



# R.M.K. ENGINEERING COLLEGE

[An Autonomous Institution]

R.S.M Nagar, Kavaraipettai, Gummidipoondi Taluk, Thiruvallur District, Tamil Nadu- 601 206  
Affiliated to Anna University, Chennai / Approved by AICTE, New Delhi/ Accredited by NAAC with A+ Grade  
An ISO 9001:2015 Certified Institution / All the Eligible UG Programs are accredited by NBA, New Delhi.



## B.E. COMPUTER SCIENCE AND ENGINEERING REGULATIONS - 2020 CHOICE BASED CREDIT SYSTEM

### PROGRAM EDUCATIONAL OBJECTIVES

**The Computer Science and Engineering Graduates of R.M.K. Engineering College will:**

- PEO 1.** Apply the principles and practices of Computer Science and Engineering encompassing Mathematics, Science and Basic Engineering and to employ the modern engineering tools effectively in their profession with their world class technical competence.
- PEO 2.** Possess expertise to function as members of multi-disciplinary teams and implement software technology solutions for real world problems of international standards and will be achievers at global level.
- PEO 3.** Excel in the field of software industry or in higher studies endowed with the spirit of innovation and entrepreneurship by evolving their professional knowledge on a lifelong basis.
- PEO 4.** Practice the profession with ethics, integrity, leadership and social responsibility with a good insight of the changing societal needs for the benefit of humanity.

### PROGRAMME OUTCOMES (POs)

**On successful completion of the programme,**

**Engineering Graduates will be able to:**

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

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

## **PROGRAMME SPECIFIC OUTCOMES (PSOs)**

**After the successful completion of the program, the graduates will be able to:**

- Apply knowledge acquired from the basic hardware design and software core areas of Computer Science and Engineering for solving real world problems.
- Apply cutting edge technologies and strong analytical skills to develop quality software in scientific and business applications for the betterment of society and Industry.
- Employ modern computer languages, environments and platforms in creating innovative career paths to be an entrepreneur and with a zeal for higher studies.

### **Mapping of POs/PSOs to PEOs**

Contribution

1: Reasonable    2: Significant    3: Strong

## PEOs & POs

The B.E. Computer Science and Engineering program outcomes leading to the achievement of the objectives are summarized in the following table.

PROGRAM EDUCATIONAL OBJECTIVES	PROGRAM OUTCOMES											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
I	3	3	3	3	2	2	2	1	1	1	1	1
II	3	3	3	3	2	1	1	1	3	3	1	3
III	3	3	3	3	2	2	2	3	3	3	2	1
IV	2	2	2	2	2	3	2	3	3	1	1	1

PROGRAM EDUCATIONAL OBJECTIVES	PROGRAM SPECIFIC OUTCOMES		
	PSO1	PSO2	PSO3
I	3	3	3
II	2	3	2
III	3	3	3
IV	1	1	1

## MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES

A broad relation between the Course Outcomes and Programme Outcomes is given in the following table.

YEAR	SEMESTER	COURSE NAME	Programme Outcome (PO)													
			1	2	3	4	5	6	7	8	9	10	11	12		
YEAR I	SEMESTER 1	Communicative English & Life Skills		✓								✓	✓		✓	
		Engineering Mathematics I	✓	✓	✓	✓	✓	✓	✓						✓	
		Physics for Computer Science and Information Technology	✓	✓	✓	✓										
		Engineering Chemistry	✓	✓					✓	✓						✓

<b>YEAR II</b>	<b>SEMESTER 2</b>	Problem Solving and C Programming	✓	✓	✓						✓			✓	
		Basic Electrical, Electronics and Measurement Engineering	✓	✓	✓										
		Induction Program						✓	✓	✓	✓	✓	✓	✓	✓
		Physics & Chemistry Laboratory	✓	✓			✓				✓				✓
		C Programming Laboratory	✓	✓	✓						✓				✓
		Interpersonal Skills - Listening & Speaking Laboratory									✓	✓			✓
	Technical English									✓		✓	✓		
	Engineering Mathematics II	✓	✓	✓	✓	✓	✓							✓	
	Environmental Science and Engineering	✓	✓				✓	✓			✓			✓	
	Computer Aided Engineering Graphics	✓		✓		✓					✓				
	Data Structures	✓	✓	✓										✓	
	Python Programming (Lab Integrated)	✓	✓	✓		✓				✓	✓	✓		✓	
	Engineering Practices Laboratory	✓	✓	✓						✓				✓	
	Data Structures Laboratory	✓	✓	✓						✓	✓	✓		✓	
	Advanced Reading and Writing Laboratory										✓	✓		✓	
	<b>SEMESTER 3</b>	Discrete Mathematics	✓	✓	✓	✓									
		Digital Principles and Systems Design (Lab Integrated)	✓	✓	✓			✓		✓	✓	✓			✓
		Object Oriented Programming	✓	✓	✓										
Software Engineering		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Database Management Systems		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Universal Human Values 2: Understanding Harmony							✓	✓	✓	✓	✓	✓	✓	✓	
Object Oriented Programming Laboratory		✓	✓	✓					✓	✓	✓			✓	
Database Management Systems Laboratory		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Aptitude and Coding Skills - I		✓	✓								✓	✓			

		Mini Project	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<b>SEMESTER 4</b>	Probability and Statistics	✓	✓	✓	✓					✓	✓		✓
		Computer Architecture	✓	✓	✓	✓	✓				✓			✓
		Design and Analysis of Algorithms	✓	✓	✓	✓	✓				✓			✓
		Internet Programming	✓	✓	✓		✓			✓	✓	✓		✓
		Operating Systems	✓	✓	✓	✓	✓				✓			✓
		Microprocessors and Interfacing (Lab Integrated)	✓	✓	✓					✓	✓	✓		✓
		Internet Programming Laboratory	✓	✓	✓		✓			✓	✓	✓		✓
		Operating System Laboratory	✓	✓	✓					✓	✓	✓		✓
		Internship	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Aptitude and Coding Skills - II	✓	✓							✓	✓		
	<b>SEMESTER 5</b>	Computer Networks	✓	✓	✓	✓	✓				✓			✓
		Object Oriented Analysis and Design (Lab Integrated)	✓	✓	✓		✓	✓		✓	✓	✓		✓
		Theory of Computation	✓	✓	✓									
		Artificial Intelligence	✓	✓	✓									
		Open Elective I*												
		Professional Elective I												
		Networks Laboratory	✓	✓	✓					✓	✓	✓		✓
		Artificial Intelligence Laboratory	✓	✓	✓		✓			✓	✓	✓		✓
		Advanced Aptitude and Coding Skills – I	✓	✓	✓						✓	✓		
		Mini Project and Design Thinking Practices Laboratory	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<b>SEMESTER 6</b>	Compiler Design (Lab integrated)	✓	✓	✓					✓	✓	✓		✓
		Cryptography and Network Security	✓	✓	✓									
		Mobile Computing	✓	✓	✓									
		Machine Learning	✓	✓	✓		✓							
		Professional Elective II												
		Professional Elective III												
		Mobile Application Development Laboratory	✓	✓	✓					✓	✓	✓		✓

		Security Laboratory	✓	✓	✓					✓	✓	✓		✓
		Internship	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
		Advanced Aptitude and Coding Skills - II	✓	✓	✓						✓	✓		
	<b>SEMESTER 7</b>	Cloud Computing	✓	✓	✓									
		Data Analytics	✓	✓	✓	✓	✓							
		Open Elective II*												
		Professional Elective IV												
		Professional Elective V												
		Professional Elective VI												
		Cloud Computing Laboratory	✓	✓	✓		✓			✓	✓	✓		✓
		Data Analytics and Machine Learning Laboratory	✓	✓	✓	✓				✓	✓	✓		✓
		Project Phase I	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<b>SEMESTER 8</b>	Project Phase II	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

<b>PROFESSIONAL ELECTIVE</b>														
<b>YEAR</b>	<b>SEMESTER</b>	<b>COURSE NAME</b>	<b>Programme Outcome (PO)</b>											
			<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>
<b>YEAR III</b>	<b>SEMESTER 5 / SEMESTER 6</b>	Cyber Physical Systems	✓	✓	✓									
		Web Security	✓	✓	✓					✓				
		Vulnerability Analysis and Penetration Testing	✓	✓	✓					✓				
		Natural Language Processing	✓	✓	✓		✓	✓						
		Image Processing	✓	✓	✓									
		Computer Vision	✓	✓	✓									
		Software Project Management	✓	✓	✓			✓		✓	✓	✓	✓	✓



	Knowledge Engineering	✓	✓	✓									
	Service Oriented Architecture	✓	✓	✓									
	Resource Management Techniques	✓	✓	✓							✓		
	Video Analytics	✓	✓	✓	✓		✓						
	Nature Inspired Computing Techniques	✓	✓	✓									
	Game Theory and Programming	✓	✓	✓									
	Intelligent Robots	✓	✓	✓									
	Wireless Sensor Networks	✓	✓	✓									
	UAV and Drone Technology	✓	✓	✓									
	Soft Computing	✓	✓	✓	✓								
	UI/UX Design	✓	✓	✓	✓	✓				✓	✓	✓	✓
	Operational and Supply Chain Management	✓	✓	✓									
	Lean Six Sigma	✓	✓	✓			✓		✓	✓	✓		✓
	Indian Constitution						✓	✓	✓				✓
	Entrepreneurship	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓





# R.M.K. ENGINEERING COLLEGE

[An Autonomous Institution]

R.S.M Nagar, Kavaraipettai, Gummidipoondi Taluk, Thiruvallur District, Tamil Nadu- 601 206  
Affiliated to Anna University, Chennai / Approved by AICTE, New Delhi/ Accredited by NAAC with A+ Grade  
An ISO 9001:2015 Certified Institution / All the Eligible UG Programs are accredited by NBA, New Delhi.



## B.E. COMPUTER SCIENCE AND ENGINEERING

### REGULATIONS – 2020 CHOICE BASED CREDIT SYSTEM

#### I - VIII SEMESTERS CURRICULA & I - II SEMESTERS SYLLABI

#### SEMESTER I

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	20EL101	Communicative English & Life Skills	HS	2	2	0	0	2
2.	20MA101	Engineering Mathematics I	BS	5	3	2	0	4
3.	20PH101	Physics for Computer Science and Information Technology	BS	3	3	0	0	3
4.	20CH101	Engineering Chemistry	BS	3	3	0	0	3
5.	20GE101	Problem Solving and C Programming	ES	3	3	0	0	3
6.	20EE102	Basic Electrical, Electronics and Measurement Engineering	ES	3	3	0	0	3
7.		Induction Program	MC	3 Weeks	-	-	-	-
<b>PRACTICALS</b>								
8.	20PC111	Physics & Chemistry Laboratory	BS	4	0	0	4	2
9.	20GE111	C Programming Laboratory	ES	4	0	0	4	2
10.	20EL111	Interpersonal Skills - Listening & Speaking Laboratory	HS	2	0	0	2	1
			<b>TOTAL</b>	<b>29</b>	<b>17</b>	<b>2</b>	<b>10</b>	<b>23</b>

### SEMESTER II

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	20EL201	Technical English	HS	2	2	0	0	2
2.	20MA201	Engineering Mathematics II	BS	5	3	2	0	4
3.	20CH102	Environmental Science and Engineering	HS	3	3	0	0	3
4.	20ME103	Computer Aided Engineering Graphics	ES	6	2	0	4	4
5.	20CS201	Data Structures	PC	3	3	0	0	3
6.	20CS202	Python Programming (Lab Integrated)	ES	5	3	0	2	4
<b>PRACTICALS</b>								
7.	20EM111	Engineering Practices Laboratory	ES	4	0	0	4	2
8.	20CS211	Data Structures Laboratory	PC	4	0	0	4	2
9.	20EL211	Advanced Reading and Writing Laboratory	HS	2	0	0	2	1
			<b>TOTAL</b>	<b>34</b>	<b>16</b>	<b>2</b>	<b>16</b>	<b>25</b>

### SEMESTER III

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	20MA302	Discrete Mathematics	BS	5	3	2	0	4
2.	20CS301	Digital Principles and Systems Design (Lab Integrated)	ES	5	3	0	2	4
3.	20CS302	Object Oriented Programming	PC	3	3	0	0	3
4.	20CS303	Software Engineering	PC	3	3	0	0	3
5.	20IT403	Database Management Systems	PC	3	3	0	0	3
6.	20GE301	Universal Human Values 2:	HS	4	2	2	0	3

		Understanding Harmony						
<b>PRACTICALS</b>								
7.	20CS311	Object Oriented Programming Laboratory	PC	4	0	0	4	2
8.	20IT412	Database Management Systems Laboratory	PC	4	0	0	4	2
9.	20CS312	Mini Project	EEC	2	0	0	2	1
10.	20CS313	Aptitude and Coding Skills - I	EEC	2	0	0	2	1
			<b>TOTAL</b>	<b>35</b>	<b>17</b>	<b>4</b>	<b>14</b>	<b>26</b>

#### SEMESTER IV

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	20MA402	Probability and Statistics	BS	5	3	2	0	4
2.	20CS401	Computer Architecture	PC	3	3	0	0	3
3.	20CS402	Design and Analysis of Algorithms	PC	4	2	2	0	3
4.	20CS403	Internet Programming	PC	3	3	0	0	3
5.	20CS404	Operating Systems	PC	3	3	0	0	3
6.	20EC441	Microprocessors and Interfacing (Lab Integrated)	PC	5	3	0	2	4
<b>PRACTICALS</b>								
7.	20CS411	Internet Programming Laboratory	PC	4	0	0	4	2
8.	20CS412	Operating System Laboratory	PC	4	0	0	4	2
9.	20CS413	Internship	EEC	-	-	-	-	1
10.	20CS414	Aptitude and Coding Skills - II	EEC	2	0	0	2	1
			<b>TOTAL</b>	<b>33</b>	<b>17</b>	<b>4</b>	<b>12</b>	<b>26</b>

**SEMESTER V**

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	20CS501	Computer Networks	PC	3	3	0	0	3
2.	20CS502	Object Oriented Analysis and Design (Lab Integrated)	PC	5	3	0	2	4
3.	20CS503	Theory of Computation	PC	3	3	0	0	3
4.	20AI401	Artificial Intelligence	PC	3	3	0	0	3
5.		Open Elective I*	OE	3	3	0	0	3
6.		Professional Elective I	PE	3	3	0	0	3
<b>PRACTICALS</b>								
7.	20CS511	Networks Laboratory	PC	4	0	0	4	2
8.	20AI411	Artificial Intelligence Laboratory	PC	4	0	0	4	2
9.	20CS512	Advanced Aptitude and Coding Skills - I	EEC	2	0	0	2	1
10.	20CS513	Mini Project and Design Thinking Practices Laboratory	EEC	2	0	0	2	1
			<b>TOTAL</b>	<b>32</b>	<b>18</b>	<b>0</b>	<b>14</b>	<b>25</b>

**SEMESTER VI**

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	20CS601	Compiler Design (Lab integrated)	PC	5	3	0	2	4
2.	20CS602	Cryptography and Network Security	PC	3	3	0	0	3
3.	20CS603	Mobile Computing	PC	3	3	0	0	3
4.	20AI502	Machine Learning	PC	3	3	0	0	3
5.		Professional Elective II	PE	3	3	0	0	3

6.		Professional Elective III	PE	3	3	0	0	3
<b>PRACTICALS</b>								
7.	20CS611	Mobile Application Development Laboratory	PC	4	0	0	4	2
8.	20CS612	Security Laboratory	PC	4	0	0	4	2
9.	20CS613	Internship	EEC	-	-	-	-	1
10.	20CS614	Advanced Aptitude and Coding Skills-II	EEC	2	0	0	2	1
			<b>TOTAL</b>	<b>30</b>	<b>18</b>	<b>0</b>	<b>12</b>	<b>25</b>

### SEMESTER VII

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	20CS701	Cloud Computing	PC	3	3	0	0	3
2.	20AI402	Data Analytics	PC	3	3	0	0	3
3.		Open Elective II*	OE	3	3	0	0	3
4.		Professional Elective IV	PE	3	3	0	0	3
5.		Professional Elective V	PE	3	3	0	0	3
6.		Professional Elective VI	PE	3	3	0	0	3
<b>PRACTICALS</b>								
7.	20CS711	Cloud Computing Laboratory	PC	4	0	0	4	2
8.	20CS712	Data Analytics and Machine Learning Laboratory	PC	4	0	0	4	2
9.	20CS713	Project Phase I	EEC	2	0	0	2	1
			<b>TOTAL</b>	<b>28</b>	<b>18</b>	<b>0</b>	<b>10</b>	<b>23</b>

### SEMESTER VIII

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>PRACTICALS</b>								
1.	20CS811	Project Phase II	EEC	20	0	0	20	10
			<b>TOTAL</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>10</b>

**TOTAL NO. OF CREDITS: 183**

**\*Course from the curriculum of other UG programmes**

**HUMANITIES AND SOCIAL SCIENCES (HS)**

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20EL101	Communicative English & Life Skills	HS	2	2	0	0	2
2.	20EL111	Interpersonal Skills - Listening & Speaking Laboratory	HS	2	0	0	2	1
3.	20EL201	Technical English	HS	2	2	0	0	2
4.	20EL211	Advanced Reading and Writing Laboratory	HS	2	0	0	2	1
5.	20CH102	Environmental Science and Engineering	HS	3	3	0	0	3
6.	20GE301	Universal Human Values 2: Understanding Harmony	HS	3	3	0	0	3

**BASIC SCIENCES (BS)**

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20MA101	Engineering Mathematics I	BS	5	3	2	0	4
2.	20PH101	Physics for Computer Science and Information Technology	BS	3	3	0	0	3
3.	20CH101	Engineering Chemistry	BS	3	3	0	0	3
4.	20PC111	Physics & Chemistry Laboratory	BS	4	0	0	4	2
5.	20MA201	Engineering Mathematics II	BS	5	3	2	0	4
6.	20MA302	Discrete Mathematics	BS	5	3	2	0	4
7.	20MA402	Probability and Statistics	BS	5	3	2	0	4

**MANDATORY COURSE (MC)**

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
8.		Induction Program	MC	3 Weeks	-	-	-	-

### ENGINEERING SCIENCES (ES)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20GE101	Problem Solving and C Programming	ES	3	3	0	0	3
2.	20EE102	Basic Electrical , Electronics and Measurement Engineering	ES	3	3	0	0	3
3.	20GE111	C Programming Laboratory	ES	4	0	0	4	2
4.	20ME103	Computer Aided Engineering Graphics	ES	6	2	0	4	4
5.	20CS202	Python Programming (Lab Integrated)	ES	5	3	0	2	4
6.	20EM111	Engineering Practices Laboratory	ES	4	0	0	4	2
7.	20CS301	Digital Principles and Systems Design (Lab Integrated)	ES	5	3	0	2	4

### PROFESSIONAL CORE (PC)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	20CS201	Data Structures	PC	3	3	0	0	3
2.	20CS211	Data Structures Laboratory	PC	4	0	0	4	2
3.	20CS302	Object Oriented Programming	PC	3	3	0	0	3
4.	20CS303	Software Engineering	PC	3	3	0	0	3
5.	20IT403	Database Management Systems	PC	3	3	0	0	3
6.	20CS311	Object Oriented Programming Laboratory	PC	4	0	0	4	2
7.	20IT412	Database Management Systems Laboratory	PC	4	0	0	4	2
8.	20CS401	Computer Architecture	PC	3	3	0	0	3
9.	20CS402	Design and Analysis of Algorithms	PC	4	2	2	0	3
10.	20CS403	Internet Programming	PC	3	3	0	0	3
11.	20CS404	Operating Systems	PC	3	3	0	0	3
12.	20EC441	Microprocessors and Interfacing (Lab Integrated)	PC	5	3	0	2	4

13.	20CS411	Internet Programming Laboratory	PC	4	0	0	4	2
14.	20CS412	Operating System Laboratory	PC	4	0	0	4	2
15.	20CS501	Computer Networks	PC	3	3	0	0	3
16.	20CS502	Object Oriented Analysis and Design (Lab Integrated)	PC	5	3	0	2	4
17.	20CS503	Theory of Computation	PC	3	3	0	0	3
18.	20AI401	Artificial Intelligence	PC	3	3	0	0	3
19.	20CS511	Networks Laboratory	PC	4	0	0	4	2
20.	20AI411	Artificial Intelligence Laboratory	PC	4	0	0	4	2
21.	20CS601	Compiler Design (Lab integrated)	PC	5	3	0	2	4
22.	20CS602	Cryptography and Network Security	PC	3	3	0	0	3
23.	20CS603	Mobile Computing	PC	3	3	0	0	3
24.	20AI502	Machine Learning	PC	3	3	0	0	3
25.	20CS611	Mobile Application Development Laboratory	PC	4	0	0	4	2
26.	20CS612	Security Laboratory	PC	4	0	0	4	2
27.	20CS701	Cloud Computing	PC	3	3	0	0	3
28.	20AI402	Data Analytics	PC	3	3	0	0	3
29.	20CS711	Cloud Computing Laboratory	PC	4	0	0	4	2
30.	20CS712	Data Analytics and Machine Learning Laboratory	PC	4	0	0	4	2

### PROFESSIONAL ELECTIVES (PE)

#### SEMESTER V/VI – PROFESSIONAL ELECTIVES – I / II /II

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	20CS901	Cyber Physical Systems	PE	3	3	0	0	3
2.	20CS902	Web Security	PE	3	3	0	0	3



3.	20CS903	Vulnerability Analysis and Penetration Testing	PE	3	3	0	0	3
4.	20AI702	Natural Language Processing	PE	3	3	0	0	3
5.	20CS904	Image Processing	PE	3	3	0	0	3
6.	20CS905	Computer Vision	PE	3	3	0	0	3
7.	20CS906	Software Project Management	PE	3	3	0	0	3
8.	20CS907	Human Computer Interaction	PE	3	3	0	0	3
9.	20CS908	Agile Methodologies	PE	3	3	0	0	3
10.	20CS909	Software Quality Assurance	PE	3	3	0	0	3
11.	20CS910	Social Network Analysis	PE	3	3	0	0	3
12.	20AI914	Semantic Web	PE	3	3	0	0	3
13.	20CS911	High Performance Computing	PE	3	3	0	0	3
14.	20CS912	Multicore Architecture and Programming	PE	3	3	0	0	3
15.	20CS913	Internet of Things	PE	3	3	0	0	3
16.	20CS914	Embedded Systems	PE	3	3	0	0	3
17.	20CS915	Parallel Programming	PE	3	3	0	0	3
18.	20CS916	Product Design and IPR	PE	3	3	0	0	3
19.	20CS917	Data Science Fundamentals	PE	4	2	0	2	3
20.	20CS918	Professional Ethics in Engineering	PE	3	3	0	0	3
21.	20ME926	Principles of Management	PE	3	3	0	0	3
22.	20IT917	Essence of Indian Traditional Knowledge	PE	3	3	0	0	3
23.	20CS931	Google Cloud: Architecting with Google Compute Engine	PE	4	2	0	2	3

### PROFESSIONAL ELECTIVES (PE)

#### SEMESTER VII – PROFESSIONAL ELECTIVE – IV / V /VI

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	20CS919	Cyber Forensics	PE	3	3	0	0	3

2.	20CS920	Blockchain Technologies	PE	3	3	0	0	3
3.	20CS921	Quantum Computing	PE	3	3	0	0	3
4.	20AI913	Bigdata and Cloud Databases	PE	3	3	0	0	3
5.	20AI701	Deep Learning Techniques	PE	3	3	0	0	3
6.	20AI915	Pattern Recognition	PE	3	3	0	0	3
7.	20AI919	Computational Intelligence	PE	3	3	0	0	3
8.	20AI917	Intelligent Agent Technology	PE	3	3	0	0	3
9.	20AI604	Knowledge Engineering	PE	3	3	0	0	3
10.	20CS922	Service Oriented Architecture	PE	3	3	0	0	3
11.	20CS923	Resource Management Techniques	PE	3	3	0	0	3
12.	20AI916	Video Analytics	PE	3	3	0	0	3
13.	20AI902	Nature Inspired Computing Techniques	PE	3	3	0	0	3
14.	20CS924	Game Theory and Programming	PE	3	3	0	0	3
15.	20AI918	Intelligent Robots	PE	3	3	0	0	3
16.	20CS925	Wireless Sensor Networks	PE	3	3	0	0	3
17.	20CS926	UAV and Drone Technology	PE	3	3	0	0	3
18.	20AI912	Soft Computing	PE	3	3	0	0	3
19.	20CS927	UI/UX Design	PE	4	2	0	2	3
20.	20CS928	Operational and Supply Chain Management	PE	3	3	0	0	3
21.	20CS930	Lean Six Sigma	PE	3	3	0	0	3
22.	20IT927	Indian Constitution	PE	3	3	0	0	3
23.	20CS929	Entrepreneurship	PE	3	3	0	0	3

### EMPLOYABILITY ENHANCEMENT COURSES (EEC)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1.	20CS311	Mini Project	EEC	2	0	0	2	1

2.	20CS313	Aptitude and Coding Skills - I	EEC	2	0	0	2	1
3.	20CS413	Internship	EEC	-	-	-	-	1
4.	20CS414	Aptitude and Coding Skills - II	EEC	2	0	0	2	1
5.	20CS512	Advanced Aptitude and Coding Skills - I	EEC	2	0	0	2	1
6.	20CS513	Mini Project and Design Thinking Practices Lab	EEC	2	0	0	2	1
7.	20CS613	Internship	EEC	-	-	-	-	1
8.	20CS614	Advanced Aptitude and Coding Skills - II	EEC	2	0	0	2	1
9.	20CS713	Project Phase I	EEC	2	0	0	2	1
10.	20CS811	Project Phase II	EEC	20	0	0	20	10

### SUMMARY

S. NO.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL	PERCENTAGE
		I	II	III	IV	V	VI	VII	VIII		
1.	HS	3	6	3						12	6.56%
2.	BS	12	4	4	4					24	13.11%
3.	ES	8	10	4						22	12.02%
4.	PC		5	13	20	17	17	10		82	44.81%
5.	PE					3	6	9		18	9.84%
6.	OE					3		3		6	3.28%
7.	EEC			2	2	2	2	1	10	19	10.38%
8.	MC										
	<b>TOTAL</b>	<b>23</b>	<b>25</b>	<b>26</b>	<b>26</b>	<b>25</b>	<b>25</b>	<b>23</b>	<b>10</b>	<b>183</b>	
9.	Non Credit/ Mandatory										

**HUMANITIES AND SOCIAL SCIENCES (HS) / BASIC SCIENCES (BS) /  
ENGINEERING SCIENCES (ES) / PROFESSIONAL CORE (PC) / PROFESSIONAL  
ELECTIVES (PE) / OPEN ELECTIVES (OE) / EMPLOYABILITY ENHANCEMENT  
COURSES (EEC) / MANDATORY COURSES (MC)**

## SEMESTER I

<b>20EL101</b>	<b>COMMUNICATIVE ENGLISH &amp; LIFE SKILLS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

### OBJECTIVES:

The Course will enable learners to:

- Strengthen their basic reading and writing skills.
- Comprehend listening contexts competently.
- Improve their speaking skills to speak fluently in real contexts.
- Develop vocabulary of a general kind and enhance their grammatical accuracy.

### **UNIT I COMMUNICATION BASICS 06**

Listening - short texts- short formal and informal conversations. Speaking- introducing oneself - exchanging personal information. Reading - practice in skimming - scanning and predicting. Writing-completing sentences - developing hints- free writing – Everyday expressions- collocations. Life Skills - Overview of Life Skills: significance of life skills.

### **UNIT II COMMUNICATION INTERMEDIATE 06**

Listening- telephonic conversations. Speaking – sharing information of a personal kind — greeting – taking leave. Reading – short comprehension passages - pre-reading-post reading-comprehension questions (multiple choice questions and /or short questions / open-ended questions) - Writing – paragraph writing- topic sentence - main ideas, short narrative descriptions using some suggested vocabulary and structures. Life skills – Self-awareness: definition, need for self-awareness; Coping with Stress and Emotions.

### **UNIT III COMMUNICATION VANTAGE 06**

Listening – listening to longer texts and filling up the table - Speaking- asking about routine actions and expressing opinions. Reading- Long texts (cloze reading) - Writing- jumbled sentences - product description - use of reference words and discourse markers. Grammar – Tenses - phrasal verbs - Wh – Questions, yes or no questions and direct / indirect questions – countable & uncountable nouns – modal verbs. Life skills – Assertiveness vs Aggressiveness

### **UNIT IV SYNERGISTIC COMMUNICATION 06**

Listening - listening to dialogues or conversations and completing exercises based on them - Speaking- speaking about oneself- speaking about one’s friend – Reading - different types of texts- magazines - Writing - letter writing, informal or personal letters - e-mails-conventions of personal email - Language development - synonyms – antonyms. Life Skills –Problem Solving Techniques.

### **UNIT V COMMUNICATION HIGHER 06**

Listening – listening to TED talks - Speaking – role play – Reading - Biographies – Writing- writing short essays (analytical & issue-based essays) – dialogue writing. Life Skills – Leadership & Decision making.

**TOTAL: 30 PERIODS**

### OUTCOMES:

**At the end of this course, the students will be able to:**

- Read articles of a general kind in magazines and newspapers efficiently and identify different life skills.
- Participate efficiently in informal conversations and develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.
- Comprehend conversations and short talks delivered in English.



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

**TOTAL: 75 PERIODS**

**OUTCOMES:**

After the successful completion of the course, the student will be able to:

- Diagonalize a matrix by orthogonal transformation.
- Determine the Evolute and Envelope of curves.
- Examine the maxima and minima of function of several variables.
- Apply Gamma and Beta integrals to evaluate improper integrals.
- Evaluate the area and volume by using multiple integrals.

**TEXT BOOKS:**

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
3. T. Veerarajan, "Engineering Mathematics", Tata McGraw Hill, 2nd Edition, New Delhi, 2011.

**REFERENCES:**

1. M. K. Venkataraman, "Engineering Mathematics, Volume I", 4th Edition, The National Publication Company, Chennai, 2003.
2. Sivaramakrishna Dass, C. Vijayakumari, "Engineering Mathematics", Pearson Education India, 4th Edition 2019.
3. H. K. Dass, and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Limited, 3rd Edition 2014.
4. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.
5. S.S. Sastry, "Engineering Mathematics", Vol. I & II, PHI Learning Private Limited, 4th Edition, New Delhi, 2014.

**20PH101**

**PHYSICS FOR COMPUTER SCIENCE AND  
INFORMATION TECHNOLOGY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

The Course will enable learners to:

1. To learn the fundamental concepts of physics and apply this knowledge to scientific, engineering and technological problems.
2. To make the students enrich basic knowledge in electronics and quantum concepts and apply the same in computing fields.

**UNIT I LASER AND FIBRE OPTICS**

**9**

Population of energy levels – Einstein’s A and B coefficients derivation -Resonant cavity - Optical amplification (qualitative) - Semiconductor lasers: homojunction and heterojunction- Engineering applications of lasers in data storage (qualitative).

Fibre optics: Principle, numerical aperture and acceptance angle -V-number - Types of optical fibres (Material, refractive index and mode) -Losses in optical fibre - Fibre optic communication- Fibre optic sensors (pressure and displacement).

## **UNIT II MAGNETIC PROPERTIES OF MATERIALS 9**

Magnetic dipole moment - atomic magnetic moments - Origin of magnetic moments- Magnetic permeability and susceptibility - Magnetic material classifications- Diamagnetism - Paramagnetism- Ferromagnetism -Antiferromagnetism- Ferrimagnetism - Ferromagnetism: Domain Theory- M versus H behaviour- Hard and soft magnetic materials - Examples and uses - Magnetic principle in computer data storage - Magnetic hard disc (GMR sensor)- Introduction to Spintronics.

## **UNIT III ELECTRICAL PROPERTIES OF MATERIALS 9**

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity expression - Wiedemann-Franz law - Success and failures of CFT- Particle in a three dimensional box - Degenerate states - Effect of temperature on Fermi function- Density of energy states and average energy of electron at 0 K - Energy bands in solids.

## **UNIT IV SEMICONDUCTOR PHYSICS 9**

Intrinsic Semiconductors – Energy band diagram -Direct and indirect band gap semiconductors - Carrier concentration in intrinsic semiconductors- Band gap determination-Extrinsic semiconductors - n-type and p-type semiconductors (qualitative) -Variation of Fermi level with temperature and impurity concentration - Hall effect and its applications.

## **UNIT V INTRODUCTION TO NANO DEVICES AND QUANTUM COMPUTING 9**

Introduction to nanomaterial -Electron density in bulk material - Size dependence of Fermi energy - Quantum confinement - Quantum structures - Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterial- Tunneling: single electron phenomena and single electron transistor - Quantum dot laser.

Quantum computing: Introduction - Differences between quantum and classical computation.

**TOTAL: 45 PERIODS**

### **OUTCOMES:**

**At the end of this course, the students will be able to:**

- Know the principle, construction and working of lasers and their applications in fibre optic communication.
- Understand the magnetic properties of materials and their specific applications in computer data storage.
- Analyze the classical and quantum electron theories and energy band structures.
- Evaluate the conducting properties of semiconductors and its applications in various devices.
- Comprehend the knowledge on quantum confinement effects.
- Apply optical, magnetic and conducting properties of materials, quantum concepts at the nanoscale in various applications.

### **TEXT BOOKS:**

1. M.N. Avadhanulu and P.G. Kshirsagar, “A text book of Engineering Physics”, S. Chand and Company, New Delhi, 2014.
2. R.K. Gaur and S.L. Gupta, “Engineering Physics”, Dhanpat Rai Publications (P) Ltd., Eighth Edition., New Delhi, 2001.
3. A. Marikani, “Materials Science”, PHI Learning Private Limited, Eastern Economy Edition, 2017.
4. V. Rajendran, “Materials Science”, Tata McGraw-Hill, 2011.
5. R.A.Serway and J.W. Jewett, “Physics for Scientists and Engineers”, Ninth Edition., Cengage Learning, 2014.

6. C.Kittel, "Introduction to Solid State Physics", 8th Edition., John Wiley & Sons, NJ, USA, 2005.
7. G.W.Hanson, "Fundamentals of Nanoelectronics", Pearson Education, 2008.

#### REFERENCES:

1. D. Halliday, R. Resnick and J. Walker, "Fundamentals of Physics", 9th Edition., John Wiley & sons, 2011.
2. R.P. Feynman, "The Feynman Lectures on Physics - Vol. I, II and III", The New Millennium Edition, 2012.
3. N.W. Aschroft and N.D.Mermin, "Solid State Physics", Harcourt College Publishers, 1976.
4. S.O. Pillai, "Solid state physics", New Age International, 2015.
5. M.A.Wahab, "Solid State Physics", 3rd Edition, Narosa Publishing House Pvt. Ltd., 2015
6. N.Garcia and A.Damask, "Physics for Computer Science Students", Springer-Verlag, 2012.
7. B.Rogers, J. Adams and S.Pennathur, "Nanotechnology: Understanding Small System", CRC Press, 2014.
8. C.P. Williams, "Explorations in Quantum Computing", Springer-Verlag London, 2011.

20CH101

ENGINEERING CHEMISTRY

L T P C  
3 0 0 3

#### OBJECTIVES:

The goal of this course is to achieve conceptual understanding of the applications of chemistry in engineering and technology. The syllabus is designed to:

- Understand the role of chemistry in everyday life.
- Develop an understanding of the basic concepts of electro chemistry and its applications.
- Learn the principles and generation of energy in different types of batteries, fuel cells, nuclear reactors, solar cells and wind mills.
- Make them acquire basic knowledge of polymers, their classification and the applications of speciality polymers in engineering and technology.
- Understand the preparation, properties and applications of nanomaterials in various fields.

#### UNIT I CHEMISTRY IN EVERYDAY LIFE

8

**Importance of chemistry in everyday life** - food additives - types (colours, preservatives, flavours and sweeteners), effects - food adulteration – types of adulteration (intentional, incidental) - effects of food adulterants – cosmetics and personal care products (fairness creams, perfumes, deodorants, shampoos)- effects – beverages-classification – carbonated beverages – nutritive values and effects.

**Water** – impurities – industrial uses of water – hardness, external treatment (demineralization) – desalination (reverse osmosis).

#### UNIT II ELECTROCHEMISTRY

10

**Introduction** – terminology - conductance of electrolytes- specific conductance, equivalent conductance, molar conductance- factors affecting conductance- origin of electrode potential- single electrode potential, standard electrode potential- measurement of single electrode



potential-reference electrodes (standard hydrogen electrode, calomel electrode) - electrochemical series, applications – measurement of EMF of the cell – Nernst equation (derivation), numerical problems.

**Chemical sensors** – principle of chemical sensors- breath analyzer and Clark oxygen analyzer.

### **UNIT III ENERGY STORAGE DEVICES AND ENERGY SOURCES 9**

**Batteries** – primary battery (alkaline battery) - secondary battery (Pb-acid battery, Ni-metal hydride battery, Li-ion battery) - fuel cells (H<sub>2</sub>-O<sub>2</sub> fuel cell).

**Nuclear Energy** –nuclear reactions – fission, fusion, differences, characteristics– nuclear chain reactions –light water nuclear reactor – breeder reactor.

**Renewable energy sources**- solar energy – thermal conversion (solar water heater and heat collector) - photovoltaic cell– wind energy.

### **UNIT IV POLYMERS 9**

**Introduction** – monomer, functionality, degree of polymerization – classification based on sources and applications – effect of polymer structure on properties - types of polymerization (addition, condensation) - thermoplastic and thermosetting resins – preparation, properties and applications of Teflon, polyvinyl chloride, polycarbonate, Bakelite.

**Special polymers** - biodegradable polymers - properties and applications of polycaprolactone, polyhydroxyalkanoate – properties and applications of electrically conducting polymers (poly aniline, polyvinylidene fluoride).

### **UNIT V NANOCHEMISTRY 9**

**Introduction** – synthesis – top-down process (laser ablation, chemical vapour deposition), bottom-up process (precipitation, electrochemical deposition) – properties of nanomaterials – types (nanorods, nanowires, nanotubes-carbon nanotubes, nanocomposites).

**Applications** of carbon nanotubes – applications of nanomaterials in electronics, information technology, medical and healthcare, energy, environmental remediation, construction and transportation industries.

**TOTAL: 45 PERIODS**

### **OUTCOMES:**

**At the end of this course, the students will be able to:**

- Illustrate the role of chemistry in everyday life and the industrial uses of water.
- Construct electrochemical cells and to determine the cell potential.
- Compare and analyse the different energy storage devices and to explain potential energy sources.
- Classify different types of polymeric materials and to discuss their properties and applications.
- Explain basic concepts of nanochemistry and to enumerate the applications of nanomaterials in engineering and technology.

### **TEXT BOOKS:**

1. P. C. Jain and Monika Jain, “Engineering Chemistry”, 17<sup>th</sup> edition, Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi, 2018.
2. Prasanta Rath, “Engineering Chemistry”, 1<sup>st</sup> edition, Cengage Learning India Pvt. Ltd., Delhi, 2015.

### **REFERENCES:**

1. S. S. Dara and S. S. Umare, “A Textbook of Engineering Chemistry”, 12th edition, S. Chand & Company, New Delhi, 2010.

2. Kirpal Singh, "Chemistry in daily life", 3rd edition, PHI Learning Pvt. Ltd., 2012.
3. J. C. Kuriacose and J. Rajaram, "Chemistry in Engineering and Technology", Volume-1 & Volume -2, Tata McGraw-Hill Education Pvt. Ltd., 2010.
4. Geoffrey A. Ozin, Andre C. Arsenault, Ludovico Cademartiri, "Nanochemistry: A Chemical Approach to Nanomaterials", 2nd edition, RSC publishers, 2015.
5. Prasanna Chandrasekhar, "Conducting polymers, fundamentals and applications - A Practical Approach", 1st edition, Springer Science & Business Media, New York, 1999.

<b>20GE101</b>	<b>PROBLEM SOLVING AND C 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:

The syllabus is designed to:

- To make the students understand the fundamentals of problem solving using Algorithm and Flowchart.
- To teach the basic programming constructs for solving simple problems.
- To introduce the basic concepts of arrays and strings.
- To acquaint the students about functions, pointers, structures and their relationship.
- To impart knowledge on the concepts of file handling.

### UNIT I INTRODUCTION TO ALGORITHM AND C 9

Introduction to Computer System – Block diagram, Program Development Life Cycle

**General problem Solving concepts:** Algorithm and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.

**Imperative languages:** Introduction to imperative language, syntax and constructs of a specific language (ANSI C), Applications

**Types, Operators:** Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Basic I/O using scanf, printf, Operators – Types, Precedence, Associativity, Proper variable naming and Hungarian Notation.

### UNIT II CONTROL FLOW STATEMENTS 7

Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, goto labels, structured and unstructured programming.

### UNIT III ARRAYS AND FUNCTIONS 10

Arrays and Strings – Initialization, Declaration – One Dimensional and Two Dimensional arrays – Linear search, Binary Search, Matrix Operations (Addition and Subtraction)

Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Pre-processor, Standard Library Functions and return types.

### UNIT IV STRUCTURES AND POINTERS 10

Basic Structures, Structures and Functions, Array of structures.

Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

Pointer of structures, Self-referential structures, Table look up, typedef, unions, Bit-fields

## **UNIT V      FORMATTED I/O AND FILE PROCESSING**

**9**

Formatted Output – fprintf, Formated Input – fscanf, Variable length argument list

Files - file access including FILE structure, fopen, fread, fwrite, stdin, stdout and stderr, File Types – Text, Binary - Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions.

**TOTAL: 45 PERIODS**

### **OUTCOMES:**

**At the end of this course, the students will be able to:**

- Develop algorithmic solutions to simple computational problems
- Develop simple applications using basic constructs
- Write programs using arrays and strings
- Design and implement applications using functions, pointers and structures.
- Design applications using sequential and random access file processing.

### **TEXT BOOKS:**

1. Brian W Kernighan and Dennis M Ritchie, The C Programming Language, Pearson Education India, 2nd Edition, 2015.
2. Anita Goel and Ajay Mittal, “ Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

### **REFERENCES:**

1. B. Gottfried, Programming with C, Schaum Outline Series, Fourth Edition, 2018
2. Herbert Schildt, C: The Complete Reference, McGraw Hill, Fourth Edition, 2017
3. Yashavant Kanetkar, Let Us C, BPB Publications, 16th Edition, 2018.
4. Reema Thareja, “Programming in C”, 2nd Edition, Oxford University Press, 2018.
5. Zed A. Shaw, “Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (like C)”, (Zed Shaw’s Hard Way Series), 1st Edition, Addison-Wesley Professional, 2015.

<b>20EE102</b>	<b>BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **OBJECTIVES:**

The syllabus is designed to:

- To impart knowledge on fundamentals of electrical circuits and its analysis
- To interpret the basic principles of electrical machines and their performance
- To examine the different energy sources and protection methods
- To explore the different types of electronic circuits and its characteristics
- To acquire knowledge on the principles and operation of measuring instruments and transducers

## **UNIT I      ELECTRICAL CIRCUITS ANALYSIS**

**9**

Ohms Law, Kirchhoff’s Law- power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- - star delta conversion.

**UNIT II POWER SYSTEM****9**

Power Generation -Thermal-Hydro-wind and solar. construction and working principle. Protection-need for earthing, fuses and circuit breakers. Energy Tariff calculation for domestic loads.

**UNIT III ELECTRICAL MACHINES****9**

DC Generator-Types, Construction, working principle, EMF equation, DC Motor- working Principle, - Three Phase Induction Motors- Types, Construction, working principle- Single Phase Induction Motors, –working Principle -Transformers-Types and construction, EMF equation- Basics of Stepper Motor- applications of various machines

**UNIT IV ELECTRONIC CIRCUITS****9**

PN Junction-VI Characteristics of Diode, Rectifier- zener diode, Transistors OPAMP-configuration, differentiator, integrator, ADC- Types, Successive approximation type, DAC-Types, Weighted resistor DAC and R-2R ladder type, Voltage regulator IC using LM 723, LM 317.

**UNIT V ELECTRICAL MEASUREMENT****9**

Characteristic of measurement-errors in measurement, torque in indicating instruments- moving coil and moving iron meters, Induction type Energy meter and Dynamometer watt meter. Transducers- classification-Thermocouple, RTD, Strain gauge, LVDT, LDR and piezoelectric. Oscilloscope-CRO.

**TOTAL: 45 PERIODS****OUTCOMES:**

**At the end of this course, the students will be able to:**

- Analyse the electric circuits.
- Classify the different types of electric machines and transformers
- Study the different type of renewable sources and common domestic loads.
- Acquire knowledge in basics of electronic circuits.
- Describe the different types of measuring instruments and transducers.

**TEXT BOOKS:**

1. S.K.Bhattacharya, Basic Electrical and Electronics Engineering, Pearson (Covers Units 1,2,4 and 5)
2. C L Wadhwa, Generation Distribution and Utilization of Electrical Energy, New Age International: Unit 3 except Domestic refrigerator and air conditioner - construction and working principle)

**REFERENCES:**

1. S.B. Lal Seksena and Kaustuv Dasgupta, Fundaments of Electrical Engineering, Cambridge, 2016
2. B.L Theraja, Fundamentals of Electrical Engineering and Electronics. Chand & Co
3. S.K.Sahdev, Basic of Electrical Engineering, Pearson
4. John Bird, —Electrical and Electronic Principles and Technology, Fourth Edition, Elsevier,
5. Mittle,Mittal, Basic Electrical Engineering, 2nd Edition, Tata McGraw-Hill Edition, 2016.
6. R.S Khurmi and J K Gupta, Textbook of Refrigeration and Air-conditioning (M.E.), S Chand & Co

**20PC111**

**PHYSICS LABORATORY**

**L T P C**  
**0 0 2 1**

**OBJECTIVES:**

The syllabus is designed to:

- Introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter, semiconductors and liquids.

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

1. Determination of wavelength and velocity of ultrasonic waves by Ultrasonic Interferometer.
2. Determination of thermal conductivity of a poor conductor by LEE'S Disc method.
3. (i) Determination of wavelength and divergence angle of semiconductor laser source using diffraction grating.  
(ii) Determination of particle size by using diffraction of semiconductor laser beam.  
(iii) Analysis of Numerical aperture and acceptance angle of an optical fiber.
4. Determination of Young's Modulus of a beam by non-uniform bending method.
5. Determination of the moment of inertia of the disc and rigidity modulus of wire by Torsional pendulum.
6. Spectrometer - Determination of wavelength of Mercury Spectrum using diffraction grating.
7. Determination of thickness of wire by air wedge method.
8. Determination of Young's Modulus of a beam by Uniform bending method.
9. Determination of band gap of a semiconductor.

**TOTAL: 30 PERIODS**

**OUTCOMES:**

**Upon completion of the course, based on hands-on experience of the students, they will be able to**

- Use the ultrasonic interferometer and to determine the wavelength and velocity of ultrasonic waves of a liquid.
- Examine the thermal conductivity of a bad conductor.
- Determine the wavelength of mercury spectrum and also determine the wavelength of a laser source, particle size, divergence angle of semiconductor laser source using diffraction grating and to analyze the numerical aperture and acceptance angle of an optical fiber.
- Examine the Young's modulus of a beam by uniform and non-uniform bending and to estimate the moment of inertia of the disc and rigidity modulus of wire by torsional pendulum.
- Calculate the thickness of a thin wire by the interference pattern.
- Determine the band gap of a semiconductor.

**REFERENCES:**

1. Physics laboratory manual, Department of Physics, R.M.K. Engineering College, 2019.
2. Wilson J.D. and Hernandez C.A., - Physics Laboratory Experiments, Houghton Mifflin Company, New York, 2005.

**20PC111**

**CHEMISTRY LABORATORY**

**L T P C**  
**0 0 2 1**

**OBJECTIVES:**

The syllabus is designed to:

- To make the students acquire practical skills through volumetric and instrumental analysis.

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

1. Determination of total, temporary and permanent hardness of water by EDTA method.
2. Conductometric titration of strong acid vs. strong base.
3. Determination of strength of acids in a mixture using a conductivity meter.
4. Determination of strength of given hydrochloric acid using a pH meter.
5. Estimation of the iron content of the given solution using a potentiometer.
6. Estimation of the iron content of the water sample using a spectrophotometer (thiocyanate method).
7. Estimation of sodium present in water using a flame photometer.
8. Determination of the molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Determination of corrosion rate by weight loss method.
10. Determination of flash and fire point of a lubricating oil (Pensky Martens apparatus).
11. Determination of concentration of a given solution by constructing a galvanic cell.

**TOTAL: 30 PERIODS**

**OUTCOMES:**

**Based on hands-on experience, students will be able to:**

- Analyse the given hard water sample and estimate different types of hardness present.
- Observe and analyse the change in conductivity of an acid(s) when added with base through conductometry.
- Examine the change in pH when an acid is added with a base using pH meter.
- Understand the redox reactions and its impact on emf values through potentiometry.
- Determine the flash and fire point of an oil.
- Assess the corrosion rate of a given metal.
- Construct an electrochemical cell to determine the concentration of the given solution.

**REFERENCES:**

1. J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas and B. Sivasankar, "Vogel's Quantitative Chemical Analysis", 6<sup>th</sup> edition, Pearson Education Pvt. Ltd., 2009.

**20GE111**

**C PROGRAMMING LABORATORY**

**L T P C**  
**0 0 4 2**

**OBJECTIVES:**

The syllabus is designed to:

- To make the students write simple programs using basic constructs
- To familiarize the concepts of strings, pointers, functions and structures

- To equip the students on the knowledge of file processing concepts

### **LIST OF EXPERIMENTS:**

1. Constructing Flow charts using RAPTOR tools.
2. Programs using I/O statements and expression
3. Write a program to find whether the given line is horizontal or vertical.
4. Write a program to calculate the distance between two points  $p_1(x_1, y_1)$ ,  $p_2(x_2, y_2)$ .
5. Write a program to calculate the force for the given mass and acceleration.
6. Write a program to calculate the Young's modulus.
7. Write a program to calculate the type of solution based on its pH value.
8. Write a program to temperature conversion (Fahrenheit to Celsius and vice versa)
9. Programs using decision-making constructs.
10. 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)
11. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
12. Check whether a given number is Armstrong number or not?
13. Given a set of numbers like, find sum of weights based on the following conditions.
  - 5 if it is a perfect cube.
  - 4 if it is a multiple of 4 and divisible by 6.
  - 3 if it is a prime number.

Sort the numbers based on the weight in the increasing order as shown below  
 $\langle 10, \text{its weight} \rangle$ ,  $\langle 36, \text{its weight} \rangle$ ,  $\langle 89, \text{its weight} \rangle$
14. Populate an array with height of persons and find how many persons are above the average height.
15. Populate a two dimensional array with height and weight of persons and compute the Body Mass Index of the individuals.
16. Given a string —a\$bcd./fg| find its reverse without changing the position of special characters.(Example input:a@gh%;j and output:j@hg%;a)
17. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.
18. From a given paragraph perform the following using built-in functions:
  - a. Find the total number of words.
  - b. Capitalize the first word of each sentence.
  - c. Replace a given word with another word.
19. Solve towers of Hanoi using recursion.
20. Sort the list of numbers using pass by reference.
21. Generate salary slip of employees using structures and pointers. Create a structure Employee with the following members:

EID, Ename, Designation, DOB, DOJ, Basicpay

Note that DOB and DOJ should be implemented using structure within structure.

22. Compute internal marks of students for five different subjects using structures and functions.
23. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
24. Count the number of account holders whose balance is less than the minimum balance using sequential access file.
25. Mini project: Create a —Railway reservation system with the following modules
  - Booking
  - Availability checking
  - Cancellation
  - Prepare chart

**TOTAL: 60 PERIODS**

### **OUTCOMES:**

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

- Write programs for simple applications making use of basic constructs, arrays and strings.
- Develop programs involving functions, recursion, pointers, and structures.
- Create applications using sequential and random access file processing.

**20EL111 INTERPERSONAL SKILLS (LISTENING & SPEAKING)**

<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:**

The Course will enable learners to:

- Equip and strengthen the English language skills.
- Provide guidance and practice to engage in specific academic speaking activities and enhance
- Writing skills with specific reference to technical writing (interview skills).
- Improve general and academic listening skills.
- Demonstrate their presentation skills competently.

### **UNIT I**

**6**

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics - taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

### **UNIT II**

**6**

Listen to a process information- give information, as part of a simple explanation – conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.



**UNIT III****6**

Deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail.

**UNIT IV****6**

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and participating in conversations.

**UNIT V****6**

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

**TOTAL: 30 PERIODS****OUTCOMES:**

**At the end of this course, the students will be able to:**

- Listen and respond appropriately.
- Participate in group discussions.
- Make effective presentations.
- Participate confidently and appropriately in conversations both formal and informal.

**TEXT BOOKS:**

1. Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2. Dhanavel, S P. English and Soft Skills, Volume Two, Orient Black Swan, ISBN 978 93 528769142.

**REFERENCES:**

1. Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014.
4. Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010
5. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.

**SEMESTER II****20EL201****TECHNICAL ENGLISH**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**OBJECTIVES:**

The Course prepares second semester Engineering and Technology students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Demonstrate their speaking skills to make technical presentations, participate in group

discussions.

- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

#### **UNIT I INTRODUCTION - TECHNICAL ENGLISH 06**

**Listening-** Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** –Asking for and giving directions- **Reading** – reading short technical texts from journals- newspapers- **Writing-** purpose statements – extended definitions - writing instructions – checklists – recommendations - Vocabulary Development- technical vocabulary. Language Development –subject verb agreement - compound words.

#### **UNIT II READING AND STUDY SKILLS 06**

**Listening-** Listening to longer technical talks and completing exercises based on them - **Speaking** - describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing- **Writing-** interpreting charts, graphs - Vocabulary Development- vocabulary used in formal letters/emails and reports Language Development- impersonal passive voice, numerical adjectives.

#### **UNIT III TECHNICAL WRITING AND GRAMMAR 06**

**Listening-** Listening to classroom lectures/ talks on engineering/technology -**Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading; **Writing-**Describing a process, use of sequence words- Vocabulary Development- sequence words- Misspelled words. Language Development- embedded sentences

#### **UNIT IV REPORT WRITING 06**

**Listening-** Listening to documentaries and making notes. **Speaking** – mechanics of presentations-**Reading** – reading for detailed comprehension- **Writing-** Report Writing (accident and survey) - minutes of a meeting - Vocabulary Development- finding suitable synonyms-paraphrasing-. Language Development- reported speech.

#### **UNIT V GROUP DISCUSSION AND JOB APPLICATIONS 06**

**Listening-** TED talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– email etiquette- job application – cover letter – Résumé preparation (via email and hard copy)- Vocabulary Development- verbal analogies - Language Development- clauses- if conditionals.

**TOTAL: 30 PERIODS**

#### **OUTCOMES:**

**At the end of this course, the students will be able to:**

- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialization successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.

#### **TEXT BOOKS:**

1. Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014.
2. Sudharshana. N. P and Saveetha C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.

#### **REFERENCES:**

1. Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007.

2. Herbert, A. J. The Structure of Technical English. Longman. 1976.
3. Kumar, Suresh. E. Engineering English. Orient Black swan: Hyderabad, 2015.
4. Means, L. Thomas and Elaine Langlois, English & Communication for Colleges. Cengage Learning, USA: 2007.
5. Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014.

<b>20MA201</b>	<b>ENGINEERING MATHEMATICS – II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>2</b>	<b>0</b>	<b>4</b>

**OBJECTIVES:**

The syllabus is designed to:

- Explain various techniques in solving ordinary differential equations.
- Make the students understand the concepts of vector differentiation and integration.
- Introduce the concepts of Laplace transforms and its applications.
- Develop an understanding on analytic function, conformal mapping and complex integration.

**UNIT I ORDINARY DIFFERENTIAL EQUATIONS 9+6**

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy’s and Legendre’s linear equations – Simultaneous first order linear equations with constant coefficients.

**UNIT II VECTOR CALCULUS 9+6**

Gradient, divergence and curl (excluding vector identities) – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stoke’s theorem (Statement only) – Simple applications involving cubes and rectangular parallelepipeds.

**UNIT III LAPLACE TRANSFORMS 9+6**

Laplace transforms – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions – Derivatives and integrals of transforms – Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transform – Convolution theorem (Statement only) – Initial and final value theorems – Solution of linear ordinary differential equation of second order with constant coefficients using Laplace transformation techniques.

**UNIT IV COMPLEX DIFFERENTIATION AND CONFORMAL MAPPING 9+6**

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (Statement only) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping:  $w = z + k$ ,  $kz$ ,  $1/z$ ,  $z^2$  and bilinear transformation.

**UNIT V COMPLEX INTEGRATION 9+6**

Complex integration – Statement and applications of Cauchy’s integral theorem and Cauchy’s integral formula – Taylor’s and Laurent’s series expansions – Singular points – Residues – Statement and applications of Cauchy’s residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

**TOTAL: 75 PERIODS**

## OUTCOMES:

At the end of this course, the students will be able to:

- Solve the higher order linear differential equations.
- Determine the gradient of a scalar field, divergence and curl of a vector fields and interpret their physical meaning and evaluate line, surface and volume integrals by vector integration.
- Apply Laplace Transforms method for solving linear ordinary differential equation.
- Construct an analytic function and analyze conformal mapping.
- Evaluate the real integrals using complex integration.

## TEXT BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
3. T. Veerarajan, "Engineering Mathematics", Tata McGraw Hill, 2nd Edition, New Delhi, 2011.

## REFERENCES:

1. M. K. Venkataraman, "Engineering Mathematics, Volume I", 4th Edition, The National Publication Company, Chennai, 2003.
2. Sivaramakrishna Dass, C. Vijayakumari, "Engineering Mathematics", Pearson Education India, 4th Edition 2019.
3. H. K. Dass, and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Limited, 3rd Edition 2014.
4. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.
5. S.S. Sastry, "Engineering Mathematics", Vol. I & II, PHI Learning Private Limited, 4th Edition, New Delhi, 2014.

<b>20CH102</b>	<b>ENVIRONMENTAL SCIENCE AND ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## OBJECTIVES:

The goal of this course is to enlighten and sensitize the students on environmental conservation and social issues. The course is designed to:

- Appreciate the natural resources of environment which are inherently created for supporting life.
- Learn scientific and technological solutions to current day pollution issues.
- Study the interrelationship between living organisms and environment
- Understand the integrated themes of biodiversity.
- Appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.

## **UNIT I NATURAL RESOURCES**

**11**

**Introduction** - scope and importance of environment – need for public awareness.

**Forest resources**- Use and over-exploitation, deforestation - timber extraction, mining, dams and their effects on forests and tribal people. **Water resources** - Use and over- utilization of surface and ground water, conflicts over water, dams-benefits and problems. **Mineral resources**- Use and exploitation, 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, salinity. **Energy resources** - Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. **Land resources**- Land as a resource, land degradation, soil erosion and desertification – role of an individual in conservation of natural resources - case studies.

## **UNIT II POLLUTION AND ITS MANAGEMENT**

**11**

**Pollution** – causes, effects and control measures - Air pollution- Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards - nuclear accidents and holocaust - role of an individual in prevention of pollution – case studies.

**Waste management** - causes, effects and control measures of municipal solid wastes, e- waste, plastic waste.

## **UNIT III ECOSYSTEMS AND BIODIVERSITY**

**9**

**Introduction to ecosystems** – structure and function of an ecosystem – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids - types, characteristic features, structure and functions of - Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (lakes, oceans)

**Introduction to biodiversity** – types (genetic, species and ecosystem diversity) –values of biodiversity – threats to biodiversity - endangered and endemic species – conservation of biodiversity (in-situ and ex-situ conservation) - India as a mega-diversity nation – hot-spots of biodiversity in India

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

**8**

**Sustainable development** – sustainable development goals - water conservation, rain water harvesting, watershed management – resettlement and rehabilitation - consumerism and waste products, value education.

**Disaster management**- floods, drought, earthquake, tsunami, cyclone and landslides - case studies.

**Environmental ethics**- issues and possible solutions – environment protection act – air (prevention and control of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest conservation act.

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

**6**

**Introduction** - population growth, variation among nations, population explosion, family welfare programme – women and child welfare - environment and human health – endemic/epidemic/pandemic, COVID – 19, HIV / AIDS– role of information technology in environment and human health –environmental impact assessment- case studies.

**TOTAL: 45 PERIODS**

## **OUTCOMES:**

**At the end of this course, the students will be able to:**

- Illustrate the importance and conservation of natural resources.
- Assess the impact of various pollutants and suggest appropriate pollution control methods.
- Explain the basic structure of ecosystem and the conservation of biodiversity.
- Analyze the social issues related to environment and recommend suitable solutions.
- Investigate the trends in population explosion and assess its impact.

## **TEXT BOOKS:**

1. Anubha Kaushik and C. P. Kaushik, “Perspectives in environmental studies”, New Age International, 6th edition, 2018.
2. Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, New Delhi, 2017.
3. Gilbert M. Masters, Wendell P. Ela “Introduction to Environmental Engineering and Science”, 3rd edition, Pearson Education, 2015.

## **REFERENCES:**

1. William P. Cunningham and Mary Ann Cunningham, “Environmental Science: A Global Concern”, McGraw Hill, 14th edition, 2017.
2. G. Tyler Miller and Scott E. Spoolman, “Environmental Science”, Cengage Learning India Pvt. Ltd., Delhi, 14th edition, 2014.
3. Erach Bharucha, “Textbook of Environmental Studies”, Universities Press Pvt. Ltd., Hyderabad, 2nd edition, 2015.

<b>20ME103</b>	<b>COMPUTER AIDED ENGINEERING GRAPHICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>4</b>	<b>4</b>

## **OBJECTIVES:**

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

## **UNIT I INTRODUCTION TO CONVENTIONS IN ENGINEERING DRAWING AND CAD COMMANDS 18**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Introduction to CAD commands- CAD user interface- coordinate systems, object selection methods, selection of units and precession. Sketching – line, circle, arc, polygon, rectangle and ellipse. Working with object snaps, layers and object properties. Editing the objects – copy, move, trim, extend, working with arrays, mirror, scale, hatch, fillet and chamfer. Conversion of simple pictorial diagrams to orthographic view using CAD software.

## **UNIT II PLANE CURVES 16**

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

**UNIT III PROJECTION OF POINTS, LINES AND PLANE SURFACE 18**

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT IV PROJECTION OF SOLIDS AND PROJECTION OF SECTIONED SOLIDS 20**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method. Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.

**UNIT V DEVELOPMENT OF SURFACES AND ISOMETRIC PROJECTION 18**

Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions.

**TOTAL: 90 PERIODS**

**OUTCOMES:**

**At the end of this course, the students will be able to:**

- Illustrate the fundamentals and standards of engineering drawing and apply the concepts of orthographic projections using CAD software.
- Interpret and construct various plane curves.
- Develop orthographic projections of points, lines and plane surfaces.
- Make use of concepts in projection to draw projections of solids and interpret the concept in section of solids.
- Interpret and visualize development of surfaces.
- Interpret and visualize isometric projection of simple solids.

**TEXT BOOKS:**

1. Natarajan K.V.,“A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 33<sup>rd</sup> Edition, 2020.
2. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 15<sup>th</sup> Edition, 2019.

**REFERENCES:**

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 2012.
2. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2<sup>nd</sup> Edition, 2013.
3. Engineering Drawing Practice for Schools and Colleges SP: 46 , BIS, 2003.
4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy 11th Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 1993.
5. Parthasarathy N.S and Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2<sup>nd</sup> Edition, 2009.

**OBJECTIVES:**

- To understand the concepts of ADTs
- To learn linear data structures – lists, stacks, and queues
- To understand and apply Tree data structures
- To understand and apply Graph structures
- To analyze sorting, searching and hashing algorithms

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

Algorithm analysis-What to analyze-running time calculations-Abstract Data Types (ADTs) – 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 II LINEAR DATA STRUCTURES – STACKS, QUEUES 9**

Stack ADT – Stack Model - Implementations: Array and Linked list - Applications - Balancing symbols - Evaluating arithmetic expressions - Conversion of Infix to postfix expression- Queue ADT – Queue Model - Implementations: Array and Linked list - Circular Queue – Priority Queue - deQueue – applications of queues.

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

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 – Priority Queues – Applications of priority queues.

**UNIT IV NON LINEAR DATA STRUCTURES - GRAPHS 9**

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – 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****OUTCOMES:****At the end of this course, the students will be able to:**

- Implement abstract data types for linear data structures.
- Apply the appropriate linear data structures to solve problems.
- Identify and use appropriate tree data structures in problem solving.
- Choose appropriate Graph representations and solve real-world applications.
- Critically analyze the various sorting and searching algorithms.

**TEXT BOOKS:**

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 2016.
2. Reema Thareja, “Data Structures Using C”, Second Edition, Oxford University Press, 2014.



## REFERENCES:

1. Narasimha Karumanchi, “Data Structure and Algorithmic Thinking with Python: Data Structure and Algorithmic Puzzles”, CareerMonk Publications, 2020.
2. Jean-Paul Tremblay and Paul Sorenson, “An Introduction to Data Structures with Application”, McGraw-Hill, 2017.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in Java”, Third Edition, Pearson Education, 2012.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008.
5. Ellis Horowitz, Sartaj Sahni, Dinesh P Mehta, “Fundamentals of Data Structures in C++”, Second Edition, Silicon Press, 2007.

<b>20CS202</b>	<b>PYTHON PROGRAMMING (LAB INTEGRATED)</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 and write simple Python programs.
- To write Python programs using functions and understand recursion
- To solve problems using Python data structures — lists, tuples, dictionaries.
- To understand files, modules and packages in Python.
- To use Exceptions, Standard Libraries and IDE for application development.

### **UNIT I INTRODUCTION TO PYTHON 9+6**

Introduction to Python programming – Arithmetic Operators - values and types - variables, expressions, statements – Functions – Conditionals and Recursion – Iteration.

### **UNIT II FUNCTIONS 9+6**

Fruitful functions: Return Values, Incremental Development, Composition, Boolean functions, Recursion, Example, Checking Types – Strings: len, Traversal with a for loop, String slices, Immutable, Searching, Looping and Counting, String Methods, in Operator, String Comparison – Case Study: Word Play.

### **UNIT III LISTS, DICTIONARIES, TUPLES 9+6**

Lists: Sequence, Mutable, Traversing, Operations, list slices, list methods, Map, Filter and Reduce, Deleting elements, Lists and Strings, Objects and Values, Aliasing, List Arguments.

Dictionaries: Mapping, Collection of Counters, Looping and Dictionaries, Reverse Lookup, Dictionaries and Lists, Memos, Global Variables.

Tuples: Immutable, Tuple Assignment, Tuple as Return Values, Variable-length Argument Tuples, Lists and Tuples, dictionaries and Tuples, Sequences of Sequences. Case Study: Data Structure Selection.

### **UNIT IV FILES, MODULES, PACKAGES 9+6**

Files: Persistence, Reading and Writing, Format Operator, Filenames and Paths, Catching Exceptions - Modules: Importing a module, Packages, Creating a module.

### **UNIT V EXCEPTIONS, LIBRARIES 9+6**

Exception Handling – Built-in Exceptions – Application Development with Python: Integrated Development Environment, Python Standard Library.

## LIST OF EXPERIMENTS:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Operations on Tuples:
  - a. finding repeated elements
  - b. slice a tuple
  - c. reverse a tuple
  - d. replace last value of a tuple
5. String manipulation
  - a. Get a string from a given string where all occurrences of its first char have been changed to '\$', except the first char itself
  - b. Python function that takes a list of words and returns the length of the longest one
  - c. Python program to remove the characters which have odd index values of a given string
  - d. Python program to count the occurrences of each word in a given sentence.
  - e. Python program that accepts a comma separated sequence of words as input and prints the unique words in sorted form
  - f. Python function to reverse a string if its length is a multiple of 4
6. List operations
  - a. Find the maximum of a list of numbers
  - b. Python program to remove duplicates from a list.
  - c. Python program to get the smallest number from a list.
  - d. Python program to print a specified list after removing the 0th, 4th and 5th elements.
  - e. Python program to print the numbers of a specified list after removing even numbers from it.
  - f. Python program to find the second smallest number in a list.
7. Linear search and Binary search
8. Selection sort, Insertion sort
9. Merge sort
10. First n prime numbers
11. Multiply matrices
12. Programs that take command line arguments (word count)
13. Find the most frequent words in a text read from a file
14. Simulate elliptical orbits in Pygame
15. Simulate bouncing ball using Pygame

**TOTAL: 45 +30 = 75 PERIODS**

## **OUTCOMES:**

**At the end of this course, the students will be able to:**

- Implement simple Python programs.
- Develop Python programs using functions.
- Represent and solve compound data using Python lists, tuples, dictionaries.
- Implement and perform operations on files, modules and packages.
- Apply Exceptions, Standard Libraries and IDE for application development.

## **TEXT BOOKS:**

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist“, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016 (<http://greenteapress.com/wp/thinkpython/>)
2. Martin C. Brown, Python: The Complete Reference, Mc-Graw Hill,. (Unit 4 – Chapter 5 , Unit 5 – Chapter 7, 17)

## **REFERENCES:**

1. David Beazley, Brian K. Jones, Python Cookbook, O’Reilly , Third Edition, 2013.
2. Reema Thareja, “Problem Solving and Programming with Python”, 2nd Edition, Oxford University Press 2019.
3. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
4. John V Guttag, Introduction to Computation and Programming Using Python“, Revised and expanded Edition, MIT Press , 2013
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
7. Kenneth A. Lambert, Fundamentals of Python: First Programs, CENGAGE Learning, 2012.
8. Charles Dierbach, Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
9. Paul Gries, Jennifer Campbell and Jason Montojo, Practical Programming: An Introduction to Computer Science using Python 3, Second edition, Pragmatic Programmers, LLC, 2013.

**20EM111**

**ENGINEERING PRACTICES LABORATORY**

**L T P C**

**0 0 4 2**

## **OBJECTIVES:**

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

## GROUP A (CIVIL & MECHANICAL)

### **I CIVIL ENGINEERING PRACTICE**

**15**

#### **Buildings:**

- (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

#### ***Plumbing Works:***

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in house hold fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works.
- (d) Hands-on-exercise:  
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- (e) Demonstration of plumbing requirements of high-rise buildings.

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

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise:  
Wood work, joints by sawing, planing and cutting.

### **II MECHANICAL ENGINEERING PRACTICE**

**15**

#### ***Welding:***

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

#### ***Basic Machining:***

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

#### ***Sheet Metal Work:***

- (a) Forming & Bending:
- (b) Model making – Trays and funnels.
- (c) Different type of joints.

#### ***Machine assembly practice:***

- (a) Study of centrifugal pump
- (b) Study of air conditioner

#### ***Demonstration on:***

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

## **GROUP B (ELECTRICAL & ELECTRONICS)**

### **III ELECTRICAL ENGINEERING PRACTICE**

**15**

1. Study of various safety measures in Electrical System
2. Draw and demonstrate the layout for a residential house wiring using energy meter, switches, fuse, indicator, LED lamp, fluorescent lamp with one of the lamps to be controlled by 2 different switches
3. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit (series and parallel circuit).
4. Measurement of energy using single phase energy meter for incandescent lamp and LED lamp.
5. Measurement of resistance to earth of an electrical equipment

### **IV ELECTRONICS ENGINEERING PRACTICE**

**15**

1. Study of Electronic components (fixed and Variable):
  - i. Resistor – Measurement of resistance using colour coding and digital multimeter.
  - ii. Capacitor – Measurement of capacitance using identification code, LCR meter
  - iii. Inductor – Measurement of inductance using colour coding and LCR meter
2. Study of Electronic equipment:
  - i. Signal generation using AFO (sine, square, triangle for various frequency and amplitude ranges)
  - ii. Measurement of amplitude, frequency, peak-peak, RMS, period, DC level of sine, square and triangle waveform using CRO and DSO.
  - iii. Measurement of DC voltage and current using analog and digital meters
3. Study of Electronic accessories:
  - i. Circuit connection using Breadboard and wires.
  - ii. Circuit connection using general purpose PCB by Soldering practice techniques.
4. Study of logic gates AND, OR, EX-OR and NOT by demonstration.
5. Generation of Clock Signal.
6. Measurement of ripple factor of HWR and FWR.
7. Study of Iron box, fan and regulator (resistive and electronics type), emergency lamp,  
Power Tools: (a) Range Finder (b) Digital Live-wire detector

**TOTAL: 60 PERIODS**

**(Part A :30 periods and Part B: 30 periods)**

### **OUTCOMES:**

**At the end of this course, the students will be able to:**

- Develop carpentry components and pipe connections including plumbing works.
- Make use of welding equipments to join the structures
- Analyse the basic machining operations
- Develop the models using sheet metal works
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and

- fittings
- Fabricate carpentry components and pipe connections including plumbing works.
- Carry out simple wiring as per the layout given
- Measures various electrical parameters like Voltage, Current, Power factor, Energy, Earth resistance etc.
- Calculate ripple factor of a given waveform, use logic gates for simple applications.

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

**CIVIL**

- |   |         |
|---|---------|
| 1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and Other fittings. | 15Sets. |
| 2. Carpentry vice (fitted to workbench)   | 15Nos.  |
| 3. Standard wood working tools  | 15Sets. |
| 4. Models of industrial trusses, door joints, furniture joints  | 5each   |
| 5. Power Tools: (a) Rotary Hammer   | 2Nos    |
| (b) Demolition Hammer   | 2Nos    |
| (c) Circular Saw  | 2 Nos   |
| (d) Planer  | 2 Nos   |
| (e) Hand Drilling Machine   | 2Nos    |
| (f) Jigsaw  | 2 Nos   |

**MECHANICAL**

- |   |           |
|---|-----------|
| 1. Arc welding transformer with cables and holders                            | 5Nos.     |
| 2. Welding booth with exhaust facility  | 5Nos.     |
| 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                     | One each. |

**ELECTRICAL**

1. Assorted electrical components for house wiring (One Way Switch, Two Way Switch, Lamp Holder, Ceiling rose, LED lamp, fluorescent lamp etc ) -15 Nos.
2. Electrical measuring instruments (Ammeter, Voltmeter, DRB, DIB etc) - 1 each
3. Earth Tester - 1 No.
4. Energy Meter, Ammeter, Voltmeter, Lamp load / Resistive load - 1 each

**ELECTRONICS**

1. Soldering guns - 10 No.
2. Assorted electronic components for making circuits (Resistor, Capacitor, Inductor, logic gates etc) - 50 Nos.
3. Small PCBs, Breadboard -10 Nos.

4. Multimeters - 10 Nos.
5. LCR Meter, DSO - 1No.
6. CRO, AFO - 5 Nos.
7. Study purpose items: Iron box, fan and regulator, emergency lamp, Range Finder, Digital Live-wire detector - 1 each

**20CS211**

**DATA STRUCTURES LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**OBJECTIVES:**

- To implement the basic data structures for solving simple problems.
- 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 algorithms.

**LIST OF EXPERIMENTS :**

1. Array Manipulation
  - a. Find kth smallest element in an unsorted array
  - b. Find the sub array with given sum
  - c. Matrix manipulations – Addition, Subtraction, Multiplication
  - d. Job Sequencing: Given an array of jobs where every job has a deadline and a profit. Profit can be earned only if the job is finished before the deadline. It is also given that every job takes a single unit of time, so the minimum possible deadline for any job is 1. How to maximize total profit if only one job can be scheduled at a time. Print the sequence of jobID order to maximize total profit.
2. String manipulations:
  - a. Reversing a set of words and count the frequency of each letter in the string.
  - b. Pattern Recognition - Find the number of patterns of form 1[0]1 where [0] represents any number of zeroes (minimum requirement is one 0) there should not be any other character except 0 in the [0] sequence in a given binary string.
  - c. Remove all the occurrences of string S2 in string S1 and print the remaining.
3. Pointers
  - a. Manipulating two dimensional arrays using pointers.
  - b. Print all permutations of a given string using pointers.
4. Dynamic Memory Allocation
  - a. Find Largest Number.
  - b. Print the list in reverse order.
5. Array implementation of List, Stack and Queue ADTs.
6. Linked list implementation of List, Stack and Queue ADTs.
7. Applications of List, Stack and Queue ADTs.
8. Implementation of Binary Trees and operations of Binary Trees.
9. Implementation of Binary Search Trees.
10. Implementation of AVL Trees.

11. Implementation of Heaps using Priority Queues.
12. Graph representation and Traversal algorithms.
13. Implement searching and sorting algorithms. Analyze and compare the time taken for various algorithms with best, average and worst case inputs.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

- Write functions to implement linear and non-linear data structure operations.
- Suggest and use appropriate linear / non-linear data structure operations for solving a given problem.
- Implement different operations of search trees.
- Implement appropriate Graph representations and traversals to solve real-world applications.
- Implement and analyze the various searching and sorting algorithms.

<b>20EL211</b>	<b>ADVANCED READING &amp; WRITING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	(Common to All Branches)	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**OBJECTIVES:**

The Course will enable learners to:

- Strengthen their reading skills.
- Enhance writing skills with specific reference to technical writing.
- Apply their critical thinking skills.
- Demonstrate their project and proposal writing.

<b>UNIT I</b>	<b>6</b>
Reading - Strategies for effective reading - Writing - Descriptive essays- Predicting content using photos.	
<b>UNIT II</b>	<b>6</b>
Reading - Use of graphic organizers to review and aid comprehension - Writing - Expository essays.	
<b>UNIT III</b>	<b>6</b>
Reading - Speed reading techniques - Writing - Elements of a good essay - Analytical essays.	
<b>UNIT IV</b>	<b>6</b>
Reading - Genre and organization of ideas – Writing - Email writing - Job applications.	
<b>UNIT V</b>	<b>6</b>
Reading - Critical reading and thinking -Writing - Letter of recommendation - Vision statement.	



**TOTAL: 30 PERIODS**

**OUTCOMES:**

**At the end of this course, the students will be able to:**

- Read and evaluate texts critically.
- Display critical thinking in various professional contexts.
- Apply various texts using speed reading techniques.
- Illustrate and write different types of Essays.
- Write effective emails, winning job applications and persuasive recommendations.

**TEXT BOOKS:**

1. Debra Daise, Charl Norloff, and Paul Carne Reading and Writing (Level 4) Oxford University Press: Oxford, 2011.
2. Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011.

**REFERENCES:**

1. Elbow, Peter. Writing Without Teachers. London: Oxford University Press, 1973. Print.
2. Goatly, Andrew., and Hiradhar, Preet. Critical Reading and Writing. New York: Routledge, 2016.
3. Liss, Rhonda., and Davis, Jason. Effective Academic Writing (Level 3).Oxford: Oxford University Press, 2006.
4. Petelin, Roslyn., and Durham, Marsha. The Professional Writing Guide: Knowing Well and Knowing Why. Warriewood, NSW: Business & Professional Publishing, 2004.
5. Suresh Kumar, E., Sandhya, B. Savithri, J., and Sreehari, P. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012.
6. Withrow, Jeans., Brookes, Gay., and Cummings, Martha Clark. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge: Cambridge University Press, 2004.

**SEMESTER III**

<b>20MA302</b>	<b>DISCRETE MATHEMATICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>2</b>	<b>0</b>	<b>4</b>

**OBJECTIVES:**

- Validate the arguments by using connectives and rules of inference.
- Develop the knowledge on the basics of counting, solving recurrence relations.
- Demonstrate the fundamentals of graphs.
- Illustrate the functions, relations and group theory.
- Familiarize the concepts of lattices and Boolean algebra.

**UNIT I LOGIC AND PROOFS**

**15**

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

**UNIT II COMBINATORICS 15**

Mathematical induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

**UNIT III GRAPH THEORY 15**

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

**UNIT IV ALGEBRAIC STRUCTURES 15**

Algebraic systems – Semi groups and monoids – Groups – Subgroups – Homomorphisms – Normal subgroup and cosets – Lagrange's theorem – Definitions and examples of Rings and Fields.

**UNIT V LATTICES AND BOOLEAN ALGEBRA 15**

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

**TOTAL: 75 PERIODS**

**OUTCOMES:**

**At the end of this course, the students will be able to:**

CO1: Examine the validity of the arguments.

CO2: Demonstrate various proof techniques and application of principles.

CO3: Apply graph theory techniques to solve real life problems.

CO4: Identify algebraic techniques to formulate and solve group theoretic problems.

CO5: Utilize the significance of lattices and Boolean algebra in computer science and engineering.

**TEXT BOOK:**

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

**REFERENCES:**

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



## OUTCOMES:

**At the end of this course, the students will be able to:**

CO1: Design and implement digital circuits using simplified Boolean functions

CO2: Analyze, design and implement combinational circuits

CO3: Analyze, design and implement synchronous and asynchronous sequential circuits

CO4: Understand Programmable Logic Devices

CO5: Develop HDL code for combinational and sequential circuits

## TEXT BOOK:

1. M. Morris R. Mano, Michael D. Ciletti, "Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog", 6th Edition, Pearson Education, 2018.

## REFERENCES:

1. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
2. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Seventh Edition, CENGAGE Learning, 2014
3. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
4. Donald D. Givone, "Digital Principles and Design", Tata Mc Graw Hill, 2007.

<b>20CS302</b>	<b>OBJECT ORIENTED PROGRAMMING</b> <b>(Common to CSE and AI&amp;DS)</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 explain object oriented programming concepts and fundamentals of Java
- To apply the principles of packages, inheritance, interfaces and exceptions
- To develop a Java application with I/O streams, threads and generics classes
- To use the functionalities of Strings and Collections
- To design and build simple Graphical User Interfaces

## **UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 9**

An Overview of Java - Data Types, Variables, and Arrays – Operators - Control Statements – Class Fundamentals – Declaring objects – Methods – Constructors – this keyword - Overloading methods - Overloading constructors - Access Control – Static – Final.

## **UNIT II INHERITANCE, INTERFACES AND EXCEPTION HANDLING 9**

Inheritance: Inheritance basics, Using super, Method Overriding, Using Abstract Classes, Using final with Inheritance – Package and Interfaces: Packages, Packages and member access, Importing Packages, Interfaces, Static Methods in an Interface – Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions.

## **UNIT III MULTITHREADING, I/O AND GENERIC PROGRAMMING 9**

Multithreaded Programming: Creating a Thread, Thread Priorities, Synchronization, Interthread Communication – I/O: I/O Basics, Reading Console Input, Writing Console Output, Reading and Writing Files – Generics: Introduction, Generic class, Bounded Types, Generic Methods, Generic Interfaces, Generic Restrictions.

**UNIT IV STRING HANDLING AND COLLECTIONS 9**  
Lambda Expressions - String Handling – Collections: The Collection Interfaces, The Collection Classes – Iterator – Map - Regular Expression Processing.

**UNIT V EVENT DRIVEN PROGRAMMING 9**  
Event Handling - Introducing the AWT: Working with Windows, Graphics, and Text - Using AWT Controls, Layout Managers, and Menus - Introducing Swing - Exploring Swing.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of this course, the students will be able to:**

- CO1: Explain the object oriented programming concepts and fundamentals of Java
- CO2: Develop Java programs with the packages, inheritance, interfaces and exceptions
- CO3: Build Java applications with I/O streams, threads and generics classes
- CO4: Apply strings and collections in applications
- CO5: Develop interactive Java applications using swings and event handling mechanism

**TEXT BOOK:**

1. Herbert Schildt, Java:The complete reference, 11<sup>th</sup> Edition, McGraw Hill Education, 2019.

**REFERENCES:**

1. Cay S. Horstmann, Gary Cornell, “Core Java Volume–I Fundamentals”, 11<sup>th</sup> Edition, Prentice Hall, 2019.
2. Paul Deitel, Harvey Deitel, Java SE 8 for programmers, 3rd Edition, Pearson, 2015.
3. Steven Holzner, Java 2 Black book, Dreamtech press, 2011.
4. Timothy Budd, Understanding Object-oriented programming with Java, Third Edition, Pearson Education, 2008.

**20CS303**

**SOFTWARE ENGINEERING**

<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 explain software engineering principles and activities involved in building large software programs
- To describe the process of requirements gathering and analysis
- To illustrate the design process.
- To analyse the various testing methods
- To apply estimation techniques, schedule project activities and compute pricing.

**UNIT I PRODUCT AND PROCESS 9**  
The Nature of Software – Defining the Discipline – The Software Process – Process models – Prescriptive Process Models – Product and Process – Agility and Process – Agile Process - Scrum – Other Agile Frameworks

**UNIT II REQUIREMENTS AND ANALYSIS 9**  
Requirements Engineering – Establishing the Groundwork: Non-functional Requirements – Requirements Gathering – Developing Use Cases – Negotiating and Validating Requirements.

Requirements Analysis – Overall Objectives and Philosophy – Analysis Rules of Thumb – Requirements Modelling Principles. Classical Analysis: Structured system analysis; Petri Nets.

**UNIT III DESIGN PROCESS 9**

Design Process – Design Concepts – Design Model: Design Principles and Design Elements. Architectural Design – Conducting Component Level Design – Designing traditional components - User Interface Analysis and Design – Pattern-Based Software Design.

**UNIT IV SOFTWARE TESTING 9**

Component Level: A Strategic Approach to Software Testing – Test Case Design - White-Box Testing – Black Box Testing Integration Level: Integration Testing – AI and Regression Testing – Validation Testing - Security Testing – Performance Testing – Real time Testing – Testing AI Systems – Testing Virtual Environments.

**UNIT V SOFTWARE QUALITY AND PROJECT MANAGMENT 9**

Software Metrics and Analytics: Software Measurement – Product Metrics. Creating a Viable Software Plan: The Project Planning Process – Software Scope and Feasibility – Decomposition and Estimation Techniques – Project Scheduling. Risk Management: Reactive Versus Proactive Risk Strategies – Risk Identification – Risk Projection – The RMMM Plan. Software Process Improvement: The SPI Process – The CMMI

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of this course, the students will be able to:**

- CO1: Summarize software engineering principles and activities involved in building large software programs
- CO2: Describe the process of requirements gathering and analysis
- CO3: Illustrate the design process.
- CO4: Analyse the various testing methods
- CO5: Apply estimation techniques, schedule project activities and compute pricing.

**TEXT BOOK:**

1. Roger S. Pressman, “Software Engineering: A Practitioner’s Approach” , McGraw Hill International Edition, Ninth Edition, 2020.

**REFERENCES:**

1. Ian Sommerville, “Software Engineering”, Tenth Edition, Pearson Education, 2016.
2. Ivar Jacobson, Harold Bud Lawson, Pan-Wei Ng, Paul E. McMahon, Michael Goedicke, “The Essentials of Modern Software Engineering”, Morgan & Claypool Publishers, 2019.
3. Rajib Mall, “Fundamentals of Software Engineering”, PHI Learning Private Limited, Fourth Edition, 2014.
4. Karl Wieggers, “Software Requirements - Best Practices”, Microsoft Press US, 3rd Edition, 2013.
5. David P. Voorhees, "Guide to Efficient Software Design: An MVC Approach to Concepts, Structures, and Models", Springer; 1st ed, 2020.
6. Gerard O'Regan, "Concise Guide to Software Testing", 1st ed, Springer, 2019.
7. Duane Petersen, "Transforming Project Management: An Essential Paradigm for Turning Your Strategic Planning into Action", McGraw-Hill Education, 1st edition, 2021.

20IT403

**DATABASE MANAGEMENT SYSTEMS**  
(Common to CSE, AI&DS and IT)

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

- To understand the basic concepts of Data modeling and Database Systems.
- To understand SQL and effective relational database design concepts.
- To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- To understand efficient data querying and updates, with needed configuration
- To learn how to efficiently design and implement various database objects and entities

**UNIT I DATABASE CONCEPTS 9**

Concept of Database and Overview of DBMS - Characteristics of databases, Database Language, Types of DBMS architecture – Three-Schema Architecture -Introductions to data models types- ER Model- ER Diagrams Extended ER Diagram reducing ER to table Applications: ER model of University Database Application.

SQL fundamentals Views - Integrity Procedures, Functions, Cursor and Triggers Embedded SQL Dynamic SQL.

**UNIT II DATABASE DESIGN 9**

Design a DB for Car Insurance Company - Draw ER diagram and convert ER model to relational schema. Evaluating data model quality - The relational Model Schema Keys-Relational Algebra Domain Relational Calculus- Tuple Relational Calculus - Fundamental operations. Relational Database Design and Querying Undesirable Properties of Relations Functional Dependency: Closures- Single Valued Dependency Single valued Normalization (1NF, 2NF 3NF and BCNF) - Desirable properties of Decompositions 4NF - 5NF De-normalization

**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 DATA STORAGE AND QUERYING 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 – Overview of physical storage structure- stable storage, failure classification -log based recovery, deferred database modification, check-pointing-File Structures:-Index structures-Primary, Secondary and clustering indices. Single and multilevel indexing.

Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation

Distributed database Implementation Concurrent transactions - Concurrency control Lock based Time stamping-Validation based. NoSQL, NoSQL Categories - Designing an enterprise database system - Client Server database.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of this course, the students will be able to:**

- CO1: Implement SQL and effective relational database design concepts.
- CO2: Map ER model to Relational model to perform database design effectively.
- CO3: Compare and contrast various indexing strategies in different database systems.
- CO4: Implement queries using normalization criteria and optimization techniques.
- CO5: Analyse how advanced databases differ from traditional databases.
- CO6: Design and deploy an efficient and scalable data storage node for varied kind of application requirements.

**TEXT BOOKS:**

1. Elmasri R. and S. Navathe, “Fundamentals of Database Systems”, Pearson Education, 7th Edition, 2016.
2. Abraham Silberschatz, Henry F.Korth, “Database System Concepts”, Tata McGraw Hill , 7th Edition, 2021.
3. Elmasri R. and S. Navathe, Database Systems: Models, Languages, Design and Application Programming, Pearson Education, 2013.

**REFERENCES:**

1. Raghu Ramakrishnan, Gehrke “Database Management Systems”, MCGraw Hill, 3rd Edition 2014.
2. Plunkett T., B. Macdonald, “Oracle Big Data Hand Book” , McGraw Hill, First Edition, 2013
3. Gupta G K , “Database Management Systems” , Tata McGraw Hill Education Private Limited, New Delhi, 2011.
4. C. J. Date, A.Kannan, S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2015.
5. Maqsood Alam, Aalok Muley, Chaitanya Kadaru, Ashok Joshi, Oracle NoSQL Database: Real-Time Big Data Management for the Enterprise, McGraw Hill Professional, 2013.
6. Thomas Connolly, Carolyn Begg, “ Database Systems: A Practical Approach to Design, Implementation and Management”, Pearson , 6th Edition, 2015.



<b>20GE301</b>	<b>Universal Human Values 2: Understanding Harmony</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>2</b>	<b>0</b>	<b>3</b>

### **OBJECTIVES:**

The objective of the course is fourfold:

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

### **COURSE TOPICS:**

The course has 28 lectures (2 lecture hours) and 14 practice sessions (2 Tutorial hour) in 5 Units:

#### **UNIT I Course Introduction - Need, Basic guidelines, Content and Process for Value Education**

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

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

#### **UNIT II Understanding Harmony in the Human Being – Harmony in Myself!**

- Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’
- Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility
- Understanding the body as an instrument of ‘I’ (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of ‘I’ and harmony in ‘I’
- ‘Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods

available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss programs for ensuring health vs dealing with disease

### **UNIT III                    Understanding harmony in the family and society- Harmony in human-human relationship**

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

Include practice sessions to reflect on relationships in family, hostel and institutes extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

### **UNIT IV                    Understanding Harmony in the Nature and Existence - Whole existence as coexistence**

- Understanding the harmony in nature
- Interconnectedness and mutual fulfilment among the four orders of nature-recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
- Holistic perception of harmony at all levels of existence.
- Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

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

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems.
- Strategy for transition from the present state to Universal Human Order: a. At the level of

individual: as socially and ecologically responsible engineers, technologists and managers b.  
At the level of society: as mutually enriching institutions and organizations

- Sum up.

Include practice exercises and case studies will be taken up in practice (tutorial) sessions eg.  
To discuss the conduct as an engineer or scientist etc.

## **OUTCOMES:**

**At the end of this course, the students will be able to:**

CO1: Would become more aware of themselves, and their surroundings (family, society, nature).

CO2: Would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO3: Would have better critical ability.

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

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

## **TEXT BOOK:**

1. R R Gaur, R Sangal, G P Bagaria, "Human Values and Professional Ethics", Excel Books, New Delhi, Second Edition 2019.

## **REFERENCES:**

1. A Nagaraj, "Jeevan Vidya: Ek Parichaya", Jeevan Vidya Prakashan, Amarkantak, 1999.
2. E. F Schumacher, "Small is Beautiful", Vintage classics, London, 1993.
3. A.N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, Third Edition 2020.
4. Maulana Abdul Kalam Azad, "India Wins Freedom", Oriental blackswan private limited, Hyderabad, 2020.
5. Mahatma Gandhi, "Hind Swaraj or Indian Home Rule", Maheswari Publications, Delhi 2020.
6. Romain Rolland, "The life of Vivekananda and the universal gospel", Publication house of Ramakrishna Math, Kolkata, Thirty second edition 2018.
7. Romain Rolland, "Mahatma Gandhi: The man who become one with the universal being", Srishti Publishers & Distributors, New Delhi, Sixth Edition 2013.
8. Heaton, Dennis P. "The story of stuff." (2010): 553-556.
9. Gandhi, Mohandas Karamchand, "The story of my experiments with truth: An autobiography", Om Books International, 2018.
10. Andrews, Cecile, "Slow is beautiful: new visions of community, leisure, and joie de vivre", New society publishers, 2006.
11. Kumarappa, Joseph Cornelius, "The economy of permanence. CP", All India Village Industries Assn., 1946.
12. Vivekananda-Romain Rolland (English)
13. Gandhi-Romain Rolland (English)

<b>20CS311</b>	<b>OBJECT ORIENTED PROGRAMMING LABORATORY</b> (Common to CSE and AI&DS)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**OBJECTIVES:**

- To build software development skills using java programming for real-world applications.
- To implement the concepts of classes, packages, interfaces, collections, exception handling, regular expressions and file processing.
- To develop applications using event handling.

**LIST OF EXERCISES:**

1. Develop a Java application to generate Electricity bill. You must use one super class called EB Bill and must have two sub classes namely Domestic Bill and Commercial Bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff  
 If the type of the EB connection is domestic, calculate the amount to be paid as follows:  
 First 100 units - Rs. 1 per unit  
 101-200 units - Rs. 2.50 per unit  
 201 -500 units - Rs. 4 per unit  
 > 501 units - Rs. 6 per unit  
 If the type of the EB connection is commercial, calculate the amount to be paid as follows:  
 First 100 units - Rs. 2 per unit  
 101-200 units - Rs. 4.50 per unit  
 201 -500 units - Rs. 6 per unit  
 > 501 units - Rs. 7 per unit
2. Arrays Manipulations: (Use Methods for implementing these in a Class)
  - a. Find k<sup>th</sup> smallest element in an unsorted array
  - b. Find the sub array with given sum
  - c. Matrix manipulations – Addition, Subtraction, Multiplication
  - d. Remove duplicate elements in an Array
  - e. Accept an integer value N and print the N<sup>th</sup> digit in the integer sequence 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and so on till infinity.  
 Example: The 11th digit in the sequence 12345678910111213.... is 0.
3. Develop a Java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages.
4. Develop a Java application with Employee class with Emp\_name, Emp\_id, Address, Mail\_id, Mobile\_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
5. Design a Java interface for ADT Stack. Implement this interface using array and built-in classes. Provide necessary exception handling in both the implementations.
6. Write a Java Program to create an abstract class named Shape that contains two integers

- and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains the methods print Area () that prints the area of the given shape and Numberofsides() that prints the number of sides of the given shape.
7. Write a Java program to apply built-in and user defined exceptions.
  8. String Manipulation:
    - a. Reversing a set of words and count the frequency of each letter in the string.
    - b. Pattern Recognition - Find the number of patterns of form 1[0]1 where [0] represents any number of zeroes (minimum requirement is one 0) there should not be any other character except 0 in the [0] sequence in a given binary string.
    - c. Remove all the occurrences of string S2 in string S1 and print the remaining.
    - d. Find the longest repeating sequence in a string
    - e. Print the number of unique string values that can be formed by rearranging the letters in the string S.
  9. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
  10. Write a Java program to read and copy the content of one file to other by handling all file related exceptions.
  11. Collections:
    - a. Write a program to perform string operations using ArrayList. Write functions for the following
      - i. Append - add at end
      - ii. Insert – add at particular index
      - iii. Search
      - iv. List all string starts with given letter
    - b. Find the frequency of words in a given text.
  12. Write a Java program to remove all non-alphanumeric characters from a string using regular expression.
  13. Design a calculator using event-driven programming paradigm of Java with the following options.
    - a. Decimal manipulations
    - b. Scientific manipulations
  14. Develop a mini project for any application using Java concepts.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**At the end of this course, the students will be able to:**

CO1: Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.

CO2: Develop and implement Java programs with collections, exception handling, regular expressions and multithreading.

CO3: Design applications using file processing and event handling

20IT412

**DATABASE MANAGEMENT SYSTEMS  
LABORATORY**

**L T P C  
0 0 4 2**

**(Common to CSE, AI&DS and IT)**

**OBJECTIVES:**

- To understand data definitions and data manipulation commands
- To learn the use of 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. Views, Sequences, 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 anyone from the following list
  - a) Inventory Management for a EMart Grocery Shop
  - b) Society Financial Management
  - c) Cop Friendly App – Eseva
  - d) Property Management – eMall
  - e) Star Small and Medium Banking and Finance
  - Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.
  - Apply Normalization rules in designing the tables in scope.
  - Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features.
  - Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.
  - Ability to showcase ACID Properties with sample queries with appropriate settings

**TOTAL: 60 PERIODS**

## OUTCOMES:

**At the end of this course, the students will be able to:**

- CO1: Apply typical data definitions and manipulation commands.
- CO2: Design applications to test Nested and Join Queries.
- CO3: Implement simple applications that use Views.
- CO4: Implement applications that require a Front-end Tool.
- CO5: Critically analyze the use of Tables, Views, Functions and Procedures.

**20CS313**

**APTITUDE AND CODING SKILLS – I**  
**(Common to All Branches)**

<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 vocabulary for effective communication and reading skills.
- To build the logical reasoning and quantitative skills.
- To develop error correction and debugging skills in programming.

## List of Exercises:

### 1. English – Phase I

Vocabulary: Synonyms, Antonyms, Grammar: Subject-Verb Agreement, Tenses and Articles, Prepositions and Conjunctions, Speech and Voices, Comprehension: Inferential and Literal Comprehension, Contextual Vocabulary, Comprehension ordering

### 2. Logical Reasoning – Phase I

Deductive Reasoning: Coding deductive logic, Directional sense, Blood relations, Objective Reasoning, Selection decision tables, Puzzles, Inductive reasoning: Coding pattern and Number series pattern recognition, Analogy and Classification pattern recognition, Abductive Reasoning: Logical word sequence, Data sufficiency

### 3. Quantitative Ability - Phase I

Basic Mathematics: Divisibility, HCF and LCM, Numbers, decimal fractions and power, Applied Mathematics: Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Engineering Mathematics: Logarithms, Permutation and Combinations, Probability

### 4. Automata Fix – Phase I

Logical, Compilation and Code reuse

**TOTAL: 30 PERIODS**

## OUTCOMES:

**At the end of this course, the students will be able to:**

- CO1: Develop vocabulary for effective communication and reading skills.
- CO2: Build the logical reasoning and quantitative skills.
- CO3: Develop error correction and debugging skills in programming.

## SEMESTER IV

20MA402

### PROBABILITY AND STATISTICS (Common to CSE and AI&DS)

L T P C  
3 2 0 4

#### OBJECTIVES:

The Course will enable learners to:

- Determine the probability value of one dimensional random variables.
- Illustrate the concepts of covariance, correlation and regression.
- Discuss the concept of testing of hypothesis for small and large samples.
- Demonstrate the difference between the types of design to experiments.
- Identify and interpret the control charts for variables and attributes.

#### UNIT I ONE DIMENSIONAL RANDOM VARIABLES 15

Random variable – Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

#### UNIT II TWO DIMENSIONAL RANDOM VARIABLES 15

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables.

#### UNIT III TESTING OF HYPOTHESIS 15

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

#### UNIT IV DESIGN OF EXPERIMENTS 15

One way and Twoway classifications – Completely randomized design – Randomized block design – Latin square design.

#### UNIT V STATISTICAL QUALITY CONTROL 15

Control charts for measurements ( $\bar{X}$  and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits.

**TOTAL: 75 PERIODS**

#### OUTCOMES:

**At the end of this course, the students will be able to:**

- Understand the fundamental knowledge of modern probability theory and standard distributions.
- Categorize the probability models and function of random variables based on one and two dimensional random variables.
- Employ the concept of testing the hypothesis in real life problems.
- Implement the analysis of variance for real life problems.
- Apply the statistical quality control in engineering and management problems.

#### TEXT BOOKS:

1. R.A. Johnson, I. Miller and J. Freund, "Miller and Freund's Probability and Statistics for





**UNIT V                      PARALLEL PROCESSING AND MULTICORE COMPUTERS                      9**

Parallel Processing: Use of Multiple Processors - Symmetric Multiprocessors - Cache Coherence - Multithreading and Chip Multiprocessors - Clusters - Nonuniform Memory Access Computers - Vector Computation - Multicore Organization.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of this course, the students will be able to:**

- CO1: Explain the basic principles and operations of digital computers.
- CO2: Design Arithmetic and Logic Unit to perform fixed and floating point operations
- CO3: Develop pipeline architectures for RISC Processors.
- CO4: Summarize Various Memory systems & I/O interfacings.
- CO5: Recognize Parallel Processor and Multi Processor Architectures

**TEXT BOOKS:**

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Computer organization, Tata McGraw Hill, Sixth edition, 2012.
2. David A. Patterson and John L. Hennessy Computer Organization and Design-The Hardware/Software Interface 5th edition, Morgan Kaufmann, 2013.

**REFERENCES:**

1. John P.Hayes, Computer Architecture and Organization, Third Edition, TataMcGraw Hill, 2012.
2. David A. Patterson and John L. Hennessy Computer Organization and Design-The Hardware/Software Interface, 6th edition, Morgan Kaufmann, 2021.
3. John L. Hennessy and David A. Patterson, Computer Architecture – A Quantitate Approach, Morgan Kaufmann / Elsevier Publishers, Fifth Edition,2012.

<b>20CS402</b>	<b>DESIGN AND ANALYSIS OF ALGORITHMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>(Common to CSE, AI&amp;DS and IT)</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To critically analyse the efficiency of alternative algorithmic solutions for the same problem
- To illustrate brute force and divide and conquer design techniques.
- To explain dynamic programming and greedy technique for solving various problems.
- To apply iterative improvement technique to solve optimization problems
- To examine the limitations of algorithmic power and handling it in different problems.

**UNIT I                      INTRODUCTION                      8+3**

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                      10+3**

Brute Force – Computing  $a^n$  – 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 - Decrease and Conquer Method: Josephus Problem-Transform and Conquer Method: Presorting

**UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 11+3**

Dynamic programming – Principle of optimality - Coin changing problem, Computing a Binomial Coefficient – Floyd’s algorithm – Multi stage graph - Optimal Binary Search Trees - Longest common subsequence - Matrix-chain multiplication – Travelling Salesperson Problem – Knapsack Problem and Memory functions. Greedy Technique – Prim’s algorithm and Kruskal’s Algorithm – 0/1 Knapsack problem - Huffman Trees.

**UNIT IV ITERATIVE IMPROVEMENT 7+3**

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

**UNIT V COPING WITH THE LIMITATIONS OF ALGORITHM POWER 9+3**

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+15=60 PERIODS**

**OUTCOMES:**

**At the end of this course, the students will be able to:**

- CO1: Analyse the efficiency of recursive and non-recursive algorithms mathematically
- CO2: Analyse the efficiency of brute force, divide and conquer, decrease and conquer, Transform and conquer algorithmic techniques
- CO3: Implement and analyse the problems using dynamic programming and greedy technique algorithmic techniques.
- CO4: Solve the problems using iterative improvement technique for optimization.
- CO5: Compute the limitations of algorithmic power and solve the problems using backtracking and branch and bound technique.

**TEXT BOOKS:**

1. Anany Levitin, 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, 2019.
3. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.

**REFERENCES:**

1. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.
2. Harsh Bhasin, Algorithms Design and Analysis, Oxford university press, 2016.
3. S. Sridhar, Design and Analysis of Algorithms, Oxford university press, 2014.
4. <http://nptel.ac.in/>

**OBJECTIVES:**

- To understand different internet technologies and to design website using HTML and CSS
- To build dynamic webpages
- To create server-side programs using JSP and Servlets
- To construct simple web pages in PHP and to represent data in XML format.
- To demonstrate Java-specific web services

**UNIT I WEBSITE BASICS, HTML 5, CSS 3 9**

Web Essentials: Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, embedded and external style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

**UNIT II CLIENT SIDE PROGRAMMING 9**

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request – SQL.

**UNIT III SERVER SIDE PROGRAMMING 9**

Servlets: Java Servlet Architecture - Servlet Life Cycle - Parameter Data - Session Handling- Understanding Cookies - Installing and Configuring Apache Tomcat Web Server - DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages - JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

**UNIT IV PHP and XML 9**

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation- Regular Expressions - File handling – Cookies - Connecting to Database. XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

**UNIT V INTRODUCTION TO AJAX and WEB SERVICES 9**

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP – REST based web services – Introduction to Java Web Development Frameworks.

**TOTAL: 45 PERIODS****OUTCOMES:**

**At the end of this course, the students will be able to:**

CO1: Construct a basic website using HTML and Cascading Style Sheets.

CO2: Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms.

- CO3: Develop server side programs using Servlets and JSP.  
 CO4: Construct simple web pages in PHP and to represent data in XML format.  
 CO5: Apply AJAX and web services to develop interactive web applications

**TEXT BOOKS:**

1. Deitel and Deitel and Nieto, “Internet and World Wide Web - How to Program”, Pearson, 5<sup>th</sup> Edition, 2018.
2. Jeffrey C and Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011.

**REFERENCES:**

1. Stephen Wynkoop and John Burke “Running a Perfect Website”, QUE, 2nd Edition, 1999.
2. Chris Bates, “Web Programming – Building Intranet Applications”, 3rd Edition, Wiley Publications, 2009.
3. Gopalan N.P. and Akilandeswari J., “Web Technology”, Second Edition, Prentice Hall of India, 2014.
4. Uttam K.Roy, “Web Technologies”, Oxford University Press, 2011.
5. Nicholas S. Williams, Professional Java for Web Applications, Wrox Publisher, First Edition, 2014.

<b>20CS404</b>	<b>OPERATING SYSTEMS</b> <b>(Common to CSE and IT)</b>	<b>L T P C</b> <b>3 0 0 3</b>
----------------	---	----------------------------------

**OBJECTIVES:**

- To explain the basic concepts of operating systems and process.
- To discuss threads and analyse various CPU scheduling algorithms.
- To describe the concept of process synchronization and deadlocks.
- To analyse various memory management schemes.
- To describe I/O management and file systems.

**UNIT I INTRODUCTION TO OPERATING SYSTEMS AND PROCESSES 9**

Introduction to OS –Computer system organization - architecture – Resource management - Protection and Security – Virtualization - Operating System Structures - Services - User and Operating-System Interface - System Calls - System Services -Design and Implementation - Building and Booting an Operating System - Process Concept - Process Scheduling - Operations on Processes – Inter process Communication - IPC in Shared-Memory Systems - IPC in Message-Passing Systems

**UNIT II THREADS AND CPU SCHEDULING 9**

Threads & Concurrency: Overview - Multicore Programming - Multithreading Models - Thread Libraries - Implicit Threading - Threading Issues - CPU Scheduling: Basic Concepts - Scheduling Criteria - Scheduling Algorithms - Thread Scheduling - Multi-Processor Scheduling - Real-Time CPU Scheduling

**UNIT III PROCESS SYNCHRONISATION AND DEADLOCKS 9**

Process Synchronization - The critical-section problem, Peterson's Solution - Synchronization hardware, Mutex locks, Semaphores, monitors, Liveness - Classic problems of synchronization – Bounded Buffer Problem - Reader's & Writer Problem, Dining Philosopher Problem, Barber's shop problem. Deadlock - System model - Deadlock characterization, Methods for handling deadlocks - Deadlock prevention - Deadlock avoidance - Deadlock detection - Recovery from deadlock.

**UNIT IV MEMORY MANAGEMENT 9**

Memory Management: Contiguous Memory Allocation - Paging - Structure of the Page Table – Swapping - Virtual Memory: Demand Paging – Copy-on write – Page Replacement – Allocation of frames – Thrashing Memory – Compression

**UNIT V FILE MANAGEMENT 9**

File Management: File Concept – Access Methods – Directory Structure – Protection - Memory-Mapped File - Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks - I/O Hardware: I/O devices, Device controllers, Direct Memory Access - Case Study-Linux.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of this course, the students will be able to:**

- CO1: Implement the basic concepts of operating systems and process.
- CO2: Analyse various CPU scheduling algorithms and thread mechanism.
- CO3: Implement the concepts of process synchronization and deadlocks.
- CO4: Design various memory management schemes to given situation
- CO5: Implement various I/O and file management techniques.

**TEXT BOOK:**

1. Silberschatz Abraham, Greg Gagne, Peter B. Galvin. "Operating System Concepts", Tenth Edition, Wiley, 2018.

**REFERENCES:**

1. William Stallings, Operating Systems – Internals and Design Principles, Pearson Education, New Delhi, 2018.
2. Achyut S.Godbole, Atul Kahate, Operating Systems, McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, "Modern Operating System", 4 th Edition, PHI Learning, New Delhi, 2018.

<b>20EC441</b>	<b>MICROPROCESSORS AND INTERFACING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>(Common to CSE and IT)</b>	<b>3</b>	<b>0</b>	<b>2</b>	<b>4</b>

**OBJECTIVES:**

- To acquire knowledge of 8086 microprocessor.
- To summarize the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To explain the Architecture of 8051 microcontroller.
- To demonstrate a microcontroller based system



## OUTCOMES:

**At the end of this course, the students will be able to:**

- CO1: Acquire knowledge of basic architecture, operation, programming of microprocessor 8086.
- CO2: Summarize the design of basic and multiprocessor systems and their bus timings.
- CO3: Design the 8086 interfaces with memory, I/O and other peripheral chips.
- CO4: Describe the basic architecture and programming of microcontroller 8051.
- CO5: Apply programming concepts to implement microcontroller interfaces for different applications.
- CO6: Design and construct Microprocessor and Microcontroller based systems.

## TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design, 2<sup>nd</sup> Edition, Pearson, 2015.
2. Mohamed Ali Mazidi, Janice GillispieMazidi, RolinMcKinlay, The 8051 Microcontroller and Embedded Systems: Using Assembly and C, 2<sup>nd</sup> Edition, Pearson Education, 2011.

## REFERENCES:

1. DouglasV.Hall, Microprocessors and Interfacing, Programming and Hardware, TMH, 2012.Achyut S.Godbole, Atul Kahate, Operating SystemsI, McGraw Hill Education, 2016.
2. A.K.Ray,K.M.Bhurchandi, Advanced Microprocessors and Peripherals 3<sup>rd</sup> Edition, Tata McGraw Hill, 2012.
3. Barry B Bray, The Intel Microprocessor 8086/8088,80186,80286,80386 and 80486 – Architecture, Programming and Interfacing, 8<sup>th</sup> Edition, PHI, 2011.
4. Mohamed Rafiquazzaman, Microprocessor and Microcomputer based System Design, 2<sup>nd</sup> Edition, Universal Book Stall, 1995.

**20CS411**

**INTERNET PROGRAMMING LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

## OBJECTIVES:

- To create web pages using HTML/XML and style sheets.
- To design user interfaces using Java frames and applets.
- To develop dynamic web pages using server-side scripting and PHP programming.
- To build applications with AJAX.

## LIST OF EXERCISES:

1. Create a web page with the following.
  - a. Cascading style sheets.
  - b. Embedded style sheets.
  - c. Inline style sheets.
2. Form Validation (Date, Email, User name, Password and Number validation) using JavaScript.
3. Write programs in Java using Servlets:
  - a. To invoke servlets from HTML forms



- b. Session tracking.
4. Create a three-tier java application using JDBC with the following functionalities: Add Record, Modify Record, Delete Record, Display one Record, Display All  
Get the input from the user through forms and display the results in the client browser.
5. Create a dynamic web application using Servlet/JSP with a facility to
  - a. Login to the application
  - b. Register a new user and
  - c. Change password for an existing user
6. Create an Ajax application to retrieve data from an XML file and display the data in an HTML.
7.
  - i. Validate the form using PHP regular expression.
  - ii. PHP stores a form data into database.
8. Write a web service for finding public review about a consumer product.
9. Mini Projects-Develop any one of the following web applications (not limited to one) using above technologies.
  - a. Online assessment system
  - b. Ticket reservation system
  - c. Online shopping
  - d. Student management system
  - e. Student result management system
  - f. Library management
  - g. Hospital management
  - h. Attendance management system
  - i. Examination automation system
  - j. Web based chat application

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**At the end of this course, the students will be able to:**

CO1: Create web pages using HTML/XML and style sheets.

CO2: Design user interfaces using Java frames and applets.

CO3: Develop dynamic web pages using server-side scripting and PHP programming.

CO4: Build applications with AJAX.

**20CS412**

**OPERATING SYSTEMS LABORATORY**  
(Common to CSE and IT)

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**OBJECTIVES:**

- To practice system calls and shell programming
- To implement various CPU scheduling algorithms
- To build inter process communication deadlock detection and avoidance algorithms.
- To design page replacement and disk scheduling algorithms
- To implement file allocation strategies

## LIST OF EXERCISES:

1. Basic Unix file system commands such as ls, cd, mkdir, rmdir, cp, rm, mv, more, lpr, man, grep, sed, etc.
2. Shell Programming
3. Programs for Unix System Calls.
  - a. Write a program to fetch the below information; Name of the operating system, Current release level, Current version level, Total usable main memory size, Available memory size, Amount of shared memory, Memory used by buffers, Total swap space size, and Swap space still available.
  - b. Use system calls to imitate the action of UNIX command "ls" with option -a, and -li command
  - c. Use system calls to imitate the action of UNIX command "cp" or "dir" with a couple of options
  - d. Implement process life cycle: Use the system calls fork(), exec(), wait(), waitpid(), exit(0), abort() and kill().
4. Write a program to implement the following actions using pthreads
  - a) Create a thread in a program and called Parent thread, this parent thread creates another thread (Child thread) to print out the numbers from 1 to 20. The Parent thread waits till the child thread finishes
  - b) Create a thread in the main program, this program passes the 'count' as an argument to that thread function and this created thread function has to print your name 'count' times
5. Process Synchronization using Semaphores. A shared data has to be accessed by two categories of processes namely A and B. Satisfy the following constraints to access the data without any data loss.
  - (i) When a process A1 is accessing the database another process of the same category is permitted.
  - (ii) When a process B1 is accessing the database neither process A1 nor another process B2 is permitted.
  - (iii) When a process A1 is accessing the database process B1 should not be allowed to access the database.Write appropriate code for both A and B satisfying all the above constraints using semaphores.

Note: The time-stamp for accessing is approximately 10 sec.
6. Implementation of IPC using Shared memory
  - a. Write a UNIX system call program to implement the following shared memory concept
    - i) In process 1 - Creation a shared memory of size 5 bytes with read/write permission and enter balance amount of Rs 1000.
    - ii) In process 2 – Add Rs. 200 to your balance. During this modification maintain the atomicity of shared memory using binary semaphore
    - iii) In process 3 – Subtract Rs. 800 to your balance. During this also modification maintain the atomicity of shared memory using binary semaphore
    - iv) In process 4 – Display the current balance of shared memory
    - v) Delete the shared memory

7. Implementation of IPC using message queue

- a) Get the input data (integer value) from a process called sender
  - b) Use Message Queue to transfer this data from sender to receiver process
  - c) The receiver does the prime number checking on the received data
  - d) Communicate the verified/status result from receiver to sender process, This status should be displayed in the Sender process.
- Note: Simultaneously execute two or more processes. Don't do it as a single process

8. Write C programs to implement the various CPU Scheduling Algorithms

9. Bankers Algorithm for Deadlock Avoidance

10. Implementation of Memory Allocation Methods for fixed partition

11. Implementation of Paging Technique of Memory Management

12. Implementation of Page Replacement Algorithms

13. Implementation of disk scheduling

14. Implementation of File Allocation Strategies

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

- CO1: Practice system calls and shell programming
- CO2: Implement various CPU scheduling algorithms
- CO3: Build inter process communication deadlock detection and avoidance algorithms.
- CO4: Design page replacement and disk scheduling algorithms
- CO5: Implement file allocation strategies

**20CS414**

**APTITUDE AND CODING SKILLS – II**  
**(Common to All Branches)**

<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 advanced vocabulary for effective communication and reading skills.
- To build an enhanced level of logical reasoning and quantitative skills.
- To develop error correction and debugging skills in programming.
- To apply data structures and algorithms in problem solving.

## List of Exercises:

### 1. English – Phase II

Vocabulary: Synonyms, Antonyms, Grammar: Subject-Verb Agreement, Tenses and Articles, Prepositions and Conjunctions, Speech and Voices, Comprehension: Inferential and Literal Comprehension, Contextual Vocabulary, Comprehension ordering

### 2. Logical Reasoning – Phase II

Deductive Reasoning: Coding deductive logic, Directional sense, Blood relations, Objective Reasoning, Selection decision tables, Puzzles, Inductive reasoning: Coding pattern and Number series pattern recognition, Analogy and Classification pattern recognition, Abductive Reasoning: Logical word sequence, Data sufficiency

### 3. Quantitative Ability - Phase II

Basic Mathematics: Divisibility, HCF and LCM, Numbers, decimal fractions and power, Applied Mathematics: Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Engineering Mathematics: Logarithms, Permutation and Combinations, Probability

### 4. Automata Fix – Phase II

Logical, Compilation and Code reuse

### 5. Automata - Phase II

Data Structure Concepts: Array and Matrices, Linked list, String processing and manipulation, Stack/Queue, Sorting and Searching

Advanced Design and Analysis Techniques: Greedy Algorithms, Minimum Spanning Trees, String Matching, Divide and Conquer, Computational Geometry

**TOTAL: 30 PERIODS**

## OUTCOMES:

**At the end of this course, the students will be able to:**

CO1: Develop advanced vocabulary for effective communication and reading skills.

CO2: Build an enhanced level of logical reasoning and quantitative skills.

CO3: Develop error correction and debugging skills in programming.

CO4: Apply data structures and algorithms in problem solving.

