



# SENGUNTHAR ENGINEERING COLLEGE (AUTONOMOUS)

(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)  
Recognized Under Section 2(f) & 12(B) of the UGC Act, 1956  
NAAC Accredited with 'A' Grade

TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU



## CURRICULUM & SYLLABI M.E. COMPUTER SCIENCE AND ENGINEERING

(CHOICE BASED CREDIT SYSTEM)

### REGULATIONS – 2023

(For the Students Admitted in the Academic Year 2023-2024 onwards)



Note: The regulations hereunder are subject to amendments as may be decided by the Academic Council of the Sengunthar Engineering College from time to time. Any or all such amendments will be effective from such date and to such batches of candidates including those already undergoing the program under the same Regulation as may be decided by the Academic Council.





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**DEPARTMENT  
OF  
COMPUTER SCIENCE AND ENGINEERING**

**REGULATION 2023**

**CURRICULUM AND SYLLABI**

**FOR M.E. – COMPUTER SCIENCE AND ENGINEERING**

**(For the Students admitted in the Academic Year 2023-2024 onwards)**

**FIRST SEMESTER**

**TO**

**FOURTH SEMESTER**





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# ***SCHEME FOR CURRICULUM***

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***M.E. –Computer Science and Engineering***





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## REGULATIONS 2023

### CHOICE BASED CREDIT SYSTEM

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### M.E-COMPUTER SCIENCE AND ENGINEERING

#### VISION

- To become a prominent in futuristic technologies of Computer Science and Engineering and producing competent professionals with research and innovation skills, inculcating moral values and societal concerns.

#### MISSION

- To impart high quality technical education and knowledge for uplift our students to become sound professional engineers with and moral values.
- To produce best quality computer science professionals and researchers by providing state-of-the-art training, hands on experience and healthy research environment.
- To provide learning ambience to generate innovative and problem solving skills with Professionalism
- To empower the students with the required skills to solve the complex technological problems of modern society and also provide them with a framework for promoting collaborative and multidisciplinary activities.

#### PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates can

- ✓ Impart high level knowledge and skills to analyze, design, test and implement diverse range of software for real life problems.
- ✓ Apply their technical competence in computer science and contribute in research and development to the advancement of computer science and engineering.
- ✓ Inculcate life-long learning skills and preparing them for work in changing environments with the sense of professionalism and ethics.



## PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO1	<b>Engineering knowledge</b>	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO2	<b>Problem analysis</b>	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	<b>Design / development of solutions</b>	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.
PO4	<b>Conduct investigations of complex problems</b>	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.
PO5	<b>Modern tool usage</b>	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
PO6	<b>The engineer and society</b>	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.
PO7	<b>Environment and sustainability</b>	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	<b>Ethics</b>	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	<b>Individual and team work</b>	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	<b>Communication</b>	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.
PO11	<b>Project management and finance</b>	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.
PO12	<b>Life-long learning</b>	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.



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## PROGRAM SPECIFIC OUTCOME (PSOs)

<b>PSO1</b>	Execute innovation and excellence in Structural Engineering problem solving and design in global and societal contexts.
<b>PSO2</b>	Applying an analytical approach for the practical problems in the field of Structural Engineering.
<b>PSO3</b>	Commit to lifelong learning and professional development in the Structural Engineering.



**MAPPING OF COURSE OUTCOME AND PROGRAM OUTCOME**

Year	Sem	Course Name	PO												PSO			
			1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
I	I	23PCM101 - Applied Mathematics for Computer Science	3.0	2.8	2.6	-	-	-	-	-	-	-	-	-	2.8	2.6	1.6	
		23PGT101 - Research Methodology and IPR	3.0	2.0	1.6	1.6	1.6	1.0	-	-	-	-	2.0	1.0	2.0	1.0	1.4	
		23PCT101 - Machine Learning Techniques	3.0	3.0	3.0	-	-	-	-	-	-	-	-	-	3.0	2.0	3.0	
		23PCT102 - Web Engineering	3.0	2.80	2.0	2.0	-	-	2.60	1.0	-	2.0	-	1.0	3.0	2.0	1.0	
		23PCE101- Advanced Data Structures and Algorithms	3.0	1.6	1.0	0.8	1.0	2.0	-	-	-	-	-	-	3.0	2.0	3.0	
		Professional Elective – I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		23PEE101 - Research Paper Writing and Seminar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	II	II	23PCT201- Advanced Soft Computing	3.0	3.0	3.0	-	-	-	-	-	-	-	-	3.0	2.0	3.0	
			23PCT202- Industrial IoT	1.6	1.8	1.6	1.4	2.0	2.2	-	-	-	-	-	3.0	2.0	3.0	
			23PCE201 - Data Science and Analytics	2.83	2.83	1.67	2.33	1.0	-	-	-	-	1.0	1.0	1.0	2.83	1.33	1.0
			Professional Elective – II	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			Professional Elective – III	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			Open Elective	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
			23PEE201 - Mini Project	3.0	3.0	3.0	3.0	3.0	1.0	1.0	3.0	3.0	3.0	3.0	1.0	3.0	3.0	3.0
II	III	Professional Elective – IV	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		Professional Elective – V	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		Professional Elective – VI	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
		23PEE301 - Project work (Phase – I)	3.0	3.0	3.0	3.0	3.0	1.0	1.0	3.0	3.0	3.0	3.0	1.0	3.0	3.0	3.0	





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	IV	23PEE401 - Project work (Phase - II)	3.0	3.0	3.0	3.0	3.0	1.0	1.0	3.0	3.0	3.0	3.0	1.0	3.0	3.0	3.0
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<b>PROFESSIONAL ELECTIVE COURSES</b>																	
S.N o.	Course Name	PO												PSO			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
1	23PCP101- Advanced Databases	2.4	2.0	1.2	1.6	0.6	1.2	-	-	-	-	-	-	3.0	3.0	3.0	
2	23PCP102 - Agile Software Development and Usability Engineering	2.2	0.8	1.4	1.0	2.2	3.0	-	-	-	-	-	-	1.0	1.4	1.4	
3	23PCP103 - Image Processing and Analysis	2	1.16	0.83	2	1.16	1.5	-	-	-	-	-	-	-	-	-	
4	23PCP104 - Mobile Application Development	3.0	1.6	1.4	2.8	1.8	1.8	-	-	-	-	-	-	3.0	3.0	3.0	
5	23PCP105 - Cloud Services and Virtualization	1.6	1.0	0.8	0.8	0.6	1.6	-	-	-	-	-	-	1.6	1.6	1.6	
6	23PCP201 - Real Time Systems	3.0	3.0	3.0	3.0	3.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	3.0	3.0	2.0	
7	23PCP202 - Data Visualization Techniques	2.2	0.8	2.4	2.4	1.4	1.6	-	-	-	-	-	-	2.2	0.8	2.4	
8	23PCP203 - Integrated Software Project Management	2.2	0.8	2.4	2.4	1.4	1.6	-	1.8	-	1.4	1.2	3.0	1.2	0.8	1.2	
9	23PCP204 - Modern Computer Architecture	2.2	0.8	2.4	2.4	1.4	1.6	-	1.8	-	1.4	1.2	3.0	2.0	1.0	2.2	
10	23PCP205 - Software Architectures and Design	2.2	0.8	2.2	2.2	1.4	1.6	-	1.8	-	1.4	1.2	3.0	2.0	1.0	2.2	
11	23PCP206 - Human Computer Interaction	2.0	2.2	2.0	2.2	1.6	2.0	-	-	-	-	-	-	2.0	1.8	2.0	
12	23PCP207 - Block Chain Technology	2.0	1.0	2.5	2.25	2.0	2.0	-	-	-	-	-	-	2.0	1.0	2.0	
13	23PCP208 - Computer Vision	3.0	3.0	3.0	3.0	3.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	3.0	3.0	2.0	
14	23PCP209 - Cyber Security and Computer Forensics	2.2	1.2	2.2	2.0	1.4	1.4	-	2.0	-	1.4	1.0	3.0	2.0	1.0	2.2	





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15	23PCP210 - Software Quality Assurance and Testing	3.0	3.0	3.0	3.0	3.0	1.0	3.0	1.0	1.0	1.0	1.0	2.0	3.0	3.0	2.0
16	23PCP301 - Security for IoT	2.25	2.75	2.75	2.5	2.5	1.25	2.75	1.25	1.0	1.0	1.0	1.5	2.25	2.25	2.5
17	23PCP302 - Parallel Programming Paradigms	2.25	2.75	2.75	2.5	-	-	-	-	-	-	-	1.5	2.25	2.25	2.5
18	23PCP303 - Design Thinking	2.25	2.75	2.75	2.5	-	-	-	-	-	-	-	1.5	2.25	2.25	2.5
19	23PCP304 - Performance Analysis of Computer Systems	2.2	0.8	2.4	2.4	1.4	1.6	-	-	-	-	-	-	2.2	0.8	2.2
20	23PCP305 - Compiler Optimization Techniques	2.25	2.75	2.75	2.5	2.5	1.25	-	1.5	1.0	1.0	1.0	1.5	2.25	2.25	2.5
21	23PCP306 - Cognitive Computing	2.25	2.75	2.75	2.5	2.5	1.25	2.75	3.0	1.0	1.0	1.0	1.5	2.25	2.25	2.5
22	23PCP307 - Security Practices	1.6	1.8	1.6	1.4	2.0	2.2	-	-	-	-	-	-	3.0	2.0	3.0
23	23PCP308 - Network Design and Technologies	2.2	2.8	2.8	2.0	2.0	1.2	1.0	-	1.0	1.0	1.0	1.6	2.0	2.0	2.0
24	23PCP309 - Embedded Software Development	3.0	2.75	2.75	2.5	2.5	1.25	-	-	1.0	1.0	1.0	1.5	2.25	2.25	2.5
25	23PCP310 - Natural Language Processing	2.25	2.75	2.75	2.5	2.5	1.25	2.75	3.0	1.0	1.0	1.0	1.5	2.25	2.25	2.5
26	23PCP311 - Bio-inspired Computing	3.0	3.0	3.0	3.0	3.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	3.0	3.0	3.0
27	23PCP312 - Speech Processing and Synthesis	3.0	3.0	3.0	3.0	3.0	3.0	3.0	1.0	1.0	1.0	1.0	2.0	3.0	3.0	3.0
28	23PCP313 - Information Security Risk Management	3.0	3.0	3.0	3.0	3.0	1.0	3.0	1.0	1.0	1.0	1.0	2.0	3.0	3.0	1.0
29	23PCP314 - Deep Learning	2.0	2.0	1.0	3.0	2.6	2.6	-	-	-	-	-	-	2.8	2.6	1.4
30	23PCP315 - Cyber Security Standards and Audits	3.0	1.6	1.4	2.8	1.8	1.8	-	-	-	-	-	-	3.0	3.0	3.0





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## OPEN ELECTIVE COURSES

S.N o.	Course Name	PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	23PGO201 - Disaster Management	3.0	2.0	2.0	2.0	1.0	1.0	1.0	-	-	1.0	1.0	1.0	3.0	2.0	1.0
2	23PGO202 - Cost Management of Engineering Projects	3.0	3.0	3.0	3.0	2.0	1.0	1.0	1.0	1.0	1.0	3.0	1.0	2.0	2.0	1.0
3	23PGO203 - Constitution of India	3.0	2.0	2.0	1.0	-	1.0	-	1.0	1.0	1.0	-	1.0	2.0	1.0	1.0
4	23PGO204 - Business Analytics	3.0	3.0	3.0	3.0	2.0	1.0	-	1.0	1.0	1.0	2.0	1.0	3.0	2.0	1.0
5	23PGO205 - Digital Marketing	3.0	3.0	3.0	3.0	2.0	1.0	-	1.0	1.0	1.0	1.0	1.0	3.0	2.0	1.0





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M.E. COMPUTER SCIENCE AND ENGINEERING

## CURRICULUM AND SYLLABI

(For the Students admitted in the Academic Year 2022-2023 onwards)

### FIRST SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
<b>THEORY</b>									
23PCM101	Applied Mathematics for Computer Science	FC	3	1	0	4	40	60	100
23PGT101	Research Methodology and IPR	FC	3	0	0	3	40	60	100
23PCT101	Machine Learning Techniques	PC	3	0	0	3	40	60	100
23PCT102	Web Engineering	PC	3	0	1	4	40	60	100
23PCE101	Advanced Data Structures and Algorithms	PC	3	0	2	4	40	60	100
	Professional Elective –I	PE	3	0	0	3	40	60	100
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23PEE101	Research Paper Writing and Seminar	EEC	1	0	0	0	100	-	100
<b>TOTAL CREDITS IN SEMESTER- I</b>						<b>21</b>			

FC	:	Foundation Courses
PC	:	Professional Core
PE	:	Professional Elective
OE	:	Open Elective
EEC	:	Employability Enhancement Courses
L	:	Lecture
T	:	Tutorial
P	:	Practical
C	:	Credit Point
CIA	:	Continuous Internal Assessment
ESE	:	End Semester Examination
TOT	:	Total





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## SECOND SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks			
			L	T	P		C	CIA	ESE	TOT
<b>THEORY</b>										
23PCT201	Advanced Soft Computing	PC	3	0	0	3	40	60	100	
23PCT202	Industrial IoT	PC	3	0	0	3	40	60	100	
23PCE201	Data Science and Analytics	PC	3	0	2	4	40	60	100	
	Professional Elective–II	PE	3	0	0	3	40	60	100	
	Professional Elective–III	PE	3	0	0	3	40	60	100	
	Open Elective	OE	3	0	0	3	40	60	100	
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>										
23PEE201	Mini Project	EEC	0	0	2	1	100	-	100	
<b>TOTAL CREDITS IN SEMESTER- II</b>						<b>20</b>				

FC	:	Foundation Courses
PC	:	Professional Core
PE	:	Professional Elective
OE	:	Open Elective
EEC	:	Employability Enhancement Courses
L	:	Lecture
T	:	Tutorial
P	:	Practical
C	:	Credit Point
CIA	:	Continuous Internal Assessment
ESE	:	End Semester Examination
TOT	:	Total





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## THIRD SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
<b>THEORY</b>									
	Professional Elective –IV	PE	3	1	0	4	40	60	100
	Professional Elective –V	PE	3	1	0	4	40	60	100
	Professional Elective –VI	PE	3	0	0	3	40	60	100
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23PEE301	Project Work Phase – I	EEC	0	0	12	6	40	60	100
<b>TOTAL CREDITS IN SEMESTER- III</b>						<b>17</b>			

## FOURTH SEMESTER

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
<b>EMPLOYABILITY ENHANCEMENT COURSE</b>									
23PEE401	Project Work Phase – II	EEC	0	0	24	12	40	60	100
<b>TOTAL CREDITS IN SEMESTER -IV</b>						<b>12</b>			

**TOTAL NO. OF CREDITS: 70**

- FC : Foundation Courses
- PC : Professional Core
- PE : Professional Elective
- OE : Open Elective
- EEC : Employability Enhancement Courses
- L : Lecture
- T : Tutorial
- P : Practical
- C : Credit Point
- CIA : Continuous Internal Assessment
- ESE : End Semester Examination
- TOT : Total





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## FOUNDATION COURSES (FC)

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23PCM101	Applied Mathematics For Computer Science	FC	3	1	0	4	40	60	100
23PGT101	Research Methodology and IPR	FC	3	0	0	3	40	60	100

## PROFESSIONAL CORE (PC)

Course Code	Course Title	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23PCT101	Machine Learning Techniques	PC	3	0	0	3	40	60	100
23PCT102	Web Engineering	PC	3	0	2	4	40	60	100
23PCE101	Advanced Data Structures and Algorithms	PC	3	0	2	4	40	60	100
23PCT201	Advanced Soft Computing	PC	3	0	0	3	40	60	100
23PCT202	Industrial IoT	PC	3	0	0	3	40	60	100
23PCE201	Data Science and Analytics	PC	3	0	2	4	40	60	100





## LIST OF ELECTIVES

### I SEMESTER

#### PROFESSIONAL ELECTIVE-I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23PCP101	Advanced Databases	PE	3	0	0	3	40	60	100
23PCP102	Agile Software Development and Usability Engineering	PE	3	0	0	3	40	60	100
23PCP103	Image Processing and Analysis	PE	3	0	0	3	40	60	100
23PCP104	Mobile Application Development	PE	3	0	0	3	40	60	100
23PCP105	Cloud Services and Virtualization	PE	3	0	0	3	40	60	100

### II SEMESTER

#### PROFESSIONAL ELECTIVE-II

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23PCP201	Real Time Systems	PE	3	0	0	3	40	60	100
23PCP202	Data Visualization Techniques	PE	3	0	0	3	40	60	100
23PCP203	Integrated Software Project Management	PE	3	0	0	3	40	60	100
23PCP204	Modern Computer Architecture	PE	3	0	0	3	40	60	100
23PCP205	Software Architectures and Design	PE	3	0	0	3	40	60	100

## II SEMESTER

### PROFESSIONAL ELECTIVE-III

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23PCP206	Human Computer Interaction	PE	3	0	0	3	40	60	100
23PCP207	Block Chain Technology	PE	3	0	0	3	40	60	100
23PCP208	Computer Vision	PE	3	0	0	3	40	60	100
23PCP209	Cyber Security and Computer Forensics	PE	3	0	0	3	40	60	100
23PCP210	Software Quality Assurance and Testing	PE	3	0	0	3	40	60	100

## II SEMESTER

### PROFESSIONAL ELECTIVE-IV

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23PCP301	Security for IoT	PE	3	1	0	4	40	60	100
23PCP302	Parallel Programming Paradigms	PE	3	1	0	4	40	60	100
23PCP303	Design Thinking	PE	3	1	0	4	40	60	100
23PCP304	Performance Analysis of Computer Systems	PE	3	1	0	4	40	60	100
23PCP305	Compiler Optimization Techniques	PE	3	1	0	4	40	60	100

## III SEMESTER

### PROFESSIONAL ELECTIVE-V

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23PCP306	Cognitive Computing	PC	3	1	0	4	40	60	100
23PCP307	Security Practices	PC	3	1	0	4	40	60	100
23PCP308	Network Design and Technologies	PC	3	1	0	4	40	60	100
23PCP309	Embedded Software Development	PE	3	1	0	4	40	60	100
23PCP310	Natural Language Processing	PE	3	1	0	4	40	60	100

## III SEMESTER

### PROFESSIONAL ELECTIVE-VI

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23PCP311	Bio-inspired Computing	PE	3	0	0	3	40	60	100
23PCP312	Speech Processing and Synthesis	PE	3	0	0	3	40	60	100
23PCP313	Information Security Risk Management	PE	3	0	0	3	40	60	100
23PCP314	Deep Learning	PE	3	0	0	3	40	60	100
23PCP315	Cyber Security Standards and Audits	PE	3	0	0	3	40	60	100



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## II SEMESTER OPEN ELECTIVE-I

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23PGO201	Disaster Management	OE	3	0	0	3	40	60	100
23PGO202	Cost Management of Engineering Projects	OE	3	0	0	3	40	60	100
23PGO203	Constitution of India	OE	3	0	0	3	40	60	100
23PGO204	Business Analytics	OE	3	0	0	3	40	60	100
23PGO205	Digital Marketing	OE	3	0	0	3	40	60	100

## EMPLOYABILITY ENHANCEMENT COURSE (EEC)

Course Code	Name of the Subject	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CIA	ESE
23PEE101	Research Paper Writing and Seminar	EEC	1	0	0	0	100	-	100
23PEE201	Mini Project	EEC	0	0	2	1	100	-	100
23PEE301	Project Work Phase – I	EEC	0	0	12	6	40	60	100
23PEE401	Project Work Phase – II	EEC	0	0	24	12	40	60	100

FC	:	Foundation Courses
PC	:	Professional Core
PE	:	Professional Elective
OE	:	Open Elective
EEC	:	Employability Enhancement Courses
L	:	Lecture
T	:	Tutorial
P	:	Practical
C	:	Credit Point
CIA	:	Continuous Internal Assessment
ESE	:	End Semester Examination
TOT	:	Total

# ***SCHEME FOR SYLLABI***

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***M.E. –Computer Science and Engineering***





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## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

### M.E. COMPUTER SCIENCE AND ENGINEERING

#### SEMESTER I

23PCM101

APPLIED MATHEMATICS FOR COMPUTER SCIENCE

L T P C

3 1 0 4

#### OBJECTIVES

- To study the hypothesis about the population using t, f and Chi-square test.
- To learn knowledge of analysis of variance.
- To study about Estimation theory and Regression lines.
- To learn logical thinking and knowledge on how discrete structures actually helped computer engineers to solve problems occurred in the development of programming languages.
- To understand the theoretical knowledge on graph theory and trees.

#### UNIT I TESTING OF HYPOTHESIS

9+3

Sampling distribution – Sample and large samples – Test based on normal, t- test, Chi-square and F- distribution for testing mean, variance and proportions -test for goodness of fit – Independence of attributes.

#### UNIT II DESIGN OF EXPERIMENTS

9+3

Analysis of variance – one way classification – Completely randomised design – Two way classification – Randomised block design – Latin square design.

#### UNIT III ESTIMATION THEORY

9+3

Unbiased estimators – Method of moments – Maximum likelihood estimation – Curve fitting by principles of least squares – Regression lines.

#### UNIT IV PROPOSITIONAL AND PREDICATE CALCULUS

9+3

Propositional Logic – Applications of Propositional Logic – Propositional Equivalences – Predicates and Quantifiers – Nested Quantifiers – Rules of Inference – Introduction to Proofs – Proof Methods and Strategy.

#### UNIT V GRAPHS AND TREES

9+3

Graphs and Graphs Models – Graph Terminology and Special Types of Graph– Matrix Representation of Graphs – Shortest Path Problems – Planar Graphs – Graph Coloring – Introduction to trees – Properties of Trees – Spanning Trees – Minimum Spanning Trees.

**TOTAL : 45+15= 60 PERIODS**





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## OUTCOMES

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

- Identify the inference of the samples by using various methods in testing of hypothesis.
- Explain variances by design of experiments to obtain inferences.
- Apply the concept of Estimation theory.
- Apply logical thinking and its applications to computer science.
- Describe sequential structures, tree structures, and graph structures and its applications.

## TEXT BOOKS

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, Eighth Edition, 2014.
2. Kenneth H.Rosen, K.H., "Discrete Mathematics and its Applications" McGraw Hill Education (India), Private Limited, New Delhi, Special Indian Edition, 2011.

## REFERENCES

1. Dr.Kandasamy. P, Dr.Thilagavathy . K and Dr. Gunavathy .K., "Statistics and Numerical Methods", S. Chand and Company Ltd., NewDelhi, 2010.
2. Tremblay,J.P and Manohar.R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Publishing Company Limited, New Delhi, 30<sup>th</sup> Reprint, 2011

## E-RESOURCES

1. <https://nptel.ac.in/courses/110/107/110107114/> (Testing of Hypothesis)
2. <https://nptel.ac.in/courses/111/106/111106102/> (Propositional Calculus)







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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	1	-	-	-	-	-	-	-	-	-	2	3	1
2	3	2	3	-	-	-	-	-	-	-	-	-	3	2	3
3	3	3	3	-	-	-	-	-	-	-	-	-	3	2	1
4	3	3	3	-	-	-	-	-	-	-	-	-	3	3	1
5	3	3	3	-	-	-	-	-	-	-	-	-	3	3	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	2.8	2.6	-	-	-	-	-	-	-	-	-	2.8	2.6	1.6

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation





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23PGT101

**RESEARCH METHODOLOGY AND IPR**  
(Common to all PG Engineering Courses)

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

## OBJECTIVES

- To learn the problem formulation, analysis and solutions.
- To know the effective literature study approaches.
- To study Technical papers / presentations without violating professional ethics.
- To understand the process of process and procedure of patenting.
- To gain basic knowledge on intellectual property rights.

## UNIT I RESEARCH PROBLEM

9

Meaning of research problem – Sources of research problem – Criteria characteristics of a good research problem – Errors in selecting a research problem – Scope and objectives of research problem – Approaches of investigation of solutions for research problem – Data collection – Analysis – Interpretation – Necessary instrumentations

## UNIT II LITERATURE REVIEW

9

Effective literature studies approaches – Analysis – Plagiarism and research ethics.

## UNIT III TECHNICAL WRITING /PRESENTATION

9

Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee.

## UNIT IV INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR)

9

Nature of Intellectual Property – Patents, Designs – Trade and Copyright – Process of Patenting and Development: technological research – Innovation, patenting, development – International Scenario: International cooperation on Intellectual Property – Procedure for grants of patents, Patenting under PCT.

## UNIT V INTELLECTUAL PROPERTY RIGHTS (IPR)

9

Patent Rights: Scope of Patent Rights – Licensing and transfer of technology – Patent information and databases – Geographical Indications – New Developments in IPR: Administration of Patent System – IPR of Biological Systems, Computer Software etc – Traditional knowledge Case Studies, IPR and IITs.

**TOTAL: 45 PERIODS**

## OUTCOMES

Upon completion of the course, Students will be able to:

- Identify research problems.
- Apply effective literature studies in research work.
- Develop effective technical papers/presentations.
- Describe that today's world is controlled by Computer, Information Technology, but tomorrow the world will be ruled by ideas, concepts, and creativity.





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- Explain about IPR and filing patents in R & D.

## TEXT BOOKS

1. Ranjith Kumar, "Research Methodology: A step-by-step guide for beginners", SAGE Publications, Fourth Edition, 2014.
2. Neeraj Pandey, Khushdeep Dhrani, "Intellectual Property Rights", PHI Learning Private Limited, 2014.

## REFERENCES

1. Heather Silyn-Roberts, "Writing for Science and Engineering: Papers, Presentations and Reports", Elsevier, Second Edition, 2013.
2. Douglas C. Montgomery, "Design and Analysis of Experiments", Ninth Edition, Wiley Publishers, 2017.

## E-RESOURCES

1. <https://nptel.ac.in/courses/121/106/121106007/> (Introduction to Research)
2. <https://nptel.ac.in/courses/109/106/109106137/> (IPR)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	2	1	-	-	-	-	2	1	2	1	2
2	3	2	2	2	2	1	-	-	-	-	2	1	2	1	2
3	3	2	1	1	1	1	-	-	-	-	2	1	2	1	1
4	3	2	2	2	2	1	-	-	-	-	2	1	2	1	1
5	3	2	1	1	1	1	-	-	-	-	2	1	2	1	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	2.0	1.6	1.6	1.6	1.0	-	-	-	-	2.0	1.0	2.0	1.0	1.4

1-Low 2-Medium 3-High '-' – No Correlation





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23PCT101

MACHINE LEARNING TECHNIQUES

L T P C

3 0 0 3

## OBJECTIVES

- To learn the basic concepts and techniques of machine learning.
- To study the neural network algorithms.
- To understand the concept of genetic algorithms for machine learning techniques.
- To learn the learning set of rules.
- To understand the graphical models of machine learning algorithms.

### UNIT I INTRODUCTION

9

Introduction – Designing a Learning System – Perspectives and issues in Machine Learning – A Concept Learning Task – Version Spaces and the Candid Elimination Algorithm – Inductive bias – Decision Tree learning – Inductive bias in Decision Tree Learning – Issues in Decision Tree Learning.

### UNIT II NEURAL NETWORKS

9

Neural Network Representations – perceptrons – Multilayer and Backpropagation Algorithm – An Illustrative Examples: Face Recognition – Advanced Topics in Artificial Neural Networks.

### UNIT III GENETIC ALGORITHMS

9

Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning – Parallelizing Genetic Algorithms.

### UNIT IV LEARNING SET OF RULES

9

Introduction – Sequential Covering Algorithms – Learning First-Order Rules – learning Sets of First-Order Rules: FOIL – Induction as Inverted Deduction – Inverting Resolution.

### UNIT V GRAPHICAL MODELS

9

Introduction – Generative Models – d-Separation – Belief Propagation – Learning the Structure of Graphical Models – Hidden Markov Model.

**TOTAL: 45 PERIODS**

## OUTCOMES

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

- Describe software architecture and its quality attributes.
- Apply back propagation algorithm for machine learning applications.
- Analyze the genetic algorithms for various problems.
- Describe set of rules for machine learning.
- Analyze systems that uses appropriate graph models of machine learning.





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## TEXT BOOKS

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education Private Limited, Indian Edition, 2013.
2. Ethem Alpaydin, "Introduction to Machine Learning 3e (Adaptive Computation and Machine Learning Series)", MIT Press, Third Edition, 2014.

## REFERENCES

1. Stephen Marsland, "Machine Learning: An Algorithmic Perspective", CRC Press, 2009.
2. Jason Bell, "Machine learning – Hands on for Developers and Technical Professionals", First Edition, Wiley, 2014.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/105/106105152/> (Different Types of Learning)
2. <https://nptel.ac.in/courses/106/106/106106202/> (Learning Problem)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
2	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
3	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
4	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
5	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>AVG</b>	<b>3.0</b>	<b>3.0</b>	<b>3.0</b>	-	-	-	-	-	-	-	-	-	<b>3.0</b>	<b>2.0</b>	<b>3.0</b>

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation





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23PCT102

WEB ENGINEERING

L T P C

3 0 2 4

## OBJECTIVES

- To understand the characteristics of web applications
- To learn to Model web applications
- To gain knowledge in systematic design methods
- To know the testing techniques for web applications
- To study the web application development and project management application.
- To design and develop web applications.

## UNIT I INTRODUCTION TO WEB ENGINEERING

9

Motivation, Categories of Web Applications, Characteristics of Web Applications. Requirements of Engineering in Web Applications- Web Engineering-Components of Web Engineering-Web Engineering Process-Communication-Planning.

## UNIT II WEB APPLICATION ARCHITECTURES & MODELLING WEB APPLICATIONS

9

Introduction- Categorizing Architectures- Specifics of Web Application Architectures, Components of a Generic Web Application Architecture- Layered Architectures, 2-Layer Architectures, N-Layer Architectures-Data-aspect Architectures, Database-centric Architectures- Architectures for Web Document Management- Architectures for Multimedia Data - Modeling Concepts -Modeling languages- Analysis Modeling for Web Apps-The Content Model-The Interaction Model-Configuration Model.

## UNIT III WEB APPLICATION DESIGN

9

Design for Web Apps - Goals-Design Process-Interactive Design- Principles and Guidelines- Workflow-Preliminaries-Design Steps- Usability- Issues- Information Design- Information Architecture- structuring- Accessing Information-Navigation Design- Functional Design-Web App Functionality- Design Process- Functional Architecture- Detailed Functional Design.

## UNIT IV TESTING WEB APPLICATIONS

9

Introduction-Fundamentals-Test Specifics in Web Engineering-Test Approaches- Conventional Approaches, Agile Approaches- Testing concepts- Testing Process -Test Scheme- Test Methods and Techniques- Link Testing- Browser Testing-Usability Testing- Load, Stress, and Continuous Testing, Testing Security, Test-driven Development, -Content Testing-User Interface testing-Usability Testing-Compatibility Testing-Component Level Testing-Navigation Testing-Configuration testing - Security and Performance Testing- Test Automation.







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## UNIT V PROMOTING WEB APPLICATIONS AND WEB PROJECT MANAGEMENT 9

Introduction-challenges in launching the web Application-Promoting Web Application- Content Management-Usage Analysis-Web Project Management-Challenges in Web Project Management-Managing Web Team- Managing the Development Process of a Web Application-Risk, Developing a Schedule, Managing Quality, Managing Change, Tracking the Project. Introduction to node JS – web sockets.

### LIST OF EXPERIMENTS

1. Write a program in Java Script for the following:
  - Copying, passing, and comparing by value
  - Copying, passing, and comparing by reference
  - References themselves are passed by value
2. Write program in Java Script for pattern matching using regular expressions and errors in scripts.
3. Analyze the designing of a web page with various cascading style sheets.
4. Design a web application to calculate the Celsius to Fahrenheit.
5. Test the Web Application to check for the proper functioning.

**TOTAL : 45+15 = 60 PERIODS**

### OUTCOMES

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

- Explain the characteristics of web applications.
- Model web applications.
- Design web applications.
- Apply Agile approaches to test web applications.
- Perform web applications and project management applications.
- Design and implementation of web applications.

### TEXT BOOKS

1. Chris Bates, "Web Programming: Building Internet Applications", Third Edition, Wiley India Edition, 2007.
2. Gerti Kappel, Birgit Proll, "Web Engineering", John Wiley and Sons Ltd, 2006.

### REFERENCES

1. Guy W. Lecky-Thompson, "Web Programming", Cengage Learning, 2008.
2. John Paul Mueller, "Web Development with Microsoft Visual Studio 2005", Wiley Dream tech, 2006.







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## E-RESOURCES

1. <https://nptel.ac.in/courses/106/106/106106156/> (Web Architecture)
2. <https://www.digimat.in/nptel/courses/video/106101163/L47.html> (Introduction to Web Engineering)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
2	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
3	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
4	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
5	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
6	2	2	3	2	1	2	-	-	2	1	2	2	2	2	-
AVG	2.83	2.83	3.0	0.33	0.16	0.33	-	-	0.33	0.16	0.33	0.33	2.83	2.0	2.5

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation





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23PCE101

ADVANCED DATA STRUCTURES AND ALGORITHMS

L T P C  
3 0 2 4

## OBJECTIVES

- To understand the usage of algorithms in computing.
- To learn and use hierarchical data structures and its operations
- To learn the usage of graphs and its applications.
- To study data structures and algorithms that is appropriate for problems.
- To understand the NP problems.
- To apply various algorithms in programming.

## UNIT I ROLE OF ALGORITHMS IN COMPUTING

9

Algorithms – Algorithms as a Technology- Insertion Sort – Analyzing Algorithms – Designing Algorithms- Growth of Functions: Asymptotic Notation – Standard Notations and Common Functions- Recurrences: The Substitution Method – The Recursion-Tree Method

## UNIT II HIERARCHICAL DATASTRUCTURES

9

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red- Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion -B-Trees: Definition of B- trees – Basic operations on B-Trees – Deleting a key from a B-Tree- FibonacciHeaps: structure – Mergeable-heap operations- Decreasing a key and deleting a node- Bounding the maximum degree.

## UNIT III GRAPHS

9

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra'sAlgorithm; All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd- Warshall Algorithm;

## UNIT IV ALGORITHM DESIGN TECHNIQUES

9

Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: An Activity-Selection Problem – Elements of the Greedy Strategy- HuffmanCodes.

## UNIT V NP COMPLETE AND NP HARD

9

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP- Completeness and Reducability – NP-Completeness Proofs – NP-Complete Problems.





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(Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai)

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## LIST OF EXPERIMENTS

1. Implementation of Merge Sort and Quick Sort-Analysis
2. Implementation of a Binary SearchTree
3. Graph Traversals
4. Spanning Tree Implementation
5. Shortest Path Algorithms (Dijkstra's algorithm, Bellmann Ford Algorithm)
6. Activity Selection and Huffman Coding Implementation.

**TOTAL : 45+15= 60 PERIODS**

## OUTCOMES

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

- Analyze data structures and algorithms to solve computing problems.
- Describe algorithms using graph structure and various string matching algorithms to solvereal-life problems.
- Apply suitable design strategy for problem solving.
- Define data structures and algorithms that is appropriate for problems.
- Analyze the NP problems.
- Apply various algorithms in programming.

## TEXT BOOKS

1. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, First Edition, Reprint 2006.
2. Robert Sedgewick and Kevin Wayne, "ALGORITHMS", Pearson Education, Fourth Edition, 2011.

## REFERENCES

1. S.Sridhar, "Design and Analysis of Algorithms", Oxford University Press., First Edition, 2014.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Third Edition, Prentice-Hall, 2011.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/106/106106131/> (Introduction to Data Structures)
2. <https://nptel.ac.in/courses/106/104/106104019/> (Trees, Graphs)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	3	1	3	-	-	-	-	-	-	3	2	3
2	3	1	-	-	2	3	-	-	-	-	-	-	3	2	3
3	3	-	1	1	-	2	-	-	-	-	-	-	3	2	3
4	3	2	1	-	2	1	-	-	-	-	-	-	3	2	3
5	3	3	1	1	-	1	-	-	-	-	-	-	3	2	3
6	3	2	1	-	1	2	-	-	-	-	-	-	3	2	3
AVG	3.0	1.6	1.0	0.8	1.0	2.0	-	-	-	-	-	-	3.0	2.0	3.0

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation





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23PEE101

RESEARCH PAPER WRITING AND SEMINAR

L T P C

1 0 0 0

In this course, students will develop their scientific and technical reading and writing skills that they need to understand and construct research articles. A term paper requires a student to obtain information from a variety of sources (i.e., Journals, dictionaries, reference books) and then place it in logically developed ideas. The work involves the following steps:

1. Selecting a subject, narrowing the subject into a topic
2. Stating an objective.
3. Collecting the relevant bibliography (at least 15 journal papers).
4. Preparing a draft outline of research work.
5. Studying the papers and understanding the authors contributions and critically analyzing each paper.
6. Linking the papers and preparing a draft of the paper.
7. Preparing conclusions based on the reading of all the papers.
8. Writing the Final Paper and giving final Presentation.
9. Maintaining a file for records of activities.

### Activities to be carried out

Activity	Instructions	Submission week	Evaluation
Selection of area of interest and Topic	You are requested to select an area of interest, topic and state an objective	2 <sup>nd</sup> week	3 % Based on clarity of thought, current relevance and clarity in writing
Stating an Objective			



Collecting Information about your area & topic	<ol style="list-style-type: none"> <li>1. List 1 Special Interest Groups or professional society</li> <li>2. List 2 journals</li> <li>3. List 2 conferences, symposia or workshops</li> <li>4. List 1 thesis title</li> <li>5. List 3 web presences (mailing lists, forums, news sites)</li> <li>6. List 3 authors who publish regularly in your area</li> <li>7. Attach a call for papers (CFP) from your area.</li> </ol>	3 <sup>rd</sup> week	<b>3%</b> ( the selected information must be area specific and of international and national standard)
Collection of Journal papers in the topic in the context of the objective —collect 20 & then filter	<ul style="list-style-type: none"> <li>• You have to provide a complete list of references you will be using- Based on your objective -Search various digital libraries and Google Scholar</li> <li>• When picking papers to read - try to: <ul style="list-style-type: none"> <li>• Pick papers that are related to each other in some ways and/or that are in the same field so that you can write a meaningful survey out of them,</li> <li>• Favour papers from well-known journals and conferences,</li> <li>• Favour —first foundational papers in the field (as indicated in other people's survey paper),</li> <li>• Favour more recent papers,</li> <li>• Pick a recent survey of the field so you can quickly gain an overview,</li> <li>• Find relationships with respect to each other and to your topic area (classification scheme/categorization)</li> <li>• Mark in the hard copy of papers whether complete work or section/sections of the paper are being considered</li> </ul> </li> </ul>	4 <sup>th</sup> week	<b>6%</b> ( the list of standard papers and reason for selection)
Reading and notes for first 5 papers	<p>Reading Paper Process</p> <ul style="list-style-type: none"> <li>• For each paper form a Table answering the following questions:</li> <li>• What is the main topic of the article?</li> </ul>	5 <sup>th</sup> week	<b>8%</b> ( the table given should indicate your



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	<ul style="list-style-type: none"> <li>• What was/were the main issue(s) the author said they want to discuss?</li> <li>• Why did the author claim it was important?</li> <li>• How does the work build on other's work, in the author's opinion?</li> <li>• What simplifying assumptions does the author claim to be making?</li> <li>• What did the author do?</li> <li>• How did the author claim they were going to evaluate their work and compare it to others?</li> <li>• What did the author say were the limitations of their research?</li> <li>• What did the author say were the important directions for future research?</li> </ul> <p>Conclude with limitations/issues not addressed by the paper ( from the perspective of your survey)</p>		<p>understanding of the paper and the evaluation is based on your conclusions about Each paper)</p>
<p>Reading and notes for next 5 papers</p>	<p>Repeat Reading Paper Process</p>	<p>6<sup>th</sup> week</p>	<p><b>8%</b> ( the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)</p>







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Reading and notes for final 5 papers	Repeat Reading Paper Process	7 <sup>th</sup> week	<b>8%</b> ( the table given should indicate your understanding of the paper and the evaluation is based on your conclusions about each paper)
Draft outline 1 and Linking papers	Prepare a draft Outline, your survey goals, along with a classification / categorization diagram	8 <sup>th</sup> week	<b>8%</b> ( this component will be evaluated based on the linking and classification among the papers)
Abstract	Prepare a draft abstract and give a presentation	9 <sup>th</sup> week	<b>6%</b> (Clarity, purpose and conclusion) <b>6%</b> Presentation & Viva Voce
Introduction Background	Write an introduction and background sections	10 <sup>th</sup> week	<b>5%</b> ( clarity)





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Sections of the paper	Write the sections of your paper based on the classification / categorization diagram in keeping with the goals of your survey	11 <sup>th</sup> week	<b>10%</b> (this component will be evaluated based on the linking and classification among the papers)
Your conclusions	Write your conclusions and future work	12 <sup>th</sup> week	<b>5%</b> (conclusions –clarity and your ideas)
Final Draft	Complete the final draft of your paper	13 <sup>th</sup> week	<b>10%</b> (formatting, English, Clarity and linking) <b>4%</b> Plagiarism Check Report
Seminar	A brief 15 slides on yourpaper	14 <sup>th</sup> & 15 <sup>th</sup> week	10%(based on presentation and Viva-voce)

**TOTAL: 30 PERIODS**





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU

SEMESTER II



23PCT201

ADVANCED SOFT COMPUTING

L T P C

3 0 0 3

## OBJECTIVES

- To learn the basic concepts of Soft Computing.
- To know the various techniques like neural networks.
- To understand Genetic algorithms and fuzzy systems.
- To apply soft computing techniques to solve problems.
- To understand the genetic representations.

### UNIT I INTRODUCTION TO SOFT COMPUTING

9

Introduction – Artificial Intelligence – Artificial Neural Networks – Fuzzy Systems – Genetic Algorithm and Evolutionary Programming – Swarm Intelligent Systems – Classification of ANNs – McCulloch and Pitts Neuron Model – Learning Rules: Hebbian and Delta – Perceptron Network – Adaline Network – Madaline Network.

### UNIT II ARTIFICIAL NEURAL NETWORKS

9

Introduction — Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks, back propagation learning methods, effect of learning rule coefficient ;back propagation algorithm, factors affecting backpropagation training, applications.

### UNIT III FUZZY SYSTEMS

9

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion — Membership functions, inference in fuzzy logic, fuzzy if–then rules, Fuzzy implications and Fuzzy algorithms.

### UNIT IV GENETIC ALGORITHMS

9

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.

### UNIT V HYBRID SYSTEMS

9

Hybrid Systems – Neural Networks, Fuzzy Logic and Genetic – GA Based Weight Determination – LR-Type Fuzzy Numbers – Fuzzy Neuron – Fuzzy BP Architecture – Learning in Fuzzy BP – Inference by Fuzzy BP – Fuzzy ArtMap: A Brief Introduction – Soft Computing Tools – GA in Fuzzy Logic Controller Design – Fuzzy Logic Controller – Case Studies.

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Apply suitable soft computing techniques for various applications.
- Describe various soft computing techniques for complex problems.
- Analyze and integrate various soft computing techniques.
- Apply genetic algorithm to solve problems effectively and efficiently.
- Analyze the various problems and to be solved by hybrid systems.

## TEXT BOOKS

1. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming" , Oxford University Press, 2015.
2. S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd.,Second Edition, 2011.

## REFERENCES

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro - Fuzzy and Soft Computing", Prentice-Hall of India, 2002.
2. Kwang H.Lee, "First course on Fuzzy Theory and Applications", Springer, 2005.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/105/106105173/> (Introduction to Soft computing)
2. <https://www.digimat.in/nptel/courses/video/106105173/L01.html> (Computing Techniques)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
2	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
3	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
4	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
5	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	3.0	3.0	-	-	-	-	-	-	-	-	-	3.0	2.0	3.0

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation





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23PCT202

INDUSTRIAL IoT

LT P C  
3 0 0 3

## OBJECTIVES:

- To understand the fundamentals of Internet of Things.
- To learn about the basics of IOT protocols.
- To study the embedded system using RaspberryPi.
- To know the concept of Internet of Things in the real world scenario.
- To study various use cases in industries.

### UNIT I INTRODUCTION TO IoT

9

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.

### UNIT II IoT ARCHITECTURE

9

M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT referencemodel - Domain model - information model - functional model - communication model - IoT reference architecture.

### UNIT III IoT PROTOCOLS

9

Protocol Standardization for IoT — Efforts — M2M and WSN Protocols — SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP – Security.

### UNIT IV BUILDING IoT WITH RASPBERRY PI & ARDUINO

9

Building IOT with RASPBERRY PI- IoT Systems - Logical Design using Python — IoT PhysicalDevices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi -Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Platforms - Arduino.

### UNIT V CASE STUDIES AND REAL - WORLD APPLICATIONS

9

Real world design constraints - Applications - Asset management, Industrial automation, smart grid,Commercial building automation,Smart cities — participatory sensing- Amazon Web Services for IoT. Industrial IoT- Application Domains: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies.

**TOTAL : 45 PERIODS**





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## OUTCOMES

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

- Discuss various protocols for IoT.
- Analyze web services to access/control IoT devices.
- Describe embedded system using RaspberryPi.
- Apply the concept of Internet of Things in the real world scenario.
- Analyze applications of IoT in real time scenario.

## TEXT BOOKS

1. Arshdeep Bahga, Vijay Madiseti, "Internet of Things — A hands-on approach", Universities Press, First Edition, 2015.
2. Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", (Apress), First Edition, 2016.

## REFERENCES

1. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
2. Jan Ho" ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things -Introduction to a New Age of Intelligence", Elsevier, 2014.

## E – RESOURCES

1. <https://nptel.ac.in/courses/106/105/106105166/> (Introduction to IoT)
2. [https://onlinecourses.swayam2.ac.in/arp19\\_ap52/preview](https://onlinecourses.swayam2.ac.in/arp19_ap52/preview) (IoT Protocols)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	1	2	1	1	3	-	-	-	-	-	-	3	2	3
2	3	2	1	2	3	2	-	-	-	-	-	-	3	2	3
3	1	1	2	1	3	3	-	-	-	-	-	-	3	2	3
4	2	3	2	1	2	2	-	-	-	-	-	-	3	2	3
5	1	2	1	2	1	1	-	-	-	-	-	-	3	2	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	1.6	1.8	1.6	1.4	2.0	2.2	-	-	-	-	-	-	3.0	2.0	3.0

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation







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23PCE201

DATA SCIENCE AND ANALYTICS

L T P C

3 0 2 4

## OBJECTIVES

- To understand the basics of Data Science.
- To learn different conventional data analytics tools.
- To know the advanced analytical theory and methods.
- To learn data analytics using Python.
- To learn exploratory data analytics using Python.
- To implement data analytics techniques in Data Science Application.

## UNIT I INTRODUCTION

9

Introduction of Data Science – Basic Data Analytics using R – R Graphical User Interfaces – Data Import and Export – Attribute and Data Types – Descriptive Statistics – Exploratory Data Analysis – Visualization Before Analysis – Dirty Data – Visualizing a Single Variable – Examining Multiple Variables – Data Exploration Versus Presentation.

## UNIT II CONVENTIONAL DATA ANALYTICS TOOLS

9

Analytic processes and tools, Analysis vs reporting - Modern data analytic tools, Statistical concepts: Sampling distributions, resampling, statistical inference, and prediction error. Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods.

## UNIT III ADVANCED ANALYTICAL THEORY AND METHODS

9

Overview of Clustering – K-means – Use Cases – Overview of the Method – Perform a K-means Analysis using R – Classification – Decision Trees – Overview of a Decision Tree – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Tree in R – Bayes' Theorem – Naïve Bayes Classifier – Smoothing – Naïve Bayes in R.

## UNIT IV DATA ANALYTICS USING PYTHON

9

Understanding the Data- Python Packages for Data Science- Importing and Exporting Data in Python - Importing Datasets for Python- Data Wrangling-Pre-processing Data in Python- Dealing with Missing Values in Python -Data Formatting in Python- Data Normalization in Python.- Binning in Python. -Turning categorical variables into quantitative variables in Python.

## UNIT V EXPLORATORY DATA ANALYTICS USING PYTHON

9

Exploratory Data Analysis -Descriptive Statistics- GroupBy in Python- Data correlation in python Correlation Statistics -Analysis of Variance (ANOVA). Linear Regression and Multiple Linear Regression Model Evaluation using Visualization- Polynomial Regression and Pipelines - Measures for In-Sample Evaluation -Model Development and applications.







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## LIST OF EXPERIMENTS

1. Introduction to R tool for for Data Science.
2. K-means Clustering.
3. Linear and Logistic Regression.
4. Sending Emails with Python.
5. Implement Sentiment analysis using Python.
6. Sample Data analysis using Python and R.

**TOTAL: 45+15 = 60 PERIODS**

## OUTCOMES

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

- Describe the importance of Data Science.
- Apply different tools and techniques for analysis.
- Analyze Classification and Clustering methods.
- Apply data analytical techniques using Python.
- Use appropriate exploratory data analytical techniques using Python.
- Implement data analytics techniques in Data Science Application.

## TEXTBOOKS

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Kindle Edition, First Edition, 2015.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Third Edition, 2020.

## REFERENCES

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, 2008.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/106/106106179/> (Variables and Data Types in R)
2. <https://nptel.ac.in/courses/106/107/106107220/> (Python Demo for Distributions)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
2	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
3	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
4	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
5	3	3	3	-	-	-	-	-	-	-	-	-	3	2	3
6	3	2	-	-	3	-	-	-	-	-	2	-	2	3	-
AVG	3	2.83	1.33	-	0.5	-	-	-	-	-	0.33	-	2.83	2.16	2.5

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation





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23PEE201

MINI PROJECT

L T P C  
0 0 2 1

## OBJECTIVES

To analyze specific problem for the current need of the society/ industry and develop a solution by using programming languages, algorithms, mechanisms and new tools and to present in the form of complete report.

## GUIDELINES

Students have to work individually under the supervision of a faculty member, with standard programming languages, computational tools and software packages for analyzing, designing and implementing a solution. A detailed report on the work done shall be submitted by individual student in the form of a report and presentation.

**TOTAL: 30 PERIODS**

## OUTCOMES

At the end of the course the students will have a clear idea of his/her area of work, methodology for solution implementation and finally prepare the complete report.

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	1	1	-	-	-	-	-	1	3	2	2
AVG	3.0	3.0	2.0	2.0	1.0	1.0	-	-	-	-	-	1.0	3.0	2.0	2.0

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation





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## SEMESTER III

23PEE301

PROJECT WORK (PHASE-I)

L T P C

0 0 12 6

### OBJECTIVES

- To identify a specific problem for the current need of the society and collecting information related to the same through detailed review of literature.
- To develop the methodology to solve the identified problem.
- To train the students in preparing project reports and to face reviews and viva-voce examination.

### GUIDELINES

The student individually works on a specific topic approved by faculty member who is familiar in this area of interest. The student can select any topic which is relevant to his/her specialization of the programme. The topic may be experimental or analytical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

**TOTAL: 180 PERIODS**

### OUTCOMES

At the end of the course project the students will have a clear idea of his/her area of work and they are in a position to carry out the remaining phase II work in a systematic way.

### Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	1	1	-	-	-	1	1	1	3	2	2
AVG	3.0	3.0	2.0	2.0	1.0	1.0	-	-	-	1.0	1.0	1.0	3.0	2.0	2.0

1-Low 2-Medium 3-High '-' – No Correlation





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## SEMESTER IV

23PEE401

PROJECT WORK (PHASE – II)

L T P C

0 0 24 12

### OBJECTIVES

- To solve the identified problem based on the formulated methodology.
- To develop skills to analyze and discuss the test results, and make conclusions.
- To train the students in preparing project reports and to face reviews and viva– voce examination.

### GUIDELINES

The student should continue the phase-I work on the selected topic as per the formulated methodology. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated through based on the report and the viva-voce examination by a panel of examiners including one external examiner.

**TOTAL: 360 PERIODS**

### OUTCOMES

On completion of the project work students will be in a position to take up any challenging practical problem and find better solutions.

### Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	2	1	1	-	-	-	1	1	1	3	2	2
AVG	3.0	3.0	2.0	2.0	1.0	1.0	-	-	-	1.0	1.0	1.0	3.0	2.0	2.0

1-Low 2-Medium 3-High '-' – No Correlation





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## SEMESTER I

### PROFESSIONAL ELECTIVE - I

23PCP101

ADVANCED DATABASES

L T P C

3 0 0 3

#### OBJECTIVES

- To study the various database revolution.
- To learn the NoSQL databases for analyzing the big data.
- To understand the different data models based on data representation methods and storage needs.
- To study the application programming interface with SQL and NoSQLdatabases.
- To know the survey on future generation databases.

#### UNIT I INTRODUCTION

9

Database Revolutions- System Architecture- Relational Database- Database Design Data Storage- Transaction Management- Data warehouse and Data Mining- Information Retrieval

#### UNIT II DOCUMENT DATABASES

9

Big Data Revolution- CAP Theorem- Birth of NoSQL- Document Database—XML Databases- JSON Document Databases- Graph Databases. Column Databases— Data Warehousing Schemes- Columnar Alternative- Sybase IQ- C-store and Vertica- Column Database Architectures- SSD and In-Memory Databases— In Memory Databases- Berkeley Analytics Data Stack and Spark.

#### UNIT III DISTRIBUTED DATABASE PATTERNS

9

Distributed Relational Databases- Non-relational Distributed Databases- MongoDB - Sharing and ReplicationHBase- Cassandra Consistency Models— Types of Consistency- Consistency MongoDB- HBase ConsistencyCassandra Consistency.

#### UNIT IV DATA MODELS AND STORAGE

9

SQL- NoSQL APIs- Return SQL- Advance Databases-PostgreSQL- Riak-HBase-MongoDB- Cassandra Query Language-MapReduce-Pig-DAG-Cascading-Spark- CouchDB- NEO4J- Redis.

#### UNIT V FUTURE DATABASE

9

Database of Future-Key value database-Distrubutive transaction-Other Convergent Databases- Disruptive Database Technologies - Storage Technologies – BlockChain - Quantum Computing.

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Identify the various database revolution model in big data analytics.
- Analyze the big data for useful business.
- Analyze the different data models based on data representation methods and storage needs.
- Apply application programming interface with SQL and NoSQL databases.
- Describe the survey on future generation databases.

## TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGrawHill, Seventh Edition, 2019
2. Guy Harrison, "Next Generation Databases", Apress, First Edition, 2015.

## REFERENCES

1. Eric Redmond, Jim R Wilson, "Seven Databases in Seven Weeks", LLC. 2012
2. Dan Sullivan, "NoSQL for Mere Mortals", Addison-Wesley, 2015.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/106/106106093/> (Introduction to Database Management System)
2. <https://nptel.ac.in/courses/106/104/106104021/> (Indexing and searching)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	1	3	1	2	-	-	-	-	-	-	3	3	3
2	2	2	-	2	1	1	-	-	-	-	-	-	3	3	3
3	3	1	2	1	-	1	-	-	-	-	-	-	3	3	3
4	3	2	2	1	1	1	-	-	-	-	-	-	3	3	3
5	2	3	1	1	-	1	-	-	-	-	-	-	3	3	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>AVG</b>	<b>2.4</b>	<b>2.0</b>	<b>1.2</b>	<b>1.6</b>	<b>0.6</b>	<b>1.2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3.0</b>	<b>3.0</b>	<b>3.0</b>

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation







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## 23PCP102 AGILE SOFTWARE DEVELOPMENT AND USABILITY ENGINEERING L T P C 3 0 0 3

### OBJECTIVES

- To understand the genesis of Agile and driving forces for choosing Agile techniques.
- To study the Agile Scrum framework and development practices.
- To know the Agile testing methodologies and perform testing and activities within an agile project.
- To learn the software design principles and refactoring techniques to achieve agility.
- To understand the business value for adopting agile software development.

### UNIT I FUNDAMENTALS OF AGILE 9

The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools

### UNIT II AGILE SCRUM FRAMEWORK 9

Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles — Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management

### UNIT III AGILE TESTING 8

The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester

### UNIT IV AGILE SOFTWARE DESIGN AND DEVELOPMENT 10

Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control.





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## UNIT V INDUSTRY TRENDS

9

Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid

**TOTAL: 45 PERIODS**

### OUTCOMES

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

- Explain the genesis of Agile and driving forces for choosing Agile techniques.
- Implement the Agile Scrum framework and development practices.
- Analyze the software product using Agile testing methodologies and perform testing activities within an agile project.
- Apply software design principles and refactoring techniques to achieve agility.
- Describe the agile approach impact on cutting-edge technologies and also realize the business value for adopting agile software development.

### TEXT BOOKS

1. Ken Schwaber, Mike Beedle, "Agile Software Development with Scrum", Pearson, 2014.
2. Robert C. Martin, "Agile Software Development, Principles, Patterns and Practices" Pearson, First Edition, 2003.

### REFERENCES

1. Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams" Addison Wesley, 2008.
2. Alistair Cockburn, "Agile Software Development: The Cooperative Game" Addison Wesley, Second Edition, 2006.

### E-RESOURCES

1. <https://nptel.ac.in/courses/106/101/106101061/> (Introduction to Software Engineering)
2. <https://lecturenotes.in/s/1421-agile-software-development/videos> (Agile Methodology)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	3	-	2	3	-	-	-	-	-	-	1	1	1
2	2	-	3	3	1	3	-	-	-	-	-	-	1	2	2
3	3	-	-	-	3	3	-	-	-	-	-	-	1	1	1
4	2	-	1	2	3	3	-	-	-	-	-	-	1	2	2
5	1	3	-	-	2	3	-	-	-	-	-	-	1	1	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.2	0.8	1.4	1.0	2.2	3.0	-	-	-	-	-	-	1.0	1.4	1.4

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation





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23PCP103

IMAGE PROCESSING AND ANALYSIS

L T P C

3 0 0 3

## OBJECTIVES

- To learn the basics of digital images.
- To study various types of filters.
- To understand the steps involved in the analysis of an image viz., segmentation and edge detection.
- To know the morphological operations.
- To understand the texture analysis and compression techniques.

## UNIT I SPATIAL DOMAIN PROCESSING

9

Introduction to digital image processing - Fundamental Steps - Components – imaging modalities – image file formats – image sensing and acquisition – image sampling and quantization – noise models – spatial filtering operations – histograms – smoothing filters – sharpening filters – fuzzy techniques for spatial filtering – spatial filters for noise removal.

## UNIT II FREQUENCY DOMAIN PROCESSING

9

Frequency domain – Review of Fourier Transform (FT), Discrete Fourier Transform (DFT), and Fast Fourier Transform (FFT) – filtering in frequency domain – image smoothing – image sharpening – selective filtering – frequency domain noise filters.

## UNIT III SEGMENTATION AND EDGE DETECTION

9

Thresholding techniques – region growing methods – region splitting and merging – adaptive thresholding – threshold selection – global valley – histogram concavity – edge detection – template matching – gradient operators – circular operators – differential edge operators – hysteresis thresholding – Canny operator – Laplacian operator – active contours – object segmentation.

## UNIT IV INTEREST POINTS, MORPHOLOGY, AND TEXTURE

9

Corner and interest point detection – template matching – second order derivatives – median filter based detection – Harris interest point operator – corner orientation – local invariant feature detectors and descriptors – morphology – dilation and erosion – morphological operators – grayscale morphology – noise and morphology.

## UNIT V COLOR IMAGES AND IMAGE COMPRESSION

9

Color models – pseudo colors – full-color image processing – color transformations – smoothing and sharpening of color images – image segmentation based on color – noise in





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color images. Image Compression – redundancy in images – coding redundancy – irrelevant information in images – image compression models – basic compression methods : Huffman Coding, Golomb Coding – digital image watermarking.

**TOTAL: 45 PERIODS**

## OUTCOMES

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

- Explain image modalities, sensing, acquisition, sampling, and quantization.
- Perform spatial and frequency domain transformations.
- Apply segmentation algorithms and edge detection techniques.
- Define various morphological operations.
- Analyze colour images and implement image compression algorithms.

## TEXT BOOKS

1. R. C. Gonzalez and R. E. Woods, “Digital Image Processing”, Pearson, Third Edition, 2008.
2. E. R. Davies, “Computer & Machine Vision”, Academic Press, Fourth Edition, 2012.

## REFERENCES

1. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Academic Press, Third Edition, 2012.
2. D. L. Baggio et al., “Mastering OpenCV with Practical Computer Vision Projects”, Packt Publishing, 2012.

## E-RESOURCES

1. <http://nptel.ac.in/courses/106105032/> (Digital Image Processing Introduction)
2. <https://nptel.ac.in/courses/117/105/117105135/> (Point Detection Algorithms)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	3	-	-	-	-	-	-	-	-	-	-	-
2	2	-	3	3	2	3	-	-	-	-	-	-	-	-	-
3	3	3	-	2	-	-	-	-	-	-	-	-	-	-	-
4	3	-	-	2	3	3	-	-	-	-	-	-	-	-	-
5	2	2	2	2	2	3	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.4	1.4	1.0	2.4	1.4	1.8	-	-	-	-	-	-	-	-	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation





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23PCP104

MOBILE APPLICATION DEVELOPMENT

L T P C  
3 0 0 3

## OBJECTIVES

- To understand system requirements for mobile applications.
- To study the mobile development frameworks.
- To understand the knowledge about mobile application design.
- To learn the designing activities using android applications.
- To study the IOS features and UI concepts.

### UNIT I INTRODUCTION

5

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications.

### UNIT II BASIC DESIGN

8

Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

### UNIT III ADVANCED DESIGN

8

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

### UNIT IV ANDROID

12

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

### UNIT V IOS

12

Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace.

**TOTAL: 45 PERIODS**







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## OUTCOMES

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

- Describe the requirements for mobile applications.
- Explain the challenges in mobile application design and development.
- Design the framework for mobile applications.
- Discuss the designing activities using android SDK.
- Analyze the design using Objective C and iOS.

## TEXT BOOKS

1. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012.
2. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6 Development: Exploring the iOS SDK", Apress, First Edition, 2013.

## REFERENCES

1. Reto Meier, "Professional android Development", Wiley-India Edition, 2012.
2. James Dovey and Ash Furrow, "Beginning Objective C", Apress, First Edition, 2012.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/106/106106156/> (Introduction to Modern Application Development)
2. <https://nptel.ac.in/courses/106/106/106106222/> (Mobile Application Development)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	-	3	3	-	-	-	-	-	-	-	3	3	3
2	3	1	1	3	-	2	-	-	-	-	-	-	3	3	3
3	3	2	3	3	3	1	-	-	-	-	-	-	3	3	3
4	3	1	1	2	-	3	-	-	-	-	-	-	3	3	3
5	3	2	2	3	3	3	-	-	-	-	-	-	3	3	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	1.6	1.4	2.8	1.8	1.8	-	-	-	-	-	-	3.0	3.0	3.0

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation





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23PCP105

CLOUD SERVICES AND VIRTUALIZATION

L T P C

3 0 0 3

## OBJECTIVES

- To study the types of virtualization.
- To know the concept of cloud and utility computing.
- To learn the various cloud platforms and the need for cloud security.
- To gain the knowledge in cloud programming model.
- To understand the emergence of cloud as the next generation computing paradigm.

## UNIT I CLOUD INFRASTRUCTURE

9

Scalable Computing over the Internet – Technologies for Network based Systems - System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture- Cloud Computing and Services Model – Public, Private and Hybrid Clouds – Cloud Eco System- IaaS - PaaS – SaaS.

## UNIT II VIRTUALIZATION STRUCTURES

9

Implementation Levels of Virtualization - Virtualization Structures — Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource Management — Virtualization for Data-Center Automation.

## UNIT III CLOUD SYSTEM MODEL

9

Architectural Design of Compute and Storage Clouds — Layered Cloud Architecture Development — Design Challenges - Public Cloud Platforms- GAE, AWS, and Azure- Inter Cloud Resource Management — VM Management - Resource Provisioning and Platform Deployment - Global Exchange of Cloud Resources - Cloud Security and Trust Management.

## UNIT IV CLOUD SECURITY - MIDDLEWARE AND TESTING

9

Parallel and Distributed Programming Paradigms — MapReduce , Twister and Iterative MapReduce — Hadoop Library from Apache — Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments - Eucalyptus, Open Nebula, OpenStack. CloudSim — Architecture - Cloudlets — VM creation — Broker — VM allocation — Hosts — Data Center.

## UNIT V CLOUD APPLICATIONS AND CASE STUDIES

9

Cloud Computing Risk Issues – Cloud Computing Security Challenges – CCS Architecture – Trusted cloud Computing – Identity Management and Access Control – Autonomic Security. Dynamic Resource Allocation Using Virtual Machines for Cloud Computing Environment.

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Apply virtualization for efficient resource utilization.
- Describe cloud computing models and services
- Apply cloud platforms for different applications.
- Examine various services using cloud programming models.
- Analyze the security and resource allocation issues of cloud computing.

## TEXT BOOKS

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, First Edition, 2012.
2. Ronald L. Krutz, Russell Dean Vines, “Cloud Security – A comprehensive Guide to Secure Cloud Computing”, Wiley – India, First Edition, 2010

## REFERENCES

1. John W. Rittinghouse and James F. Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, First Edition, 2010.
2. Rajkumar Buyya, Christian Vecchiola, S. Tamarai Selvi, “Mastering Cloud Computing”, TMGH, First Edition, 2013.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/104/106104182/> (Cloud Computing and Distributed Systems)
2. <https://nptel.ac.in/courses/106/105/106105167/> (Cloud Computing)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	-	-	2	2	1	-	-	-	-	-	-	1	1	1
2	2	3	1	-	-	1	-	-	-	-	-	-	1	1	1
3	3	-	3	-	1	3	-	-	-	-	-	-	3	3	3
4	-	-	-	2	-	3	-	-	-	-	-	-	3	3	3
5	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	1.6	1.0	0.8	0.8	0.6	1.6	-	-	-	-	-	-	1.6	1.6	1.6

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation





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## SEMESTER II

### PROFESSIONAL ELECTIVE - II

23PCP201

REAL TIME SYSTEMS

L T P C  
3 0 0 3

#### OBJECTIVES

- To learn the real time operating system concepts, the associated issues and Techniques.
- To understand the Software Requirement Engineering Process.
- To study the synchronization problems in Real Time System.
- To know the concepts of real time databases.
- To study the evaluation techniques present in Real Time System.

#### UNIT I REAL TIME SYSTEM AND SCHEDULING

9

Introduction– Structure of a Real Time System –Task classes – Performance Measures for Real Time Systems – Estimating Program Run Times – Issues in Real Time Computing – Task Assignment and Scheduling – Classical uniprocessor scheduling algorithms –Fault Tolerant Scheduling.

#### UNIT II SOFTWARE REQUIREMENTS ENGINEERING

9

Requirements engineering process – types of requirements – requirements specification for real time systems – Formal methods in software specification – structured Analysis and Design – object oriented analysis and design and unified modelling language – organizing the requirements document – organizing and writing documents – requirements validation and revision.

#### UNIT III INTER TASK COMMUNICATION AND MEMORY MANAGEMENT

9

Buffering data – Time relative Buffering- Ring Buffers – Mailboxes – Queues – Critical regions –Semaphores – other Synchronization mechanisms – deadlock – priority inversion – process stack management – run time ring buffer – maximum stack size – multiple stack arrangement –memory management in task control block - swapping – overlays – Block page management –

replacement algorithms – memory locking – working sets – real time garbage collection – contiguous file systems.

#### UNIT IV REAL TIME DATABASES

9

Real time Databases — Basic Definition, Real time Vs General Purpose Databases, MainMemory Databases, Transaction priorities, Transaction Aborts, Concurrency control





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issues, Disk Scheduling Algorithms, Two– phase Approach to improve Predictability — Maintaining Serialization Consistency — Databases for Hard Real Time Systems.

## UNIT V EVALUATION TECHNIQUES AND CLOCK SYNCHRONIZATION 9

Reliability Evaluation Techniques – Obtaining parameter values, Reliability models for Hardware Redundancy–Software error models. Clock Synchronization–Clock, A Nonfault–Tolerant Synchronization Algorithm – Impact of faults – Fault Tolerant Synchronization in Hardware – Fault Tolerant Synchronization in software.

**TOTAL : 45 PERIODS**

### OUTCOMES

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

- Apply principles of real time system design techniques to develop real time applications.
- Describe the Requirements for Software Engineering Process.
- Design the database in real time applications.
- Explain the architectural process and behaviour of real time operating systems.
- Apply evaluation techniques and Clock Synchronization in application.

### TEXT BOOKS

1. C.M. Krishna, Kang G. Shin, “Real-Time Systems”, McGraw-Hill International Editions, 1997.
2. Philip.A.Laplante, “Real Time System Design and Analysis”, Prentice Hall of India, Third Edition, 2004.

### REFERENCES

1. Rajib Mall, “Real-time systems: theory and practice”, Pearson Education, 2009.
2. R.J.A Buhur, D.L Bailey, “An Introduction to Real-Time Systems”, Prentice Hall International, 1999.

### E-RESOURCES

1. <https://nptel.ac.in/courses/106/105/106105229/> (Introduction)
2. <https://nptel.ac.in/courses/106/105/106105036/> (Real time databases)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	1	1	1	2	1	1	2	3	3	2
2	3	3	3	3	3	1	1	1	2	1	1	2	3	3	2
3	3	3	3	3	3	1	1	1	3	1	1	3	3	3	3
4	3	3	3	3	3	1	1	1	1	1	1	1	3	3	1
5	3	3	3	3	3	1	1	1	2	1	1	2	3	3	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	3.0	3.0	3.0	3.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	3.0	3.0	2.0

1 - Low, 2 - Medium, 3 - High, '-' - No correlation







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23PCP202

DATA VISUALIZATION TECHNIQUES

L T P C

3 0 0 3

## OBJECTIVES

- To learn the basic introduction of Visualization Designs.
- To understand how accurately represent voluminous complex data set in web and from other data sources.
- To understand the methodologies used to visualize large data sets.
- To know the process involved in data visualization.
- To understand the security aspects involved in data visualization.

## UNIT I INTRODUCTION

9

Context of data visualization - Definition, Methodology, Visualization design objectives. Key Factors - Purpose, visualization function and tone, visualization design options — Data representation, Data Presentation, Seven stages of data visualization, widgets, data visualization tools.

## UNIT II VISUALIZING DATA METHODS

9

Mapping - Time series - Connections and correlations - Scatter plot maps - Trees, Hierarchies and Recursion - Networks and Graphs, Info graphics.

## UNIT III VISUALIZING DATA PROCESS

9

Acquiring data - Where to Find Data, Tools for Acquiring Data from the Internet, Locating Files for Use with Processing, Loading Text Data, Dealing with Files and Folders, Listing Files in a Folder, Asynchronous Image Downloads, Advanced Web Techniques, Using a Database, Dealing with a Large Number of Files. Parsing data - Levels of Effort, Tools for Gathering Clues, Text Is Best, Text Markup Languages, Regular Expressions (regexps), Grammars and BNF Notation, Compressed Data, Vectors and Geometry, Binary Data Formats, Advanced Detective Work.

## UNIT IV INTERACTIVE DATA VISUALIZATION

9

Drawing with data – Scales - Axes – Updates, Transition and Motion - Interactivity - Layouts – Geo mapping – Exporting, Framework - D3.js, tableau, Google chart-Jupyter.

## UNIT V SECURITY DATA VISUALIZATION

9

Port scan visualization - Vulnerability assessment and exploitation - Firewall log visualization - Intrusion detection log visualization - Attacking and defending visualization systems - Creating security visualization system.

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Analyze the basics about virtualization designs.
- Discuss various methodologies present in data visualization.
- Describe the process involved and security issues present in data visualization.
- Apply appropriate visualization techniques.
- Explain security aspects involved in data visualization.

## TEXT BOOKS

1. Scott Murray, “Interactive data visualization for the web”, O’Reilly Media, Inc., Second Edition, 2013.
2. Ben Fry, “Visualizing Data”, O’Reilly Media, Inc., First Edition, 2008.

## REFERENCES

1. Greg Conti, “Security Data Visualization: Graphical Techniques for Network Analysis”, NoStarch Press Inc, First Edition, 2007.
2. Claus Wilke, “Fundamentals of Data Visualization”, O’Reilly Publishers, 2019.

## E-RESOURCES

1. <https://nptel.ac.in/courses/110/107/110107092/> (Data Visualization)
2. <https://nptel.ac.in/courses/106/106/106106179/> (Visualizing Data Methods)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	2	1	2	-	-	-	-	-	-	3	1	2
2	2	1	2	3	2	2	-	-	-	-	-	-	2	1	2
3	1	-	2	2	1	1	-	-	-	-	-	-	1	-	2
4	3	1	3	3	2	2	-	-	-	-	-	-	3	1	3
5	2	1	3	2	1	1	-	-	-	-	-	-	2	1	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.2	0.8	2.4	2.4	1.4	1.6	-	-	-	-	-	-	2.2	0.8	2.4

1 - Low, 2 - Medium, 3 - High, ‘-’- No Correlation





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23PCP203 INTEGRATED SOFTWARE PROJECT MANAGEMENT

L T P C  
3 0 0 3

## OBJECTIVES

- To study the software process framework.
- To learn managed and optimized software process.
- To understand the projects against strategic, technical and economic criteria.
- To study the activity plan and to estimate the overall duration of a project and to minimize the risks.
- To study the cost, changes in the project and to manage the project contracts effectively.

## UNIT I PROCESS DEFINITION 9

Software Maturity Framework – Software Standards: Benefits, Establishment of standards, Examples – Inspections – Defining the Software Process - Software Engineering Process Group.

## UNIT II PROCESS MANAGEMENT AND OPTIMIZATION 9

Data Gathering and Analysis – Managing Software Quality - Defect Prevention – Automating the Software Process – Contracting for software: Negotiation, Software Contract Principles, Managing software contract, Process Certification .

## UNIT III PROJECT MANAGEMENT AND EVALUATION 9

Project Management Overview – Activities Covered By Software Project Management - Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

## UNIT IV ACTIVITY PLANNING 9

Objectives – Project Schedule – Sequencing and Scheduling Activities –Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration –Activity on Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – ManagingRisk – Hazard Identification – Hazard Analysis –Planning And Control.

## UNIT V MONITORING AND CONTROL 9

Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – EarnedValue – Prioritizing Monitoring – Getting Project Back To Target – Change Control – ManagingContracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical TermsOf A Contract – Contract Management – Acceptance

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Analyze the software process framework.
- Discuss optimized software process..
- Apply cost benefit evaluation techniques for project plan.
- Design an activity plan and formulate the network model for each and every softwareProjects.
- Analyze the various risks and hazards problems using risk planning and control techniques.

## TEXT BOOKS

1. Watts S. Humphrey, "Managing the Software Process", Pearson Education, 2008.
2. Bob Hughes, Mikecotterell, "Software Project Management", Tata McGraw Hill, Fifth Edition, 2011.

## REFERENCES

1. Robert K.Wysocki, "Effective Project Management: Traditional, Agile, Extreme", Sixth Edition, Wiley, 2011.
2. Watts S. Humphrey, "Introduction to the Team Software Process", Pearson Education, 2006.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/105/106105218/> (Software Project Management)
2. <https://nptel.ac.in/courses/110/104/110104073/> (Software Process)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	2	1	2	-	1	-	-	1	3	3	1	2
2	2	1	2	3	2	2	-	2	-	3	1	3	2	1	2
3	1	-	2	2	1	1	-	2	-	-	1	3	1	-	2
4	3	1	3	3	2	2	-	1	-	3	1	3	3	1	3
5	2	1	3	2	1	1	-	3	-	1	2	3	2	1	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.2	0.8	2.4	2.4	1.4	1.6	-	1.8	-	1.4	1.2	3.0	1.2	0.8	1.2

1 - Low, 2 – Medium, 3 - High, ‘-‘- No Correlation





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23PCP204

MODERN COMPUTER ARCHITECTURE

LT P C  
3 0 0 3

## OBJECTIVES

- To understand the recent trends in the field of Computer Architecture.
- To learn the performance related parameters.
- To learn the different multiprocessor issues.
- To study the different types of multicore architectures.
- To understand the design of the memory hierarchy.

### UNIT I FUNDAMENTALS OF COMPUTER DESIGN AND ILP 9

Fundamentals of Computer Design – Measuring and Reporting Performance – Instruction Level Parallelism and its Exploitation – Concepts and Challenges –Exposing ILP - Advanced Branch Prediction - Dynamic Scheduling - Hardware-Based Speculation - Exploiting ILP - Instruction Delivery and Speculation - Limitations of ILP – Multithreading.

### UNIT II MEMORY HIERARCHY DESIGN 9

Introduction – Optimizations of Cache Performance – Memory Technology and Optimizations –Protection: Virtual Memory and Virtual Machines – Design of Memory Hierarchies – Case Studies.

### UNIT III MULTIPROCESSOR ISSUES 9

Introduction- Centralized, Symmetric and Distributed Shared Memory Architectures –Cache Coherence Issues – Performance Issues – Synchronization – Models of Memory Consistency – Case Study-Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks.

### UNIT IV MULTICORE ARCHITECTURES 9

Homogeneous and Heterogeneous Multi-core Architectures – Intel Multicore Architectures – SUN CMP architecture – IBM Cell Architecture. Introduction to Warehouse-scale computers Architectures- Physical Infrastructure and Costs- Cloud Computing –Case Study- Google Warehouse-Scale Computer.

### UNIT V VECTOR, SIMD AND GPU ARCHITECTURES 9

Introduction-Vector Architecture – SIMD Extensions for Multimedia – Graphics Processing Units – Case Studies – GPGPU Computing – Detecting and Enhancing Loop Level Parallelism-Case Studies.

**TOTAL : 45 PERIODS**





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## OUTCOMES

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

- Identify the limitations of ILP.
- Describe the issues related to multiprocessing and suggest solutions.
- Analyze the salient features of different multicore architectures and how they exploit parallelism.
- Apply the various techniques used for optimizing the cache performance.
- Describe hierarchal memory system and point out how data level parallelism is exploited in architectures.

## TEXT BOOKS

1. Darryl Gove, "Multicore Application Programming: For Windows, Linux, and Oracle Solaris", Pearson Education, 2011.
2. David B. Kirk, Wen-mei W. Hwu, "Programming Massively Parallel Processors", Morgan Kaufman, Second Edition, 2010.

## REFERENCES

1. John L. Hennessey and David A. Patterson, "Computer Architecture — A Quantitative Approach", Morgan Kaufmann / Elsevier, Fifth Edition, 2012.
2. Kai Hwang and Zhi. Wei Xu, "Scalable Parallel Computing", Tata McGraw Hill, New Delhi, 2003.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/105/106105163/> (Multicore Architecture)
2. <https://nptel.ac.in/courses/106/102/106102157/> (Parallelism)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	2	1	2	-	1	-	-	1	3	1	2	3
2	2	1	2	3	2	2	-	2	-	3	1	3	3	1	2
3	1	-	2	2	1	1	-	2	-	-	1	3	2	1	2
4	3	1	3	3	2	2	-	1	-	3	1	3	1	-	2
5	2	1	3	2	1	1	-	3	-	1	2	3	3	1	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.2	0.8	2.4	2.4	1.4	1.6	-	1.8	-	1.4	1.2	3.0	2.0	1.0	2.2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation







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23PCP205

SOFTWARE ARCHITECTURES AND DESIGN

L T P C

3 0 0 3

## OBJECTIVES

- To understand the architectural requirements.
- To learn the architectural structures.
- To understand the architectural documentation.
- To study the architectural alternatives.
- To learn the mapping of architecture against the drivers.

### UNIT I ARCHITECTURAL DRIVERS 9

Introduction – Standard Definitions of Software Architecture– Architectural structures – Influence of software architecture on organization – Architecture Business Cycle – Functional requirements – Technical constraints – Quality Attributes – Quality Attribute Workshop (QAW) – Documenting Quality Attributes – Six part scenarios.

### UNIT II ARCHITECTURAL VIEWS AND DOCUMENTATION 9

Introduction – Standard Definitions for views – Structures and views- Perspectives: Static, dynamic and physical and the accompanying views – Representing views-available notations – Good practices in documentation– Documenting the Views using UML – Merits and Demerits of using visual languages – Need for formal languages - Architectural Description Languages –ACME.

### UNIT III ARCHITECTURAL STYLES 9

Introduction – Data flow styles – Call-return styles – Shared Information styles – Event styles –Case studies for each style.

### UNIT IV ARCHITECTURAL DESIGN 9

Approaches for architectural design – System decomposition – Attributes driven design – Architecting for specific quality attributes – Performance, Availability – Security – Architectural conformance.

### UNIT V ARCHITECTURE EVALUATION AND SOME SPECIAL TOPICS 9

Need for evaluation – Scenario based evaluation against the drivers – ATAM and its variations – Case studies in architectural evaluations – Adaptive structures - Introduction to Architectural patterns.

**TOTAL : 45 PERIODS**

## OUTCOMES

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

- Analyze the architectural requirements.







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- Identify the structure of architecture.
- Design a proper documentation regarding architecture .
- Determine the right architectural style for the given problem.
- Design multiple architectures for given problem.

## TEXT BOOKS

1. Len Bass, Paul Clements, and Rick Kazman, “Software Architectures Principles and Practices”, Third Edition, SEI Series in Software Engineering, 2013.
2. Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, Paulo Merson, Robert Nord, and Judith Stafford, “Documenting Software Architectures. Views and Beyond”, Second Edition, SEI Series in Software Engineering, 2010.

## REFERENCES

1. Anthony J Lattanze, “Architecting Software Intensive System. A Practitioner's Guide”, Auerbach Publications, 2010.
2. Frank Bachmann, Regine Meunier, Hans Rohnert “Pattern Oriented Software Architecture” Volume1, 2008 reprint.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/101/106101061/> (Software Architecture)
2. <https://nptel.ac.in/courses/106/105/106105087/> (Architectural Styles)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	2	1	2	-	1	-	-	1	3	1	2	3
2	2	1	2	3	2	2	-	2	-	3	1	3	3	1	2
3	1	-	2	2	1	1	-	2	-	-	1	3	2	1	2
4	3	1	3	3	2	2	-	1	-	3	1	3	1	-	2
5	2	1	3	2	1	1	-	3	-	1	2	3	3	1	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.2	0.8	2.2	2.2	1.4	1.6	-	1.8	-	1.4	1.2	3.0	2.0	1.0	2.2

1 - Low, 2 - Medium, 3 - High, ‘-’- No Correlation





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SEMESTER II



## PROFESSIONAL ELECTIVE III

23PCP206

HUMAN COMPUTER INTERACTION

L T P C

3 0 0 3

### OBJECTIVES

- To learn the foundations of Human Computer Interaction.
- To understand the role of software process.
- To study the design technologies for individuals and persons with disabilities.
- To gain the knowledge about mobile HCI.
- To learn the guidelines for user interface.

### UNIT I FOUNDATIONS OF HCI 9

The Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.

### UNIT II DESIGN & SOFTWARE PROCESS 9

Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.

### UNIT III MODELS AND THEORIES 9

Cognitive models –Socio-Organizational issues and stake holder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

### UNIT IV MOBILE HCI 9

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.

### UNIT V : WEB INTERFACE DESIGN 9

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.

**TOTAL : 45 PERIODS**

### OUTCOMES

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

- Apply effective dialog for HCI.
- Discuss effective HCI for individuals and persons with disabilities.





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- Analyze the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Websites.
- Design meaningful user interface.

## TEXT BOOKS

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, Pearson Education, Third Edition, 2004 (UNIT I , II & III).
2. Brian Fling, “Mobile Design and Development”, O’Reilly Media Inc., First Edition, 2009(UNIT –IV).

## REFERENCES

1. Yvonne Rogers, Helen Sharp, Jenny Preece, Interaction Design: beyond human-computer interaction, John- Wiley and Sons Inc.,Third Edition,2011.
2. Alan Dix, Janet Finlay, Gregory D.Abowd, Russell Beale, “Human Computer Interaction”, Pearson Education, Third Edition,2008.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/106/106106177/> (Human Computer Interaction)
2. <https://nptel.ac.in/courses/106/103/106103115/> (Introduction to Computer Interaction)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	3	-	-	-	-	-	-	3	3	3
2	1	-	1	2	2	1	-	-	-	-	-	-	1	-	1
3	2	3	2	2	-	1	-	-	-	-	-	-	2	2	2
4	2	3	1	2	-	2	-	-	-	-	-	-	2	2	2
5	2	2	3	3	3	3	-	-	-	-	-	-	2	2	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.0	2.2	2.0	2.2	1.6	2.0	-	-	-	-	-	-	2.0	1.8	2.0

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23PCP207

BLOCKCHAIN TECHNOLOGY

L T P C  
3 0 0 3

## OBJECTIVES

- To learn the foundations of crypto currency and block chain Technologies.
- To understand the role of crypto currency.
- To know the concept of Bit coin.
- To study the significance of Ethereum.
- To learn the guidelines for hyper ledger.

## UNIT I CRYPTO CURRENCY AND BLOCKCHAIN- INTRODUCTION 9

Blockchain- An Introduction, Distinction between databases and blockchain, Distributed ledger. Blockchain ecosystem - Consensus Algorithms & Types, Blockchain structure, Distributed networks- Distributed Applications (DApps) — Web 3.0 - DApps Ecosystems. Working - Permissioned and permission-less Blockchain – Cross Chain Technologies. – IOT & Blockchain Digital Disruption in Industries — Banking, Insurance, Supply Chain, Governments, IP rights, Creation of trustless Ecosystems – Block chain as a Service – Open Source Block chains.

## UNIT II CRYPTO CURRENCIES 9

Crypto Currencies - Anonymity and Pseudonymity in Cryptocurrencies - Digital Signatures - Cryptocurrency Hash Codes -Need for Crypto Currencies – Crypto Markets – Explore Crypto Currency Ecosystems - ICOs – Crypto Tokens - Atomic Swaps – Crypto Currency Exchanges – Centralised and Decentralized Crypto exchanges – Regulations on Crypto Currencies & exchanges – Downside of non-regulated currencies – crypto Scams – Exchange hacks.

## UNIT III BITCOIN 9

Bitcoin - history- Bitcoin- usage, storage, selling, transactions, working- Invalid Transactions- Parameters that invalidate the transactions- Scripting language in Bitcoin- Applications of Bitcoin script- Nodes and network of Bitcoin- Bitcoin ecosystem

## UNIT IV ETHEREUM 9

The Ethereum ecosystem, DApps and DAOs - Ethereum working- Solidity- Contract classes, functions, and conditionals- Inheritance & abstract contracts- Libraries- Types & optimization of Ether- Global variables- Debugging- Future of Ethereum- Smart Contracts on Ethereum- different stages of a contract deployment- Viewing Information about blocks in Block chain- Developing smart contract on private Block chain- Deploying contract from web and console.





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## UNIT V HYPER LEDGER

9

Hyperledger Architecture- Consensus- Consensus & its interaction with architectural layers- Application programming interface- Application model -Hyperledger frameworks- Hyperledger Fabric -Various ways to create Hyperledger Fabric Blockchain network- Creating and Deploying a business network on Hyperledger Composer Playground- Testing the business network definition- Transferring the commodity between the participants.

**TOTAL: 45 PERIODS**

### OUTCOMES

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

- Apply the secure and efficient transactions with crypto-currencies.
- Analyze the crypto currency trading and crypto exchanges.
- Design private block chain environment and develop a smart contract on Ethereum.
- Analyze the role of Ethereum.
- Describe the hyper ledger architecture and the consensus mechanism applied in the hyperledger.

### TEXT BOOKS

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Packt Publishing, Second Edition, 2018.
2. Kumar Saurabh, Ashutosh Saxena, "Blockchain Technology: Concepts and Applications", Wiley Technology Emerging series, September 2020.

### REFERENCES

1. Andreas M Antonopoulos, "Mastering Bitcoin: Unlocking Digital Cryptocurrencies", O'Reilly Media, First Edition, 2018.
2. Henning Diedrich, "Ethereum: Block chains, Digital Assets, Smart Contracts, Decentralized Autonomous Organizations", 2016.

### E-RESOURCES

1. <https://nptel.ac.in/courses/106/105/106105184/> ( Introduction to BlockChain)
2. <https://nptel.ac.in/courses/106/104/106104220/> (BlockChain Technology)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	3	2	2	3	-	-	-	-	-	-	2	1	2
2	2	1	2	3	2	2	-	-	-	-	-	-	2	1	2
3	2	1	3	1	2	1	-	-	-	-	-	-	2	1	2
4	2	1	2	3	2	2	-	-	-	-	-	-	2	1	2
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.0	1.0	2.5	2.25	2.0	2.0	-	-	-	-	-	-	2.0	1.0	2.0

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation







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23PCP208

COMPUTER VISION

L T P C  
3 0 0 3

## OBJECTIVES

- To study image processing techniques for computer vision.
- To learn Hough Transform and its applications to detect lines, circles, ellipses.
- To understand three-dimensional image analysis techniques.
- To study the motion analysis.
- To understand some applications of computer vision algorithms.

### UNIT I IMAGE PROCESSING FOUNDATIONS 9

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture.

### UNIT II SHAPES AND REGIONS 9

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

### UNIT III HOUGH TRANSFORM 9

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

### UNIT IV 3D VISION AND MOTION 9

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

### UNIT V APPLICATIONS 9

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground- background







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separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

**TOTAL: 45 PERIODS**

## OUTCOMES

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

- Discuss fundamental image processing techniques required for computer vision and apply chain codes and other region descriptors
- Apply Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques.
- Describe motion related techniques.
- Apply computer vision techniques for developing the applications.

## TEXT BOOKS

1. D. L. Baggio et al., “Mastering OpenCV with Practical Computer Vision Projects”, Packt Publishing, 2012.
2. E. R. Davies, “Computer & Machine Vision”, Academic Press, Fourth Edition, 2012.

## REFERENCES

1. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, Academic Press, Third Edition, 2012.
2. R. Szeliski, “Computer Vision: Algorithms and Applications”, Springer 2011.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/106/106106224/> (Deep Learning for Computer Vision)
2. <https://nptel.ac.in/courses/106/105/106105216/> (Fundamentals of Image Processing)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	1	1	1	1	1	1	2	3	3	2
2	3	3	3	3	3	1	1	1	1	1	1	2	3	3	2
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4	3	3	3	3	3	1	1	1	1	1	1	1	3	3	1
5	3	3	3	3	3	1	1	1	1	1	1	2	3	3	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	3.0	3.0	3.0	3.0	1.0	1.0	1.0	1.0	1.0	1.0	2.0	3.0	3.0	2.0

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation





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23PCP209

CYBER SECURITY AND COMPUTER FORENSICS

L T P C

3 0 0 3

## OBJECTIVES

- To understand the threats in networks and security concepts.
- To study authentication applications in different networks.
- To understand security services for email.
- To learn the essential and up-to-date concepts, algorithms, protocols, tools.
- To study the methodology of Computer Forensics.

### UNIT I INTRODUCTION TO CYBER SECURITY 9

Ethical hacking, Attack Vectors, Cyberspace and Criminal Behaviour, Clarification of Terms, Traditional Problems associated with Computer Crimes, Realms of Cyber world, brief history of the internet, contaminants and destruction of data, unauthorized access, computer intrusions, white-collar crimes, viruses and malicious code, virus attacks, pornography, software piracy, mail bombs, exploitation, stalking and obscenity in internet, Cyber psychology, Social Engineering.

### UNIT II DIGITAL FORENSICS 9

Introduction to Digital forensics, Forensic software and handling, forensic hardware and handling, analysis and advanced tools, forensic technology and practices, Biometrics: face, iris and fingerprint recognition, Audio-video evidence collection, Preservation and Forensic Analysis.

### UNIT III SECURITY SERVICES 9

Investigation Tools, e-discovery, EDRM Models, digital evidence collection and preservation, email investigation, email tracking, IP tracking, email recovery, search and seizure of computer systems, password cracking.

### UNIT IV COMPUTER FORENSICS 9

Definition and Cardinal Rules, Data Acquisition and Authentication Process, Windows Systems-FAT12, FAT16, FAT32 and NTFS, UNIX file Systems, mac file systems, computer artifacts, Internet Artifacts, OS Artifacts and their forensic applications.

### UNIT V PROCESSING OF DIGITAL EVIDENCE 9

Processing of digital evidence, digital images damaged SIM and data recovery, multimedia evidence, retrieving deleted data: desktops, laptops and mobiles, retrieving data from slack space, renamed file, ghosting, and compressed files.

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Describe the usages of cyber security and its applications.
- Analyze and Integrate various Digital Forensics.
- Analyze various investigation tools.
- Discuss the process of digital evidence effectively and efficiently.
- Identify the Methodology of Cyber Forensics.

## TEXT BOOKS

1. Charles P. Fleeger, "Security in Computing", Prentice Hall, Fifth Edition, New Delhi, 2015.
2. Behrouz A.Forouzan, "Cryptography & Network Security", Tata McGraw Hill, India, New Delhi, Third Edition, 2015.

## REFERENCES

1. William Stallings, "Cryptography and Network Security", Prentice Hall, New Delhi, 2006.
2. C. Altheide & H. Carvey, "Digital Forensics with Open Source Tools", Syngress, 2011.

## E-RESOURCES

1. [https://onlinecourses.swayam2.ac.in/nou21\\_cs08/preview\(Introduction to Cyber Security\)](https://onlinecourses.swayam2.ac.in/nou21_cs08/preview(Introduction to Cyber Security))
2. <https://www.coursera.org/specializations/computerforensics> (Computer Forensics)

## Mapping of Cos-Pos & PSOs

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2	2	2	2	3	2	2	-	2	-	3	1	3	3	1	2
3	1	-	2	-	1	-	-	2	-	-	-	3	2	1	2
4	3	1	3	3	2	2	-	2	-	3	1	3	1	-	2
5	2	2	3	2	1	1	-	3	-	1	2	3	3	1	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.2	1.2	2.2	2.0	1.4	1.4	-	2.0	-	1.4	1.0	3.0	2.0	1.0	2.2

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation





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23PCP210

SOFTWARE QUALITY ASSURANCE AND TESTING

L T P C  
3 0 0 3

## OBJECTIVES

- To understand the basics of testing, test planning & design and test team organization.
- To study the various types of test in the life cycle of the software product.
- To know the design concepts for system testing and execution.
- To learn the software quality assurance ,metrics, defect prevention techniques.
- To learn the techniques for quality assurance and applying for applications.

### UNIT I SOFTWARE TESTING - CONCEPTS, ISSUES, AND TECHNIQUES 9

Quality Revolution, Verification and Validation, Failure, Error, Fault, and Defect, Objectives of Testing, Testing Activities, Test Case Selection White-Box and Black ,test Planning and design, Test Tools and Automation, . Power of Test. Test Team Organization and Management-Test Groups, Software Quality Assurance Group ,System Test Team Hierarchy, Team Building.

### UNIT II SYSTEM TESTING 9

System Testing - System Integration Techniques-Incremental, Top Down Bottom Up Sandwich and Big Bang, Software and Hardware Integration, Hardware Design Verification Tests, Hardware and Software Compatibility Matrix Test Plan for System Integration. Built- in Testing. Functional testing - Testing a Function in Context. Boundary Value Analysis.

### UNIT III SYSTEM TEST CATEGORIES 9

System test categories Taxonomy of System Tests, Interface Tests Functionality Tests. GUI Tests, Security Tests Feature Tests, Robustness Tests, Boundary Value Tests Power Cycling Tests Interoperability Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests.

### UNIT IV SOFTWARE QUALITY 9

Software quality - People's Quality Expectations, Frameworks and ISO-9126, McCall's Quality Factors and Criteria — Relationship. Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement ,Testing Maturity Model.

### UNIT V SOFTWARE QUALITY ASSURANCE 9

Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees. Comparing Quality Assurance Techniques and Activities. QA Monitoring and Measurement, Risk





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Identification for Quantifiable Quality Improvement. Case Study: FSM-Based Testing of Web-Based Applications

**TOTAL: 45 PERIODS**

## OUTCOMES

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

- Determine functional and nonfunctional tests in the life cycle of the software product.
- Analyze the role of system Testing.
- Apply system testing and test execution process.
- Identify defect prevention techniques and software quality assurance metrics.
- Apply techniques of quality assurance for typical applications.

## TEXT BOOKS

1. William E. Perry, "Effective Methods for Software Testing", Third Edition, Wiley India, 2009
2. Naresh Chauhan, "Software Testing – Principles and Practices", Oxford University Press, 2010.

## REFERENCES

1. Kshirasagar Nak Priyadarshi Tripathy, "Software Testing And Quality Assurance- Theory and Practice", John Wiley & Sons Inc, First Edition, 2008.
2. Jeff Tian, "Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement", John Wiley & Sons, Inc., Hoboken, New Jersey. 2005.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/105/106105150/> (Introduction to Software Testing)
2. <https://nptel.ac.in/courses/106/101/106101163/> (Motivation Software Testing)





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## Mapping of Cos-Pos & PSOs

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4	3	3	3	3	3	1	3	1	1	1	1	1	3	3	1
5	3	3	3	3	3	1	3	1	1	1	1	2	3	3	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	3.0	3.0	3.0	3.0	1.0	3.0	1.0	1.0	1.0	1.0	2.0	3.0	3.0	2.0

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation







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## SEMESTER III

### PROFESSIONAL ELECTIVE - IV

23PCP301

SECURITY FOR IoT

L T P C

3 1 0 4

#### OBJECTIVES

- To gain knowledge about Internet of Things.
- To learn about the basics of IOT protocols.
- To learn a small low cost embedded system using Raspberry Pi.
- To study the concept of Internet of Things in the real world scenario.
- To understand the Problem of IoT Attack.

#### UNIT I IoT SECURITY OVERVIEW

9+3

IoT Reference Model- Introduction -Functional View,IoT Security Challenges-Hardware Security Risks - Hardcoded/Default Passwords -Resource Constrained Computations -Legacy Assets Connections - Devices Physical Security, Software Security Risks -Software Vulnerabilities - Data Interception - Identification of Endpoints -Tamper Detection, Lack of Industrial Standards.

#### UNIT II IoT SECURITY &VULNERABILITY ISSUES

9+3

IoT Security Requirements -Data Confidentiality -Data Encryption -Data Authentication - Secured Access Control -IoT-Vulnerabilities — Secret-Key, Authentication/Authorization for Smart Devices - Constrained System Resources -Device Heterogeneity -Fixed Firmware.IoT Attacks -Side-channel Attacks.

#### UNIT III SECURED PROTOCOLS FOR IoT

9+3

Infrastructure-IPv6 -LowPAN , Identification-Electronic Product Code -uCode, Transport-Bluetooth - LPWAN, Data -MQTT -CoAP, Multi-layer Frameworks-Alljoyn,-IoTivity.

#### UNIT IV SECURING INTERNET OF THINGS ENVIRONMENT

9+3

IoT Hardware -Test Device Range-Latency and Capacity -Manufacturability Test -Secure from Physical Attacks, IoT Software -Trusted IoT Application Platforms, -Secure Firmware Updating - Network Enforced Policy -Secure Analytics Visibility and Control.

#### UNIT V IoT ATTACKS - CASE STUDY

9+3

MIRAI Botnet Attack -Iran's Nuclear Facility Stuxnet Attack -Tesla Crypto jacking Attack -The TREND net Webcam Attack -The Jeep SUV Attack -The Owlet Wi-Fi Baby Heart Monitor Vulnerabilities.

**TOTAL: 45+15 =60 PERIODS**





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## OUTCOMES

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

- Apply knowledge about IoT general models and security challenges.
- Analyze IoT security and vulnerability threats.
- Discuss different IoT protocols and their security measures.
- Describe how to secure an IoT environment.
- Analyze the problem of IoT Attack.

## TEXT BOOKS

1. Fei HU, "Security and Privacy in Internet of Things (IoTs): Models Algorithms and Implementations", CRC Press,2016.
2. Russell, Brian Drew, Van Duren, "Practical Internet of Things Security", Packt Publishing, 2016.

## REFERENCES

1. Ollie Whitehouse, "Security of Things: An Implementers' Guide to Cyber-Security for Internet of Things Devices and Beyond", NCC Group, 2014.
2. Arsheep Bahga , Vijay Madiseti "Internet Of Things: A Hands-On Approach ", Pearson Education, First Edition,16 August 2017.

## E - RESOURCES

1. [https://onlinecourses.nptel.ac.in/noc21\\_cs17/preview](https://onlinecourses.nptel.ac.in/noc21_cs17/preview) (Introduction to IoT).
2. [https://onlinecourses.nptel.ac.in/noc21\\_ee85/preview](https://onlinecourses.nptel.ac.in/noc21_ee85/preview) (Design for IoT).

## Mapping of Cos-Pos& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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3	3	2	3	3	2	2	3	1	1	1	1	1	2	2	3
4	1	3	2	2	3	1	2	2	1	1	1	1	2	1	2
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.25	2.75	2.75	2.5	2.5	1.25	2.75	1.25	1.0	1.0	1.0	1.5	2.25	2.25	2.5

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23PCP302

PARALLEL PROGRAMMING PARADIGMS

L T P C

3 1 0 4

## OBJECTIVES

- To understand the fundamentals of parallel programming.
- To learn the issues in parallel computing.
- To study distributed memory programming using MPI.
- To understand shared memory paradigm with Pthreads and OpenMP.
- To learn the GPU based parallel programming using OpenCL.

### UNIT I FOUNDATIONS OF PARALLEL PROGRAMMING

9+3

Motivation for parallel programming – Need-Concurrency in computing – Basics of processes, multitasking and threads–Issues in shared memory model and distributed memory model – Parallel Software- Caveats- coordinating processes/ threads- hybrid model – shared memory model and distributed memory model -I/O – performance of parallel programs– parallel program design.

### UNIT II DISTRIBUTED MEMORY PROGRAMMING WITH MPI

9+3

Basic MPI programming – MPI\_Init and MPI\_Finalize – MPI communicators – SPMD-programs– MPI\_Send and MPI\_Recv – message matching – MPI- I/O – parallel I/O – collectivecommunication – Tree-structured communication -MPI\_Reduce – MPI\_Allreduce.

### UNIT III SHARED MEMORY PARADIGM WITH PTHREADS

9+3

Basics of threads, Pthreads – thread synchronization – critical sections – busy waiting – mutex – semaphores – barriers and condition variables – read write locks with examples - Thread safety-Pthreads case study.

### UNIT IV SHARED MEMORY PARADIGM: OPENMP

9+3

Basics OpenMP – Trapezoidal Rule-scope of variables – reduction clause – parallel for directive – loops in OpenMP – scheduling loops –Producer Consumer problem – cache issues – threads safety in OpenMP.

### UNIT V GRAPHICAL PROCESSING PARADIGMS

9+3

Introduction to OpenCL - Example-OpenCL Platforms - Devices-Contexts - OpenCL programming – Event model – Command-Queue - Event Object - case study. Introduction to CUDA programming.

**TOTAL: 45+15 = 60 PERIODS**





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## OUTCOMES

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

- Apply the knowledge about the parallel processing.
- Identify issues in parallel programming.
- Analyze distributed memory programs using MPI framework.
- Discuss shared memory paradigm with Pthreads and OpenMP.
- Apply OpenCL programs for Graphical Processing paradigms.

## TEXT BOOKS

1. A.Munshi, B.Gaster, T.G.Mattson, J. Fung, and D. Ginsburg, "OpenCL programming guide", Addison Wesley, 2011.
2. Peter S. Pacheco, "An introduction to parallel programming", Morgan Kaufmann, 2011.

## REFERENCES

1. Rob Farber, "CUDA application design and development", Morgan Kaufmann, 2011.
2. W. Gropp, E.Lusk, and A.Skjellum, "Using MPI: Portable parallel programming with the message passing interface", Second Edition, MIT Press, 1999.

## E-RESOURCES

1. [https://onlinecourses.nptel.ac.in/noc19\\_cs45/preview](https://onlinecourses.nptel.ac.in/noc19_cs45/preview) (Introduction to Parallel Programming in Open MP).
2. <https://nptel.ac.in/courses/106/102/106102114/> (Introduction Shared Memory Paradigm).

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	-	-	-	-	-	-	-	2	3	3	3
2	2	3	3	2	-	-	-	-	-	-	-	2	2	3	2
3	3	2	3	3	-	-	-	-	-	-	-	1	2	2	3
4	1	3	2	2	-	-	-	-	-	-	-	1	2	1	2
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.25	2.75	2.75	2.5	-	-	-	-	-	-	-	1.5	2.25	2.25	2.5

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation





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TIRUCHENGODE - 637 205 NAMAKKAL (Dt) TAMILNADU



23PCP303

DESIGN THINKING

L T P C

3 1 0 4

## OBJECTIVES

- To understand the concepts of design thinking approaches.
- To learn design thinking teams and conduct design thinking sessions.
- To study the critical thinking and design thinking in parallel to solve problems.
- To know authentic opportunity for students to develop teamwork and leadership skills.
- To understand some design thinking concepts to their daily work.

### UNIT I PROCESS OF DESIGN

9+3

Introduction — Product Life Cycle - Design Ethics - Design Process - Four Step - Five Step - Twelve Step - Creativity and Innovation in Design Process - Design limitation.

### UNIT II GENERATING AND DEVELOPING IDEAS

9+3

Introduction - Create Thinking - Generating Design Ideas - Lateral Thinking — Analogies — Brainstorming - Mind mapping - National Group Technique – Synectics - Development of work - Analytical Thinking - Group Activities Recommended.

### UNIT III REVERSE ENGINEERING

9+3

Introduction - Reverse Engineering Leads to New Understanding about Products - Reasons for Reverse Engineering - Reverse Engineering Process - Step by Step - Case Study.

### UNIT IV BASICS OF DRAWING TO DEVELOP DESIGN IDEAS

9+3

Introduction - Many Uses of Drawing - Communication through Drawing - Drawing Basis – Line - Shape/ Form – Value – Colour – Texture - Practice using Auto CAD recommended.

### UNIT V TECHNICAL DRAWING TO DEVELOP DESIGN

9+3

Introduction - Perspective Drawing - One Point Perspective - Two Point Perspective - Isometric Drawing - Orthographic Drawing - Sectional Views - Practice using Auto CAD recommended.

**TOTAL: 45+15 = PERIODS**

## OUTCOMES

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

- Analyze various design process procedure.
- Determine the design ideas through different technique.
- Identify the significance of reverse Engineering to Understand products.
- Discuss the basics idea of drawing to development.
- Apply the technical drawing ideas to develop design.





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## TEXT BOOKS

1. John.R.Karsnitz, Stephen O'Brien and John P. Hutchinson, "Engineering Design", Cengage learning (International Edition) Second Edition, 2013.
2. Vijay Kumar "A Structured Approach for Driving Innovation in Your Organization" John wiley and sons Inc,2012.

## REFERENCES

1. Yousef Haik and Tamer M.Shahin, "Engineering Design Process", Cengage Learning, Second Edition, 2011.
2. IDEO,"The Field Guide to Human-Centered Design" IDEO ,First Edition, 2015 .

## E - RESOURCES

1. [https://onlinecourses.nptel.ac.in/noc20\\_mg38/preview](https://onlinecourses.nptel.ac.in/noc20_mg38/preview) (Introduction to Design Thinking).
2. <http://www.digimat.in/nptel/courses/video/110106124/L02.html>. (Basic Technical drawing to develop Design)

## Mapping of Cos-Pos& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	2	3	3	2	-	-	-	-	-	-	-	2	2	3	2
3	3	2	3	3	-	-	-	-	-	-	-	1	2	2	3
4	1	3	2	2	-	-	-	-	-	-	-	1	2	1	2
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.25	2.75	2.75	2.5	-	-	-	-	-	-	-	1.5	2.25	2.25	2.5

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation







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23PCP304

PERFORMANCE ANALYSIS OF COMPUTER SYSTEMS

L T P C  
3 1 0 4

## OBJECTIVES

- To understand the mathematical foundations needed for performance evaluation of computer systems.
- To learn the metrics used for performance evaluation.
- To understand the analytical modelling of computer systems.
- To study new queuing analysis for both simple and complex systems.
- To learn the use of smart scheduling and introduce the students to analytical techniques for evaluating scheduling policies.

### UNIT I OVERVIEW OF PERFORMANCE EVALUATION 9+3

Need for Performance Evaluation in Computer Systems – Overview of Performance Evaluation Methods – Introduction to Queuing – Probability Review – Generating Random Variables for Simulation – Sample Paths, Convergence and Averages – Little's Law and other Operational Laws-Modification for closed systems.

### UNIT II MARKOV CHAINS AND SIMPLE QUEUES 9+3

Discrete-Time Markov Chains – Ergodicity Theory – Real World Examples – Google, Aloha – Transition to Continuous-Time Markov Chain – M/M/1.

### UNIT III MULTI-SERVER AND MULTI-QUEUE SYSTEMS 9+3

Server Farms: M/M/k and M/M/k/k – Capacity Provisioning for Server Farms – Time Reversibility and Burke's Theorem – Networks of Queues and Jackson Product Form – Classed and closed networks of queues.

### UNIT IV REAL-WORLD WORKLOADS 9+3

Case Study of Real-world Workloads – Phase-Type Distributions and Matrix-Analytic Methods – Networks with Time-Sharing Servers – M/G/1 Queue and the Inspection Paradox – Task Assignment Policies for Server Farms.

### UNIT V SMART SCHEDULING IN THE M/G/1 9+3

Performance Metrics – Scheduling Non-Pre-emptive and Pre-emptive Non-Size-Based Policies – Scheduling Non-Pre-emptive and Pre-emptive Size-Based Policies – Scheduling - SRPT and Fairness.

**TOTAL: 45+15 = 60 PERIODS**







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## OUTCOMES

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

- Identify the need for performance evaluation and the metrics used for it.
- Compare between open and closed queuing networks.
- Apply the operational laws to open and closed systems.
- Analyze discrete-time and continuous-time Markov chains to model real world systems.
- Describe analytical techniques for evaluating scheduling policies.

## TEXT BOOKS

1. K.S.Trivedi "Probability and Statistics with Reliability, Queueing and Computer Science Applications", John Wiley and Sons, Second Edition, 2001.
2. Lieven Eeckhout, Computer Architecture Performance Evaluation Methods", Morgan and Claypool Publishers, 2010.

## REFERENCES

1. MorHarchol - Balter, "Performance Modeling and Design of Computer Systems Queueing Theory in Action", Cambridge University Press, 2013.
2. Paul J. Fortier and Howard E. Michel, "Computer Systems Evaluations and Prediction", Elsevier, 2003.

## E-RESOURCES

1. <http://www.nptelvideos.in/2012/11/performance-evaluation-of-computer.html>  
(Introduction to Performance evaluation).
2. <https://www.coursera.org/learn/algorithms-part1>. (Introduction to Real world Workloads)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	2	1	2	-	-	-	-	-	-	3	1	2
2	2	1	2	3	2	2	-	-	-	-	-	-	2	1	2
3	1	-	2	2	1	1	-	-	-	-	-	-	1	-	2
4	3	1	3	3	2	2	-	-	-	-	-	-	3	1	3
5	2	1	3	2	1	1	-	-	-	-	-	-	2	1	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.2	0.8	2.4	2.4	1.4	1.6	-	-	-	-	-	-	2.2	0.8	2.2

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation





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23PCP305

COMPILER OPTIMIZATION TECHNIQUES

L T P C

3 1 0 4

## OBJECTIVES

- To study the different forms of intermediate languages and analyzing programs.
- To learn the loop optimization techniques.
- To understand optimizations techniques for simple program blocks.
- To apply optimizations on procedures control flow and parallelism.
- To learn the inter procedural analysis and optimizations and to explore the knowledge about resource utilization.

## UNIT I INTERMEDIATE REPRESENTATIONS AND ANALYSIS

9+3

Review of Compiler Structure-Structure of an Optimizing Compiler-Intermediate Languages - LIR, MIR, HIR — Control Flow Analysis — Iterative Data Flow Analysis — Static Single-Assignment – Dependence Relations -Dependences in Loops and Testing-Basic Block Dependence DAGs — Alias Analysis.

## UNIT II EARLY AND LOOP OPTIMIZATIONS

9+3

Importance of Code Optimization Early Optimizations: Constant-Expression-Evaluation- Scalar Replacement of Aggregates-Algebraic Simplification and Re-association, Value Numbering - Copy Propagation – Sparse Conditional Constant Propagation, Loop Optimizations.

## UNIT III PROCEDURE OPTIMIZATION AND SCHEDULING

9+3

Procedure Optimizations: Tail-Call Optimization and Tail-Recursion Elimination-Procedure Integration-In-Line Expansion-Leaf-Routine Optimization and Shrink Wrapping Code Scheduling, Instruction Scheduling.

## UNIT IV INTERPROCEDURAL OPTIMIZATION

9+3

Symbol table-Runtime Support-Inter procedural Analysis and Optimization: Inter procedural Control Flow Analysis - The Call Graph – Inter procedural Data-Flow Analysis-Inter procedural Constant Propagation- Inter procedural Alias Analysis - Inter procedural Optimizations .

## UNIT V REGISTER ALLOCATION AND OPTIMIZING FOR MEMORY

9+3

Register Allocations: Register Allocation and Assignment - Local Methods -GraphColoring- Priority Based GraphColoring-OtherApproaches to Register Allocation. Optimization for the Memory Hierarchy.

**TOTAL: 45+15 = 60 PERIODS**





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## OUTCOMES

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

- Identify the different forms of intermediate languages and analyzing programs.
- Apply the different optimization techniques for simple program blocks.
- Describe performance enhancing optimization techniques.
- Discuss the optimization on procedures.
- Examine better utilization of resources.

## TEXT BOOKS

1. Alfred V.Aho, Ravi Sethi, Jeffrey D.Ullman,"Compilers Principles Techniques and Tools", Addison Wesley, Second Edition, 2017.
2. Andrew W.Appel, Jens Palsberg,"Modern Compiler Implementation in Java", Cambridge University Press, Second Edition, 2012.

## REFERENCES

1. Keith Cooper, Linda Torczon,"Engineering a Compiler", Morgan Kaufmann, Second Edition,2011.
2. Robert Morgan,"Building an Optimizing Compiler",Digital Press,2009.

## E - RESOURCES

1. <https://www.embedded.com/advanced-compiler-optimization-techniques/>.(Introduction to Compiler Optimization Techniques).
2. [https://www.tutorialspoint.com/compiler\\_design/](https://www.tutorialspoint.com/compiler_design/).(Introduction to Compiler Design).

## Mapping of Cos-Pos& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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3	3	2	3	3	2	2	-	1	1	1	1	1	2	2	3
4	1	3	2	2	3	1	-	2	1	1	1	1	2	1	2
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.25	2.75	2.75	2.5	2.5	1.25	-	1.5	1.0	1.0	1.0	1.5	2.25	2.25	2.5

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation





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SEMESTER III



## PROFESSIONAL ELECTIVE - V

23PCP306

COGNITIVE COMPUTING

L T P C

3 1 0 4

### OBJECTIVES

- To learn about design of cognitive systems.
- To study NLP in cognitive systems.
- To learn the effectiveness of a cognitive system.
- To understand the deployment of cognitive applications.
- To understand the development process of cognitive systems.

### UNIT I INTRODUCTION TO COGNITIVE COMPUTING

9+3

The Foundation of Cognitive Computing-Cognitive Computing as a New Generation-The Uses of Cognitive Systems-What Makes a System Cognitive?-Artificial Intelligence as the Foundation of Cognitive Computing-Understanding Cognition-Understanding Complex Relationships Between Systems-The Elements of a Cognitive System-Design Principles for Cognitive Systems-Components of a Cognitive System.

### UNIT II NATURAL LANGUAGE PROCESSING IN COGNITIVE SYSTEMS

9+3

Natural Language Processing in Support of a Cognitive System-The Role of NLP in a Cognitive System-Semantic Web-Appling Natural Language Technologies to Business Problems Representing Knowledge in Taxonomies and Ontologies-Representing Knowledge Defining Taxonomies and Ontologies.

### UNIT III ADVANCED ANALYTICS IN COGNITIVE COMPUTING

9+3

Applying Advanced Analytics to Cognitive Computing-Advanced Analytics Is on a Path to Cognitive Computing-Key Capabilities in Advanced Analytics-Using Advanced Analytics to Create Value-Impact of Open Source Tools on Advanced Analytics- Case studies.

### UNIT IV COGNITIVE SYSTEMS APPROACHES

9+3

The Role of Cloud and Distributed Computing in Cognitive Computing-Leveraging Distributed Computing for Shared Resources-Why Cloud Services Are Fundamental to Cognitive Computing Systems.

### UNIT V BUILDING A COGNITIVE APPLICATION

9+3

The Process of Building a Cognitive Application-The Emerging Cognitive Platform-Defining the Objective-Defining the Domain-Understanding the Intended Users and Defining their Attributes-Defining Questions and Exploring Insights-Creating and Refining the Corpora Training.

**TOTAL:45+15=60 PERIODS**





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## OUTCOMES

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

- Apply the designing techniques in cognitive system.
- Discuss the role of Natural language processing and knowledge representation in Cognitive systems.
- Analyze a cognitive computing system through case studies.
- Identify an appropriate approach to build a cognitive system.
- Describe a system flow to deploy a cognitive application.

## TEXT BOOKS

1. Marcia Kaufman Adrian Bowles, Judith Hurwitz, "Cognitive Computing and Big Data Analytics", First Edition, Wiley, 2015.
2. Peter Fingar, "Cognitive Computing" Meghan-Kiffer Press, 2016.

## REFERENCES

1. Steven Bird, Ewan Klein, Edward Loper, "Natural Language Processing with Python Analyzing text with natural language toolkit", O'Reilly Media , 2009.
2. Tom M. Mitchell, "Machine Learning", McGraw Hill, 2015.

## E - RESOURCES

1. [https://onlinecourses.nptel.ac.in/noc21\\_cs51/preview](https://onlinecourses.nptel.ac.in/noc21_cs51/preview) (Introduction to cognitive computing)
2. <https://www.ibm.com/developerworks/learn/cognitive/> (Developing cognitive applications).

## Mapping of Cos-Pos& PSOs

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3	3	2	3	3	2	2	3	3	1	1	1	1	2	2	3
4	1	3	2	2	3	1	2	3	1	1	1	1	2	1	2
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.25	2.75	2.75	2.5	2.5	1.25	2.75	3.0	1.0	1.0	1.0	1.5	2.25	2.25	2.5

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23PCP307

SECURITY PRACTICES

L T P C

3 1 0 4

## OBJECTIVES

- To learn the core fundamentals of system and web security concepts.
- To understanding the security concepts related to the networks.
- To understand the security essentials in IT Sector.
- To study the concepts of Cyber Security and encryption Concepts.
- To learn a detailed study of Privacy and Storage security and related Issues.

### UNIT I SYSTEM SECURITY

9+3

Building a secure organization- A Cryptography primer- detecting system Intrusion- Preventing system Intrusion- Fault tolerance and Resilience in cloud computing environments-Security web applications, services and servers.

### UNIT II NETWORK SECURITY

9+3

Internet Security - Botnet Problem- Intranet security- Local Area Network Security - Wireless Network Security - Wireless Sensor Network Security- Cellular Network Security- Optical Network Security- Optical wireless Security.

### UNIT III SECURITY MANEGEMENT

9+3

Information security essentials for IT Managers- Security Management System - Policy Driven System Management- IT Security - Online Identity and User Management System - Intrusion and Detection and Prevention System.

### UNIT IV CYBER SECURITY AND CRYPTOGRAPHY

9+3

Cyber Forensics- Cyber Forensics and Incidence Response - Security e-Discovery - Network Forensics - Data Encryption- Satellite Encryption - Password based authenticated Key establishment Protocols.

### UNIT V PRIVACY AND STORAGE SECURITY

9+3

Privacy on the Internet - Privacy Enhancing Technologies - Personal privacy Policies - Detection of Conflicts in security policies- privacy and security in environment monitoring systems. Storage Area Network Security - Storage Area Network Security Devices - Risk management - Physical Security Essentials.

**TOTAL: 45+15=60 PERIODS**







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## OUTCOMES

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

- Analyze the core fundamentals of system security.
- Apply the security concepts related to networks in wired and wireless scenario.
- Apply and Manage the security essentials in IT Sector.
- Explain the concepts of Cyber Security and encryption Concepts.
- Describe the knowledge in the area of Privacy and Storage security.

## TEXT BOOKS

1. John R.Vacca, "Computer and Information Security Handbook", Elsevier, Second Edition, 2013.
2. Michael E. Whitman, Herbert J. Mattord, "Principals of Information Security", Cengage Learning, Fourth Edition, 2012.

## REFERENCES

1. Richard E.Smith, Elementary Information Security, Jones and Bartlett Learning, Second Edition, 2016.
2. Robert Fischer "Introduction to Security ", Butterworth Heinemann, Ninth Edition, 2013.

## E - RESOURCES

1. [https://onlinecourses.nptel.ac.in/noc21\\_cs16/preview](https://onlinecourses.nptel.ac.in/noc21_cs16/preview) (Introduction to Information Security)
2. <https://ishareyoublog.files.wordpress.com/2018/04/cp5291-security-practices-unit-2-docx>. (Introduction to Security Management and Cyber Security).

## Mapping of Cos-Pos & PSOs

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4	2	3	2	1	2	2	-	-	-	-	-	-	3	2	3
5	1	2	1	2	1	1	-	-	-	-	-	-	3	2	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>AVG</b>	<b>1.6</b>	<b>1.8</b>	<b>1.6</b>	<b>1.4</b>	<b>2.0</b>	<b>2.2</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3.0</b>	<b>2.0</b>	<b>3.0</b>

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation







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23PCP308

NETWORK DESIGN AND TECHNOLOGIES

L T P C

3 1 0 4

## OBJECTIVES

- To understand the principles required for network design.
- To learn various technologies in the wireless domain.
- To study about 3G cellular networks.
- To study about 4G cellular networks.
- To understand the paradigm of Software defined networks.

### UNIT I NETWORK DESIGN

9+3

Connectionless, Connection oriented, Wireless Scenarios –Applications, Quality of Service –End to end level and network level solutions. LAN cabling topologies – Ethernet Switches, Routers, Firewalls and L3 switches – Remote Access Technologies and Devices – Modems and DSLs – SLIP and PPP – Core networks, and distribution networks.

### UNIT II WIRELESS NETWORKS

9+3

IEEE802.16 and WiMAX – Security – Advanced 802.16 Functionalities – Mobile WiMAX - 802.16e – Network Infrastructure – WLAN – Configuration – Management Operation – Security– IEEE 802.11e and WMM – QoS – Comparison of WLAN and UMTS – Bluetooth –Protocol Stack – Security – Profiles.

### UNIT III CELLULAR NETWORKS

9+3

GSM – Mobility Management and call control – GPRS – Network Elements – Radio Resource Management – Mobility Management and Session Management – Small Screen Web Browsing over GPRS and EDGE – MMS over GPRS – UMTS – Channel Structure on the Air Interface –UTRAN –Core and Radio Network Mobility Management – UMTS Security.

### UNIT IV 4G NETWORKS

9+3

LTE – Network Architecture and Interfaces – FDD Air Interface and Radio Networks – Scheduling – Mobility Management and Power Optimization – LTE Security Architecture – Interconnection with UMTS and GSM – LTE Advanced (3GPP Release 10) - 4G Networks and Composite Radio Environment – Protocol Boosters – Hybrid 4G Wireless Networks Protocols – Green Wireless Networks – Physical Layer and Multiple Access – Channel Modelling for 4G – Introduction to 5G.





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## UNIT V SOFTWARE DEFINED NETWORKS

9+3

Introduction – Centralized and Distributed Control and Data Planes – Open Flow – SDN Controllers – General Concepts – VLANs – NVGRE – Open Flow – Network Overlays – Types–Virtualization – Data Plane – I/O – Design of SDN Framework.

**TOTAL: 45+15=60 PERIODS**

### OUTCOMES

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

- Identify the components required for designing a network.
- Describe a network at high-level using different networking technologies.
- Analyze the various protocols of wireless and cellular networks.
- Describe the features of 4G and 5G networks.
- Define software defined networks.

### TEXT BOOKS

1. Erik Dahl man, Stefan Parkvall, Johan Skold, "4G:LTE/LTE-Advanced for Mobile Broadband", Academic Press,2013.
2. Jonathan Rodriguez, " Fundamentals of 5G Mobile Networks", Wiley, 2015.

### REFERENCES

1. Larry Peterson and Bruce Davie,"Computer Networks: Systems Approach",Morgan Kaufman, Fifth Edition,2011.
2. Martin Sauter, "From GSM to LTE An Introduction to Mobile Networks and Mobile Broadband", Wiley, 2014.

### E-RESOURCES

1. <http://www.nptelvideos.in/2012/11/computer-networks.html> (Introduction to Network Design and Technologies)
2. <https://nasrinword.wordpress.com/cp5201-network-design-and-technologies/>.(Introduction to 4G and 5G Networks).





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## Mapping of Cos-Pos& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	1	1	-	1	1	1	2	3	3	3
2	2	3	3	1	2	1	1	-	1	1	1	2	3	3	2
3	3	2	3	3	2	2	2	-	1	1	1	1	2	2	3
4	1	3	2	2	3	1	-	-	1	1	1	1	2	1	2
5	2	3	3	1	-	1	1	-	1	1	1	2	2	3	2
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.2	2.8	2.8	2.0	2.0	1.2	1.0	-	1.0	1.0	1.0	1.6	2.0	2.0	2.0

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation





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23PCP309

EMBEDDED SOFTWARE DEVELOPMENT

L T P C  
3 1 0 4

## OBJECTIVES

- To understand the architecture of embedded processor, microcontroller and peripheral devices.
- To learn the concepts of memory and peripherals with embedded systems.
- To study the embedded network environment.
- To understand challenges in Real time operating systems.
- To understand challenges in system design Techniques.

### UNIT I EMBEDDED PROCESSORS 9+3

Embedded Computers-Characteristics of Embedded Computing Applications Challenges in Embedded Computing System Design - Embedded System Design Process-Formalism for System Design-Structural Description-Behavioral Description-ARM Processor–Intel ATOM.

### UNIT II EMBEDDED COMPUTING PLATFORM 9+3

CPU Bus Configuration - Memory Devices and Interfacing - Input/output Devices and Interfacing - System Design - Development and Debugging –Emulator — Simulator – JTAG Design Example — Alarm Clock - Analysis and Optimization of Performance-Power and Program Size.

### UNIT III EMBEDDED NETWORK ENVIRONMENT 9+3

Distributed Embedded Architecture-Hardware and Software Architectures-Networks for Embedded Systems - I2C - CAN Bus - SHARC Link Supports –Ethernet –Myrinet–Internet-Network-based Design-Communication Analysis-System Performance Analysis-Hardware Platform Design-Allocation and Scheduling-Design example-Elevator Controller.

### UNIT IV REAL-TIME CHARACTERISTICS 9+3

Clock Driven Approach - Weighted Round Robin Approach - Priority Driven Approach - Dynamic versus Static Systems - Effective Release Times and Deadlines-Optimality of the Earliest Deadline First (EDF) Algorithm-Challenges in Validating Timing Constraints in Priority Driven Systems - Off-Line versus On-Line Scheduling.

### UNIT V SYSTEM DESIGN TECHNIQUES 9+3

Design Methodologies-Requirement Analysis-Specification-System Analysis and Architecture Design-Quality Assurance-Design examples–Telephone PBX-Inkjet printer-Personal Digital Assistants-Set-Top Boxes.

**TOTAL: 45+15=60 PERIODS**





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## OUTCOMES

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

- Analyze different architectures of embedded processor, microcontroller and peripheral devices interface memory and peripherals with embedded systems.
- Apply the concepts of Emulator and Simulator in embedded computing.
- Discuss embedded network environment.
- Apply challenges in Real time operating systems.
- Analyze system design techniques using embedded system.

## TEXT BOOKS

1. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things "Wiley Publication, First Edition, 2013.
2. Arshdeep Bahga, Vijay Madiseti,"Internet of Things: A Hands on Approach", VPT First Edition, 2014.

## REFERENCES

1. Frank Vahid and Tony Givargis, "Embedded System Design: A Unified Hardware Software Introduction", John Wiley&Sons, 2011.
2. Jane.W.S.Liu, "Real Time systems", Pearson Education Asia, 2016.

## E - RESOURCES

1. <https://nptel.ac.in/courses/117/106/117106112/>. (Introduction to Embedded Software).
2. [https://onlinecourses.nptel.ac.in/noc20\\_ee98/preview](https://onlinecourses.nptel.ac.in/noc20_ee98/preview). (Introduction to Embedded Computing Platform) .

## Mapping of Cos-Pos& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	1	-	-	1	1	1	2	3	3	3
2	3	3	3	2	2	1	-	-	1	1	1	2	2	3	2
3	3	2	3	3	2	2	-	-	1	1	1	1	2	2	3
4	3	3	2	2	3	1	-	-	1	1	1	1	2	1	2
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	2.75	2.75	2.5	2.5	1.25	-	-	1.0	1.0	1.0	1.5	2.25	2.25	2.5

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation





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23PCP310

NATURAL LANGUAGE PROCESSING

L T P C

3 1 0 4

## OBJECTIVES

- To learn the fundamentals of natural language processing.
- To study the role of word level analysis.
- To understand the use of CFG and PCFG in NLP.
- To understand the role of semantics of sentences and pragmatics.
- To apply the NLP techniques to IR applications.

### UNIT I INTRODUCTION

9+3

Origins and challenges of NLP — Language Modelling: Grammar-based LM, Statistical LM — Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.

### UNIT II WORD LEVEL ANALYSIS

9+3

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Back off — Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging — Hidden Markov and Maximum Entropy models.

### UNIT III SYNTACTIC ANALYSIS

9+3

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

### UNIT IV SEMANTICS AND PRAGMATICS

9+3

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation.

### UNIT V DISCOURSE ANALYSIS AND LEXICAL RESOURCE

9+3

Discourse segmentation, Coherence — Reference Phenomena, Anaphora Resolution using Hobbs and Centring Algorithm — Co reference Resolution — Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

**TOTAL: 45+15=60 PERIODS**







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## OUTCOMES

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

- Analyze a given text with basic Language features.
- Describe an innovative application using NLP components.
- Discuss a rule based system to tackle morphology/syntax of a language.
- Define a tag set to be used for statistical processing for real-time applications.
- Compare and contrast the use of different statistical approaches for different types of NLP applications.

## TEXT BOOKS

1. Daniel Jurafsky, James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing Computational Linguistics and Speech", Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, "Natural Language Processing with Python", OReilly Media, First Edition, 2009.

## REFERENCES

1. Breck Baldwin, "Language processing with Java and LingPipe Cookbook", Atlantic Publisher, 2015.
2. Richard M Reese, "Natural Language Processing with Java", OReilly Media, 2015.

## E-RESOURCES

1. [https://onlinecourses.nptel.ac.in/noc19\\_cs56/preview](https://onlinecourses.nptel.ac.in/noc19_cs56/preview) .(Introduction to Natural Language Processing)
2. [https://onlinecourses.nptel.ac.in/noc20\\_cs87/preview](https://onlinecourses.nptel.ac.in/noc20_cs87/preview) . (Introduction to Syntactic Analysis).







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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	-	2	3	1	1	-	-	-	-	-	-	-	-	-	-
2	2	2	2	3	-	3	-	-	-	-	-	-	-	-	-
3	3	-	3	3	-	3	-	-	-	-	-	-	-	-	-
4	1	-	2	3	-	3	-	-	-	-	-	-	-	-	-
5	1	-	2	3	-	3	-	-	-	-	-	-	-	-	-
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	1.4	0.8	2.4	2.6	0.16	2.4	-	-	-	-	-	-	-	-	-

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation





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SEMESTER III



## PROFESSIONAL ELECTIVE VI

23PCP311

BIO-INSPIRED COMPUTING

L T P C

3 0 0 3

### OBJECTIVES

- To learn bio-inspired theorem and algorithms.
- To understand random walk and simulated annealing.
- To study genetic algorithm and differential evolution.
- To learn swarm optimization and ant colony for feature selection.
- To understand bio-inspired application in image processing.

### UNIT I INTRODUCTION

9

Introduction to algorithm - Newton's method - optimization algorithm - No-Free-Lunch Theorems Nature- Inspired Metaheuristics -Analysis of Algorithms -Nature Inspires Algorithms -Parameter tuning and parameter control

### UNIT II RANDOM WALK AND ANEALING

9

Random variables - Isotropic random walks - Levy distribution and flights - Markov chains - step sizes and search efficiency - Modality and intermittent search strategy - importance of randomization- Eagle strategy-Annealing and Boltzmann Distribution - parameters -SA algorithm - Stochastic Tunneling.

### UNIT III GENETIC ALGORITHM AND DIFFERENTIAL EVOLUTION

9

Introduction to genetic algorithms and - role of genetic operators - choice of parameters - GA variants - schema theorem - convergence analysis - introduction to differential evolution - variants - choice of parameters - convergence analysis - implementation.

### UNIT IV SWARM OPTIMIZATION AND FIREFLY ALGORITHM

9

Swarm intelligence - PSO algorithm - accelerated PSO - implementation - convergence analysis - binary PSO - The Firefly algorithm - algorithm analysis - implementation - variantsAnt colony optimization toward feature selection.

### UNIT V APPLICATION IN IMAGE PROCESSING

9

Bio-Inspired Computation and its Applications in Image Processing: An Overview — Fine Tuning Enhanced Probabilistic Neural Networks Using Meta-heuristic-driven Optimization - Fine-Tuning Deep Belief Networks using Cuckoo Search - Improved Weighted Threshold Histogram Equalization Algorithm for Digital Image Contrast Enhancement Using Bat Algorithm - Ground Glass Opacity Nodules Detection and Segmentation using Snake Model.

**TOTAL: 45 PERIODS**





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## OUTCOMES

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

- Describe bio-inspired theorem and algorithms.
- Explain random walk and simulated annealing.
- Analyze genetic algorithms in different forms.
- Explain swarm intelligence and ant colony for feature selection.
- Apply bio-inspired techniques in image processing.

## TEXT BOOKS

1. Eiben,A.E.,Smith,James E, "Introduction to Evolutionary Computing", Springer 2015.
2. Helio J.C. Barbosa, "Ant Colony Optimization - Techniques and Applications", Intech 2013.

## REFERENCES

1. Xin-She Yang , Jaao Paulo papa, "Bio-Inspired Computing and Applications in Image Processing", Elsevier, 2016.
2. Yang ,Cui,Xlao,Gandomi,Karamanoglu , "Swarm Intelligence and Bio-Inspired Computing", Elsevier First Edition, 2013.

## E-RESOURCES

1. <https://tutorials.one/bio-inspired-computing-approach-in-artificial-intelligence/> (Computing Approach in AI)
2. <https://www.udemy.com/course/ai-academy-4-learn-bio-inspired-optimization-methods-a-z/> (Optimization)

## Mapping of Cos-Pos& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	3	3	3	3	3	1	1	1	2	1	1	2	3	3	3
3	3	3	3	3	3	1	1	1	3	1	1	3	3	3	3
4	3	3	3	3	3	1	1	1	2	1	1	1	3	3	3
5	3	3	3	3	3	1	1	1	1	1	1	2	3	3	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	3.0	3.0	3.0	3.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0	3.0	3.0	3.0

1 - Low, 2 - Medium, 3 - High, ‘-’- No Correlation





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23PCP312

SPEECH PROCESSING AND SYNTHESIS

L T P C

3 0 0 3

## OBJECTIVES

- To understand the mathematical foundations needed for speech processing.
- To study the speed signal Representation processing Techniques.
- To learn the basic concepts and algorithms of speech processing and synthesis.
- To understand the various speech signal representation, coding and recognition techniques.
- To learn the use of speech processing in current technologies.

### UNIT I FUNDAMENTALS OF SPEECH PROCESSING 9

Introduction – Spoken Language Structure – Phonetics and Phonology – Syllables and Words – Syntax and Semantics – Probability, Statistics and Information Theory – Probability Theory – Estimation Theory – Significance Testing – Information Theory.

### UNIT II SPEECH SIGNAL REPRESENTATIONS AND CODING 9

Overview of Digital Signal Processing – Speech Signal Representations – Short time Fourier Analysis – Acoustic Model of Speech Production – Linear Predictive Coding – Cepstral processing – Formant Frequencies – The Role of Pitch – Speech Coding – LPC Coder.

### UNIT III SPEECH RECOGNITION 9

Hidden Markov Models – Definition – Continuous and Discontinuous HMMs – Practical Issues – Limitations. Acoustic Modeling – Variability in the Speech Signal – Extracting Features – Phonetic Modeling – Adaptive Techniques – Confidence Measures.

### UNIT IV TEXT ANALYSIS 9

Lexicon – Document Structure Detection – Text Normalization – Linguistic Analysis – Homograph Disambiguation – Morphological Analysis – Letter-to-sound Conversion – Prosody – Generation schematic – Speaking Style – Symbolic Prosody - Duration Assignment – Pitch Generation.

### UNIT V SPEECH SYNTHESIS 9

Attributes – Formant Speech Synthesis – Concatenative Speech Synthesis – Prosodic Modification of Speech – Source - filter Models for Prosody Modification – Evaluation of TTS Systems.

**TOTAL : 45 PERIODS**





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## OUTCOMES

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

- Identify the various temporal, spectral and cepstral features required for identifying speech units – phoneme, syllable and word.
- Apply Mel-frequency cepstral coefficients for processing all types of signals.
- Analyze the use of formant and concatenative approaches to speech synthesis.
- Identify the apt approach of speech synthesis depending on the language to be processed.
- Determine the various encoding techniques for representing speech.

## TEXT BOOKS

1. Lawrence Rabiner, Biing and- Hwang Juang and B.Yegnanarayana, "Fundamentals of Speech Recognition", Pearson Education, 2009
2. Claudio Becchetti and Lucio Prina Ricotti, "Speech Recognition", John Wiley and Sons, 1999.

## REFERENCES

1. Joseph Mariani, "Language and Speech Processing", Wiley, 2009.
2. Lawrence Rabiner and Biing-Hwang Juang, "Fundamentals of Speech Recognition", Prentice Hall Signal Processing Series, 1993.

## E-RESOURCES

1. <http://www.digimat.in/nptel/courses/video/117105145/L37.html> (Text to Speech synthesis)
2. <https://nptel.ac.in/courses/117/105/117105145/> (Introduction to Digital Image Processing)





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## Mapping of Cos-Pos & PSOs

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1	3	3	3	3	3	3	3	1	1	1	1	2	3	3	3
2	3	3	3	3	3	3	3	1	1	1	1	2	3	3	3
3	3	3	3	3	3	3	3	1	1	1	1	3	3	3	3
4	3	3	3	3	3	3	3	1	1	1	1	1	3	3	3
5	3	3	3	3	3	3	3	1	1	1	1	2	3	3	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	3.0	3.0	3.0	3.0	3.0	3.0	1.0	1.0	1.0	1.0	2.0	3.0	3.0	3.0

1 - Low, 2 - Medium, 3 - High, '-' - No Correlation





ESTD 2001  
23PCP313

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INFORMATION SECURITY RISK MANAGEMENT



L T P C  
3 0 0 3

## OBJECTIVES

- To understand the basics of Information Security and Risk Management.
- To know the basic regulations for the IT-security risk process.
- To study actual approaches for IT-security risk management and provide students with deep knowledge for the state-of-the-art international standards.
- To learn a safeguards (controls) and direct how these items can be apply efficiently with deep knowledge for the up-to-date IT-security techniques.
- To learn the appropriate international risk management.

### UNIT I INTRODUCTION 9

Introduction to Information Security - Social Engineering — Human behavior and information security- Risk Management -Complexity of Risk Management — Introduction to Information Security Risk Management - Risk Identification -Risk Assessment - Risk Control Strategies - Selecting a Risk Control Strategy.

### .UNIT II POLICIES, STANDARDS AND DECISION MAKING 9

Information Security Governance - Information Security Policy Basics - Information Security Policy Framework - Information Security Procedures and Standards - Policy Development - Decision Making from a Managerial Perspective - User Decision Making.

### UNIT III INFORMATION SECURITY FRAMEWORKS 9

Security Frameworks - Challenges - The Risk Management Process- Operational Responsibilities - IT and Cybersecurity Processes - Functional Area Operational Objectives - Controls - Capabilities - Cybersecurity and Enterprise IT.

### UNIT IV SECURITY AND USABILITY 9

Introduction to Security and Usability - Security Culture: Creating a Culture of Information Security - Computer Ethics - Scanning and Analysis Tools, Access Control Devices - Physical Security - Security and Personnel.

### UNIT V CHANGING THE CULTURE 9

Changing the Approach to Security- Change the Culture, Change the Game - The Corporate Culture - Case Studies.

**TOTAL: 45 PERIODS**







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## OUTCOMES

After completing this course, students will be able to:

- Identify the security threats, attacks and device suitable security policies and Standards.
- Discuss the plan, assess and device suitable risk control strategies in practice.
- Determine appropriate intrusion detection and prevention systems to ensure information availability.
- Apply various national, international laws and legal frameworks emphasizing responsibility and accountability at all levels in the organization

## TEXT BOOKS

1. Leron Zinatullin, "The Psychology of Information Security Resolving conflicts between security compliance and human behavior", IT Governance Ltd , 2016.
2. Douglas Landoll, "Information Security Policies, Procedures, and Standards - A Practitioner's Reference", CRC Press, 2016.

## REFERENCES

1. Jack Freund, Jack Jones , "Measuring and Managing Information Risk: A FAIR Approach", First Edition, 2016.
2. Faiyaz Ahamad, "Cyber Law and Information Security", Wiley dreamtech press, 2013.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/104/106104119/> (Biometric Controls)
2. <https://nptel.ac.in/courses/106/106/106106178/> (Information and Network Security)

## Mapping of Cos-Pos& PSOs

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2	3	3	3	3	3	1	3	1	1	1	1	2	3	3	1
3	3	3	3	3	3	1	3	1	1	1	1	3	3	3	1
4	3	3	3	3	3	1	3	1	1	1	1	1	3	3	1
5	3	3	3	3	3	1	3	1	1	1	1	2	3	3	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	3.0	3.0	3.0	3.0	1.0	3.0	1.0	1.0	1.0	1.0	2.0	3.0	3.0	1.0

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23PCP314

DEEP LEARNING

L T P C

3 0 0 3

## OBJECTIVES

- To learn the fundamentals of deep learning.
- To understand the use various deep learning algorithms.
- To understand the CNN and RNN to model for real world applications.
- To study the deep learning Generative model and deep learning applications.
- To know Convolutional Neural Networks.

### UNIT I INTRODUCTION TO DEEP LEARNING 9

Introduction to Deep Learning: Basics: Biological Neuron, Idea of computational units, McCulloch– Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability, Convergence theorem for Perceptron Learning Algorithm.

### UNIT II CONVOLUTIONAL NETWORKS 9

Convolutional Networks: The Convolution Operation - Variants of the Basic Convolution Function - Structured Outputs - Data Types - Efficient Convolution Algorithms - Random or Unsupervised Features- LeNet, Alex Net.

### UNIT III RECURRENT NEURAL NETWORKS 9

Recurrent Neural Networks: Bidirectional RNNs - Deep Recurrent Networks Recursive Neural Networks - The Long Short-Term Memory and Other Gated RNNs.

### UNIT IV DEEP GENERATIVE MODELS 9

Deep Generative Models: Boltzmann Machines - Restricted Boltzmann Machines - Introduction to MCMC and Gibbs Sampling- gradient computations in RBMs - Deep Belief Networks- Deep Boltzmann Machines.

### UNIT V DEEP LEARNING APPLICATIONS 9

Applications: Large-Scale Deep Learning - Computer - Speech Recognition - Natural Language Processing - Other Applications.

**TOTAL: 45 PERIODS**

## OUTCOMES

After completing this course, students will be able to:

- Analyze the basics concepts of deep learning.
- Apply the knowledge on various deep learning algorithms.
- Describe CNN and RNN to model for real world applications.





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- Analyze the various challenges involved in designing deep learning algorithms for varied applications.
- Describe Convolutional Neural Networks.

## TEXT BOOKS

- Ian Good fellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.
- Bengio, Yoshua. "Learning deep architectures for AI - Foundations and trends in Machine Learning 2.1", 2009.

## REFERENCES

- N.D.Lewis, "Deep Learning Made Easy with R: A Gentle Introduction for Data Science", January 2016.
- Nikhil Buduma, "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", O'Reilly publications, 2016.

## E-RESOURCES

- <https://nptel.ac.in/courses/106/106/106106184/> (Deep Learning)
- <https://nptel.ac.in/courses/108/108/108108148/> (Neural Networks)

## Mapping of Cos-Pos& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	-	3	3	3	-	-	-	-	-	-	2	3	1
2	2	2	2	3	3	2	-	-	-	-	-	-	3	2	3
3	2	2	2	3	2	3	-	-	-	-	-	-	3	2	1
4	2	2	1	3	3	3	-	-	-	-	-	-	3	3	1
5	2	2	-	3	2	2	-	-	-	-	-	-	3	3	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	2.0	2.0	1.0	3.0	2.6	2.6	-	-	-	-	-	-	2.8	2.6	1.4

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation





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23PCP315

CYBER SECURITY STANDARDS AND AUDIT

L T P C

3 0 0 3

## OBJECTIVES

- To understand the fundamentals of cyber security.
- To study how threats materialize into attacks.
- To understand typical threats, attacks and exploits and the motivations behind them.
- To learn strategies for cyber security and protecting critical infrastructure.
- To understand policies to mitigate cyber risks and digital signature.

### UNIT I INTRODUCTION TO CYBER SECURITY 9

Introduction -Computer Security - Threats - Harm - Vulnerabilities - Controls - Authenticate Access Control and Cryptography - Web—User Side - Browser Attacks - Web Att Targeting Users - Obtaining User or Website Data - Email Attacks.

### UNIT II DEFENCES: SECURITY COUNTER MEASURES 9

Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.

### UNIT III MANAGEMENT AND INCIDENTS 9

Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting - Cyber Warfare- Cyberspace and the Law - International Laws – Cyber Crime - Cyber Warfare and Home Land Security.

### UNIT IV STRATEGIES FOR CYBER SECURITY 9

Creating a Secure Cyber, Types of Attacks, Comparison of Attacks, Creating an Assurance Framework, Encouraging Open Standards, Strengthening the Regulatory framework, Creating Mechanisms for IT Security, Securing E-Governance Services, and Protecting Critical Information Infrastructure.

### UNIT V POLICIES TO MITIGATE CYBER RISK 9

Promotion of R&D in Cyber security, Reducing Supply Chain Risks, Mitigate Risks through Human Resource Development, Creating Cyber security Awareness, Information sharing - Implementing a Cyber security Framework. SIGNATURES - Digital Signature, Electronic Signature, Digital Signature to Electronic.

**TOTAL: 45 PERIODS**





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## OUTCOMES

After completing this course, students will be able to:

- Analyze the basics concepts of cyber security.
- Identify the knowledge of preventing into the attack.
- Apply the knowledge of management incidents.
- Discuss various national, international laws and legal frameworks emphasizing responsibility and accountability at all levels in the organization.
- Analyze policies to mitigate cyber risks and digital signature.

## TEXT BOOKS

1. Charles P.fleeger, Shari Lawrence P fleeger and Jonathan Margulies, "Security in Computing", Fifth Edition, Pearson Education, 2015
2. George K.Kostopoulous, "Cyber Space and Cyber Security", CRC Press, 2013.

## REFERENCES

1. Peter Trim and Yang-Im Lee, "Cyber Security Management- A Governance, Risk and Compliance Framework", Gower Publishing, England ,2014.
2. Stuart Broderick J, "Cyber Security Program", Cisco Security Solutions, June 2016.

## E-RESOURCES

1. <https://nptel.ac.in/courses/106/105/106105162/> (Cryptography and Network Security)
2. [https://onlinecourses.swayam2.ac.in/nou21\\_ge40/preview](https://onlinecourses.swayam2.ac.in/nou21_ge40/preview) (Cyber security and Counter Measures)

## Mapping of Cos-Pos& PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	-	3	3	-	-	-	-	-	-	-	3	3	3
2	3	1	1	3	-	2	-	-	-	-	-	-	3	3	3
3	3	2	3	3	3	1	-	-	-	-	-	-	3	3	3
4	3	1	1	2	-	3	-	-	-	-	-	-	3	3	3
5	3	2	2	3	3	3	-	-	-	-	-	-	3	3	3
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	1.6	1.4	2.8	1.8	1.8	-	-	-	-	-	-	3.0	3.0	3.0

1 - Low, 2 - Medium, 3 - High, '-'- No Correlation





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## SEMESTER II

### OPEN ELECTIVE

23PGO201

DISASTER MANAGEMENT

L T P C  
3 0 0 3

#### OBJECTIVES

- To learn the basic conceptual understanding of disasters.
- To study different types of disasters.
- To learn about the disaster management techniques.
- To create awareness about disasters.
- To understand the concept of disaster risk assessment.

#### UNIT I INTRODUCTION

9

Definition and types of disaster Hazards and Disasters – Risk and Vulnerability in Disasters – Natural and Man-made disasters – Earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunamis, avalanches, global climate extremes – Man-made disasters: Terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

#### UNIT II TYPES OF DISASTERS

9

Study of important disasters Earthquakes and its types – Magnitude and intensity – Seismic zones of India – Major fault systems of India plate – Flood types and its management – Drought types and its management – Landside and its managements – Case studies of disasters in Sikkim (e.g) Earthquakes, Landside) – Social economics and environmental impact of disasters.

#### UNIT III DISASTER MANAGEMENT

9

Mitigation and Management techniques of Disaster – Basic principles of disasters management – Disaster Management cycle – Disaster management policy – National and State Bodies for Disaster Management – Early Warning Systems – Building design and construction in highly seismic zones – Retrofitting of buildings.

#### UNIT IV DISASTER AWARENESS

9

Training, awareness program and project on disaster management – Training and drills for disaster preparedness – Awareness generation program – Usages of GIS and Remote sensing techniques in disaster management.







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## UNIT V RISK ASSESSMENT

9

Mini project on disaster risk assessment and preparedness for disasters with reference to disasters in Sikkim and its surrounding areas.

**TOTAL: 45 PERIODS**

### OUTCOMES

Upon completion of the course, Students will be able to:

- Describe the basic conceptual understanding of disasters.
- Explain the different types of disasters.
- Analyze the disaster mitigation and management techniques.
- Discuss the importance of disaster awareness programs for disaster management.
- Analyze the risk behind the disasters.

### TEXT BOOKS

1. Harsh K Gupta, Disaster Management, Universities Press Pvt. Limited, Ninth Edition, 2018.
2. Sulphery M.M., "Disaster Management", PHI Learning Private Limited, Fourth Edition, 2017.
3. Damon P. Copola, "Introduction to International Disaster Management", Elsevier Inc, First Edition, 2016.

### REFERENCES

1. Sharma S.C., "Disaster Management", Khanna Book Publishing Co. (P) Ltd., Fifth Edition, 2018.
2. Gupta A.K., Nair S.S. and Chatterjee S. "Disaster Management and Risk Reduction: Role of Environmental Knowledge", Narosa Publishing House, Fourth Edition, 2018.
3. Murthy D.B.N., "Disaster Management", Deep & Deep Publications, Third Edition, 2017.

### E-RESOURCES

1. <https://nptel.ac.in/courses/124/107/124107010/> (Disaster Management).
2. <https://nptel.ac.in/courses/105/103/105103209/> (Plates and Shells)







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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	1	1	-	-	-	-	1	3	2	1
2	3	2	2	2	-	1	1	-	-	-	-	1	3	2	1
3	3	2	2	2	1	1	1	-	-	1	1	1	3	2	1
4	3	2	2	2	-	1	1	-	-	1	1	1	3	2	1
5	3	2	2	2	1	1	1	-	-	1	1	1	3	2	1
6	-	-	-	-											
AVG	3.0	2.0	2.0	2.0	1.0	1.0	1.0	-	-	1.0	1.0	1.0	3.0	2.0	1.0

1-Low 2-Medium 3-High '-' – No Correlation





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23PGO202

COST MANAGEMENT OF ENGINEERING PROJECTS

L T P C  
3 0 0 3

## OBJECTIVES

- To understand the overview of cost management.
- To learn the different stages of project execution.
- To study the different analysis techniques adopted for project commissioning.
- To know the various pricing strategies followed in engineering projects.
- To study the different quantitative techniques used for cost management.

## UNIT I INTRODUCTION

9

Introduction and overview of the strategic cost management process – Cost concepts in decision making – Relevant cost, Differential cost, Incremental cost and Opportunity cost – Objectives of a Costing System – Inventory valuation – Creation of a database for operational control – Provision of data for decision making.

## UNIT II PROJECT

9

Meaning, different types, why to manage, cost overruns centres, various stages of project execution – Conception to commissioning – Project execution as conglomeration of technical and nontechnical activities – Detailed Engineering activities – Pre project execution main clearances and documents – Project team: Role of each member – Importance of project site – Data required with significance – Project contracts – Types and contents – Project execution – Project cost control – Bar charts and network diagram.

## UNIT III PROJECT COMMISSIONING

9

Mechanical and process – Cost Behavior and Profit Planning – Marginal Costing – Distinction between marginal costing and absorption costing – Break-even Analysis – Cost volume-Profit Analysis – Various decision-making problems – Standard Costing and Variance Analysis.

## UNIT IV PRICING STRATEGIES

9

Pareto Analysis – Target costing – Life cycle costing – Costing of service sector – Just-in-time approach – Material requirement planning – Enterprise resource planning – Total quality management and theory of constraints – Activity-based cost management – Bench marking – Balanced score card and value-chain analysis – Budgetary control – Flexible budgets – Performance budgets – Zero-based budgets – Measurement of divisional profitability pricing decisions including transfer pricing.





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## UNIT V QUANTITATIVE TECHNIQUES FOR COST MANAGEMENT

9

Quantitative techniques for cost management – Linear programming – PERT/CPM – Transportation problems – Assignment problems – Simulation – Learning curve theory.

**TOTAL: 45 PERIODS**

### OUTCOMES

Upon completion of the course, Students will be able to:

- Explain the basics of cost management process.
- Analyze the detailed engineering activities associated in project execution.
- Apply suitable analysis techniques for project commissioning.
- Discuss the various pricing strategies followed in project implementation.
- Analyze the different quantitative techniques used for cost management.

### TEXT BOOKS

1. Charles T. Horngren, Srikant M. Datar and Madhav V. Rajan, "Cost Accounting A Managerial Emphasis", Pearson Education, Fourteenth Edition, 2023.
2. Charles T. Horngren and George Foster, "Advanced Management Accounting", Pearson Education, Thirteenth Edition, 2018.
3. Qiu Guo Lin, Cost management of engineering project, China Electric Power Press, Seventh Edition, 2017.

### REFERENCES

1. Robert S Kaplan, Anthony A. Alkinson, "Management Accounting", Pearson Education, Fourth Edition, 2022.
2. Ashish K. Bhattacharya, "Principles & Practices of Cost Accounting", PHI Learning Private Limited, Sixth Edition, 2020.
3. Kenneth K Humpheys, Project and cost engineers' handbook (cost management), CRC Press, Fourth Edition, 2017.

### E-RESOURCES

1. <https://nptel.ac.in/courses/105/106/105106149/> (Types of Projects)
2. <https://nptel.ac.in/courses/110/104/110104073/> (Cost Management for Projects)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	-	1	1	-	-	1	-	1	2	2	1
2	3	3	3	3	-	1	1	1	-	1	3	1	2	2	1
3	3	3	3	3	2	1	1	1	-	1	3	1	2	2	1
4	3	3	3	3	2	1	1	1	1	1	3	1	2	2	1
5	3	3	3	3	2	1	1	1	1	1	3	1	2	2	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	3.0	3.0	3.0	2.0	1.0	1.0	1.0	1.0	1.0	3.0	1.0	2.0	2.0	1.0

1-Low 2-Medium 3-High '-' – No Correlation





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23PGO203

CONSTITUTION OF INDIA

L T P C  
3 0 0 3

## OBJECTIVES

- To understand the basics of constitution law and constitutionalism.
- To learn the fundamental rights and duties.
- To know the constitution powers of union and state executives.
- To study the constitutional powers and procedures.
- To learn the powers and functions of public service commissions.

## UNIT I INTRODUCTION

9

Meaning of the constitution law and constitutionalism – Historical perspective of the constitution of India – Preamble – Salient features and characteristics of the constitution of India – Citizenship.

## UNIT II FUNDAMENTAL RIGHTS

9

Scheme of the fundamental rights – The scheme of the fundamental duties and its legal status – The directive principles of state policy – Its importance and implementation.

## UNIT III UNION AND STATE EXECUTIVE

9

Federal structure and distribution of legislative and financial powers between the union and the states – Parliamentary form of Government in India – The constitution powers and status of the President of India – Governor – Appointment, powers and functions.

## UNIT IV CONSTITUTIONAL POWERS

9

Amendment of the constitutional powers and procedure – The historical perspectives of the constitutional amendments in India – Emergency Provisions – National emergency – President Rule – Financial Emergency.

## UNIT V OTHER CONSTITUTIONAL FUNCTIONARIES

9

Election commission of India – Organization – Powers and functions – Union public service commission – State public service commission – Local self government.

**TOTAL: 45 PERIODS**





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ESTD 2001

## OUTCOMES

Upon completion of the course, Students will be able to:

- Describe the features and characteristics of the constitution of India.
- Explain the importance of fundamental rights and duties.
- Analyze the constitution power of union and state executives.
- Discuss the amendment of constitutional powers and procedure.
- Examine the powers and functions of union and state public service commission.

## TEXT BOOKS

1. Durga Das Basu, "Introduction to the Constitution of India", Lexis Nexis Publishers, Twenty Fourth Edition, 2019.
2. Subhash C. Kashyap, "Our Constitution", National Book Trust, Fifth Edition, 2021.
3. P M Bakshi, The constitution of India, Universal Law Publishing, Fourteenth Edition, 2017.

## REFERENCES

1. M.Laxmikanth, "Indian Polity", McGraw Hill Publications, Seventh Edition, 2023.
2. Granville Austin, "The Indian Constitution: Cornerstone of a Nation", OUP India, Eighth Edition, 2017.
3. V N Shukla, Constitution of India, Eastern Book Company, Fourth Edition, 2019.

## E-RESOURCES

1. <https://nptel.ac.in/courses/129/106/129106002/>(Constitution of India)
2. <https://nptel.ac.in/courses/129/106/129106003/>(Constitutional Studies)

## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	1	-	1	-	1	1	1	-	1	2	1	1
2	3	2	2	1	-	1	-	1	1	1	-	1	2	1	1
3	3	2	2	1	-	1	-	1	1	1	-	1	2	1	1
4	3	2	2	1	-	1	-	1	1	1	-	1	2	1	1
5	3	2	2	1	-	1	-	1	1	1	-	1	2	1	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	2.0	2.0	1.0	-	1.0	-	1.0	1.0	1.0	-	1.0	2.0	1.0	1.0

1-Low 2-Medium 3-High '-'- No Correlation





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23PGO204

BUSINESS ANALYTICS

L T P C

3 0 0 3

## OBJECTIVES

- To learn the overview of business analysis.
- To know the importance of project life cycle and product life cycles.
- To understand the different types of requirements in business analytics.
- To study the various analysis techniques for transforming requirements.
- To learn about finalizing requirements.

### UNIT I BUSINESS ANALYSIS

9

Overview of business analysis – Overview of requirements – Role of the business analyst – Stakeholders: the project team, management, and the front line – Handling stakeholder conflicts.

### UNIT II LIFE CYCLES

9

Systems development life cycles – Project life cycles – Product life cycles – Requirement life cycles.

### UNIT III FORMING REQUIREMENTS

9

Overview of requirements – Attributes of good requirements – Types of requirements – Requirement sources – Gathering requirements from stakeholders – Common requirements documents.

### UNIT IV TRANSFORMING REQUIREMENTS

9

Stakeholder Needs Analysis – Decomposition Analysis – Additive/Subtractive Analysis – Gap Analysis – Notations (UML & BPMN) – Flowcharts – Swim Lane Flowcharts – Entity-Relationship Diagrams – State-Transition Diagrams – Data Flow Diagrams – Use Case Modeling – Business Process Modeling.

### UNIT V FINALIZING REQUIREMENTS

9

Presenting requirements – Socializing requirements and gaining acceptance – Prioritizing requirements – Managing requirements Assets – Change control – Requirement tools – Recent trends in embedded and collaborative business intelligence – Visual data recovery – Data storytelling and data journalism.

**TOTAL: 45 PERIODS**







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## OUTCOMES

Upon completion of the course, Students will be able to:

- Explain the role of business analyst in business proposals.
- Examine the necessity of product life cycle and requirement life cycle.
- Describe the overview of forming requirements.
- Analyze various transforming requirements used in business analytics.
- Apply requirement tools for finalizing requirements.

## TEXT BOOKS

1. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, "Business analytics Principles, Concepts, and Applications", Pearson FT Press, Third Edition, 2019.
2. James R Evans, "Business Analytics", Pearson FT Press, Third Edition, 2020.
3. Wayne L. Winston, "Business Analytics: Data analysis & decision making", South Western College Publishing, Sixth Edition, 2017.

## REFERENCES

1. Swain Scheps , "Business Intelligence for Dummies", Dummies Publishers, Fourth Edition, 2018.
2. Ger Koole, "An Introduction to Business Analytics", MG Books, First Edition, 2019.
3. Walter R. Paczkowski, "Business Analytics: Data Science for Business Problems", Springer International Publishing, First Edition, 2022.

## E-RESOURCES

1. <https://nptel.ac.in/courses/110/107/110107092/> (Business analytics and data mining modeling)
2. <https://nptel.ac.in/courses/110/105/110105089/> (Business analytics for management decision)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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2	3	3	3	3	2	1	-	1	1	1	2	1	3	2	1
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4	3	3	3	3	2	1	-	1	1	1	2	1	3	2	1
5	3	3	3	3	2	1	-	1	1	1	2	1	3	2	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	3.0	3.0	3.0	2.0	1.0	-	1.0	1.0	1.0	2.0	1.0	3.0	2.0	1.0

1-Low 2-Medium 3-High '-' – No Correlation





23PGO205

DIGITAL MARKETING

L T P C  
3 0 0 3

## OBJECTIVES

- To understand the origin of digital marketing.
- To learn the different types of social media marketing.
- To know the techniques adopted for search engine optimization.
- To study the importance of facebook marketing and mobile marketing in business.
- To learn the tools and methods of web analytics.

## UNIT I INTRODUCTION & ORIGIN OF DIGITAL MARKETING

9

Traditional v/s digital marketing – Digital marketing strategy – The P-O-E-M framework – Segmenting & customizing messages – The digital landscape – Digital advertising market in India – Skills required in digital marketing – Digital marketing plan.

## UNIT II SOCIAL MEDIA MARKETING

9

Meaning, purpose, types of social media websites – Blogging: types of blogs – Blogging platforms & recommendations – Social media engagement – Target audience – Sharing content on social media – Do's and don'ts of social media.

## UNIT III SEARCH ENGINE OPTIMIZATION

9

Meaning – Common SEO techniques – Understanding search engines – Basics of keyword search – Google rankings – Link building – Steps to optimize website – Basics of Email marketing: Types of Emails – Mailing list – Email marketing tools – Email deliverability & Email marketing automation.

## UNIT IV FACEBOOK MARKETING

9

Introduction – Facebook for business – Anatomy of an Ad campaign – Role of adverts – Types & targeting – Adverts budget & scheduling – Adverts objective & delivery – LinkedIn marketing- introduction & importance – LinkedIn strategies – Sales leads generation using LinkedIn – Content strategies – Mobile marketing – Introduction – Mobile usage – Mobile advertising – Mobile marketing tool kit – Mobile marketing features.





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## UNIT V UNDERSTANDING WEB ANALYTICS

9

Purpose, history, goals & objectives – Web analytic tools & methods – Web analytics mistakes and pitfalls – Basics of content marketing: Introduction – Content marketing statistics – Types of content – Types of blog posts – Content creation – Content optimization – Content management & distribution – Content marketing strategy – Content creation tools and apps – Challenges of content marketing.

**TOTAL: 45 PERIODS**

### OUTCOMES

Upon completion of the course, Students will be able to:

- Explain the strategy of digital marketing.
- Describe the purpose of social media marketing.
- Apply the suitable technique for search engine optimization.
- Examine the importance of facebook marketing and linkedin marketing in business.
- Analyze the mistakes and pitfalls of web analytics.

### TEXT BOOKS

1. Rajendra Nargundkar and Romi Sainy “Digital Marketing: Cases from India”, Notion Press, First Edition, 2018.
2. Damian Ryan, “Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation”, Kogen Page Publishers, Third Edition, 2018.
3. Simon Kingsnorth, “Digital Marketing Strategy: An integrated approach to online marketing”, Kogen Page Publishers, Second Edition, 2017.

### REFERENCES

1. Hermawan Kartajaya, Philip Kotler and Iwan Setiawan , “Marketing 4.0 : Moving from Traditional to Digital”, Wiley Publishers, First Edition, 2018.
2. Seema Gupta, “Digital Marketing”, McGraw Hill Publications, Third Edition, 2022.
3. Prabir Rai Chaudhuri, “What is digital marketing: A comprehensive guide”, WMG Publishing, First Edition, 2022.

### E-RESOURCES

1. [https://onlinecourses.swayam2.ac.in/cec19\\_mg23/preview](https://onlinecourses.swayam2.ac.in/cec19_mg23/preview) (Basics of Digital Marketing)
2. [https://onlinecourses.swayam2.ac.in/ugc19\\_hs26/preview](https://onlinecourses.swayam2.ac.in/ugc19_hs26/preview) (Digital Marketing)





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## Mapping of Cos-Pos & PSOs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	1	-	1	1	1	1	1	3	2	1
2	3	3	3	3	2	1	-	1	1	1	1	1	3	2	1
3	3	3	3	3	2	1	-	1	1	1	1	1	3	2	1
4	3	3	3	3	2	1	-	1	1	1	1	1	3	2	1
5	3	3	3	3	2	1	-	1	1	1	1	1	3	2	1
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
AVG	3.0	3.0	3.0	3.0	2.0	1.0	-	1.0	1.0	1.0	1.0	1.0	3.0	2.0	1.0

1-Low 2-Medium 3-High '-' – No Correlation



# ***SCHEME***

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## *Credit Summary*





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## CURRICULUM AND SYLLABI

### FOR M.E. DEGREE PROGRAMMES

(For the Students Admitted in the Academic Year 2023 – 2024 onwards)

### CREDIT SUMMARY

#### M.E. COMPUTER SCIENCE AND ENGINEERING

Category	Semester				Credit Total
	I	II	III	IV	
FC	7	-	-	-	7
PC	11	10	-	-	21
PE	3	6	11	-	20
OE	-	3	-	-	3
EEC	-	1	6	12	19
<b>Total</b>	<b>21</b>	<b>20</b>	<b>17</b>	<b>12</b>	<b>70</b>