/>
3. <https://courses.cs.vt.edu/csonline/Algorithms/Lessons/>
4. <http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms>.

**OUTCOMES:****Upon completion of the course, the student should be able to**

1. Review the fundamentals of algorithmic problem solving and analyzing efficiency of algorithms [K2]
2. Apply mathematical formulation, complexity analysis and methodologies to solve recurrence relations for algorithms [K3]
3. Compare the time complexities of various algorithms [K3]
4. Critically analyze the different algorithm design techniques for a given problem [K3]
5. Illustrate NP class problems and formulate solutions using standard approach [K2]
6. Articulate solutions for real life problems using algorithm design principles [K3]

**CO-PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	1	0	0	0	0	0	0	0	0	0	0	1
C02	3	3	1	0	0	0	0	0	0	0	0	0	0	1
C03	2	3	0	1	0	0	0	0	0	0	0	0	0	1
C04	2	3	0	2	0	0	0	0	0	0	0	0	0	1
C05	1	2	0	1	0	0	0	0	0	0	0	0	0	1
C06	1	2	1	2	0	0	0	0	0	0	0	0	0	1

**SEMESTER - IV**

<b>20CSPL401</b> SDG NO. 4,9	<b>OPERATING 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>

**OBJECTIVES:**

- To learn Unix commands and Shell programming
- To implement various CPU scheduling algorithm, Process Creation and Interprocess Communication
- To implement Deadlock avoidance and Deadlock Detection algorithms
- To implement Page Replacement algorithms and File strategies

**LIST OF EXPERIMENTS :**

1. Basics of UNIX commands & Administrator commands (man, uptime, users, service, pkill, pmap, wget, free, Shutdown commands, ping, su, who, env).
2. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir.
3. Write programs to simulate UNIX commands like cp, ls, grep, etc.
4. Shell Programming.
5. Write programs to implement the 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. Write program to implement Threading & Synchronization Applications.
11. Implementation of the following Memory Allocation Methods for fixed partition
  - a) First Fit    b) Worst Fit    c) Best Fit
12. Implementation of Paging Technique of Memory Management.
13. Implementation of the following Page Replacement Algorithms
  - a) FIFO    b) LRU    c) LFU
14. Implementation of the various File Organization Techniques.
15. Implementation of the following File Allocation Strategies
  - a) Sequential    b) Indexed    c) Linked

**TOTAL: 45 PERIODS**

### LAB REQUIREMENTS

1. Standalone desktops with C / C++ / Java / Equivalent compiler 30 Nos. with Linux OS

### OUTCOMES:

**On completion of this laboratory course, the student should be able to**

1. Compare the performance of various CPU Scheduling Algorithms (K4)
2. Implement Deadlock avoidance and Detection Algorithms (K2)
3. Implement Semaphores. Create processes and implement IPC (K2)
4. Analyze the performance of the various Page Replacement Algorithms (K4)
5. Implement File Organization and File Allocation Strategies (K2)
6. Implement File Allocation Strategies (K2)

### CO-PO,PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	1	-	-	-	-	-	-	1	2	2
CO2	3	3	3	2	1	1	1	2	2	2	1	2	2	2
CO3	3	3	3	3	1	2	1	2	2	2	2	2	2	2
CO4	3	3	3	2	1	-	-	1	1	1	1	2	2	2
CO5	3	3	3	2	1	-	-	1	1	1	1	1	2	2
CO6	3	3	2	2	1	-	-	1	1	1	1	1	2	2

## SEMESTER - IV

<b>20CSPL402</b> SDG NO. 4&9	<b>DATABASE MANAGEMENT SYSTEMS</b> <b>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>

### OBJECTIVES:

- To learn the use of Data Definition, Data Manipulation Commands, Nested and Join queries
- To understand Functions, Procedures and Procedural extensions of databases
- To be familiar with the use of a Front End tool
- To understand design and implementation of typical Database applications

### LIST OF EXPERIMENTS :

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements.
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins.
3. Implementation of Views, Sequences and Synonyms.
4. Database Programming: Implicit and Explicit Cursors.
5. Procedures and Functions.
6. Triggers.
7. Exception Handling.
8. Database Design using ER Modeling, Normalization and Implementation for any application.
9. Database Connectivity with Front End Tools.
10. Case Study using Real Life Database applications.

**TOTAL: 45 PERIODS**

### LAB REQUIREMENTS

#### SOFTWARE

Front end: VB/VC ++/JAVA or Equivalent

Back end: Oracle / SQL / MySQL/ Postgres / DB2 or Equivalent

### OUTCOMES :

**On completion of this laboratory course, the student should be able to**

1. Use typical data definitions and manipulation commands. (K1)
2. Design applications to test Nested and Join Queries. (K3)

3. Implement simple applications that use Views. (K3)
4. Critically analyze the use of Tables, Views, Functions and Procedures. (K4)
5. Make use of ER modeling and normalization to design and implement database. (K3)
6. Implement real life applications that require a Front-end Tool as a Team. (K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	1	1	1	2	1	0	0	0	0	0	0	2	2
C02	2	2	2	1	2	1	0	0	0	0	0	0	2	2
C03	2	2	2	1	2	1	0	0	0	0	0	0	2	2
C04	2	2	2	1	2	1	0	0	0	0	0	0	2	2
C05	2	2	2	2	1	1	0	0	0	0	0	0	2	2
C06	2	2	2	1	2	1	0	0	0	0	0	0	2	2

**SEMESTER - IV**

<b>20JPL401</b> SDG NO. 4&9	<b>JAVA PROGRAMMING 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>

**OBJECTIVES:**

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of Packages, Inheritance and Interfaces
- To develop a Java application with Threads and Generic classes
- To make the students understand life cycle of the Applets and its functionality

**LIST OF EXPERIMENTS:**

1. Basic JAVA Programs
  - a. Write a program to find the sum of individual digits of a positive integer.
  - b. Write a program to generate the first n terms of the sequence.
  - c. Write a program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

- d. Write a program to find both the largest and smallest number in a list of integers.
- e. Write a program to find the factorial of the list of number reading input as a command.
2. Write a program to calculate bonus for different departments using method overriding.
3. Write a program to sort a list of elements in ascending and descending order and show the exception handling.
4. Write a program to implement the concept of importing classes from user defined packages and creating packages.
5. Write programs that illustrate how the following forms of inheritance are supported:
  - a) Single inheritance
  - b) Multiple inheritance
  - c) Multi level inheritance
  - d) Hierarchical inheritance
6. Write a program to demonstrate use of implementing interfaces.
7. Write a program to implement interfaces for all string operations.
8. Write a program to create a student report using an applet, read the input using text boxes and display the output using buttons.
9. Write a program to implement thread priorities.
10. Write a program to implement thread, applets and graphics to animate ball movement.
11. JAVA Applet program
  - a) Write a Applet program using paint brush
  - b) Write a program to display analog clock using Applet
  - c) Write a program to create different shapes and fill colors using Applet
12. JAVA Event Handling program
  - a) Write a program that display the x and y position of the cursor movement using Mouse
  - b) Write a program that identifies key-up key-down event user entering text in a Applet
13. JAVA programs on Swings
  - a) Write a program to build a Calculator in Swings
  - b) Write a program to display the digital watch in swing
  - c) Write a program that creates a single ball bouncing inside a Jpanel.
  - d) Write a program JTree as displaying a real tree upside down

**TOTAL : 45 PERIODS**

**LAB REQUIREMENTS:****Hardware :**

Desktop Systems - Pentium IV with 2 GB RAM 160 GB HARD Disk

Monitor 1024x768 color

**Software :**

Systems with either Netbeans or Eclipse / Windows operating system / JDK 1.8

**OUTCOMES:**

**On completion of this laboratory course, the student should be able to**

1. Write Java programs in accordance with the object oriented programming concepts. (K6)
2. Design user defined java packages. (K6)
3. Create Java programs using Inheritance and Polymorphism. (K6)
4. Implement Error-handling techniques using Exception handling and Multithreading. (K6)
5. Develop Applet program and GUI using Swing components. (K6)
6. Enumerate the event handling techniques in Java Programming. (K5)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	2	2	2	-	2	-	-	-	-	2	2	3	2
C02	2	2	3	2	-	2	-	-	-	-	2	2	3	2
C03	2	2	3	2	-	2	-	-	2	2	2	2	3	2
C04	3	3	2	2	-	2	-	-	-	-	2	2	3	2
C05	3	3	3	2	-	2	-	-	-	-	2	2	3	2
C06	2	3	3	2	-	2	-	-	2	2	2	2	3	2

## SEMESTER - IV

<b>20CSTE401</b> SDG NO. 4,11,15	<b>LIVE-IN-LAB – II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### OBJECTIVES:

- To provide opportunities for the students, expose to Industrial environment and real time work
- To offer students a glimpse into real world problems and challenges that need IT based solutions
- To improve the team building, communication and management skills of the students
- To introduce students to the vast array of literature available of the various research challenges in the field of CSE

### COURSE METHODOLOGY:

1. This initiative is designed to inculcate ethical principles of research and to get involve in life-long learning process for the students.
2. The course must involve engineering design with realistic constraints. It must also include appropriate elements of the following: Engineering standards, design analysis, modeling, simulation, experimentation, prototyping, fabrication, correlation of data, and software development.
3. Project can be individual work or a group project, with maximum of 3 students. In case of group project, the individual project report of each student should specify the individual's contribution to the group project.
4. On completion of the project, the student shall submit a detailed project report. The project should be reviewed and the report shall be evaluated and the students shall appear for a viva-voce oral examination on the project approved by the Coordinator and the project guide.

### EVALUATION:

1. First evaluation (Immediately after first internal examination ) : 20 marks
2. Second evaluation (Immediately after second internal examination): 30marks
3. Final evaluation (Last week of the semester) : 50marks

**Note:** All the three evaluations are mandatory for course completion and for awarding the final grade

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**Upon completion of the course, the students should be able to**

1. Conduct literature survey to identify the gap and an application oriented research problem in the specific domain(K4)
2. Design and validate the proposed system using simulation(K6)
3. Prototype the proposed system(K5)
4. Analyze the obtained results and prepare a technical report(K4)
5. Publish the work in journals and apply for the patents.(K3)
6. Prepare for industrial environment and real time work(K3)

**CO-PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO4	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO5	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO6	2	2	2	2	3	2	2	2	2	2	3	3	3	3

**SEMESTER - IV**

<b>20CJTP401</b> <b>SDG NO. 4&amp;5</b>	<b>SKILL ENHANCEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**APTITUDE AND COGNITIVE SKILLS – PHASE 1****OBJECTIVES:**

- Improve their quantitative ability.
- Improve their reasoning ability.
- Enhance their verbal ability through vocabulary building and grammar
- Equip with creative thinking and problem solving skills

**UNIT I QUANTITATIVE ABILITY – III****10**

Compound Interest - Profit and Loss- Partnership - Percentage- Set Theory

**UNIT II QUANTITATIVE ABILITY – IV****10**

True Discount-Ratio and Proportion - Simplification - Problems On H.C.F and L.C.M

**UNIT III REASONING ABILITY – II****8**

Course of Action - Cause and Effect - Statement and Conclusion - Statement and Argument - Data Sufficiency (DS) - Statement and Assumption - Making Assumptions.

**UNIT IV VERBAL ABILITY – II****10**

Change of Voice - Change of Speech - Letter and Symbol Series - Essential Part- Verbal Reasoning- Analyzing Arguments.

**UNIT V CREATIVITY ABILITY – II****7**

Seating Arrangement - Direction Sense Test - Character Puzzles - Missing Letters Puzzles - Mirror &amp; Water Images.

**TOTAL : 45 PERIODS****REFERENCES:**

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun sharma

**ADVANCED C PROGRAMMING - PHASE 2****COURSE OBJECTIVE:**

- To improve C programming skills with understanding of code organization and functional hierarchical decomposition with using complex data types.
- To understand procedural programming methods using Dynamic memory Allocation.

**UNIT I INTRODUCTION TO RECURSION****9**

Introduction to Recursion, Types of Recursion - Head Recursion , Tail Recursion, Tree Recursion, Indirect Recursion and Nested Recursion . Recursion vs Looping - Analysis on efficiency of looping and recursion,

Working of recursive code in main memory. Recurrence Relation , Different types of recurrence relation. Deriving time complexity and space complexity using recurrence relation.

**UNIT II GROWTH FUNCTIONS AND RECURSION 9**

Polynomial Equations, Compare growth functions - order growth functions, omega growth functions, theta growth functions - Constant time, Linear time, Logarithmic time, Quadratic time and exponential time. Problems on Recursions - Factorial Number, Sum of first N Natural Numbers, Nth Fibonacci Number, Exponent Function, Taylor Series, Tower of Hanoi.

**UNIT III STORAGE CLASSES, THE PREPROCESSOR AND DYNAMIC MEMORY ALLOCATION 9**

Storage Classes and Visibility, Automatic or local variables, Global variables, Static variables, External variables, File Inclusion, Macro Definition and Substitution, Macros with Arguments, Nesting of Macros, Conditional Compilation, Dynamic Memory Allocation, Allocating Memory with malloc, Allocating Memory with calloc, Freeing Memory, Reallocating Memory Blocks, Pointer Safety, The Concept of linked list, Inserting a node by using Recursive Programs, Sorting and Reversing a Linked List, Deleting the Specified Node in a Singly Linked List.

**UNIT IV FILE MANAGEMENT 9**

Defining and Opening a file, Closing Files, Input/output Operations on Files, Predefined Streams, Error Handling during I/O Operations, Random Access to Files, Command Line Arguments.

**UNIT V BIT MANIPULATION 9**

The hexadecimal number system, C bitwise operators, Working with individual bits, How to check if a given number is a power of 2, Count the number of ones in the binary representation of the given number, Check if the ith bit is set in the binary form of the given number, How to generate all the possible subsets of a set, Find the largest power of 2 (most significant bit in binary form), which is less than or equal to the given number N, Tricks with Bits, Applications of bit operations.

**TOTAL : 45 PERIODS**

**REFERENCES:**

1. R. G. Dromey, "How to Solve It By Computer", Pearson, 1982
2. A.R. Bradley, "Programming for Engineers", Springer, 2011
3. Kernighan and Ritchie, "The C Programming Language", (2nd ed.) Prentice Hall, 1988

**COURSE OUTCOMES:**

**Upon completion of this course, the students should be able to:**

1. Analyze their quantitative ability. (K4)
2. Understand the ability of arithmetic reasoning along with creative thinking and problem solving skills. (K2)
3. Create their verbal ability through vocabulary building and grammar. (K6)
4. Evaluate code organization and functional hierarchical decomposition with complex data types. (K5)
5. Understand C programming skills to apply advanced structured and procedural programming. (K2)
6. Apply Various File and Bit Manipulation algorithms in Problem Solving. (K3)

**CO- PO & PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	-	-	-	-	3	2	-	3	2	3	-	2	-	-
C02	-	-	-	-	3	2	-	3	2	3	-	2	-	-
C03	-	-	-	-	3	2	-	-	1	3	-	2	-	-
C04	-	-	-	-	3	2	-	3	3	3	-	2	2	2
C05	-	-	-	-	3	2	-	-	2	3	-	2	2	2
C06	-	-	-	-	3	2	-	-	2	3	-	2	2	2

# SEMESTER - V

<b>20CJPC501</b> SDG NO. 4 & 9	<b>DATA WAREHOUSING AND DATA MINING</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>

## OBJECTIVES:

- To understand Data Warehouse concepts, Architecture, Business Analysis and Tools
- To understand Data Preprocessing and Data Visualization techniques
- To study algorithms for finding Hidden and Interesting patterns in Data
- To understand and apply various Classification and Clustering techniques

## UNIT I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING 9

Basic Concepts – Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors – Multidimensional Data Model – Data Warehouse Schemas for Decision Support - Concept Hierarchies - Characteristics of OLAP Systems – Typical OLAP Operations - OLAP and OLTP.

## UNIT II INTRODUCTION TO DATA MINING 9

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – Applications- Data Objects and Attribute Types - Statistical Description of Data - Data Preprocessing – Cleaning - Integration - Reduction - Transformation and Discretization - Data Visualization - Data Similarity and Dissimilarity Measures-Perform data transformation and handling missing values using R programming.

## UNIT III FREQUENT PATTERN ANALYSIS 9

Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.-Using R programming language - Apriori algorithm, FP Growth algorithm.

## UNIT IV CLASSIFICATION 9

Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Backpropagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the

Accuracy of a Classifier or Predictor – Ensemble Methods – Model Selection.- Using R programming language- Decision tree algorithm, Bayesian Classification.

## **UNIT V CLUSTERING ANALYSIS**

**9**

Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis - Implement k-means clustering -Hierarchical Clustering algorithm using R Programming

**TOTAL: 45 PERIODS**

### **TEXT BOOKS:**

1. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.
2. 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”, Second Edition, Elsevier, 2005.
3. Parteek Bhatia, “Data Mining and Data Warehousing: Principles and Practical Techniques”, Cambridge University Press, 2019.
4. Pranjali Deshpande, Soudamini Patil, “Data Warehousing and Data Mining”, First Edition, Technical Publications, 2020.
5. Dr. B. Shadaksharappa, Mr. P. Ramkumar, Dr. T.N. Prabakar, “Data Warehousing and Data Mining”, First Edition, Book Rivers, 2022.

### **WEB REFERENCES:**

1. [https://swayam.gov.in/nd1\\_noc20\\_cs12/preview](https://swayam.gov.in/nd1_noc20_cs12/preview)
2. <https://freevideolectures.com/course/3609/data-warehousing>

### **ONLINE RESOURCES:**

1. [https://www.tutorialspoint.com/data\\_mining/index.htm](https://www.tutorialspoint.com/data_mining/index.htm)
2. <https://www.guru99.com/online-analytical-processing.html>
3. <https://www.cs.waikato.ac.nz/ml/weka/courses.html>
4. [https://www.tutorialspoint.com/weka/what\\_is\\_weka.htm](https://www.tutorialspoint.com/weka/what_is_weka.htm)

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Understand Data warehouse system and perform business analysis with OLAP tools. (K2)
2. Illustrate the various data mining , data preprocessing concepts ,Use suitable pre-processing and visualization techniques for data analysis (K3)
3. Understand frequent pattern, association rule mining techniques and to examine frequent patterns (K3)
4. Summarize the various data mining techniques ,apply appropriate classification techniques to analyze the real world problems and evaluate it. (K3)
5. Implement Frequent pattern analysis, classification algorithm for real world data problems using R programming.(K3)
6. Extract the various clustering techniques, apply appropriate clustering techniques to solve the real world problems and evaluate them. (K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	1	1	-	2	2	2	2	3	3
CO2	3	3	3	2	2	2	1	-	2	2	2	3	3	2
CO3	2	2	2	2	2	1	1	-	2	2	2	3	3	3
CO4	2	2	2	2	2	2	1	-	2	3	3	3	2	2
CO5	3	2	3	2	3	2	2	-	2	2	2	3	2	3
CO6	3	2	3	2	3	2	2	-	2	2	2	3	2	3

**SEMESTER - V**

<b>20CJPC502</b> <b>SDG NO. 4 &amp; 9</b>	<b>AGILE METHODOLOGIES</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>

**OBJECTIVES:**

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.

- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

### **UNIT I AGILE METHODOLOGY 9**

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

### **UNIT II AGILE PROCESSES 9**

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

### **UNIT III AGILITY AND KNOWLEDGE MANAGEMENT 9**

Agile Information Systems – Agile Decision Making - Earl\_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

### **UNIT IV AGILITY AND REQUIREMENTS ENGINEERING 9**

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

### **UNIT V AGILITY AND QUALITY ASSURANCE 9**

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

**TOTAL: 45 PERIODS**

#### **TEXT BOOKS:**

1. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Result", Prentice Hall, 2003.

- Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.

### REFERENCES:

- Craig Larman, "Agile and Iterative Development: A Manager's Guide", Addison-Wesley, 2004.
- Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth-Heinemann, 2007.

### ONLINE RESOURCES:

- <https://www.wrike.com/project-management-guide/faq/what-is-agile-methodology-in-project-management/>
- <https://www.pmi.org/learning/library/agile-approach-projects-market-globalization-5777>
- <https://www.seamgen.com/blog/agile-qa-process/>

### OUTCOMES:

#### Upon completion of the course, the students will be able to:

- Realize the importance of interacting with business stakeholders in determining the requirements for a software system.(K2)
- Perform iterative software development processes: how to plan them, how to execute them.(K1)
- Point out the impact of social aspects on software development success.(K2)
- Develop techniques and tools for improving team collaboration and software quality.(K3)
- Perform Software process improvement as an ongoing task for development teams.(K1)
- Show how agile approaches can be scaled up to the enterprise level.(K2)

### CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	2	1	1	-	2	2	2	2	3	3
CO2	3	3	3	2	2	2	1	-	2	2	2	3	3	2
CO3	3	3	3	3	2	1	1	-	2	2	2	3	3	3
CO4	3	3	3	3	2	2	1	-	2	3	3	3	2	2
CO5	3	2	3	2	3	2	2	-	2	2	2	3	2	3
CO6	3	2	3	2	3	2	2	-	2	2	2	3	2	3

## SEMESTER - V

<b>20CSPC502</b> SDG NO. 4	<b>THEORY OF COMPUTATION</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>

### OBJECTIVES:

- To construct Automata for any given pattern and find its equivalent regular expressions
- To design a context free grammar for any given language
- To understand Turing machines and their capability
- To understand undecidable problems and NP class problems

### UNIT I AUTOMATA FUNDAMENTALS 9

Introduction to formal proof – Additional forms of Proof – Inductive Proofs – Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with Epsilon Transitions

### UNIT II REGULAR EXPRESSIONS AND LANGUAGES 9

Regular Expressions – FA and Regular Expressions – Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

### UNIT III CONTEXT FREE GRAMMAR AND LANGUAGES 9

CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

### UNIT IV PROPERTIES OF CONTEXT FREE LANGUAGES 9

Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM.

### UNIT V UNDECIDABILITY 9

Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem, The Class P and NP.

**TOTAL: 45 PERIODS**

### TEXT BOOK:

1. J.E.Hopcroft, R.Motwani and J.D.Ullman, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2011.

- Peter Linz, "An Introduction to Formal Languages and Automata", 5th Edition, Jones & Bartlett Learning, 2011.

### REFERENCES:

- H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation", Second Edition, PHI, 2010.
- J.Martin, "Introduction to Languages and the Theory of Computation", 4th Edition, TMH, 2019.
- Micheal Sipser, "Introduction of the Theory and Computation", 4th Edition Thomson Brokecole, 2014.
- K.L.P.Mishra, N.Chandrasekaran, "Theory of Computer Science (Automata, Languages and Computation)", Third Edition, PHI, 2008.
- S.P.Eugene Xavier "Theory of Automata, Formal Languages and Computation", New Age International Publishers, 2007.

### WEB REFERENCES:

- <https://nptel.ac.in/courses/106/104/106104148>
- [https:// automation simulator.com/](https://automation simulator.com/)
- [https://swayam.gov.in/nd1\\_noc19\\_cs79/](https://swayam.gov.in/nd1_noc19_cs79/)

### ONLINE RESOURCES:

- <http://www.youtube.com/watch?v=eqCkkC9A0Q4>
- <http://www.udemy.com/course/theory-of-computation-toc/>
- <https://online.stanford.edu/courses/soe-ycsautomata-automata-theory>
- <https://www.aduni.org/courses/theory/index.php?view=cw>

### OUTCOMES:

#### Upon completion of the course, the student should be able to

- Understand the models of computation, including formal languages, Grammars and Automata, and their connections (K2)
- Construct Automata, Regular Expression for any pattern (K3)
- Develop Context Free Grammar for any given language and understand the language of Push Down Automata (K3)
- Construct Turing Machines for any Language, solve various problems by applying normal form techniques (K3)
- Identify Computation Solutions using Turing Machines (K2)
- Identify whether a problem is decidable or not. (K2)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	2	3	3	2	2	1	1	-	2	2	2	2	3	3
CO2	3	3	3	2	2	2	1	-	2	2	2	3	3	2
CO3	3	3	3	3	2	1	1	-	2	2	2	3	3	3
CO4	3	3	3	3	2	2	1	-	2	3	3	3	2	2
CO5	3	2	3	2	3	2	2	-	2	2	2	3	2	3
CO6	3	2	3	2	3	2	2	-	2	2	2	3	2	3

**SEMESTER - V**

<b>20CJPW501</b> <b>SDG NO. 4 &amp; 9</b>	<b>JEE FRAMEWORK WITH LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

**OBJECTIVES:**

- To learn the fundamentals of JEE concepts and usage of build tools like Maven.
- To understand Agile development and testing To acquire knowledge on core technologies like IOC, DI, AOP
- To develop and deploy application in frameworks like Spring, Spring MVC and Building REST Services with spring MVC
- To understand Logging process, ORM framework and build secure applications using JWT and OAUTH

**UNIT I INTRODUCTION TO JAKARTA ENTERPRISE EDITION (FORMERLY CALLED AS JAVA EE):** **9**

Java EE 8 Platform Overview - Evolution - Standard architecture-Profiles- JEE Specifications-Application components- Distributed Multi tiered Applications- J2EE clients- J2EE Server communications -Web & Business Components-Java EE Containers – services & types - Java EE Application Assembly & Deployment – Packaging Applications-EAR File-Java EE modules - Development role-Getting Started with Web applications-Java EE software Implementation.

**UNIT II MODEL VIEW CONTROLLER** **9**

MVC framework - Architecture & Packaging- Three tier architecture vs MVC pattern – Web application lifecycle -Web Module structure - Web application deployment descriptor(web.xml file) - Web Application Archive (\*.WAR file),

Java ARchive (\*.JAR), Enterprise Application aRchive(\*.EAR). Build Tools: Maven -Environment setup - Lifecycle-Build profile-Configuration, Archetype, Local Maven Repository and MavnRepository-Multimodule using command line - Dependency Plugins-Types -Dependency scope.

### **UNIT III DATA PERSISTENCE**

**9**

Object/Relation Mapping using Simple JDBC Integration with native sql commands-ORM Models - Tools- SQL JNDI(Java Naming and Directory Interface), JNDI Data source Configuration,Data source objects creation - Files --Application Deployment in Tomcat with JNDI, Hibernate: Introduction, Integrating and configuring Hibernate, understanding connection pool-Architecture-core components-Hibernate and JAVA persistence API(JPA)-Dependencies-Domain Model classes..

### **UNIT IV ORM ARCHITECTURE**

**9**

ORM Architecture, Spring Data, JPA, Hibernate,JPA annotations,JPA - ORM components ,Installations , Entity Manager, Entity Relationships – Many To One Relation, One To Many,Relation, One To One Relation and Many To Many Relation. Java Persistence query language -Building a sample application using JPA-JPA - Advanced mapping- Criteria API- Service classes.

### **UNIT V WEB SECURITY**

**9**

Web Security Framework: Specifying an Authorization Constraint-Authentication Mechanisms-JSON Web Token (JWT), JWT structure and configuration,JWT Signature,OAUTH2-Roles, Architecture, Authentication grant, Obtaining Access Token, Accessing a protected resource, OAuth Registry-Authorization endpoints, Extensibility. Case Study: Develop a Spring based application with JWT-OAUTH2

### **LAB EXERCISES:**

1. Developing simple applications in Maven.
2. Implement Spring IOC.
3. Implement Spring
4. Create a web application using Spring MVC.
5. Implement Data Persistence using JPA and Hibernate.
6. Creating RESTFUL services and Test using Postman or
7. Usage of Java Naming and Directory Interface
8. Implement Logging using Log4j.
9. Implement Spring Security using JWT and OAUTH2.

**LAB REQUIREMENTS:**

- Java Programming
- NetBeans IDE

**TOTAL: 60 PERIODS****TEXT BOOKS:**

1. Jim Keogh, "J2EE: The Complete Reference", McGraw Hill, 2002
2. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.
3. Joseph B.Ottinger, Jeff LinWood, Dave Minter, " Beginning Hibernate: for Hibernate 5", 4th Edition, Apress, 2016

**REFERENCES:**

1. Elder Moraes, "Java EE 8 Cookbook", Packt Publishing, 2018..
2. Jon Brisbin, Oliver Gierke, Thomas Risberg, Mark Pollack, Michael Hunger," Spring Data: Modern Data Access for Enterprise Java", O'Reilly Media, November, 2012

**ONLINE RESOURCES:**

1. <https://www.baeldung.com/rest-with-spring-series>
2. <https://www.coursera.org/courses?query=spring%20framework>
3. <https://www.gangboard.com/spring-and-hibernate-courses>
4. <https://netbeans.apache.org/kb/docs/javaee/javaee-getting-started.html>

**OUTCOMES:****Upon completion of the course, the students will be able to:**

1. Understand the concepts of JEE and build tools like maven..(K2)
2. Apply core Technologies in real world application(K1)
3. Demonstrate real world application in different frameworks like spring and spring MVC(K2)
4. Develop techniques and tools for improving team collaboration and software quality(K3)
5. Apply logging process and spring security in real world applications.(K3)
6. Perform Software process improvement as an ongoing task for development teams.(K1)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
CO1	3	3	1	-	-	2	2	-	1	2	3	2	1	2
CO2	3	3	2	1	2	-	-	-	2	1	3	1	1	2
CO3	2	2	2	1	2	3	2	-	-	-	3	-	2	-
CO4	-	3	3	-	-	-	-	-	-	1	3	-	3	2
CO5	2	2	2	1	2	-	-	-	-	-	2	-	2	2
CO6	-	-	-	-	2	2	2	-	-	-	1	1	2	1

**SEMESTER - V**

<b>20CJPC503</b> SDG NO. 4 & 9	<b>WEB TECHNOLOGY FOUNDATION</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>

**OBJECTIVES:**

- To Learn the basic concepts in HTML, CSS, Javascript
- To understand the responsive design and development
- To understand the fundamentals of Javascript
- To explore advanced ES6 features

**UNIT I WEB DESIGN - HTML MARKUP FOR STRUCTURE 9**

Working of Web - HTML Markup for Structure - Creating simple page - Marking up text - Adding Links - Adding Images - Table Markup - Forms - HTML5- Introduction to nodejs.

**UNIT II CASCADING STYLE SHEETS 9**

CSS - Formatting text - Colors and Background - Padding, Borders and Margins - Floating and positioning - Page Layout with CSS - Transition, Transforms and Animation - Mobile-First or Desktop-First - CSS Grids, CSS Frameworks, UI Kits, and Flexbox for Responsive Web Design.

**UNIT III JAVASCRIPT FUNDAMENTALS 9**

Introduction - Variables and Data Types - Operators and Expressions - Control flow and Conditional Statements - Functions and Scope - Arrays and Loops - Objects and Properties - Events and Event Handling - Document Object Model - Basic manipulation of HTML and CSS using Javascript - Handling Errors and Exceptions.

**UNIT IV JAVASCRIPT WITH ES6****9**

Introduction to ES6 - Arrow functions and default parameters - Template literals and string interpolation - Block scoped variables with let and const - Destructuring and Spreading - Map, Filter and Reduce - Callbacks - Async/Await and Asynchronous programming.

**UNIT V JAVASCRIPT HTML DOM****9**

Using Script Tag to Link/code JS with html - jQuery Library usage - DOM - Manipulation and Traversal using JQuery- Elements- HTML- FORMS--CSS- Events- Variable Hoisting, AJAX Calls.-Introduction to bootstrap.

**TOTAL: 45 PERIODS****TEXTBOOKS:**

1. Jennifer Niederst Robbins, "Learning Web Design", O'REILLY 4th Edition, 2012
2. Ricardo Zea, "Mastering Responsive Web Design", PACKT Publishing, 2015
3. David Flanagan, "JavaScript: The Definitive Guide", O'Reilly Media, 2020

**REFERENCES:**

1. Jon Duckett, "HTML and CSS: Design and Build Websites", John Wiley and Sons, edition 2014
2. Jon Duckett, Jack Moore, "JavaScript & JQuery: Interactive Front-End Web Development", John Wiley and Sons, edition 2014
3. Ethan Brown, "JavaScript and ES6: A Comprehensive Guide" O'Reilly Media 2021

**WEB REFERENCES:**

1. <https://www.tutorialspoint.com/javascript>
2. <https://www.w3schools.com/css/>
3. <https://www.w3schools.com/jquery/>

**ONLINE RESOURCES:**

1. <https://www.edx.org/course/html5-and-css-fundamentals>
2. <https://www.udemy.com/course/html-css-javascript-course/>

**OUTCOMES:**

**Upon completion of the course, students shall have ability to**

1. Understand the basic concepts in HTML, NODEJS(K2)
2. Apply the basic concepts of CSS styling the webpages(k3)
3. Understand the basic structure of Java Script to solve the for real world problems(K2)

4. Understand the Java Script & ES6 CO concepts to solve the for real world problems(K2)
5. Apply the Java Script & ES6 concepts to solve the for real world problems(K3)
6. Interpret the JS and ES6 to design the webpage based on the application (K3)

**CO-PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	-	-	-	-	-	2	-	2	3	2	2
CO2	2	3	3	-	-	-	-	-	2	-	2	3	2	2
CO3	2	3	3	-	-	-	-	-	2	-	2	3	3	3
CO4	2	3	3	-	-	-	-	-	2	-	2	3	3	3
CO5	2	3	3	-	-	-	-	-	2	-	2	2	3	3
CO6	2	3	3	-	-	-	-	-	2	-	2	3	2	2

**SEMESTER - V**

<b>20CSPW401</b> <b>SDG NO. 4 &amp; 9</b>	<b>COMPUTER NETWORKS WITH</b> <b>LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

**OBJECTIVES:**

- To understand the protocol layering and physical level communication
- To understand the various components required to build different networks and analyze the performance of a network
- To learn the functions of network layer and the various routing protocols
- To familiarize the functions and protocols of the Transport layer

**UNIT I INTRODUCTION AND PHYSICAL LAYER****9**

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

**UNIT II DATA LINK LAYER & MEDIA ACCESS****9**

Introduction – Data Link Layer - Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.

**UNIT III NETWORK LAYER****9**

Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.

**UNIT IV TRANSPORT LAYER****9**

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram protocol – Transmission Control Protocol – SCTP.

**UNIT V APPLICATION LAYER****9**

WWW and HTTP – FTP – Email – Telnet – SSH – DNS – SNMP.

**LIST OF EXPERIMENTS :****15**

1. Simple client server program.
2. Socket program for echo/ping commands.
3. Implementing Link state routing algorithm.
4. Implementing distance vector routing algorithm.
5. Study of Network Simulator (NS2 or NS3 ) and Simulation of Congestion Control Algorithms using NS.
6. Study of TCP/UDP performance using Simulation tool.
7. Simulation of error correction code (like CRC).
8. Traffic Analysis using Wireshark.

**TOTAL: 60 PERIODS****LAB REQUIREMENTS:**

1. C/C++/JAVA/Equivalent compiler
2. Network Simulator like NS2/OPNET/Wireshark

**TEXT BOOKS:**

1. Behrouz A. Forouzan, "Data communications and networking with TCP/IP protocol suite", Sixth Edition, McGraw Hill, cop. 2022.
2. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

**REFERENCES:**

1. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson Education, 2014.
2. Nader F. Mir, "Computer and Communication Networks", Second Edition Prentice Hall, 2014.

3. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill Publisher, 2011.
4. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.
5. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks ", 5th edition, Pearson Education, 2011

**WEB REFERENCES:**

1. [https://swayam.gov.in/nd2\\_cec19\\_cs07/preview](https://swayam.gov.in/nd2_cec19_cs07/preview)
2. <https://nptel.ac.in/courses/106105081/>
3. <https://www.isi.edu/nsnam/ns/>

**ONLINE RESOURCES:**

1. <https://ptgmedia.pearsoncmg.com/images/9780789749048/samplepages/0789749041.pdf>
2. <https://www.cse.iitb.ac.in/~sri/cs348/cs378-lab00-overview.pdf>
3. <https://freevideolectures.com/course/2276/computer-networks>
4. <https://www.youtube.com/watch?v=g8iY36onLeM&list=PLWPirh4EWFpHjrW1D9UB24wsbM3zx7QMx>

**OUTCOMES:****Upon completion of the course, the student should be able to**

1. Understand the basic layers and its functions in computer networks. (K2)
2. Demonstrate the performance of a network. (K2)
3. Explain the basics of how data flows from one node to another. (K2)
4. Understand IEEE standards, analyze and design routing algorithms. (K2)
5. Describe the working of various transport and application layer protocols. (K2)
6. Apply the protocols for various functions in the network. (K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	3	2	2	-	2	1	-	1	3	2
CO2	3	3	2	-	-	-	1	-	-	-	-	-	2	1
CO3	3	3	3	-	1	-	1	-	-	1	-	1	3	1
CO4	3	3	3	-	-	-	1	-	-	1	-	-	2	2
CO5	3	3	3	-	1	-	2	-	-	1	-	1	3	2
CO6	3	3	3	-	1	-	1	-	-	1	-	-	3	2

## SEMESTER - V

<b>20CJPL501</b> SDG NO. 4	<b>WEB TECHNOLOGY 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>

### OBJECTIVES:

- To develop UI using HTML5 and CSS3
- To design interactive web pages using Java Script.
- To learn jQuery.

### LIST OF EXPERIMENTS :

1. Create an HTML form to collect details about a person, including their name, email, phone, and date of birth. Add a text area for a brief description and appropriate labels for accessibility.
2. Create an HTML page that displays a table containing information on 10 books. Each row of the table should display the book name, author name, published year, and a purchase link for the book, with the book name being a hyperlink to the purchase link.
3. Create an HTML page that includes a header, main content section, and footer. In the main content section, add an image gallery with multiple images that can be clicked on to view a larger version. Use CSS to style the image gallery, including the layout, colors, and borders. Add appropriate alt attribute to each image for accessibility.
4. Create a navigation bar that includes links to different sections of a website. Use CSS to style the navigation bar, including the layout, colors, and font. When a user hovers over a link, the background color of the link should change, and when a link is clicked, the background color of the link should remain changed to indicate the current page. Additionally, use media queries to make the navigation bar responsive and easy to use on any device.
5. Write a JavaScript program to calculate multiplication and division of two numbers (input from form styled with html and css).
6. Write a program that takes an array of objects representing a group of students, each with a name and an array of test scores. The program should use map, filter, and reduce to calculate the average test score for each student, and then return an array of objects containing only the students who have an average score above 90.
7. Write a jQuery program to create a simple slideshow of images that automatically transition to the next image after a certain time interval. The program should allow the user to pause and resume the slideshow, as well as navigate back and forth between images using buttons styled with CSS.

The images should be stored in an array, and the slideshow should loop back to the beginning once the last image is reached.

**TOTAL: 45 PERIODS**

### LAB REQUIREMENTS:

1. VS Code -HTML,CSS,JS

### OUTCOMES:

**On completion of this laboratory course, the student should be able to**

1. Develop web pages using HTML, DHTML and Cascading Styles sheets (K3)
2. Apply better UI for web pages using JQuery. (K3)
3. Develop a dynamic web pages using JavaScript (client side programming). (K3)
4. Create XML documents and XML Schema (K6)
5. Build and consume web services. (K6)
6. Develop JSP applications implementing Session management and Database Connectivity. (K3)

### CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1	3	1	1	-	-	-	2	2	3	2
CO2	3	3	3	2	3	1	1	-	-	-	2	2	2	2
CO3	3	3	3	3	3	-	-	-	-	-	2	2	3	2
CO4	2	2	3	2	3	-	-	-	-	-	2	2	3	2
CO5	3	3	3	3	2	1	1	-	-	-	3	3	3	2
CO6	3	3	3	3	2	1	1	-	-	-	2	2	3	2

## SEMESTER - V

20CJTE501 SDG NO. 4,11 & 15	LIVE-IN-LAB III	L	T	P	C
		0	0	2	1

### OBJECTIVES:

- To provide opportunities for the students, expose to Industrial environment and real time work
- To give access to NASSCOM research and intelligence that tracks industry trends, growth opportunities and best practices, access to a repository of industry presentations, blogs, discussions and articles

- To impart detailed knowledge of Computer Networks, various protocols used in Communication, Managing and configuring Cisco Switches and Routers and various WAN technologies
- To automate repetitive and redundant tasks and eliminates the human intervention using UiPath a Robotic Process Automation tool

**COURSE METHODOLOGY:**

1. This initiative is designed to inculcate ethical principles of research and to get involve in life-long learning process for the students.
2. To engage students in CSE beyond their robust academic curriculum that sparks curiosity and imagination while teaching critical knowledge and skills.
3. This practice will engage beyond curriculum using industry-relevant technologies that help students get ready for the next step in their educations or careers. It helps the learners expand knowledge; develop skills, and their innovativeness.
4. The initiative is designed to provide students with foundational knowledge and skills in areas of CSE that are universally in high demand across computing jobs
5. On completion of the course, the student shall be able to develop applications and submit a detailed report for evaluation.

**EVALUATION:**

1. First evaluation (Immediately after first internal examination ) : 20 marks
2. Second evaluation (Immediately after second internal examination): 30marks
3. Final evaluation (Last week of the semester) : 50marks

**Note:** All the three evaluations are mandatory for course completion and for awarding the final grade

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**Upon completion of the course, the students should be able to**

1. Perform literature survey to identify the gap and an application oriented research problem in the specific domain (K2)
2. Design and validate the proposed system using simulation (K3)
3. Implement the proposed system (K3)
4. Examine the obtained results and prepare a technical report (K4)
5. Publish the work in journals and apply for the patents.(K3)

6. Prepare for industrial environment and real time work (K3)

### CO-PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	2	3	3	2	2	3	3	3	3	3	3
CO3	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO4	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO5	2	2	2	1	2	1	1	1	3	2	3	3	3	2
CO6	2	2	2	2	3	2	2	2	2	2	3	3	3	3

## SEMESTER - V

20CJTP501 SDG NO. 4&5	SKILL ENHANCEMENT (DB)	L	T	P	C
		0	0	2	1

### Analytical & Critical thinking Skills – Phase 1

#### COURSE OBJECTIVES

#### To enable students to,

- Enhance their quantitative ability.
- Enhance their reasoning ability
- Enhance their verbal ability.
- Equip with creative thinking and problem solving skills

#### Unit I Quantitative Ability – V

10

Square Root And Cube Root, Logarithm, Volume and Surface Area, Permutation and Combination

#### Unit II Quantitative Ability – VI

10

Probability, Averages, Area, Odd Man Out, Crypt Arithmetic, Flowcharts

#### Unit III Reasoning Ability – III

8

Data Interpretation Table Charts, Data Interpretation Bar Charts, Blood Relationship, Puzzles

**Unit IV Verbal Ability – III****10**

Spellings, Selecting Words, Spotting Errors, Ordering of Words, Logical Sequence of Words

**Unit V Creativity Ability – III****7**

Logical Puzzles, Playing Cards Puzzles, Clock Puzzles, Number Puzzles, Sudoku

**TOTAL : 45 PERIODS****REFERENCES**

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun Sharma

**Python Programming – Part 1 & Web Technology****OBJECTIVES:**

- The course is designed to provide Strong knowledge of Python. Python programming is intended for software engineers, system analysts, program managers and user support personnel who wish to learn the Python programming language.

**UNIT I INTRODUCTION, DATA TYPES AND STRINGS, LIST & TUPLES 10**

DataTypes - Integer , Float , Boolean , String , List , Tuple , Dictionary and Sets. String - Concatenation and Replication, isalnum functions, Slicing Operation sorted() , reversed() , min() , max() , index() and count() function, packing and unpacking of data in a tuple

**UNIT II DICTIONARY AND SETS and HANDLING****10**

Dictionary - del Keyword,. Sets - Frozen sets, Internal working of sets, add() , union() , intersection() and difference() method, symmetric\_difference, clear() method, Operators in sets, Higher Order Functions - map , filter , reduce and lambda function, Random Library

**UNIT III EXCEPTIONAL HANDLING,Regular REGULAR EXPRESSIONS AND OBJECT ORIENTED PROGRAMMING 10**

Exception Handling - All Error Categories, try , except , finally blocks, Raising an exception, Regular Expression, Object Oriented Programming - Types of Inheritance, Data encapsulation and Abstraction, Polymorphism, Method OverRiding, Operator overloading, operator overRiding.

**UNIT IV HTML****8**

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message-Web Clients Web Servers. Markup Languages: XHTML-Basic XHTML Syntax and Semantics-HTML 5.0.

**UNIT V CSS****7**

CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML-CSS3.0. Client-Side Programming: The JavaScript Language-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debugger-Server-Side Programming: Java Servlets- Architecture -Overview-A Servlet-Generating Dynamic Content-Life Cycle.

**TOTAL : 45 PERIODS****REFERENCES:**

1. Python-(Mark Lutz)
2. Python Training guide (BPB Publications)
3. HTML & CSS- Jeffrey C Jackson, "Web Technologies– A Computer Science Perspective", Pearson Education, 2006.

**ONLINE RESOURCE:**

1. <https://nptel.ac.in/courses/106105084>

**WEB RESOURCE:**

1. <https://www.coursera.org/courses?query=web%20technologies>

**OUTCOMES**

**Upon completion of this course, the students will be able to:**

1. Explain basic principles of Python programming language (K2)
2. Implement object oriented concepts.(K3)
3. Implement database and GUI applications.(K3)
4. Design Simple Web Pages using markup languages like HTML & XHTML.(K4)
5. Program Server side web pages that have to process requests from client side web pages.(K3)
6. Understand various web services and how these web services interact.(K2)

**CO-PO-PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
C01	1	1	2	2	1	-	-	-	-	-	-	1	1	2
C02	2	2	1	1	1	-	-	-	-	-	-	2	2	2
C03	2	2	1	2	2	-	-	-	-	-	-	1	1	2
C04	1	2	2	1	3	-	-	-	-	-	-	2	2	2
C05	1	2	1	1	3	-	-	-	-	-	-	2	2	2

**SEMESTER - VI**

<b>20CSPC601</b> <b>SDG NO. 4 &amp; 9</b>	<b>ARTIFICIAL INTELLIGENCE</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>

**OBJECTIVES:**

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents and about the various applications of AI

**UNIT I INTRODUCTION 9**

Introduction - Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents – Typical Intelligent Agents – Problem Solving Approach to Typical AI Problems – Search Strategies - Uninformed - Heuristics - Informed.

**UNIT II PROBLEM SOLVING METHODS 9**

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.

**UNIT III REPRESENTATION OF KNOWLEDGE 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.

**UNIT IV PLANNING AND LEARNING 9**

Planning – Planning with State Space Search- Partial Order Planning Algorithm – Planning Graphs - Logical Formulation of Learning - Knowledge in Learning - Explanation-based Learning - Learning using Relevance Information.

**UNIT V NATURAL LANGUAGE PROCESSING 9**

Language models - Phrase Structure Grammars - Syntactic Analysis – Augmented Grammars and Semantic Interpretation - Application with NLP: Developing a Simple Chatbot - Types of Chatbot.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Stuart J Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2. Elaine Rich, Kevin Knight, Shivashankar B. Nair, "Artificial Intelligence", Tata McGraw-Hill Education, Third Edition, 2008.

**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", Springer, Fifth Edition, 2003.
4. George F Luger, "Artificial Intelligence: Structures and Strategies for Complex Problem Solving", Pearson Education, New Delhi, Fifth Edition, 2017.
5. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", O'Reilly, 2009, <https://www.nltk.org/book/>.
6. I. Bratko, "Prolog: Programming for Artificial Intelligence", Addison-Wesley Educational Publishers Inc., Fourth Edition, 2011.

**WEB REFERENCES:**

1. <https://books.google.co.in/books?id=uSvYmki2yg0C&printsec=frontcover&dq=Supervised+Learning&hl=en&sa=X&ved=0ahUKEwigkNa1xN3oAhWawjgGHe8hAzoQ6AEIKDAA#v=onepage&q=Supervised%20learning&f=false>

**OUTCOMES:****Upon completion of the course, the students should be able to**

1. Infer the agent characteristics and its problem solving approaches.(K2)
2. Select appropriate search algorithms for any AI problem.(K1)
3. Apply the principles of AI in game playing.(K3)
4. Construct and solve a problem using first order and predicate logic.(K3)
5. Identify the methods of solving problems using planning and learning.(K3)
6. Implement applications for Natural Language Processing that use Artificial Intelligence.(K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	3	2	3	2	1	1	-	1	-	-	1	2	3
C02	2	3	2	3	2	1	1	-	1	-	-	1	3	3
C03	2	3	2	3	2	1	1	-	1	-	-	1	3	2
C04	2	3	2	3	2	1	1	-	1	-	-	1	3	3
C05	2	3	2	3	3	1	1	-	2	-	-	1	2	2
C06	2	3	2	3	3	1	1	-	2	-	-	1	2	3

**SEMESTER - VI**

<b>20CJPC601</b> SDG NO. 4 & 9	<b>CLOUD COMPUTING Technologies</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>

**OBJECTIVES:**

- To understand the concept of Cloud Computing
- To appreciate the Evolution of Cloud from the existing technologies
- To have knowledge on the various issues in Cloud Computing
- To appreciate the Emergence of Cloud as the next generation computing paradigm

**UNIT I INTRODUCTION****9**

Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

**UNIT II CLOUD ENABLING TECHNOLOGIES****10**

Service Oriented Architecture – REST – Web Services – Publish-Subscribe Model – Micro services – Micro services Architecture - Basics of Virtualization-Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Virtualization Support and Disaster Recovery.

**UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE****8**

Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

**UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 10**

Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

**UNIT V CLOUD TECHNOLOGIES AND ADVANCEMENTS 8**

Hadoop – Map Reduce – Virtual Box - Google App Engine – Programming Environment for Google App Engine – OpenStack – Introduction to Cloud-Fog-Edge Computing-Architecture and Components-Data Management and Storage-Real-Time Analytics in Fog and Edge Scalability and Performance Optimization.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management and Security", CRC Press, 2017.

**REFERENCES:**

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach", Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)", O'Reilly, 2009.
4. Douglas Comer, "The Cloud Computing Book: The Future of Computing Explained", Chapman and Hall/CRC, 2021
5. Hemanand D, Chembian W T, Vallem Ranadheer Reddy, "CLOUD COMPUTING: Cloud Concepts; Methodology, Network Architecture" July 2021, LAP LAMBERT Academic Publishing

**ONLINE RESOURCES:**

1. <https://eni2017.files.wordpress.com/2017/03/distributed-and-cloud-computing.pdf>.
2. <https://www.vmware.com/topics/glossary/content/distributed-cloud.html>

**WEB REFERENCES:**

1. [https://swayam.gov.in/nd1\\_noc20\\_cs20/preview](https://swayam.gov.in/nd1_noc20_cs20/preview)
2. <https://nptel.ac.in/courses/106/105/106105167/>
3. <https://freevideolectures.com/course/4639/nptel-cloud-computing>
4. <https://www.udemy.com/course/learn-cloud-computing-from-scratch/>

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Identify the main concepts, key technologies, strengths and limitations of cloud computing. (K3)
2. Explain the key and enabling technologies that help in the development of the cloud.(K2)
3. Understand and use the architecture of compute and storage cloud,service and delivery models.(K2)
4. Explain the core issues of cloud computing such as resource management and security.(K2)
5. Discover and use current cloud technologies. (K3)
6. Identify the appropriate technologies, explain the cloud Fog Edge computing (K3)

**CO- PO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	-	-	-	-	-	-	-	-
CO2	2	3	2	1	-	-	-	-	-	-	-	-
CO3	3	2	2	1	3	-	-	-	-	-	-	-
CO4	3	3	3	2	3	3	2	2	1	1	2	2
CO5	3	3	2	2	2	-	-	-	-	1	-	2
CO6	3	3	3	3	1	3	1	3	-	-	2	2

## SEMESTER - VI

<b>20CJPW601</b>	<b>MOBILE APPLICATION DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG NO. 4 &amp; 9</b>	<b>WITH LABORATORY</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

### OBJECTIVES:

- To understand basic concepts of mobile technologies, different operating systems and how to work with Android .
- To develop applications for current and emerging mobile computing devices, performing tasks at all stages of the software development life-cycle.
- To learn how to code with object oriented programming.
- To design, implement and deploy mobile applications for Android .
- To design, implement and deploy mobile applications for windows OS.

### UNIT I INTRODUCTION TO ANDROID 9

Introduction to mobile technologies, mobile operating systems- brief history, Types of mobile phone generations, The Mobile Ecosystem, Types of Mobile Applications, Mobile Information Architecture, Android Versions, Features of Android, Android Architecture, Installing Android SDK Tools, Configuring Android in Eclipse IDE, Android Development Tools (ADT), Creating Android Virtual Devices (AVD).

### UNIT II ANDROID BUILDING BLOCKS & COMPONENTS 9

Creating first android application, Anatomy of android application, Deploying Android app on USB connected Android device, Android application components, Introduction to Activities and Intents- Activity life cycle, Understanding activities, Linking activities using intents, Linking Activities, Passing Data, Toast, Exploring Intent objects, Intent Types, Displaying a Dialog Window and Notifications. Content Provider, Services, Broadcast receivers, accessing databases, Location and sensors, Multimedia audio, video and camera

### UNIT III ANDROID FRAGMENTS 9

Fragments life cycle, Interaction between fragments, Understanding the components of a screen (Layouts), Adapting to display orientation, Managing changes to screen orientation, Utilizing the Action Bar, Working with Views (UI Widgets)-Button, Toast, ToggleButton, CheckBox, RadioButton, Spinner, WebView, EditText, DatePicker, TimePicker, ListView, ProgressBar, Analog and Digital clock, Handling UI events, List fragment, Dialog fragment.

**UNIT IV ANDROID MENUS**

9

Working with Menus-Option menu, Context menu, Popup menu, Working with images- ImageView, ImageSwitcher, AlertDialog, Alarm manager, SMS messaging, Sending E-mail, Media Player, Using camera for taking pictures, recording video, Handling Telephony Manager, sample applications, debugging and deploying app, publish in Playstore.

**UNIT V DATABASE CONNECTIVITY IN ANDROID**

9

Storing the data persistently-Introducing the Data Storage Options: The preferences, The Internal Storage, The External Storage, The Content Provider , The SQLite database,Connecting with the SQLite database and operations-Insert, Delete, Update, Fetch, Publishing android applications-preparing for publishing, Deploying APK files.

**LAB EXERCISES:**

1. To implement mobile application life cycle methods.
2. To implement simple calculator application.
3. To implement simple SMS application.
4. To implement authentication verification application without and with database.
5. To implement navigation application with multiple pages / activities.
6. To implement student placement registration form with database.
7. To implement a simple notification application.
8. To implement simple intent with data passing application.
9. To implement simple profile changer application through SMS.
10. To create mobile web browser application.
11. To create mobile e-mail application to sent a mail.

**LAB REQUIREMENTS:**

1. Android Studio -IDE
2. Windows OS - 64 bit

**TOTAL: 60 PERIODS****TEXT BOOKS:**

1. Reto Meier, "Professional Android Application Development", Wrox, 2010.
2. Iggy Krajci, Darren Cummings, "Android on x86", Apress, 2013

**REFERENCES:**

1. John Horton, Android Programming for Beginners, 2nd edition, Packt Publishing, 2018
2. Dawn Griffiths, "Headfirst Android Development", 1st edition, O'Reilly, 2015

**ONLINE RESOURCES:**

1. <http://www.tutorialspoint.com/android/index.htm>
2. <http://developer.android.com/training/index.html>
3. [http://www.youtube.com/playlist?list=PLGLfVvz\\_LVvQUjiCc8lUT9a00GsWA4uNe](http://www.youtube.com/playlist?list=PLGLfVvz_LVvQUjiCc8lUT9a00GsWA4uNe)

**OUTCOMES:****Upon completion of the course, the students will be able to:**

1. Understand the technologies and business trends impacting mobile applications.(K1)
2. Understand and remember the components of android mobile applications.(K1)
3. Learn the programming languages and techniques for developing mobile applications.(K1)
4. Develop mobile applications with user interface and database connectivity for real time applications.(K2)
5. Deploy mobile applications with user interface and database connectivity for real time applications for android.(K3)
6. Develop and deploy mobile applications with android IDE.(K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	1	-	-	2	2	-	1	2	3	2	1	2
C02	3	3	2	1	2	-	-	-	2	1	3	1	1	2
C03	2	2	2	1	2	3	2	-	-	-	3	-	2	-
C04	-	3	3	-	-	-	-	-	-	1	3	-	3	2
C05	2	2	2	1	2	-	-	-	-	-	2	-	2	2
C06	-	-	-	-	2	2	2	-	-	-	1	1	2	1

## SEMESTER - VI

<b>20CSPL601</b> SDG NO. 4 & 9	<b>ARTIFICIAL INTELLIGENCE</b> <b>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>

### OBJECTIVES:

- To learn Prolog Program
- To Implement in Prolog, C and its working environment
- To Implement N-Queen problem and puzzle problem using Prolog
- To Analyze the problem using BFS and DFS algorithm

### LIST OF EXPERIMENTS :

1. Study of Prolog.
2. Write simple fact for the statements using Prolog.
3. Write predicates - one converts centigrade temperature to Fahrenheit, other checks if a temperature is below freezing.
4. Write a program to solve 4-Queen problem.
5. Write a program to solve 8-Puzzle problem.
6. Write a program to solve any problem using Breadth First Search.
7. Write a program to solve any problem using Depth First Search.
8. Write a program to solve Travelling Salesman Problem.
9. Write a program to solve Water Jug problem.
10. Write a program to solve Missionaries and Cannibal problem.
11. Write a program to implement Library Management System.

**TOTAL: 45 PERIODS**

### LAB REQUIREMENTS :

SOFTWARE : Prolog, Turbo C

### OUTCOMES:

**On completion of this laboratory course, the student should be able to**

1. Interpret the concepts of Turbo and Prolog programming in AI.(K3)
2. Examine First order predicate logic to solve AI problems. (K4)
3. Apply Informed search strategies to solve AI problems.(K3)
4. Apply Uninformed search strategies to solve AI problems.(K3)
5. Select State Space Searching method to solve AI problems.(K3)
6. Demonstrate an application using Natural Language Processing. (K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	1	2	-	1	-	1	-	-	-	-	-	1	2
C02	3	2	2	1	1	-	-	-	-	-	-	-	2	2
C03	3	2	1	-	2	-	-	-	-	-	-	1	2	1
C04	3	2	1	-	2	-	-	-	-	-	-	1	2	1
C05	2	2	2	-	1	-	1	-	-	-	-	-	2	2
C06	2	2	1	2	2	-	-	-	-	-	-	-	2	1

**SEMESTER - VI**

<b>20CSPL602</b> SDG NO. 4	<b>CLOUD COMPUTING 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>

**OBJECTIVES:**

- To develop Web Applications in Cloud
- To learn the design and development process involved in creating a Cloud Based Application
- To understand the installation of Cloud Simulation tools and Cloud Setup tools
- To learn to implement and use Parallel programming using Hadoop

**LIST OF EXPERIMENTS :**

1. Install VirtualBox/VMware Workstation with different flavors of Linux or Windows OS on top of Windows 7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute simple programs.
3. Install Google App Engine. Create hello world app and other simple web applications using Python/Java.
4. Use GAE launcher to launch the Web Applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one Virtual Machine to another Virtual Machine.
7. Find a procedure to launch Virtual Machine using try stack (Online Openstack Demo Version)

8. Install Hadoop single node cluster and run simple applications like wordcount.

**TOTAL: 45 PERIODS**

**LAB REQUIREMENTS:**

**S.No. Software**

1. Virtual box
2. VMware Workstation
3. Openstack, Hadoop
4. Cloudism
5. GAE launcher

**OUTCOMES:**

**On completion of this laboratory course, the student should be able to**

1. Discuss various virtualization tools such as Virtual Box, VMware to create virtual Environment. (K2)
2. Design and Implement applications on the Cloud. (K3)
3. Illustrate web applications in a PaaS environment. (K3)
4. Understand how to simulate a cloud environment to implement new schedulers. (K2)
5. Demonstrate and use a Generic Cloud environment that can be used as a private cloud. (K3)
6. Manipulate large data sets in a parallel environment. (K3)

**CO- PO, PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	2	2	1	3	1	1	-	-	-	2	2	3	2
C02	3	3	3	2	3	1	1	-	-	-	2	2	2	2
C03	3	3	3	3	3	-	-	-	-	-	2	2	3	2
C04	2	2	3	2	3	-	-	-	-	-	2	2	3	2
C05	3	3	3	3	2	1	1	-	-	-	3	3	3	2
C06	3	3	3	3	2	1	1	-	-	-	2	2	3	2

## SEMESTER - VI

<b>20HSPL501</b> SDG NO. 4 & 8	<b>COMMUNICATION AND SOFT SKILLS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### OBJECTIVES:

- To develop effective communication and presentation skills
- To enhance the employability and career skills of the learners
- To enable the learners for preparing job application and e-portfolio
- To make the learners use soft skills efficiently
- To develop their confidence and help them in attending interviews successfully

### UNIT I LISTENING AND SPEAKING SKILLS 6

Conversational skills participate in formal and informal talks – general, – group discussion – time management – group dynamics – GD strategies – making effective presentations - listening/watching interviews conversations, documentaries – listening to lectures, discussions from social media – improving articulation.

### UNIT II ADVANCED READING AND WRITING SKILLS 6

Reading different genres of texts - writing job applications – cover letter – résumé – emails – memos - writing abstracts – summaries – interpreting visual texts - e-portfolio.

### UNIT III SKILLS FOR COMPETITIVE EXAMS 6

Reading passages for competitive exams – language focus exercise – building vocabulary tasks - FAQs related to competitive exams – current affairs - improving global reading skills – elaborating ideas – summarizing – understanding arguments – identifying opinion/attitude and making inferences - critical reading.

### UNIT IV SOFT SKILLS 6

Motivation – emotional intelligence – managing changes – stress management – leadership traits – team work – career planning – intercultural communication – creative and critical thinking

### UNIT V INTERVIEW SKILLS 6

Different types of interview – personal interview – panel interview – telephone/online interview - interview etiquette - answering questions – offering information – mock interviews – FAQs related to job interviews

**TOTAL: 30 PERIODS**

**REFERENCES:**

1. Business English Certificate Materials, Cambridge University Press.
2. Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge, 2011.
3. International English Language Testing System Practice Tests, Cambridge University Press.
4. Personality Development (CD-ROM), Times Multimedia, Mumbai.

**WEB REFERENCES:**

1. <https://nptel.ac.in/courses/109/107/109107121/>
2. [https://swayam.gov.in/nd1\\_noc19\\_hs33/preview](https://swayam.gov.in/nd1_noc19_hs33/preview)
3. <https://ict.iitk.ac.in/courses/enhancing-soft-skills-and-personality/>

**ONLINE RESOURCES:**

1. <https://www.britishcouncil.my/english/courses-adults/learning-tips/importance-of-soft-skills>
2. <https://www.skillssoft.com/content-solutions/business-skills-training/soft-skills-training/>

**OUTCOMES:****Upon completion of the course learners should be able to**

1. Demonstrate a better understanding of the communication process by articulating effectively(K2)
2. Exhibit soft skills & technical skills and construct e-portfolio effectively(K3)
3. Apply critical thinking abilities and perform well in group discussions(K2)
4. Adapt the skills towards grooming as a professional continuously(K2)
5. Identify different types of personal interview skills through mock interviews and practices(K2)
6. Execute the employability and career skills in their chosen profession(K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	2	3	1	1
CO2	-	-	-	-	-	-	-	2	3	3	2	1
CO3	-	-	-	-	-	-	-	2	3	2	-	1
CO4	-	-	-	-	-	-	-	1	1	3	2	2
CO5	-	-	-	-	-	2	-	1	2	3	-	1
CO6	-	-	-	-	-	-	-	1	1	3	2	2

**SEMESTER - VI**

<b>20CJTP601</b> SDG NO. 4 & 9	<b>SKILL ENHANCEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Aptitude and Cognitive Skills - Phase 1****COURSE OBJECTIVES****To enable students to,**

- Enhance their quantitative ability.
- Enhance their reasoning ability
- Enhance their verbal ability.

**UNIT I Quantitative Ability - VII****10**

Races And Games, Boats and Streams, Surds and Indices, Pipes and Cistern, Alligations And Mixtures

**UNIT II Quantitative Ability - VIII****10**

Numbers, Problems on Numbers, Pick Wrong Number, Missing Number, Areas, Shapes, Perimeter

**UNIT III Reasoning Ability - IV****8**

Data Interpretation Pie Charts, Data Interpretation Line Charts, Data Sufficiency (DS), Data Arrangements, LR - Arrangements, LR - Ranking.

**UNIT IV Verbal Ability - IV****10**

Sentence Correction, Sentence Improvement, Completing Statements, Sentence Formation, Paragraph Formation

**UNIT V Creativity Ability – IV**

Dot Situation, Rule Detection, Embedded Images, Grouping Of Images, Image Analysis

**TOTAL: 45 PERIODS****REFERENCES**

1. Quantitative Aptitude for Competitive Exams by R. S. Agarwal
2. Quantum CAT by Sarvesh Verma
3. A Modern Approach to Logical Reasoning by R. S. Agarwal
4. Verbal Ability and Reading Comprehension by Arun Sharma

**Problem Solving using Basic Data Structures – Mobile Application  
Development & Android Studio – Phase 2**

**OBJECTIVES:**

- Familiarize students with basic data structures and their use in fundamental algorithms.
- Understand and develop application using Android

**UNIT I LINKED LIST & STACK, QUEUE & HEAP****10**

Linked List - Doubly Linked List Traversal, Circular Linked List, Structure, Node creation, Traversal Stack, Stack -Time Complexities of the Operations, Infix to Postfix/Prefix Conversation, Histogram Problem, Implementation - Using Array, Using Linked List, Queue Implementation - Queue using Stack

**UNIT II BINARY TREE AND HASHING****10**

Binary Tree - Types of Binary Tree, Balanced Tree, Degenerate or pathological Tree, Binary Search Tree, Inorder , Preorder , PostOrder and LevelOrder Traversal, Hashing, Linear Probing for Collision Handling, Union and Intersection of two Linked Lists

**UNIT III TREES AND GRAPH****10**

AVL Tree -Right-Left Imbalance, Left and Right Rotation, - Red Black Tree, Rules of coloring Left and Right Rotation, Graph terminology –Representation of graphs –Path matrix –Graph Traversal –BFS (breadth first search) –DFS (depth first search) –Minimum spanning Tree –Kruskal's Algorithm & Prim's Algorithm –Warshall's algorithm (shortest path algorithm).

**UNIT IV INTRODUCTION TO ANDROID STUDIO APPLICATION****8**

Android Studio Development Kit - The Android Platform - Eclipse Installation- Understanding the Anatomy of Android Application - Android Installation - Building the First Android Application - Android Manifest File -Android

Technology - Android Application Design Essentials : Android Applications Anatomy -Application- Activities, Context, Services, Intents - Receiving and Broadcasting Intents - Using Intent Filter, Permissions - Android Manifest File and common settings.

#### **UNIT V ANDROID APPLICATION PROGRAMMING INTERFACES 7**

Using Android Data and Storage APIs - Designing User Interfaces and Layouts - Sharing Data between Applications with Content Providers - Managing Data Using Sqlite - Using Android Networking APIs - Using Android Telephony APIs - Using Android Web APIs - Deploying Android Application to the world - Testing Android Applications : Using Android Preferences - Publishing Android Application- Managing Application Resources in a Hierarchy - Drawing and working with Animation

**TOTAL: 45 PERIODS**

#### **REFERENCES:**

1. Weiss, Mark. A. (2012), Data structures and algorithm analysis in Java. 3 edition. Harlow, Essex : Pearson (632 p).
2. Zobel, Justin (2014), Writing for Computer Science. 3rd edition., Springer Verlag London Ltd (270 p).
3. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference" Google Developer Training Team, 2017
4. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014.
5. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Reilly SPD Publishers, 2015.
6. J F DiMarzio, "Beginning Android Programming with Android Studio", 4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126565580
7. AnubhavPradhan, Anil V Deshpande, " Composing Mobile Apps" using Android, Wiley 2014, ISBN: 978-81-265-4660-2

#### **WEBLINK:**

1. <https://www.gitbook.com/book/google-developer-training/android-developerfundamentals-course-concepts/details> (Download pdf file from the above link)

#### **ONLINE RESOURCE:**

<https://nptel.ac.in/courses/106105084>

**WEB RESOURCE:**

<https://www.coursera.org/courses?query=web%20technologies>

**OUTCOMES**

**Upon completion of this course, the students will be able to:**

1. Analyze the applications of linear data structure using Stack and Queue implementation. (K4)
2. Define the various hash functions and its implementation. (K2)
3. Apply the basic concepts of the Non Linear Data Structure - Trees and Graph. (K3)
4. Apply the components and structure of mobile application development frameworks for Android studio and windows OS. (K3)
5. Analyze various Android Application Programming Interfaces.(K4)
6. Analyze and discover your own mobile app for simple needs. (K4)

**CO-PO-PSO MAPPING:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	-	2	-	-	-	-	-	-	-	-	-	-	-
C02	3	-	2	-	-	-	-	-	-	-	-	-	-	-
C03	3	2	2	2	-	-	-	-	-	-	-	-	-	-
C04	3	2	2	2	-	-	-	-	-	-	-	-	-	-
C05	1	1	3	2	3	2	3	1	-	-	-	-	-	-
C06	1	3	1	1	1	2	1	2	-	-	-	-	-	-

**SEMESTER - VI**

<b>20CJTE601</b> SDG NO. 4,11 &15	<b>LIVE IN LAB-IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**OBJECTIVES:**

- To understand the engineering aspects of design with reference to simple products
- To foster innovation in design of products
- To develop design that add value to products and solve technical problems.
- To create awareness among the students of the characteristics of several domain areas where IT can be effectively used

**COURSE PLAN :**

**Study:** Take minimum three simple products, processes or techniques in the area of specialization, study, analyze and present them. The analysis shall be focused on functionality, construction, quality, reliability, safety, maintenance, handling, sustainability, cost etc. whichever are applicable. Each student in the group has to present individually; choosing different products, processes or techniques.

**Design:** The project team shall identify an innovative product, process or technology and proceed with detailed design. At the end, the team has to document it properly and present and defend it. The design is expected to concentrate on functionality; design for strength is not expected.

**Note:** The one hour/week allotted for tutorial shall be used for discussions and presentations. The project team (not exceeding four) can be students from different branches, if the design problem is multidisciplinary.

**EVALUATION:**

1. First evaluation (Immediately after first internal examination) : 20 marks
2. Second evaluation (Immediately after second internal examination): 20 marks
3. Final evaluation ( Last week of the semester) : 60 marks

**Note:** All the three evaluations are mandatory for course completion and for awarding the final grade.

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Understand how to approach innovation challenges from a human-centred perspective [K2]
2. Develop many creative ideas through structured brainstorming sessions [K3]
3. Apply the perspectives of different people that lead to best innovations [K3]
4. Comprehend the importance of incorporating multidisciplinary approach that address human needs and sustainable development [K3]
5. The significance of developing innovation projects with a prototyping mind set, where iterations, trial and error, and even failure are all part of a valuable, creative learning process [K4]

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02
C01	3	3	3	3	3	3	2	2	3	3	3	2	3	3
C02	3	3	3	3	3	3	2	2	3	3	3	2	3	3
C03	2	2	2	1	2	1	1	1	3	2	3	3	3	2
C04	2	2	2	1	2	1	1	1	3	2	3	3	3	2
C05	2	2	2	1	2	1	1	1	3	2	3	3	3	2

## PROFESSIONAL ELECTIVE - I

<b>20ESEC502</b>	<b>MICROPROCESORS AND</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SDG NO. 4</b>	<b>MICROCONTROLLERS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### OBJECTIVES:

- To learn the basics of 8086 Microprocessor and 8051 Microcontroller
- To understand and implement the 8086 family Assembly Language Programming and basic 8051 programming
- To explore the I/O interfacing with 8086 and 8051
- To learn about advanced Microprocessors like Pentium and Intel Core i7 Processors

### UNIT I INTRODUCTION TO MICROPROCESSOR 8

Introduction - Microprocessors and Microcontrollers - Evolution of Microprocessors - Basic Functional Blocks of a Microprocessor - 8086 Architecture - Instruction and data flow in 8086 - Even and Odd Memory Banks - Addressing Modes.

### UNIT II 8086 FAMILY ASSEMBLY LANGUAGE PROGRAMMING 8

Pin Diagram-Instruction Set-Assembler Directives- System Bus Timing - Bus Cycles of 8086 - Timing Diagram.

### UNIT III PROGRAMMING CONCEPTS 9

Password Validation - Reverse a String - Rotate a byte 3 places to the left - Convert to uppercase letter - Modular Programming - Using the Keyboard and Video Display - Data Conversions - Example Programs: Binary to ASCII - ASCII to Binary.

### UNIT IV I/O INTERFACE AND ADVANCED MICROPROCESSORS 10

Introduction to I/O Interfacing - Programmable Peripheral Interface - Intel 8253/8254 Programmable Timer/Counter - Programmable Keyboard/Display Controller - Programmable Interrupt Controller - Intel 8237 DMA Controller - Case Studies: Traffic Light Control System - LED Display - Architecture of Intel Pentium IV and Intel Core i7 Processors.

### UNIT V ARCHITECTURE AND PROGRAMMING 8051 10

Introduction to the Intel 8051 Microcontroller - Architecture of 8051 - Special Function Registers - Instruction set - Addressing modes - ALP - Programming -

8051 Timers - Serial Port Programming - Interrupt Programming - Stepper Motor Control using 8051.

**TOTAL: 45 PERIODS**

**TEXT BOOKS:**

1. A. NagoorKani, "Microprocessors and Microcontrollers", McGrawHill Education (India) Private Limited, 2013.
2. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture Programming and Design", Second Edition, Prentice Hall of India, 2007.

**REFERENCES:**

1. N. Senthilkumar, M. Saravanan, S. Jeevananthan, "Microprocessors and Microcontrollers", Oxford University Press, 2011.
2. A.K.Ray and K.M. Bhurchandi, "Advanced Microprocessor and Peripherals", Tata McGraw Hill, 3rd Edition, 2013.
3. Kenneth J Ayala, "The 8086 Microprocessor: Programming and Interfacing the PC", Cengage Learning, Reprint 2014.
4. Kenneth J Ayala, "The 8051 Microcontroller", 3rd edition, Cengage Learning, Reprint 2014.
5. Muhammed AliMazidi, Janice GillispleMaidi, Rolin.D. McKinlay, "The 8051 Microcontroller and Embedded Systems, Using Assembly and C", Second edition, Pearson Prentice Hall, 2015.

**ONLINE RESOURCES:**

1. <http://read.pudn.com/downloads165/ebook/754892/micro.pdf>
2. [http://www.openloop.com/education/classes/sjsu\\_engr/engr\\_comp Org/spring2002/studentProjects/Truc\\_Tran/Eng120.htm](http://www.openloop.com/education/classes/sjsu_engr/engr_comp/Org/spring2002/studentProjects/Truc_Tran/Eng120.htm)
3. <https://www.intel.com/content/dam/www/public/us/en/documents/white-papers/ia-introduction-basics-paper.pdf>
4. <http://ecerelatedbooks.blogspot.com/2018/01/microprocessor-and-microcontroller.html>

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Describe the fundamental concepts of 8086 Microprocessors.(K2)
2. Understand the pin diagram, instruction set and assembler directives of 8086 Microprocessor. (K2)
3. Summarize the timing diagram of 8086.(K2)
4. Implement various Assembly Language Programming using 8086.(K3)

5. Interpret I/O interfaces using 8086 and advanced microprocessors.(K3)
6. Discuss the concepts of 8051 Microcontroller.(K2)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	1	-	-	-	-	-	-	-	-	-	1	1	2
C02	2	1	-	-	-	-	-	-	-	-	-	1	1	2
C03	2	1	-	-	-	-	-	-	-	-	-	1	1	2
C04	2	1	2	-	-	-	-	-	-	-	-	1	1	2
C05	2	1	2	-	-	-	-	-	-	-	-	1	1	2
C06	2	1	2	-	-	-	-	-	-	-	-	1	1	2

**PROFESSIONAL ELECTIVE - I**

<b>20CSEL503</b> SDG NO. 4	<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>

**OBJECTIVES:**

- Understand the foundations of Distributed Systems
- Introduce the idea of Peer-to-Peer services and File System
- Understand in detail the system level and support required for Distributed Systems
- Understand the issues involved in studying Process and Resource Management

**UNIT I INTRODUCTION****7**

Examples Of Distributed Systems–Trends In Distributed Systems – Focus on Resource Sharing – Challenges - Case Study: World Wide Web.

**UNIT II COMMUNICATION IN DISTRIBUTED SYSTEM****10**

System Model – Inter Process Communication - The API for Internet Protocols – External Data Representation and Multicast Communication. Network Virtualization: Overlay Networks. Case Study: MPI Remote Method Invocation and Objects: Remote Invocation – Introduction - Request-Reply Protocols - Remote Procedure Call - Remote Method Invocation. Case Study: Java RMI - Group Communication - Publish-Subscribe Systems - Message Queues -

Shared Memory Approaches -Distributed Objects - Case Study: Enterprise Java Beans - From Objects to Components.

### **UNIT III PEER TO PEER SERVICES AND FILE SYSTEM**

**10**

Peer-to-Peer Systems – Introduction - Napster and Its Legacy - Peer-to-Peer – Middleware - Routing Overlays. Overlay Case Studies: Pastry, Tapestry- Distributed File Systems –Introduction - File Service Architecture – Andrew File System. File System: Features-File Model -File Accessing Models - File Sharing Semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP.

### **UNIT IV SYNCHRONIZATION AND REPLICATION**

**9**

Introduction - Clocks, Events and Process States - Synchronizing Physical Clocks- Logical Time and Logical Clocks - Global States – Coordination and Agreement – Introduction - Distributed Mutual Exclusion – Elections – Transactions and Concurrency Control– Transactions - Nested Transactions – Locks – Optimistic Concurrency Control - Timestamp Ordering – Atomic Commit Protocols -Distributed Deadlocks – Replication – Case Study – Coda.

### **UNIT V PROCESS & RESOURCE MANAGEMENT**

**9**

Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation - Resource Management: Introduction- Features of Scheduling Algorithms – Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

**TOTAL: 45 PERIODS**

#### **TEXT BOOK:**

1. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education India, 2012.
2. Brendan Burns, “Designing Distributed Systems”, O’Reilly Media, 2018.

#### **REFERENCES:**

1. Andriy Luntovskyy, Josef Spillner, “Architectural Transformations in Network Services and Distributed Systems”, Springer Fachmedien Wiesbaden GmbH, 2017.
2. Pradeep K Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007.
3. Maarten van Steen Andrew S. Tanenbaum., “Distributed Systems”, Published by Maarten van Steen This book was previously published by: Pearson Education, Inc. Edition: 3. Version: 02, 2018.
4. Ajay D. Kshemkalyani and Mukesh Singhal, “ Distributed Computing Principles, Algorithms and Systems”, Cambridge University Press, 2008.

- Sukumar Ghosh, "Distributed Systems: An Algorithmic Approach", Second Edition, Chapman & Hall/CRC Computer and Information Science Series, 2014.

### WEB REFERENCES:

- <https://link.springer.com/book/10.1007/978-3-658-14842-3#about>
- <https://www.udemy.com/course/distributed-systems-cloud-computing-with-java/>

### ONLINE RESOURCES:

- [https://books.google.co.in/books?id=-bJ3DgAAQBAJ&pg=Pr4&source=kp\\_read\\_button&redir\\_esc=y#v=onepage&q&f=false](https://books.google.co.in/books?id=-bJ3DgAAQBAJ&pg=Pr4&source=kp_read_button&redir_esc=y#v=onepage&q&f=false)
- [https://books.google.co.in/books/about/Distributed\\_Computing.html?id=G7SZ32dPuLgC&printsec=frontcover&source=kp\\_read\\_button&redir\\_esc=y#v=onepage&q&f=false2](https://books.google.co.in/books/about/Distributed_Computing.html?id=G7SZ32dPuLgC&printsec=frontcover&source=kp_read_button&redir_esc=y#v=onepage&q&f=false2)

### OUTCOMES:

**Upon completion of the course, the student should be able to**

- Outline the foundations and issues of distributed systems (K1)
- Understand the clock synchronisation and message ordering (K2)
- Analyse the various Group Communication Techniques (K3)
- Illustrate the distributed mutex and deadlock detection (K2)
- Evaluating the various recovery and consensus techniques in distributed systems (K3)
- Describe the concepts of P2P and distributed shared memory (K2)

### CO- PO, PSO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	2	2	2	-	1	1	-	-	1	1	2	3	2
C02	2	3	1	2	-	1	2	-	1	2	1	1	2	3
C03	3	3	2	2	-	1	1	-	1	2	2	3	3	3
C04	3	2	1	-	-	1	1	-	2	1	1	1	3	2
C05	2	1	2	1	-	1	-	-	2	2	1	2	2	1
C06	3	3	2	1	-	1	1	-	2	1	2	1	3	3

# PROFESSIONAL ELECTIVE - I

<b>20CSEL505</b> SDG NO. 4 & 9	<b>NOSQL DATABASE</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>

## OBJECTIVES:

- To define, compare and use the four types of NoSQL Databases
- To demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.
- To explain the detailed architecture, define objects, load data, query data and performance tune Document-oriented NoSQL databases.

## UNIT I INTRODUCTION TO NoSQL DATABASES 9

Overview of NoSQL Databases -Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Aggregate-Oriented Databases.

## UNIT II DATABASE FOR MODERN WEB 9

Replication and sharding, Map Reduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication Document Databases ,Scaling, Suitable Use Cases, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure

## UNIT III COLUMN-ORIENTED NOSQL DATABASES 9

Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

## UNIT IV KEY VALUE DATABASE DESIGNS 9

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets.

**UNIT V GRAPH DATABASE DESIGN****9**

Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. Pramod J. Sadalage & Martin Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison- Wesley, First Edition, 2013.
2. Andreas Meier & Michael Kaufmann, "SQL & NoSQL Databases: Models, Languages, Consistency Options and Architectures for Big Data Management", Springer 2019.

**REFERENCES:**

1. Redmond, E. & Jim Wilson R. "A Guide to Modern Databases and the NoSQL Movement Edition," Second Edition, 2018.
2. "MongoDB: The Definitive Guide (2nd ed.). Upper Saddle River", NJ: Pearson Education India, Inc. ISBN-13: 978-1449344689 ISBN-10: 1449344682.
3. Andreas Meier, Michael Kaufmann, "SQL & NoSQL Databases Models, languages, Consistency options and architectures for big data management", Springer Vieweg, 2019.
4. Shashank Tiwari, "Professional NoSQL", Wrox, 2011.
5. Dan Sullivan, "NoSQL for Mere Mortals", Addison Wesley, 2015.

**WEB REFERENCES:**

1. <https://www.mongodb.com/nosql-explained>
2. <https://en.wikipedia.org/wiki/NoSQL>
3. <https://docs.microsoft.com/en-us/dotnet/architecture/microservices/microservice-ddd-cqrs-patterns/nosql-database-persistence-infrastructure>

**ONLINE RESOURCES:**

1. <https://www.w3resource.com/mongodb/nosql.php>
2. <https://www.couchbase.com/resources/why-nosql>

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Evaluate NoSQL database development tools and programming languages.(K1)
2. Demonstrate an understanding of the detailed architecture, define objects, load data, query data and performance tune Column-oriented NoSQL databases.(K1)
3. Define, compare and use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column-oriented and Graph).(K3)
4. Perform hands-on NoSQL database lab assignments by using the four NoSQL database types via products such as Cassandra, Hadoop Hbase, MongoDB, and Neo4J.(K3)
5. Perform CRUD operations (create, read, update and delete) on data in NoSQL environment.(K5)
6. Explore the emergence, requirements and benefits of a NoSQL database. (K4)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	3	2	2	-	-	-	-	-	-	-	3	2
C02	3	3	2	2	3	-	-	-	-	1	-	-	3	3
C03	3	3	3	2	3	1	-	-	2	2	-	-	2	2
C04	3	3	3	3	3	2	-	-	-	3	-	-	3	2
C05	3	3	3	2	3	-	-	-	-	1	-	-	2	2
C06	3	3	2	2	2	2	-	-	2	3	-	-	3	2

**PROFESSIONAL ELECTIVE - I**

<b>20ITEL706</b> <b>SDG NO. 4 &amp; 9</b>	<b>COMPUTER GRAPHICS AND</b> <b>MULTIMEDIA</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>

**OBJECTIVES:**

- To gain knowledge about Graphics Hardware Devices and Software used
- To understand the 2D/3D Graphics and their Transformations
- To get knowledge about various Object representation methods and Visible Surface Detection methods
- To study the Multimedia concepts and various I/O technologies

**UNIT I OUTPUT PRIMITIVES AND 2D GRAPHICS****9**

Graphics Devices- Line – Curve and Ellipse Drawing Algorithms – Examples – Applications – Attributes – Input Techniques - 2D Geometric Transformations – 2D Clipping And Viewing.

**UNIT II 3D GRAPHICS****9**

3D Geometric and Modeling Transformations – Translation - Rotation - Scaling- Composite Transformations - 3D Viewing – Viewing Pipeline - Viewing Coordinates - Projections - Clipping - Visible Surface Detection Methods.

**UNIT III ILLUMINATION, COLOR MODELS AND ANIMATION****9**

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- Virtual Reality - Animation.

**UNIT IV MULTIMEDIA SYSTEMS DESIGN AND FILE HANDLING****9**

Multimedia Basics – Multimedia Applications – Multimedia System Architecture - Defining Objects for Multimedia Systems – Multimedia Data Interface Standards – Multimedia Databases - Compression and Decompression – Data and File Format Standards – Digital Voice and Audio – Video Image and Animation – Full Motion Video – Storage and Retrieval Technologies.

**UNIT V HYPERMEDIA****9**

Multimedia Authoring and User Interface - Hypermedia Messaging -Mobile Messaging – Hypermedia Message Component – Creating Hypermedia Message – Integrated Multimedia Message Standards – Integrated Document Management – Distributed Multimedia Systems - Case Study: Blender Graphics -Blender Fundamentals–Drawing Basic Shapes – Modelling – Shading & Textures

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. Donald Hearn and Pauline Baker M, “Computer Graphics”, Prentice Hall, New Delhi, 2007
2. Andleigh, P. K and KiranThakrar, “Multimedia Systems and Design”, PHI, 2003.

**REFERENCES:**

1. Judith Jeffcoate, "Multimedia in practice: Technology and Applications", PHI, 1998.
2. Foley, Vandam, Feiner and Hughes, "Computer Graphics: Principles and Practice", 2nd Edition, Pearson Education, 2003.
3. Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers, 2006.
4. Hill F S Jr, "Computer Graphics", Maxwell Macmillan, 1990.
5. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, Kelvin Sung, and AK Peters, "Fundamentals of Computer Graphics", CRC Press, 2010.
6. William M. Newman and Robert F. Sproull, "Principles of Interactive Computer Graphics", McGraw Hill 1978.

**WEB REFERENCES:**

1. <https://www.blender.org/support/tutorials>
2. <http://www.doc.ic.ac.uk/~dfg/graphics/graphics.html>
3. <http://www.nptelvideos.in/2012/11/computer-graphics.html>
4. <http://cs.wellesley.edu/~cs110/lectures/M01-color/graphics.pdf>

**ONLINE RESOURCES:**

1. [www.scratchapixel.com](http://www.scratchapixel.com)
2. <http://dl.finebook.ir/book/9e/11032.pdf>
3. <https://www.blender.org/support/tutorials>
4. <https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-837-computer-graphics-fall-2012/download-course-materials>

**OUTCOMES:****Upon completion of the course, the student should be able to**

1. Understand the concept of various Output Primitives, Illumination and Color Models (K2)
2. Demonstrate 2D transformations, viewing and clipping techniques (K3)
3. Illustrate various 3D Object representations, transformations, Projections and detect the Visible surfaces. (K3)
4. Understand Multimedia System Architecture, Data Interface standards and Databases (K2)
5. Interpret various Multimedia design and File Formats. (K2)
6. Demonstrate basic 3D Scenes using Blender Graphics in hypermedia messages. (K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	-	-	-	-	-	-	-	-	-	-	-	-	-
C02	2	2	-	-	-	-	-	-	-	-	-	-	-	-
C03	1	2	-	-	-	2	-	-	1	1	-	1	-	-
C04	-	-	-	-	-	-	-	-	2	2	1	2	-	1
C05	-	-	1	-	-	-	-	-	2	2	1	2	-	1
C06	-	1	1	-	2	1	2	-	2	2	1	2	1	2

**PROFESSIONAL ELECTIVE - I**

<b>20MGEL707</b> SDG NO. 4,8,9,12	<b>INTELLECTUAL PROPERTY RIGHTS</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>

**OBJECTIVES:**

- To get an introductory insight about the IPR in national and international context.
- To understand the procedures for IPR, registration and its enforcement.

**UNIT I INTRODUCTION****9**

Intellectual property: Introduction, Meaning, Nature and significance types of intellectual property, importance of intellectual property rights, Protection of human innovations by IPR such as Patents, Trademarks, Copyright, Industrial Designs Geographical Indications, and Trade Secrets

**UNIT II AGREEMENTS AND TREATIES****9**

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, General agreement on trade and tariff (GATT), Ben convention, Rome convention, Role of WTO and WIPO

**UNIT III PATENTS****9**

Concept of Patent – Historical view of Patent system in India and International Scenario, patent searching process, ownership rights and transfer, compulsory licenses, Procedure for filing of patents, Grants of patent, Benchmarks for patentability of inventions, Recent key changes and development.

**UNIT IV TRADEMARKS AND COPYRIGHTS****9**

Concept of Trademarks and copyrights – Rationale behind the protection-Purpose, function and acquisition, ownership issues, Procedure for Registration, Industrial design and integrated circuits, protection of geographical indications and plant varieties, Recent Trends in copyrights and Trademark., Trade secrets -liability for misappropriations of trade secrets

**UNIT V LEGAL ASPECTS AND NEW DEVELOPMENTS****9**

Infringements of patents– Criteria of Infringement – Modes of Infringement-remedies and modification Protection against unfair competition, enforcement of intellectual property rights, Intellectual property audits, New developments of intellectual property, Impact of international instruments relating to the protection of intellectual properties Future of IPR in National and International levels.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. S.V. Satarkar, Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002.
2. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
3. P.Narayanan, Intellectual property rights Eastern law house-2018 3rd Edition (revised and updated)
4. Deborah, E. Bouchoux, Intellectual property right, Cengage learning- 2018 5th Edition

**REFERENCES**

1. Sterling, J. L. A., World copyright law, (2008) 3rd Edition, London, Sweet & Maxwell
2. GP Reddy, Intellectual property rights & other laws, Gogia law agency
3. Barrett, Margreth, Intellectual Property, (2009) 3rd Edition, New York Aspen publishers
4. Inventing the Future: An introduction to Patents for small and medium sized Enterprises; WIPO publication
5. Cornish, William Intellectual Property: Patents, Copyright, Trademarks and allied rights, (2010) 7th Edition, London Sweet & Maxwell.
6. Kankanala and Kalyan.C : Indian Patent Law and Practice (2010), India, Oxford University Press

**WEB RESOURCES:**

1. <https://www.wipo.int/edocs/lexdocs/laws/en/ws/ws020en.pdf>
2. [http://caaa.in/Image/34\\_Hb\\_on\\_IPR.pdf](http://caaa.in/Image/34_Hb_on_IPR.pdf)
3. <http://www.ipindia.nic.in/patents.htm>
4. <http://www.ipindia.nic.in/trade-marks.htm>
5. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/627956/IP-Rights-in-India.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/627956/IP-Rights-in-India.pdf)
6. <https://economictimes.indiatimes.com/small-biz/resources/startup-handbook/intellectual-property-rights-registration/articleshow/59126802.cms?from=mdr>

**ONLINE RESOURCES:**

1. <https://www.coursera.org/learn/introduction-intellectual-property>
2. <https://www.edx.org/course/intellectual-property-law-and-policy-part-1>
3. <https://www.classcentral.com/tag/intellectual-property>
4. [https://swayam.gov.in/nd1\\_noc19\\_mg58/preview](https://swayam.gov.in/nd1_noc19_mg58/preview)

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Describe the concepts of Intellectual property rights. (K2)
2. Explain the agreements and treaties of Intellectual property rights. (K2)
3. Identify the needs and avenues for patents. (K2)
4. Discuss the necessity of Trade marks and Copy rights. (K2)
5. Explain the legal context and developments of Intellectual property rights. (K2)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	1	1	1	-	1	1	1	1	1	-	-	1	2	1
C02	3	1	3	1	2	-	1	1	-	-	-	1	2	1
C03	1	1	2	2	2	-	1	1	-	-	-	1	1	1
C04	2	1	1	2	2	-	1	1	-	-	-	1	1	2
C05	1	1	1	2	2	2	1	1	-	-	-	1	2	2

**PROFESSIONAL ELECTIVE - I**

<b>20CJEL601</b> <b>SDG NO. 4 &amp; 9</b>	<b>FOUNDATION OF CYBER SECURITY</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>

**OBJECTIVES:**

- Students should be able to understand.
- The difference between threat, risk, attack and vulnerability.
- How threats materialize into attacks.
- Where to find information about threats, vulnerabilities and attacks.
- Typical threats, attacks and exploits and the motivations behind them.

**UNIT I INTRODUCTION TO CYBER SECURITY 9**

Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls - Authentication -Access Control and Cryptography - Web—User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks

**UNIT II SECURITY IN OPERATING SYSTEM & NETWORKS 9**

Security in Operating Systems - Security in the Design of Operating Systems - Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

**UNIT III DEFENCES: SECURITY COUNTERMEASURES 9**

Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.

**UNIT IV PRIVACY IN CYBERSPACE 9**

Privacy Concepts -Privacy Principles and Policies -Authentication and Privacy - Data Mining -Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies - Where the Field Is Headed.

**UNIT V MANAGEMENT AND INCIDENTS 9**

Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting - Cyber Warfare- Cyberspace and the Law - International Laws - Cyber crime - Cyber Warfare and Home Land Security.

**TOTAL : 45 PERIODS**

**TEXT BOOKS:**

1. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition , Pearson Education , 2015

**REFERENCES:**

1. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
2. Martti Lehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
3. Nelson Phillips and Enfinger Steuart, –Computer Forensics and Investigations||, Cengage Learning, New Delhi, 2009.

**OUTCOMES:**

**Upon completion of the course, the student should be able to**

1. Describe the fundamental concepts of Cyber Security.(K2)
2. Understand the Security in Operating Systems and Network. (K2)
3. Summarize the security measures in Network and requirement of security measures in Database(K2)
4. Summarize the privacy concepts in cyberspace(K2)
5. Describe the security planning and Handling incidents(K2)
6. Analyze the emerging technologies in security aspects like Economics-electronic voting ,Cyber welfare ,laws ,Cyber (K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	3	2	2	-	-	-	-	-	-	-	3	2
C02	3	3	2	2	3	-	-	-	-	1	-	-	3	3
C03	3	3	3	2	3	1	-	-	2	2	-	-	2	2
C04	3	3	3	3	3	2	-	-	-	3	-	-	3	2
C05	3	3	3	2	3	-	-	-	-	1	-	-	2	2
C06	3	3	2	2	2	2	-	-	2	3	-	-	3	2

# PROFESSIONAL ELECTIVE - I

<b>20CSPC602</b> SDG NO. 4 & 9	<b>COMPILER DESIGN</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>

## OBJECTIVES:

- To learn about the various phases of the Compiler
- To learn various Parsing techniques
- To understand Intermediate code generation & run time environment
- To analyze Code optimization techniques & Code generation algorithm

## UNIT I INTRODUCTION TO COMPILERS 9

Translators-Compilation and Interpretation-Language processors – Analysis of the source program – Phases of a compiler – Cousins of the Compiler – Grouping of Phases – Compiler construction tools – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens– Recognition of Tokens – LEX tool–Regular Expressions to Automata Direct method.

## UNIT II SYNTAX ANALYSIS 12

Role of the parser –Writing a Grammar –Context-Free Grammars – Top Down parsing – Recursive Descent Parsing – Predictive LL(1) Parsing – Bottom-up parsing – Shift Reduce Parsing – Operator Precedence Parsing – LR Parsers – SLR Parser – Introduction to LALR & CLR Parser - Error Handling and Recovery in Syntax Analyzer-YACC.

## UNIT III INTERMEDIATE CODE GENERATION 8

Intermediate languages – Declarations – Assignment Statements – Boolean Expressions – Case Statements –BackPatching – Procedure calls. Type Systems-Specification of a simple type checker- Equivalence of Type Expressions-Type Conversions.

## UNIT IV RUN-TIME ENVIRONMENT AND CODE GENERATION 8

Source Language Issues-Storage Organization-Storage Allocation-Parameter Passing-Symbol Tables- Dynamic Storage Allocation. Issues in the design of code generator – The target machine - Basic Blocks and Flow Graphs – Next-use Information – A simple Code generator – DAG Representation of Basic Blocks.

**UNIT V CODE OPTIMIZATION****8**

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

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Second Edition, Pearson Education, 2009.
2. V. Raghavan, "Principles of Compiler Design", Tata McGraw Hill Education Publishers, 2010.

**REFERENCES:**

1. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence based Approach", Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003
3. Keith D Cooper and Linda Torczon, "Engineering a Compiler", Morgan Kaufmann Publishers Elsevier Science, 2004.
4. Allen I. Holub, "Compiler Design in C", Prentice-Hall Software Series, 1993.
5. Charles N. Fischer, Richard. J. LeBlanc, "Crafting a Compiler with C", 2008.

**WEB REFERENCES:**

1. <http://www.holub.com/software/compiler.design.in.c.docs.pdf>
2. <http://www.cs.usfca.edu/~galles/compilerdesign/x86.pdf>

**ONLINE RESOURCES:**

1. <https://www.javatpoint.com/compiler-tutorial>

**OUTCOMES:**

**Upon completion of the course, the students should be able to:**

1. Explain the role of each phase of a compiler with its construction tools.(K2)
2. Illustrate the role of a Lexical Analyzer for recognizing the tokens of a given language with the knowledge of symbol table management and error-handling (K3)
3. Construct parsers like top-down, bottom-up for a given grammar (K3)
4. Develop semantic analyzers for type-checking and intermediate code generators to translate the source program into an intermediate code (K3)

5. Outline Runtime environment and a simple Code Generator using the code generation Algorithm (K2)
6. Implement code optimizers to optimize the target code generated (K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	-	-	-	-	-	-	-	-	-	-	-	2	2
C02	3	2	-	1	2	-	-	-	-	-	-	1	2	2
C03	2	3	-	2	-	-	-	-	-	-	-	1	2	2
C04	2	3	1	2	-	-	-	-	-	-	-	1	2	2
C05	3	2	-	-	-	-	-	-	-	-	-	1	2	2
C06	1	-	3	-	1	-	-	-	-	-	-	1	2	2

**PROFESSIONAL ELECTIVE - I**

<b>20CSEL608</b> SDG NO. 4	<b>SOFT 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>

**OBJECTIVES:**

- To classify the various Soft Computing Frameworks
- To learn the design of Neural Networks
- To understand about Fuzzy logic, Fuzzy systems and Decision making
- To be exposed to Hybrid Soft Computing systems and applications

**UNIT I INTRODUCTION TO SOFT COMPUTING****9**

Soft Computing Constituents - From Conventional AI to Computational Intelligence - Artificial Neural Network - Introduction - Characteristics-Learning Methods - Taxonomy - Evolution of Neural Networks - Basic Models - Important Technologies - Applications - Introduction to Fuzzy Logic - Classical Sets - Fuzzy Sets - Introduction to Genetic Algorithm and Genetic Programming - Traditional Optimization and Search Techniques.

**UNIT II NEURAL NETWORKS****9**

Mcculloch-Pitts Neuron - Linear Separability - Hebb Network - Supervised Learning Network: Perceptron Networks - Adaptive Linear Neuron, Multiple Adaptive Linear Neuron, BPN, RBF- Associative Memory Network: BAM, Hopfield Networks - Unsupervised Learning Networks: Kohonen Self-Organizing Feature Maps - CP Networks, ART Network.

**UNIT III FUZZY LOGIC**

9

Membership Functions: Features, Fuzzification, Methods of Membership Value Assignments-Defuzzification: Lambda Cuts - Methods - Fuzzy Arithmetic and Fuzzy Measures: Fuzzy Arithmetic - Fuzzy Measures - Measures of Fuzziness - Fuzzy Integrals - Fuzzy Rule Base and Approximate Reasoning : Truth Values and Tables, Fuzzy Propositions, Formation of Rules- Decomposition of Rules, Aggregation of Fuzzy Rules, Fuzzy Reasoning-Fuzzy Inference Systems Overview of Fuzzy Expert System-Fuzzy Decision Making.

**UNIT IV GENETICALGORITHM**

9

Genetic Algorithm- Genetic Basic Concepts - Operators – Encoding Scheme – Fitness Evaluation – Crossover - Mutation - Genetic Programming – Multilevel Optimization – Advances in GA.

**UNIT V HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS 9**

Neuro-Fuzzy Hybrid Systems - Genetic Neuro Hybrid Systems - Genetic Fuzzy Hybrid and Fuzzy Genetic Hybrid Systems - Applications: A Fusion Approach of Multispectral Images with SAR, Optimization of Traveling Salesman Problem using Genetic Algorithm Approach, Soft Computing Based Hybrid Fuzzy Controllers.

**TOTAL: 45 PERIODS****TEXT BOOKS:**

1. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd, 2011.
2. J.S.R.Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI/ Pearson Education, 2004.

**REFERENCES:**

1. S.Rajasekaran and G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice-Hall of India Pvt. Ltd., 2006.
2. David E. Goldberg, "Genetic Algorithm in Search Optimization and Machine Learning", Pearson Education India, 2013.
3. George J. Klir, Ute St. Clair, Bo Yuan, "Fuzzy Set Theory: Foundations and Applications", Prentice Hall, 1997.
4. Simon Haykin, "Neural Networks Comprehensive Foundation", Second Edition, Pearson Education, 2005.
5. B.K. Tripathy and J. Anuradha, "Soft Computing-Advances and Applications", First edition, Cengage Learning, 2015.

**WEB REFERENCES:**

1. <https://nptel.ac.in/courses/106105173/>

**ONLINE RESOURCES:**

1. <https://cse.iitkgp.ac.in/~dsamanta/courses/sca/index.html>

**OUTCOMES:****Upon completion of the course, the student should be able to**

1. Illustrate various soft computing concepts for practical applications. (K2)
2. Apply suitable neural networks for real time problems. (K3)
3. Use fuzzy rules and reasoning to create decision making and an expert system. (K3)
4. Explain the importance of optimization techniques and genetic programming. (K2)
5. Develop suitable soft computing techniques for various applications. (K3)
6. Classify the various hybrid soft computing techniques and apply in real time problems. (K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	2	2	-	-	-	-	-	-	-	-	-	-	3	2
C02	2	3	3	-	-	-	-	-			-		3	2
C03	2	3	3	3	3	-	-	-	-	-	-	-	3	2
C04	2	2	2	-	-	-	-	-	-	-	-	-	3	2
C05	2	3	3	3	3	-	-	-	2	-	-	-	3	2
C06	2	3	3	-	3		-	-	-	-	-	-	3	2

## PROFESSIONAL ELECTIVE - I

<b>20CSEL703</b> SDG NO. 4 & 12	<b>INFORMATION RETRIEVAL TECHNIQUES</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>

### OBJECTIVES:

- To understand the basics of Information Retrieval
- To apply Machine Learning techniques for Text Classification and Clustering
- To implement various Search engine system operations
- To learn different techniques of Recommender system

### UNIT I INTRODUCTION

9

Information Retrieval – Early Developments – The IR Problem – The Users Task – Information Vs Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How the Web Changed Search – Practical Issues on the Web – How People Search – Search Interfaces Today – Visualization in Search Interfaces.

### UNIT II MODELING AND RETRIEVAL EVALUATION

9

Basic IR Models - Boolean Model - TF / IDF (Term Frequency/Inverse Document Frequency) Weighting - Vector Model – Probabilistic Model – Latent Semantic Indexing Model – Neural Network Model – Retrieval Evaluation – Retrieval Metrics – Precision and Recall – Reference Collection – User-Based Evaluation – Relevance Feedback and Query Expansion – Explicit Relevance Feedback.

### UNIT III TEXT CLASSIFICATION AND CLUSTERING

9

A Characterization of Text Classification – Unsupervised Algorithms - Clustering – Naïve Text Classification – Supervised Algorithms – Decision Tree – KNN Classifier – SVM Classifier – Feature Selection or Dimensionality Reduction – Evaluation Metrics – Accuracy and Error – Organizing the Classes – Indexing and Searching – Inverted Indexes – Sequential Searching – Multi-Dimensional Indexing.

### UNIT IV WEB RETRIEVAL AND WEB CRAWLING

9

The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations - Search Engine

Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation – Scheduling Algorithms – Evaluation.

## **UNIT V RECOMMENDER SYSTEM**

**9**

Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-Based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-Based Filtering – Collaborative Filtering – Matrix factorization models – Neighborhood models.

**TOTAL: 45 PERIODS**

### **TEXT BOOKS:**

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, “Modern Information Retrieval: The Concepts and Technology behind Search”, Second Edition, ACM Press Books, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, “Recommender Systems Handbook”, First Edition, 2011.

### **REFERENCES:**

1. C. Manning, P. Raghavan, and H. Schütze, “Introduction to Information Retrieval”, Cambridge University Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, “Information Retrieval: Implementing and Evaluating Search Engines”, The MIT Press, 2010.
3. ChengXiang Zhai, “Statistical Language Models for Information Retrieval (Synthesis Lectures Series on Human Language Technologies)”, Morgan & Claypool Publishers, 2008.
4. Gerald J. Kowalski, Mark T. Maybury, “Information Storage and Retrieval Systems – Theory and Implementation”, Second Edition, Springer 2013.
5. Frakes, W.B., Ricardo Baeza-Yates, “Information Retrieval Data Structures and Algorithms”, Prentice Hall, 2007.

### **WEB REFERENCES:**

1. <https://libguides.lamk.fi/informationretrieval/techniques>

### **ONLINE RESOURCES:**

1. [www.informationretrieval.org](http://www.informationretrieval.org)
2. <https://nlp.stanford.edu/IR-book/html/htmledition/irbook.html>

**OUTCOMES:**

**Upon completion of the course, the students should be able to**

1. Identify and design the various components of an Information Retrieval system. (K1)
2. Use an open source Search engine framework and explore its capabilities. (K3)
3. Apply appropriate method of Classification or Clustering. (K3)
4. Design and implement innovative features in a Search engine. (K2)
5. Design and implement a Recommender system. (K2)
6. Demonstrate Information visualization technologies like Cognition and perception in the Internet or Web search engine.(K3)

**CO- PO, PSO MAPPING :**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
C01	3	3	3	2	3	1	1	1	2	1	1	2	1	2
C02	3	3	3	3	3	1	2	2	3	2	1	2	1	2
C03	3	3	3	3	3	1	1	1	1	2	1	2	1	2
C04	3	3	3	2	3	1	2	2	2	2	1	2	2	2
C05	3	3	3	3	3	1	2	2	3	3	2	2	2	2
C06	3	3	-	-	2	2	-	-	-	-	1	1	2	2

# Imagine the Future and Make it happen!



1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE, JUSTICE AND STRONG INSTITUTIONS



17 PARTNERSHIPS FOR THE GOALS



Together let's build a better world where there is **NO POVERTY** and **ZERO HUNGER**.

We have **GOOD HEALTH AND WELL BEING**, **QUALITY EDUCATION** and full **GENDER EQUALITY** everywhere.

There is **CLEAN WATER AND SANITATION** for everyone. **AFFORDABLE AND CLEAN ENERGY** which will help to create **DECENT WORK AND ECONOMIC GROWTH**. Our prosperity shall be fuelled by investments in **INDUSTRY, INNOVATION AND INFRASTRUCTURE** that will help us to **REDUCE INEQUALITIES** by all means. We will live in **SUSTAINABLE CITIES AND COMMUNITIES**.

**RESPONSIBLE CONSUMPTION AND PRODUCTION** will help in healing our planet.

**CLIMATE ACTION** will reduce global warming and we will have abundant, flourishing **LIFE BELOW WATER**, rich and diverse **LIFE ON LAND**.

We will enjoy **PEACE AND JUSTICE** through **STRONG INSTITUTIONS** and will build long term **PARTNERSHIPS FOR THE GOALS**.



For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and **People like you.**

*Together we can...*

*Sai Prakash Leo Muthu*

CEO - Sairam Institutions

We build a Better nation  
through Quality education.



Sri

# SAI RAM ENGINEERING COLLEGE

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