



# **Sri Krishna College of Engineering and Technology**

An Autonomous Institution, Affiliated to Anna University

Coimbatore – 641 008



CURRICULUM AND SYLLABI

**M.Tech. COMPUTER SCIENCE AND ENGINEERING**

**(5 Year Integrated)**

**REGULATION 2020**

**(2021 – 2026 BATCH)**

## ABOUT THE DEPARTMENT

### VISION

To produce technologically adept, innovative professionals with human values who will serve as a valuable resource for industry and society.

### MISSION

1. To empower the students with excellence in cutting edge technology for a challenging professional career.
2. To impart moral, ethical values and interpersonal skills to the students.
3. To facilitate the academic industry collaborations and societal outreach programmes.

### PROGRAMME OUTCOMES (POs)

**Computer Science Engineering Graduates will be able to:**

**PO1 - Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2 - Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3 - Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4 - Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5 - Modern tool usage:** 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 - The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7 - Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8 - Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9 - Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10 - Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11 - Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12 - Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)**

**PEO1** Successful career in academia or industries associated with Computer Science and Engineering.

**PEO2** Exhibit analytical, decision making and problem solving skills for handling real life problems and to create novel products.

**PEO3** Ability to communicate the findings or express innovative ideas in an effective manner with an awareness of professional, social and ethical responsibilities.to broader social context.

**PEO4** Possess leadership qualities and emerge in a range of professions.

### **PROGRAMME SPECIFIC OUTCOMES (PSO)**

**Upon completion of the programme, graduates will have ability to:**

**PSO1** Apply the fundamental knowledge for problem solving and analysis as well as conduct investigations in computer science and engineering for sustainable development.

**PSO2** Design and develop the solutions for real time problems and implement them by using modern software tools in lieu of deploying them in the society for its growth.

**PSO3** Communicate effectively, adopt ethics and engage in life-long learning.

### Mapping of PO's to PEO's

Programme Educational Objectives (PEO)	Programme Outcomes (PO)											
	1	2	3	4	5	6	7	8	9	10	11	12
PEO 1	2	2	2	2	2	2	2	2	2	2	2	2
PEO 2	3	3	3	3	3	3	2	2	2	2	2	2
PEO 3	2	2	2	2	2	2	3	3	3	3	2	1
PEO 4	1	1	1	1	1	2	2	2	3	2	2	2

### Mapping of PO's to PSO's

Programme Specific Outcomes (PSO)	Programme Outcomes (PO)											
	1	2	3	4	5	6	7	8	9	10	11	12
PSO 1	2	3	2	1	2	1	1	1	2	1	2	1
PSO 2	2	2	3	1	2	1	2	1	1	1	2	1
PSO 3	1	1	1	1	1	1	1	1	3	3	1	3

### Mapping of PEO's & PSO's

Programme Specific Outcomes (PSO)	Programme Educational Objectives (PEO)			
	PEO1	PEO2	PEO3	PEO4
1	3	2	2	2
2	3	3	3	2
3	2	2	2	2

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed
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**SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**M.Tech. Computer Science and Engineering (5 Year Integrated)**  
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<b>SEMESTER I</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credits</b>	<b>Ext/Int</b>	<b>Category</b>
<b>THEORY</b>							
1	21MAI101	Linear Algebra and Differential Calculus	3/1/0	4	4	60/40	BS
2	21CSI101	Problem Solving using C	3/0/0	3	3	60/40	PC
<b>THEORY CUM PRACTICAL</b>							
3	21ENI101	Business English Communication	2/0/2	4	3	50/50	HM
4	21PHI101	Engineering Physics	3/0/2	5	4	50/50	BS
<b>PRACTICAL</b>							
5	21CSI102	C Programming Laboratory	0/0/3	3	1.5	40/60	PC
6	21MEI101	Engineering Graphics	2/0/2	4	3	40/60	ES
<b>MANDATORY COURSE</b>							
7	21MC101	Mandatory Course I (Induction Programme)	Three weeks		0	0/100	MC
<b>Total</b>				<b>23</b>	<b>18.5</b>	<b>700</b>	

<b>SEMESTER II</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credit</b>	<b>Ext/Int</b>	<b>Category</b>
<b>THEORY</b>							
1	21MAI201	Integral Calculus and Complex Variables	3/1/0	4	4	60/40	BS
2	21CSI201	Python Programming	3/0/0	3	3	60/40	PC
3	21CSI202	Data Structures	3/1/0	4	4	60/40	PC
<b>THEORY CUM PRACTICAL</b>							
4	21EEI201	Basics of Electrical and Electronics Engineering	3/0/2	5	4	50/50	ES
5	21ECI201	Digital Principles and System Design	3/0/2	5	4	50/50	ES
<b>PRACTICAL</b>							
6	21CSI203	Python Programming Laboratory	0/0/3	3	1.5	40/60	PC
7	21CSI204	Data Structures Laboratory	0/0/3	3	1.5	40/60	PC
<b>MANDATORY COURSE</b>							
8	21MC102	Mandatory Course II (Environmental Sciences)	2/0/0	2	0	0/100	MC
<b>Total</b>				<b>29</b>	<b>22</b>	<b>800</b>	

<b>SEMESTER III</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credit</b>	<b>Ext/Int</b>	<b>Category</b>
<b>THEORY</b>							
1	21MAI301	Discrete Structures	3/1/0	4	4	60/40	BS
2	21CSI301	Operating Systems	3/0/0	3	3	60/40	PC
3	21CSI302	Design and Analysis of Algorithms	3/0/0	3	3	60/40	PC
4	21CSI303	Computer Architecture	3/0/0	3	3	60/40	PC
<b>THEORY CUM PRACTICAL</b>							
5	21CSI304	Object Oriented Programming using Java and UML	3/0/2	5	4	50/50	PC
<b>PRACTICAL</b>							
6	21CSI305	Operating Systems Laboratory	0/0/3	3	1.5	40/60	PC
7	21CSI306	Analysis of Algorithms Laboratory	0/0/3	3	1.5	40/60	PC
<b>MANDATORY COURSE</b>							
8	21MC1XX	Mandatory Course III	2/0/0	2	0	0/100	MC
<b>Total</b>				<b>26</b>	<b>20</b>	<b>800</b>	

<b>SEMESTER IV</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credit</b>	<b>Ext/Int</b>	<b>Category</b>
<b>THEORY</b>							
1	21MAI401	Applied Probability	3/1/0	4	4	60/40	BS
2	21CSI401	Database Management Systems	3/0/0	3	3	60/40	PC
3	21CSI402	Core Java Programming	3/0/0	3	3	60/40	PC
4	21GE201	Universal Human Values	3/0/0	3	3	60/40	HM
5	21ECI401	Microcontrollers and Embedded Systems	3/0/0	3	3	60/40	ES
<b>PRACTICAL</b>							
6	21CSI403	Database Management Systems Laboratory	0/0/3	3	1.5	40/60	PC
7	21CSI404	Java Laboratory	0/0/3	3	1.5	40/60	PC
8	21ECI402	Microcontrollers and Embedded Systems Laboratory	0/0/2	2	1	40/60	ES
<b>MANDATORY COURSE</b>							
8	21MC1XX	Mandatory Course IV	2/0/0	2	0	0/100	MC
<b>Total</b>				<b>26</b>	<b>20</b>	<b>900</b>	

<b>SEMESTER V</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credit</b>	<b>Ext/Int</b>	<b>Category</b>
<b>THEORY</b>							
1	21CSI501	Data Warehousing and Mining	3/0/0	3	3	60/40	PC
2	21CSI502	Artificial Intelligence	3/0/0	3	3	60/40	PC
3	21CSI503	JEE Framework	3/0/0	3	3	60/40	PC
4	21CSI504	PHP and JS framework	3/0/0	3	3	60/40	PC
5	21CSI505	Computer Networks	3/0/0	3	3	60/40	PC
6	21CSI506	Agile Technology	3/1/0	4	4	60/40	PC
<b>PRACTICAL</b>							
7	21CSI507	JEE and JS Framework Laboratory	0/0/4	4	2	40/60	PC
8	21CSI508	Computer Networks Laboratory	0/0/2	2	1	40/60	PC
<b>MANDATORY COURSE</b>							
9	21MCI1XX	Mandatory Course V	2/0/0	2	0	0/100	MC
<b>Total</b>				<b>27</b>	<b>22</b>	<b>900</b>	

<b>SEMESTER VI</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credit</b>	<b>Ext/Int</b>	<b>Category</b>
<b>THEORY</b>							
1	21CSI601	Compiler Design	3/0/0	3	3	60/40	PC
2	21CSI602	Big Data Analytics	3/0/0	3	3	60/40	PC
3	21CSI603	Cryptography, Network Security and Application Security	3/1/0	4	4	60/40	PC
4	21CSI604	Software Validation and Testing	3/0/0	3	3	60/40	PC
5	21CSI605	Mobile Application Development	3/0/0	3	3	60/40	PC
6	21CSI9XX	Professional Elective I	3/0/0	3	3	60/40	PE
<b>PRACTICAL</b>							
7	21CSI606	Big Data Analytics Laboratory	0/0/3	3	1.5	40/60	PC
8	21CSI607	Mobile Application Development Laboratory	0/0/3	3	1.5	40/60	PC
<b>PROJECT WORK</b>							
9	21CSI606	Mini Project I	0/0/3	3	1.5	40/60	PW
<b>Total</b>				<b>28</b>	<b>23.5</b>	<b>900</b>	

<b>SEMESTER VII</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credit</b>	<b>Ext/Int</b>	<b>Category</b>
<b>THEORY</b>							
1	21XXXXX	Open Elective I	3/0/0	3	3	60/40	OE
2	21CSI9XX	Professional Elective II	3/0/0	3	3	60/40	PE
3	21CSI9XX	Professional Elective III	3/0/0	3	3	60/40	PE
4	21CSI701	Block Chain Technology	3/0/0	3	3	60/40	PC
5	21CSI702	Internet of Things	3/0/0	3	3	60/40	PC
6	21CSI703	Cloud Computing	3/0/0	3	3	60/40	PC
<b>THEORY CUM PRACTICAL</b>							
7	21CSI704	Block Chain Technology Laboratory	0/0/3	3	1.5	40/60	PC
8	21CSI705	IoT and Cloud Computing Laboratory	0/0/3	3	1.5	40/60	PC
<b>Total</b>				<b>24</b>	<b>21</b>	<b>800</b>	

<b>SEMESTER VIII</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credit</b>	<b>Ext/Int</b>	<b>Category</b>
<b>THEORY</b>							
1	21CSI801	Microservices and Distributed Computing Architecture	3/0/0	3	3	60/40	PC
2	21CSI802	Machine Learning	3/0/0	3	3	60/40	PC
3	21MGI801	Banking and Insurance	3/0/0	3	3	60/40	HM
4	21CSI9XX	Professional Elective IV	3/0/0	3	3	60/40	PE
5	21CSI9XX	Professional Elective V	3/0/0	3	3	60/40	PE
6	21XXXXX	Open Elective II	3/0/0	3	3	60/40	OE
<b>PRACTICAL</b>							
7	21CSI803	Machine Learning Laboratory	0/0/2	2	1	40/60	PC
<b>PROJECT WORK</b>							
8	21CSI804	Mini Project II	0/0/3	3	1.5	40/60	PW
<b>Total</b>				<b>23</b>	<b>20.5</b>	<b>800</b>	



<b>SEMESTER IX</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credit</b>	<b>Ext/Int</b>	<b>Category</b>
<b>THEORY</b>							
<b>1</b>	21CSI901	Front end Frameworks Engineering	3/0/0	3	3	60/40	PC
<b>2</b>	21CSI9XX	Professional Elective VI	3/0/0	3	3	60/40	PE
<b>PRACTICAL</b>							
<b>3</b>	21CSI902	Front end Frameworks Engineering Laboratory	0/0/2	2	1	40/60	PC
<b>PROJECT WORK</b>							
<b>4</b>	21CSI903	Project Phase I	0/0/16	16	8	40/60	PW
<b>EMPLOYABILITY ENHANCEMENT SKILLS</b>							
<b>5</b>	21EES001	Employability Enhancement Skills			1.5	0/100	EES
<b>Total</b>				<b>24</b>	<b>16.5</b>	<b>500</b>	

<b>SEMESTER X</b>							
<b>S No.</b>	<b>Course Code</b>	<b>Course</b>	<b>L/T/P</b>	<b>Contact hrs/week</b>	<b>Credit</b>	<b>Ext/Int</b>	<b>Category</b>
<b>PROJECT WORK</b>							
<b>1</b>	21CSI904	Project Phase II	0/0/32	32	16	40/60	PW
<b>Total</b>				<b>32</b>	<b>16</b>	<b>100</b>	

**HUMANITIES AND MANAGEMENT (HM) – 9 credits**

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Ext/Int	Category
1	21ENI101	Business English Communication	2/0/2	4	3	50/50	HM
2	21MGI801	Banking and Insurance	3/0/0	3	3	60/40	HM
3	21GE201	Universal Human Values	3/0/0	3	3	60/40	HM

**BASIC SCIENCES (BS) – 20 credits**

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Ext/Int	Category
1	21MAI101	Linear Algebra and Differential Calculus	3/1/0	4	4	60/40	BS
2	21PHI101	Engineering Physics	3/0/2	5	4	50/50	BS
3	21MAI201	Integral Calculus and Complex Variables	3/1/0	4	4	60/40	BS
4	21MAI301	Discrete Structures	3/1/0	4	4	60/40	BS
5	21MAI401	Applied Probability	3/1/0	4	4	60/40	BS

**ENGINEERING SCIENCES(ES) – 15 credits**

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Ext/Int	Category
1	21MEI101	Engineering Graphics	2/0/2	4	3	50/50	ES
2	21EEI201	Basics of Electrical and Electronics Engineering	3/0/2	5	4	50/50	ES
3	21ECI201	Digital Principles and System Design	3/0/2	5	4	50/50	ES
4	21ECI401	Microcontrollers and Embedded Systems	3/0/0	3	3	60/40	ES
5	21ECI402	Microcontrollers and Embedded Systems Laboratory	0/0/2	2	1	40/60	ES

**PROFESSIONAL CORE (PC) – 103.5 credits**

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Ext/Int	Category
1	21CSI101	Problem Solving using C	3/0/0	3	3	60/40	PC
2	21CSI102	C Programming Laboratory	0/0/3	3	1.5	40/60	PC
3	21CSI201	Python Programming	3/0/0	3	3	60/40	PC
4	21CSI202	Data Structures	3/1/0	4	4	60/40	PC
5	21CSI203	Python Programming Laboratory	0/0/3	3	1.5	40/60	PC
6	21CSI204	Data Structures Laboratory	0/0/3	3	1.5	40/60	PC
7	21CSI301	Operating Systems	3/0/0	3	3	60/40	PC
8	21CSI302	Design and Analysis of Algorithms	3/0/0	3	3	60/40	PC
9	21CSI303	Computer Architecture	3/0/0	3	3	60/40	PC
10	21CSI304	Object Oriented Programming using Java and UML	3/0/2	5	4	60/40	PC

11	21CSI305	Operating Systems Laboratory	0/0/3	3	1.5	40/60	PC
12	21CSI306	Analysis of Algorithms Laboratory	0/0/3	3	1.5	40/60	PC
13	21CSI401	Database Management Systems	3/0/0	3	3	60/40	PC
14	21CSI402	Core Java Programming	3/0/0	3	3	60/40	PC
15	21CSI403	Database Management Systems Laboratory	0/0/3	3	1.5	40/60	PC
16	21CSI404	Java Laboratory	0/0/3	3	1.5	40/60	PC
17	21CSI501	Data Warehousing and Mining	3/0/0	3	3	60/40	PC
18	21CSI502	Artificial Intelligence	3/0/0	3	3	60/40	PC
19	21CSI503	JEE Framework	3/0/0	3	3	60/40	PC
20	21CSI504	PHP and JS framework	3/0/0	3	3	60/40	PC
21	21CSI505	Computer Networks	3/0/0	3	3	60/40	PC
22	21CSI506	Agile Technology	3/1/0	4	4	60/40	PC
23	21CSI507	JEE and JS Framework Laboratory	0/0/4	4	2	40/60	PC
24	21CSI508	Computer Networks Laboratory	0/0/2	2	1	40/60	PC
25	21CSI601	Compiler Design	3/0/0	3	3	60/40	PC
26	21CSI602	Big Data Analytics	3/0/0	3	3	60/40	PC
27	21CSI603	Cryptography, Network Security and Application Security	3/1/0	4	4	60/40	PC
28	21CSI604	Software Validation and Testing	3/0/0	3	3	60/40	PC
29	21CSI605	Mobile Application Development	3/0/0	3	3	60/40	PC
30	21CSI606	Big Data Analytics Laboratory	0/0/3	3	1.5	40/60	PC
31	21CSI607	Mobile Application Development Laboratory	0/0/3	3	1.5	40/60	PC
32	21CSI701	Block Chain Technology	3/0/0	3	3	60/40	PC
33	21CSI702	Internet of Things	3/0/0	3	3	60/40	PC
34	21CSI703	Cloud Computing	3/0/0	3	3	60/40	PC
35	21CSI704	Block Chain Technology Laboratory	0/0/3	3	1.5	40/60	PC
36	21CSI705	IoT and Cloud Laboratory	0/0/3	3	1.5	40/60	PC
37	21CSI801	Microservices and Distributed Computing Architecture	3/0/0	3	3	60/40	PC
38	21CSI802	Machine Learning	3/0/0	3	3	60/40	PC
39	21CSI803	Machine Learning Laboratory	0/0/2	2	1	40/60	PC
40	21CSI901	Front end Frameworks Engineering.	3/0/2	5	4	50/50	PC
41	21CSI902	Front end Frameworks Engineering Laboratory	0/0/2	2	1	40/60	PC

**MANDATORY COURSES (MC)**

<b>S.No.</b>	<b>Course Code</b>	<b>Course Title</b>	<b>Category</b>
<b>1</b>	21MC101	Induction Programme	MC
<b>2</b>	21MC102	Environmental Sciences	MC
<b>3</b>	21MC103	Soft Skills	MC
<b>4</b>	21MC104	Management Organizational Behaviour	MC
<b>5</b>	21MC105	General Aptitude	MC
<b>6</b>	21MC106	Life Skills and Ethics	MC
<b>7</b>	21MC107	Stress Management	MC
<b>8</b>	21MC108	Constitution of India	MC
<b>9</b>	21MC109	Essence of Indian Traditional Knowledge	MC

## PROFESSIONAL ELECTIVE COURSES

S. No	Course Code	Course Title	L/T/P	Contact Hrs/Wk	Credits	Category
<b>Computer and Network Security</b>						
1.	21CSI911	Mobile Ad Hoc networks	3/0/0	3	3	PE
2.	21CSI912	Mobile Computing	3/0/0	3	3	PE
3.	21CSI913	Distributed Systems	3/0/0	3	3	PE
4.	21CSI914	Wireless Sensor Networks	3/0/0	3	3	PE
5.	21CSI915	Cyber Security and Ethical Hacking	3/0/0	3	3	PE
6.	21CSI916	Advanced Databases	3/0/0	3	3	PE
7.	21CSI917	Advanced Algorithms	3/0/0	3	3	PE
8.	21CSI918	Software Product Management	3/0/0	3	3	PE
9.	21CSI919	Information Ethics and Cyber Laws	3/0/0	3	3	PE
<b>Intelligent Systems</b>						
10.	21CSI921	Soft Computing	3/0/0	3	3	PE
11.	21CSI922	Deep Learning	3/0/0	3	3	PE
12.	21CSI923	Human Computer Interaction	3/0/0	3	3	PE
13.	21CSI924	Image Processing and Pattern Recognition	3/0/0	3	3	PE
14.	21CSI925	Speech and Natural Language Processing	3/0/0	3	3	PE
15.	21CSI926	Social Network Analysis	3/0/0	3	3	PE
16.	21CSI927	Optimization Techniques	3/0/0	3	3	PE
17.	21CSI928	Data Visualization	3/0/0	3	3	PE
18.	21CSI929	Computer Vision	3/0/0	3	3	PE
<b>Thriving Electives</b>						
19.	21CSI931	Game Theory and its Applications	3/0/0	3	3	PE
20.	21CSI932	Cognitive Science and Decision Making	3/0/0	3	3	PE
21.	21CSI933	Business Intelligence	3/0/0	3	3	PE
22.	21CSI934	Quantum Computing	3/0/0	3	3	PE
23.	21CSI935	Robotics and its Applications	3/0/0	3	3	PE
24.	21CSI936	Virtual Reality	3/0/0	3	3	PE
25.	21CSI937	Parallel Computing	3/0/0	3	3	PE
26.	21CSI938	DevOps	3/0/0	3	3	PE

### Open Elective Courses offered to other departments

S.No.	Course Code	Course Title	L	T	P	Credit	Ext/Int
1	21CSI001	Multimedia Applications	3	0	0	3	60/40
2	21CSI002	.NET Framework for Application Development	3	0	0	3	60/40
3	21CSI003	Dependable Computing	3	0	0	3	60/40
4	21CSI004	Business Information Systems	3	0	0	3	60/40

## VALUE ADDED COURSES

S.No.	Course	Course Title	L	T	P	Credit
1.	21VA110	Serverless Stack	2	0	0	2
2.	21VA111	Salesforce	2	0	0	2
3.	21VA112	Octave PL	2	0	0	2
4.	21VA113	Laravel	2	0	0	2
5.	21VA130	Effective Communication Skills	2	0	0	2

## SCHEME OF CREDIT DISTRIBUTION – SUMMARY

S. No	Stream	Credits/Semester										Credits
		I	II	III	IV	V	VI	VII	VIII	IX	X	
1.	Humanities and Management (HM)	3			3				3			9
2.	Basic Sciences(BS)	8	4	4	4							20
3.	Engineering Sciences(ES)	3	8		4							15
4.	Professional Core(PC)	4.5	10	16	9	22	19	12	7	4		103.5
5.	Professional Electives(PE)						3	6	6	3		18
6.	Open Electives (OE)							3	3			6
7.	Project Work(PW)						1.5		1.5	8	16	27
8.	Employability Enhancement Skills	1.5										1.5
9.	Mandatory Course (MC)											<b>Non credit</b>
<b>Total</b>		<b>18.5</b>	<b>22</b>	<b>20</b>	<b>20</b>	<b>22</b>	<b>23.5</b>	<b>21</b>	<b>20.5</b>	<b>16.5</b>	<b>16</b>	<b>200</b>

**Nature of Course** J (Problem Analytical)

**Pre requisites** -

**Course Objectives:**

- 1 To develop the skill to use matrix algebra techniques that is needed by engineers for practical applications.
- 2 To gain knowledge in using infinite series of approximations for solutions arising in mathematical modelling.
- 3 To familiarize with functions of several variables applicable in many branches of engineering.
- 4 To find the solution of ordinary differential equations as most of the engineering problems are characterized in this form.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C101.1 | Recall the concepts of matrices, ordinary and partial derivatives  | [K]  |
| C101.2 | Express square matrix in the diagonal form and infinite series approximations  | [U]  |
| C101.3 | Apply the knowledge of differential equation and extreme values of the given functions to solve the engineering problems | [AP] |

**Course Contents:**

**Module 1:**

**20 Hours**

**LINEAR ALGEBRA**

Symmetric, Skew – symmetric and orthogonal matrices - Characteristic equation – Eigen values and eigenvectors of real matrices and their properties (statement only). Cayley-Hamilton theorem (statement only): Verification and application to find inverse and powers of real matrices. Orthogonal transformation of a real symmetric matrix to diagonal form – Reduction of Quadratic form to canonical form by orthogonal reduction.

**Module 2:**

**20 Hours**

**SEQUENCES AND SERIES**

Convergence of sequences and series – Tests of convergence of positive term series: Comparison test, D’Alembert’s ratio test- Cauchy root test -Alternating Series- Leibnitz’s test- Series of positive and negative terms-Absolute and conditional convergence.

**Module 3:**

**20 Hours**

**CALCULUS**

Functions of several variables: Total derivatives – Differentiation of implicit functions – Jacobians – Taylor series expansion – Maxima and Minima – Method of Lagrangian multipliers. Ordinary differential equations-Second and Higher order linear differential equations with constant coefficients –Cauchy’s and Legendre’s linear differential equations-Method of variation of parameters. Application of ODE: Differential equations connected with electric circuits and Simple Harmonic motion (Differential equations and associated conditions need to be given)

**Total Hours: 60**

**Text Books:**

- 1 G.B.Thomas and R.L.Finney, Calculus and Analytic Geometry, 13<sup>th</sup> Edition, Pearson, Reprint, 2014
- 2 Kreyszig. E, “Advanced Engineering Mathematics”, 10<sup>th</sup> Edition, John Wiley and Sons (Asia) Limited, Singapore 2014.
- 3 Grewal. B.S, “Higher Engineering Mathematics”, 43<sup>rd</sup> Edition, Khanna Publications, Delhi, 2014.

**Reference Books:**

- 1 Veerarajan. T, "Engineering Mathematics I", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2018.
- 2 Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 4<sup>th</sup> Edition, 2012.
- 3 N.P.Bali and Dr.Manish Goyal, "A Text book of Engineering Mathematics" 9<sup>th</sup> Edition, Laxmi publications Ltd, 2014.

**Web References:**

- 1 <http://www.nptel.ac.in/courses/111105035>
- 2 <http://www.nptel.ac.in/courses/122104017>
- 3 <http://www.nptel.ac.in/courses/122102009>
- 4 <http://www.nptel.ac.in/courses/111107063>

**Online Resources:**

- 1 <https://www.coursera.org/learn/linearalgebra2>
- 2 <https://www.coursera.org/learn/differentiation-calculus>
- 3 <https://www.coursera.org/learn/single-variable-calculus>
- 4 <https://alison.com/courses/Algebra-Functions-Expressions-and-Equations>

**Assessment Methods & Levels (based on Blooms Taxonomy)****Formative assessment based on Capstone Model (Max. Marks:20)**

Course Outcome	Bloom's Level	Assessment Component	Marks
C101.1	Remember	Classroom or Online Quiz	4
C101 .2	Understand	Class Presentation/Power point Presentation	6
C101.1,2,3	Apply	Group Assignment & Tutorial	10

Summative assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%)					End Semester Examination (60 %)	
CA 1(20 Marks)			CA2(20 Marks)			
SA 1 (12 Marks)	FA 1		SA 2 (12 marks)	FA 2		Theory Examination (60 Marks)
	Component -I (4 marks)	Component -II (4 marks)		Component -I (4 marks)	Component -II (4 marks)	

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative assessment based on Capstone Model (16%)			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list – Quiz, Assignment, Case study, Seminar, Group Assignment)	Marks
C101.1	Remember	Quiz	4
C101.2	Apply	Group Activities / Tutorial	4
C101.3	Understand	Group Assignment	4
C101.3	Apply	Presentation	4



Summative assessment based on Continuous and End Semester Examination			
Bloom's Level	Continuous Assessment (24%)		End Semester Examination (60%) [60 Marks]
	CIA1 [12 Marks]	CIA2 [12 Marks]	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1	1	1	1						1				1	2	1
C101.2	2	2	2						2				2	2	2
C101.3	3	3	3						3				3	2	3

**Nature of Course** F (Theory Programming)

**Pre requisites** -

**Course Objectives:**

1. To describe problem solving concept and basics of C programming.
2. To discuss the control structures in C.
3. To solve real world problems using arrays, strings, pointers and functions.
4. To explain Structure, Union and File concepts.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C101.1: Apply problems solving techniques to solve real world problems.	[AP]
C101.2: Calculate programs using C constructs, arrays and strings.	[AP]
C101.3: Use the concepts of pointers, structures and files in programs.	[AP]
C101.4: Discuss modular programming with functions.	[U]

**Course Contents:**

**Module 1:**

**15 Hours**

**Problem Solving Techniques:** General problem Solving concepts - Algorithm, Pseudo-code and Flowchart - Problem Solving with Sequential Logic Structure - Problem Solving with Decisions - Problem Solving with Loops **Case Study:** Raptor and Scratch Tools

**Module 2:**

**15 Hours**

**C Basics:** Fundamentals – Structure of a ‘C’ program – compilation and linking process  
**Constructs of C:** Lexical elements – Operators – Constants, Variables - data types – I/O statements – format specifications – control statements – decision making and looping. **Arrays:** Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. **Strings:** Character array – string handling functions – manipulation on strings.

**Module 3:**

**15 Hours**

**Functions and Pointers:** Function – definition of function – Declaration of function – arguments (formal and actual) – return types - Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Arrays using Pointers, Pointers to structures.  
**Structures and Unions:** Introduction – need for structure data type – structure definition – Structure declaration –Structure within a structure – Union – File Handling.

**Total Hours: 45**

**Text Books:**

1. Herbert Schildt, “The Complete Reference C”, 4<sup>th</sup> Edition, McGraw Hill, 2015.
2. M. Sprankle, Jim Hubbard, “Problem Solving and Programming Concepts”, 9<sup>th</sup> Edition, Pearson Education, New Delhi,2011.
3. Byron,S.Gottfreid, “Programming with C”, McGrawHill, Schaum’soutlines,3<sup>rd</sup> Edition, 2014.

**Reference Books:**

- 1 S.ThamaraiSelvi and R.Murugesan, “Programming in ANSI C”,6<sup>th</sup> Edition, McGrawHill, 2012.
- 2 K.R.Venugopal and Sudeep R. Prasad, “Mastering C”, McGrawHill,2<sup>nd</sup> Edition,2015.

**Web References:**

1. <http://nptel.ac.in/courses/106105085/>
2. [https://onlinecourses.nptel.ac.in/noc17\\_cs43/](https://onlinecourses.nptel.ac.in/noc17_cs43/)
3. <http://raptor.martincarlisle.com/>
4. <https://scratch.mit.edu/>

**Online resources:**

1. [www.leetcode.com](http://www.leetcode.com)
2. <https://nptel.ac.in/courses/106104128/>

<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy)</b>			
<b>Formative assessment based on Capstone Model (16%)</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component</b>	<b>Marks</b>
C101.1,2	Understand	Assignment	4
C101.1,2	Apply	Quiz	4
C101.3,4	Apply	Case Study	4
C101.4	Apply	Tutorial	4
<b>Summative assessment based on Continuous and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Continuous Assessment (24%)</b>		<b>End Semester Examination (60%) [60 Marks]</b>
	<b>CIA1 [12 Marks]</b>	<b>CIA2 [12 Marks]</b>	
Remember	30	30	20
Understand	40	30	30
Apply	30	40	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

<b>Summative assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%)</b>						<b>End Semester Examination (60%)</b>
<b>CA 1 (20 Marks)</b>			<b>CA 2 (20 Marks)</b>			
<b>SA 1 (12 Marks)</b>	<b>FA 1</b>		<b>SA 2 (12 marks)</b>	<b>FA 2</b>		<b>Theory Examination (60 Marks)</b>
	<b>Component -I (4 marks)</b>	<b>Component -II (4 marks)</b>		<b>Component -I (4 marks)</b>	<b>Component -II (4 marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C101.1</b>	3	3	3						3		3	1	3	2	3
<b>C101.2</b>	3	3	3						3		3	2	3	2	3
<b>C101.3</b>	3	3	3						3		3	1	3	2	3
<b>C101.4</b>	2	2	1						2		2	2	2	2	2

21ENI101

**BUSINESS ENGLISH COMMUNICATION**

2/0/2/3

**Nature of Course** D (Theory Application)

**Pre requisites** -

**Course Objectives:**

- 1 To develop the listening skills and reading practices using authentic business vocabulary.
- 2 To instill analytical thinking and logical reasoning to enhance LSRW skills in business related situations.
- 3 To make the students to communicate effectively in corporate sector using business English.
- 4 To prepare students for competitive exams like BEC, IELTS, TOEFL.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |   |      |
|---|------|
| C101.1 Remember LSRW skills and employ cross-cultural communication in business related situations.   | [R]  |
| C101.2 Understand and gain proficiency with business vocabulary.  | [U]  |
| C101.3 Apply Task- based activity to enhance an effective communication.  | [AP] |
| C101.4 Apply Business English in working environment.   | [AP] |
| C101.5 Understand and analyse a variety of reading strategies to foster comprehension and to construct meaningful and relevant connections to the text. | [AN] |

**Course Contents:**

**Module 1: 10 Hours**

**Listening and Speaking**

Taking and Leaving Voice mail messages –Identifying the information before listening- Inferring ideas- Listening to short monologues -Longer listening tasks -Recognise functions. Expressing hypothetical Situations – Expressing obligation -Aspects of business – Giving examples- Giving reasons- Giving extra information- Presentation at a business meeting-Connecting ideas- Collaborative task – Short talk on a business topics- Film Reviews.

**Module 2: 10 Hours**

**Reading and Writing**

Science texts - Terms related about science and scientists - Scanning for specific information- Understanding cohesive features - Skimming the reading comprehensions - Interpret opinions and ideas expressed – Collocations - Identifying dependent preposition - Identifying the extra words. Definitions, Extended Definitions -Letter writing (accepting and declining invitations)- Internal communication (notes/memo/E-mail writing to the head of the department, colleague, assistant , staff in the department etc) Report writing- Business proposal- circular- agenda and minutes- Appropriate linking words- Report Phrases - Asking for Information and Making Suggestions- Transcoding (Bar Chart, Flow Chart)- Letter - calling for quotations, Replying for quotations- Placing an order and complaint letter.

**Module 3: 10 Hours**

**Parts of Speech**

Tenses - Adjectives - Adverbs - Articles- Modal verbs, Active and Passive Voice, Impersonal Passive voice, Homophones Homonyms- Acronyms- Abbreviations- British and American words- Comparatives and Superlatives- Gerunds- infinitives – Participles- Modal Verbs - Relative Pronouns- Reported Speech - Indirect Questions- Spotting errors- Job Application Letter- Sales Letter.

**Lab Components**

1 Mini Presentation	[E]
2 Logical reasoning and Ethics in a given situation	[E]
3 Technical Presentation	[E]
4 Group Discussion	[E]
5 Extempore	[E]

**Total Hours: 60 Hrs.****Text Books:**

- Whitby, Norman, "Business Benchmark Pre-Intermediate to Intermediate Student's Book", Cambridge University Press, 2013.
- Rizvi Ashraf M, "Effective Technical Communication", McGraw Hill Education (India) Private Limited, 2<sup>nd</sup> Edition, 2018.
- Sumant S, "English for Engineers, Tata Mcgraw Hill Education Private Limited 2017.

**Reference Books:**

- Wood, Ian, Paul Sanderson, Anne Williams, Marjorie Rosenberg, "Pass Cambridge BEC Vantage", Cengage learning. 2<sup>nd</sup> Edition. 2014.
- Dr. Gunasekaran S, 'A Workbook of Technical English ', Vishnu Prints Media, Fourth Edition, 2017
- Lewis, Norman, "Word Power Made Easy", Pocket Books, New York, 1979.

**Web References:**

- <http://www.cambridgeindia.org>
- <http://www.cambridgeenglish.org/exams/business-certificates/business-vantage>
- <https://stepstest.in>

**Online Resources:**

- <https://www.coursera.org/specializations/business-english>
- <http://www.academiccourses.com/Courses/English/Business-English>

<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy) - Theory</b>			
<b>Formative Assessment based on Capstone Model (10%)</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component</b>	<b>Marks</b>
C101.1 & C101.2	Understand & Apply	Extempore	2
C101.3	Apply	Mini Presentation	3
C101.4	Understand	Group Discussion	2
C101.5	Apply	Technical Presentation	3
<b>Summative Assessment based on Continuous and End Semester Examination - Theory</b>			
<b>Bloom's Level</b>	<b>Continuous Internal Assessment (15%)</b>		<b>End Semester Examination (35%) [35 Marks]</b>
	<b>CIA 1 [7 Marks]</b>	<b>CIA 2 [8 Marks]</b>	
Remember	20	15	20
Understand	30	35	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Summative Assessment based on Continuous and End Semester Examination - Practical			
Bloom's Level	Continuous Assessment (25%)		End Semester Examination (15%) [15 Marks]
	FA (19 Marks)	SA (6 Marks)	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	
Evaluate	-	-	
Create	-	-	

Summative Assessment based on Continuous and End Semester Examination									
Continuous Assessment (50%)							End Semester Examination (50%)		
CA 1 (12 Marks)			CA 2 (13 Marks)			Practical Exam (25 Marks)		Theory (35)	Practical I (15)
SA 1 (7)	FA 1		SA 2 (8)	FA 2		FA (19)	SA (6)		
	Comp - I (2)	Comp -II (3)		Comp - I (2)	Comp - II (3)				

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1								1	1	1		1	1	1	1
C101.2								1	1	1		1	1	1	1
C101.3								3	3	1		2	3	2	3
C101.4								3	3	2		1	3	2	3
C101.5								3	3	2		1	3	2	3

**Nature of Course** E (Theory skill based)

**Pre requisites** -

**Course Objectives:**

- 1 To learn the basic concepts of physics needed for computing engineering
- 2 To apply the physics concepts in solving real time engineering problem
- 3 To implement and visualize theoretical aspects in the laboratory
- 4 To familiarize the students to handle various instruments and equipment

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C101.1 | Recognize the fundamental concepts of interference, diffraction and polarization | [K]  |
| C101.2 | Explain the basics in magnetic and superconducting materials                     | [U]  |
| C101.3 | Extend knowledge about semiconductors and fibre optic communication.             | [U]  |
| C101.4 | Apply the gained knowledge to solve the problems related to their field of study | [AP] |

**Course Contents:**

**Module 1:**

**15 Hours**

***Wave optics :***

Huygen's theory (An introduction to Wavefront and its types), Interference-Principle of superposition-Young's experiment-Theory of interference fringes-Types of interference – Conditions for interference pattern- Michelson interferometer. Diffraction-Two kinds of diffraction-Difference between interference and diffraction-Fraunhofer diffraction at single slit-Plane diffraction grating. Polarization-Introduction- Brewster's law, Malus law, Double refraction-Nicol's prism-construction and working.

**Module 2:**

**15 Hours**

***Magnetic and Superconducting materials***

Basic Definitions: Permeability (absolute and relative), magnetic field intensity, magnetic moment of bar magnet, intensity of magnetisation, Magnetic line of force, magnetic field and magnetic induction, magnetic flux-Types of magnetism: para, dia, ferro and antiferro magnetic material – Domain theory – Magnetic hysteresis – Soft and hard magnetic materials – Ferrites – Properties, applications-Magnetic recording and readout-Magnetic disc drives. Superconductivity – Properties – Temperature dependence of resistivity in superconducting materials – Temperature dependence of critical field – Critical currents- Meissner effect-, Types of super conductors – BCS theory - High Tc super conductors– Application: Josephson effect - SQUID, magnetic levitation.

**Module 3:**

**15 Hours**

***Semiconductor devices and Fibre Optic Communication:***

Introduction to semiconductors – Basic of Intrinsic and extrinsic semiconductors – PN Junction diode – formation and operation – IV characteristics, Applications - Light Emitting Diode(LED)- Transistor – Bi-polar Junction Transistor (BJT)- Common base configuration - VI characteristics Fibre Optics - Principle and propagation–Numerical aperture and acceptance angle – Classification of optical fibres – Splicing - Fibre optic communication system (Block diagram) - Fibre optic sensors: temperature and displacement.

**Lab Component**

1	Laser and optical fiber parameters	[U]
2	Wavelength measurement of mercury spectrum- Spectrometer Grating	[U]
3	Young's modulus - Non- Uniform bending method	[U]
4	Rigidity modulus – Torsional Pendulum	[U]
5	Coefficient of viscosity for a liquid –Poiseuille's method	[U]
6	Magnetic field along the axis of current carrying coil- Stewart and Gee method.	[U]
7	LCR circuits.	[U]
8	Newton's ring- wavelength of sodium vapour lamp / Airwedge – Thickness of thin sample	[U]
9	Time constant of RC circuits.	[U]
10	Transverse and longitudinal wave modes- Melde's experiment.	[U]
<b>Total Hours:</b>		<b>75</b>

**Text Books:**

- 1 Beiser A, "Concepts of Modern Physics", 5<sup>th</sup>Edition, McGraw Hill International, 2010.
- 2 David Halliday, Robert Resnick, Jearl Walker "Fundamentals of Physics", Wileyplus, 2010
- 3 S.L.Gupta, Sanjeev Gupta, "Modern Engineering Physics", DhanpatRai Publications, 2011

**Reference Books:**

- 1 AjoyGhatak, "Optics" , 5<sup>th</sup>Edition, Tata McGraw Hill, 2012
- 2 Sears, Zemansky, "University Physics", Addison-Wesley, 1999
- 3 Francis.A.Jenkins and Harvey.E.White, "Fundamentals of Optics", 4<sup>th</sup>Edition, McGraw Hill Education, 2017

**Web References:**

- 1 <https://www.drdo.gov.in/drdo/data/Laser%20and%20its%20Applications.pdf>
- 2 <https://www3.nd.edu/~powers/ame.20231/planckdover.pdf>
- 3 <https://www.corning.com/in/en/products/communication-networks/.../fiber.html>
- 4 <https://physics.info/>
- 5 <http://www.feynmanlectures.caltech.edu/info/>
- 6 <http://nptel.ac.in/courses/113106032/4%20-%20Crystal%20structure.pdf>
- 7 [http://www.phys.ufl.edu/courses/phy2054/s09/lectures/2054\\_ch21A.pdf](http://www.phys.ufl.edu/courses/phy2054/s09/lectures/2054_ch21A.pdf)
- 8 <https://ocw.mit.edu/courses/physics/8-04-quantum-physics-i-spring-2013/>
- 9 <https://swayam.gov.in/course/4537-fundamentals-of-electronic-materials-and-devices>
- 10 [https://www2.physics.ox.ac.uk/sites/default/files/2011-06-08/optics\\_2016\\_week\\_1\\_notes\\_and\\_slides\\_pdf\\_19526.pdf](https://www2.physics.ox.ac.uk/sites/default/files/2011-06-08/optics_2016_week_1_notes_and_slides_pdf_19526.pdf)

**Online Resources:**

- 1 <https://www.patana.ac.th/secondary/science/anrophysics/ntopic4/commentary.htm>
- 2 <http://www.indiaeducation.net/>
- 3 <https://www.jic.ac.uk/microscopy/links.html>
- 4 <http://esiksha.com/home.asp>
- 5 [www.fiberopticonline.com/](http://www.fiberopticonline.com/)
- 6 <https://ocw.mit.edu/courses/#physics>
- 7 <https://physics.stanford.edu/people/susmita-adhikari>



<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy) - Theory</b>			
<b>Formative Assessment based on Capstone Model (10%)</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component</b>	<b>Marks</b>
C101.1	Remember	Assignment	2
C101.2	Understand	Quiz	3
C101.3	Understand		
C101.4	Apply	Seminar	2
C101.5	Apply	Tutorial	3
C101.6	Apply		
<b>Summative Assessment based on Continuous and End Semester Examination – Theory</b>			
<b>Bloom's Level</b>	<b>Continuous Internal Assessment (15%)</b>		<b>End Semester Examination (35%) [35 Marks]</b>
	<b>CIA 1 [7 Marks]</b>	<b>CIA 2 [8 Marks]</b>	
Remember	20	15	20
Understand	30	35	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

<b>Summative Assessment based on Continuous and End Semester Examination – Practical</b>			
<b>Bloom's Level</b>	<b>Continuous Assessment (25%)</b>		<b>End Semester Examination (15%) [15 Marks]</b>
	<b>FA (19 Marks)</b>	<b>SA (6 Marks)</b>	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

<b>Summative Assessment based on Continuous and End Semester Examination</b>								
<b>Continuous Assessment (50%)</b>						<b>End Semester Examination (50%)</b>		
<b>CA 1 (12 Marks)</b>			<b>CA 2 (13 Marks)</b>			<b>Practical Exam (25 Marks)</b>		
<b>SA 1 (7)</b>	<b>FA 1</b>		<b>SA 2 (8)</b>	<b>FA 2</b>		<b>FA (19)</b>	<b>SA (6)</b>	
	<b>Comp -I (2)</b>	<b>Comp -II (3)</b>		<b>Comp - I (2)</b>	<b>Comp - II (3)</b>			
							<b>Theory (35)</b>	<b>Practical (15)</b>

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C101.1</b>	1	1	1						1				1	1	1
<b>C101.2</b>	2	2	1						2				2	2	2
<b>C101.3</b>	2	2	1						2				2	2	2
<b>C101.4</b>	3	3	2						3				3	2	3

**Nature of Course** M (Practical application)

**Pre requisites** -

**Course Objectives:**

- 1 To describe problem solving concept and basics of C programming.
- 2 To discuss the control structures in C.
- 3 To solve real world problems using arrays, strings, pointers and functions.
- 4 To explain Structure, Union and File concepts.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C102.1 | Apply problems solving techniques to solve real world problems.     | [AP] |
| C102.2 | Calculate programs using C constructs, arrays and strings.          | [AP] |
| C102.3 | Use the concepts of pointers, structures and functions in programs. | [AP] |
| C102.4 | Read and write data from/to files.                                  | [AP] |

**List of Experiments:**

1. Draw a Flowchart using Raptor Tool
  - Simple Flow Chart
  - Decision Making
  - Looping [Pre test & Post test]
2. Create Animation / Gaming /Application using Scratch Tool
3. Program to process data types and evaluate an expression.
4. Program using decision making statements
5. Program using looping statements
6. Program using single and two dimensional arrays
7. Program to manipulate strings
8. Program using structures and unions
9. Program using functions
10. Program using files

**Total Hours: 45**

<b>Summative assessment based on Continuous and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Continuous Assessment (60%)</b>		<b>End Semester Examination (40%)</b>
	<b>FA (45 Marks)</b>	<b>SA (15 Marks)</b>	<b>Practical Examination (40 Marks)</b>
Remember	10	10	<b>10</b>
Understand	40	40	<b>40</b>
Apply	50	50	<b>50</b>
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-



**Nature of Course** M (Practical application)

**Pre requisites** -

**Course Objectives:**

1. To know the method to construct the conic curves used in Engineering Applications.
2. To develop an understanding of Isometric to Orthographic Views and viceversa.
3. To learn the basic projection of straight lines and plane surfaces.
4. To develop the imagination of solids inclined to one reference plane.
5. To know the development of surfaces used in various fields

**Course Outcomes**

C101.1	Explain the basic concepts of Engineering Graphics.	[U]
C101.2	Sketch isometric, orthographic projections and projection of lines and planes	[AP]
C101.3	Develop lateral surfaces of solids including prisms and pyramids	[C]
C101.4	Construct projections of lines, planes, solids and isometric views using modeling software.	[C]

**Course Contents**

Conic curves and Special curves-Isometric to Orthographic projection-Orthographic to Isometric projection-Projection of Lines and Plane surfaces-Projection of Solids-Development of Surfaces-Introduction to Perspective projection.

S.No	List of Experiments	CO Mapping	RBT
1	Introduction to Drafting Software.	C101.1	[U]
2	Construction of Conic Curves (Ellipse, Parabola and Hyperbola)	C101.1	[U]
3	Construction of Special Curves (Cycloid and Involutés)	C101.1	[U]
4	Isometric to Orthographic projections – Manual sketches	C101.2	[AP]
5	Isometric to Orthographic projections – Software sketches	C101.4	[A]
6	Projection of lines - Inclined to HP, VP and Both HP & VP	C101.4	[A]
7	Projection of Plane surfaces (Hexagon, Pentagon and circle) – inclined to any one of the principle planes	C101.4	[A]
8	Projection of Solids (Prism and Pyramid) – Inclined to HP	C101.3	[AP]
9	Projection of Solids (Cone and Cylinder) – Inclined to VP	C101.3	[AP]

10	Development of Surfaces (Prism, Pyramid, Cone and Cylinder)	C101.4	[A]
11	Introduction to Perspective projection	C101.2	[U]

**Total Hours : 60**

**Reference Books:**

1. Bhatt N.D. and PanchalV.M., "Engineering Drawing", Charotar Publishing House, 50<sup>th</sup> Edition, 2014.
2. K. V. Natarajan, "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, 2018.
3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2011.
4. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2013.

**Web References:**

1. <http://nptel.ac.in/courses/112102101/>
2. [www.solidworks.com](http://www.solidworks.com)

<b>Summative assessment based on Continuous and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Continuous Assessment (60%)</b>		<b>End Semester Examination (40%)</b>
	<b>FA (45 Marks)</b>	<b>SA (15 Marks)</b>	<b>Practical Examination (40 Marks)</b>
Remember	30	30	30
Understand	30	30	30
Apply	20	20	20
Analyse	20	20	20
Evaluate	0	0	0
Create	0	0	0

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>C101.1</b>	1	1	1		1			1					1	1	1
<b>C101.2</b>	3	3	2		1			3					3	2	3
<b>C101.3</b>	1	1	1		3			3					3	3	3
<b>C101.4</b>	1	1	1		3			3					3	3	3

**Nature of Course** Induction Programme

**Pre requisites** -

**Course Objectives:**

1. To have broad understanding of society and relationships
2. To nurture the character and fulfil one's responsibility as an engineer, a citizen and a human being
3. To incorporate meta skills and values

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C101.1	Explore academic interest and activities	[AP]
C101.2	Work for excellence	[AP]
C101.3	Promote bonding and give a broader view of life and character	[AP]

**Course Contents:**

**PHYSICAL ACTIVITY:** Research over the past years has shown Yoga to have stress-relieving powers on students, paving the way for improved academic performance with the practice of asanas, meditation and breathing exercises. To prove these words Yoga classes has been planned in this module.(CO mapping: C101.1, C101.2, C101.3)

**CREATIVE ARTS (students can select any one of their choice):** Cultural development supports students to understand, feel comfortable with, value and appreciate the potential enrichment of cultural diversity. They should challenge discrimination, whether based on cultural or racial difference. Students should experience cultural traditions embedded in arts, crafts, language, literature, theatre, song, music, dance, sport, Science, technology and travel. Students should develop an appreciation of beauty both in experiencing artistic expression and by exploring their own creative powers. To inculcate those skills they are given a chance to exhibit their talents through painting, sculpture, pottery, music, dance, craft making and so on. .(CO mapping: C101.1, C101.2, C101.3)

**UNIVERSAL HUMAN VALUES:** Moral development involves supporting students to make considered choices around their behaviour and the values that provide a framework for how they choose to live. Moral development is also learning about society's values, understanding the reasons for them, how they are derived and change; and how disagreements are resolved. Students must consider the consequences of personal and societal decisions on the wider community – local and global- and on the environment and future generations. To acquire this the students are exposed to training to enhance their soft skills. .(CO mapping: C101.1, C101.2, C101.3)

**LITERARY AND PROFICIENCY MODULES:** Social development helps students to work effectively together, developing the inter-personal skills required to relate positively with their peers and people of all ages. Students must also understand how to participate productively in a diverse and plural society and learn about, and how to effectively engage with societal institutions and processes. They should understand that a person may have different roles and responsibilities within society. To reach this the following aspects are given in the form of Reading, writing, speaking – debate, role play etc. Communication and computer skills. (CO mapping: C101.1, C101.2, C101.3)

**LECTURES BY EMINENT PEOPLE:** Teaching with Lectures. ... It is essential to see lectures as a means of helping students learn to think about the key concepts of a particular subject, rather than primarily as a means of transferring knowledge from instructor to student. During the induction period students will attend to Guest lectures by subject experts.(CO mapping: C101.1, C101.2, C101.3)

**VISIT TO LOCAL AREAS: Traveling** is in fact a way of learning to learn. You are out of your comfort zone and so you must learn to be able to adapt to a new learning environment in a very short time. It also helps in your overall learning as well. In the induction period students will be taken to different places near college to learn new things. Eg.Meditation centre/orphanage/Hospital.(CO mapping: C101.1, C101.2, C101.3)

**FAMILIARIZATION TO DEPARTMENT/BRANCH INNOVATION:** Hod's of different branches will present about their department followed by department visit to view various facilities available at their department, new innovations from students and faculties etc.(CO mapping: C101.1, C101.2, C101.3)

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1						3	3	3	3	3	3	3			1
C101.2						3	3	3	3	3	3	3			1
C101.3						3	3	3	3	3	3	3			1



**Nature of Course** J (Problem analytical)

**Pre requisites** -

**Course Objectives:**

- 1 To gain knowledge in improper integrals, Gamma and Beta functions which are needed in engineering applications
- 2 To develop logical thinking and analytical skills in evaluating multiple integrals
- 3 To acquaint with the concepts of vector calculus needed for problems in all engineering disciplines
- 4 To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C201.1 | Recall basic integration formulae, scalar and vector point function concepts   | [R]  |
| C201.2 | Identify the concepts of integrals in computing Beta and Gamma functions   | [U]  |
| C201.3 | Apply the concepts of the integration in evaluating engineering problems related to area, volume and vector point functions. | [AP] |
| C201.4 | Find the derivatives of the complex valued functions and to evaluate complex valued integrals.                               | [AP] |

**Course Contents:**

**Module 1:**

**20 Hours**

**INTEGRAL CALCULUS**

Definite integrals - Evaluation of definite integrals using Bernoulli's formula. Beta and Gamma functions: Relation between Beta and Gamma Functions - Evaluation of Integrals using Beta and Gamma Functions. Multiple integrals : Double integration in Cartesian coordinates – Area as double integral – Change the order of integration-Triple integration in Cartesian co-ordinates – Volume as triple integral

**Module 2:**

**20 Hours**

**VECTOR CALCULUS**

Vector differential operator- Gradient of a scalar point function - Directional derivatives – Divergence and Curl of a vector point function – Irrotational and solenoidal vector fields – Simple problems– Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem(theorem statements only) – Simple applications involving cubes and rectangular parallelepipeds.

**Module 3:**

**20 Hours**

**COMPLEX VARIABLE**

Complex differentiation: Analytic Functions - Cauchy-Riemann equations (excluding proof) – Harmonic functions - Conjugate harmonic functions – Construction of analytic functions – Conformal mapping. Transformation:  $w = c+z, cz, 1/z$  and Bilinear transformation. Complex integration: Cauchy's Integral theorem (statement)- Cauchy's Integral formula - Laurent's series-Zeros and singularities – Residues – Cauchy's Residue theorem (statement). Contour integration: Evaluation of real integrals of the form  $\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta$  and  $\int_{-\infty}^{\infty} \frac{P(x)}{Q(x)} dx$

**Total Hours: 60**

**Text Books:**

- 1 G.B.Thomas and R.L.Finney, Calculus and Analytic Geometry, 13<sup>th</sup> Edition, Pearson, Reprint, 2014.
- 2 Kreyszig. E, "Advanced Engineering Mathematics" Tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2014.
- 3 Grewal. B.S, "Higher Engineering Mathematics", 43<sup>rd</sup> Edition, Khanna Publications, Delhi, 2014.

**Reference Books:**

- 1 Veerarajan. T, "Engineering Mathematics II", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2018.
- 2 Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 4<sup>th</sup> Edition, 2012.
- 3 N.P.Bali and Dr.Manish Goyal, "A Text book of Engineering Mathematics", 9<sup>th</sup> Edition, Laxmi publications Ltd, 2014.

**Web References:**

- 1 <http://nptel.ac.in/video.php?subjectId=122107037>
- 2 <http://nptel.ac.in/courses/122107036/>
- 3 <http://nptel.ac.in/video.php?subjectId=117102060>

**Online Resources:**

- 1 <https://www.coursera.org/learn/pre-calculus>
- 2 <https://www.coursera.org/learn/linearalgebra1>
- 3 <https://alison.com/courses/Advanced-Mathematics-1>
- 4 <https://www.edx.org/course/algebra-lineal-mexicox-acf-0903-1x>.

Summative assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%)					End Semester Examination (60%)	
CA 1 (20 Marks)			CA2 (20 Marks)			Theory Examination (60 Marks)
SA 1 (12 Marks)	FA 1		SA 2 (12 marks)	FA 2		
	Component -I (4 marks)	Component -II (4 marks)		Component -I (4 marks)	Component -II (4 marks)	

<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy)</b>			
<b>Formative assessment based on Capstone Model (16%)</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component (Choose and map components from the list – Quiz, Assignment, Case study, Seminar, Group Assignment)</b>	<b>Marks</b>
C201.1	Remember	Quiz	4
C201.2	Apply	Group Activities / Tutorial	4
C201.3	Understand	Group Assignment	4
C201.4	Apply	Presentation	4
<b>Summative assessment based on Continuous and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Continuous Assessment (24%)</b>		<b>End Semester Examination (60%) [60 Marks]</b>
	<b>CIA1 [12 Marks]</b>	<b>CIA2 [12 Marks]</b>	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse			
Evaluate			
Create			

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>C201.1</b>	1	1	1						1				1	2	1
<b>C201.2</b>	2	2	1						2				2	3	2
<b>C201.3</b>	3	3	2						3				3	3	3
<b>C201.4</b>	3	3	2						3				3	3	3

**Nature of Course** F (Theory Programming)

**Pre requisites** -

**Course Objectives:**

- 1 To describe and execute Python script using types and expressions
- 2 To discuss the difference between expressions & statements and to understand the concept of assignment semantics.
- 3 To utilize high level data types such as lists and dictionaries.
- 4 To import and utilize a module and to perform read & write operations on files.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C201.1	Read, write, execute by hand simple Python programs.	[U]
C201.2	Structure simple Python programs for solving problems.	[U]
C201.3	Decompose a Python program into functions.	[AP]
C201.4	Represent compound data using Python lists, tuples and dictionaries.	[AP]
C201.5	Read and write data from / to files in Python Programs.	[AP]

**Course Contents:**

**Module 1:**

**15 Hours**

**INTRODUCTION, DATA, EXPRESSIONS, STATEMENTS :**

Introduction-Python Interpreter And Interactive Mode; Values and Data Types: Variables, Expressions, Statements, Tuple Assignment, Precedence of Operators, Comments; Modules and Functions, Function Definition and Use, Flow of Execution, Parameters and Arguments; Illustrative Programs: Exchange the Values of Two Variables, Circulate the Values of N Variables, Distance Between Two Points.

**Module 2:**

**15 Hours**

**CONTROL FLOW, FUNCTIONS :**

Conditionals: Boolean Values and Operators, Conditional (If), Alternative (If-Else), Chained Conditional (If-Elif-Else); Iteration: While, For, Break, Continue, Pass; Fruitful Functions: Return Values, Parameters, Local and Global Scope, Function Composition, Recursion; Strings: String Slices, Immutability, String Functions and Methods, String Module; Lists as Arrays. Illustrative Programs: Square Root, Gcd, Exponentiation, Sum an Array of Numbers, Linear Search, Binary Search.

**Module 3:**

**15 Hours**

**LISTS, FILES, MODULES, PACKAGES:**

Lists: List Operations, List Slices, List Methods, List Loop, Mutability, Aliasing, Cloning Lists, List Parameters; Tuples: Tuple Assignment, Tuple as Return Value; Dictionaries: Operations and Methods; Advanced List Processing - List Comprehension; Set in Python, Illustrative Programs: Selection Sort, Insertion Sort, Merge Sort, Histogram - Classes, Inheritance in python, Files And Exception: Text Files, Reading and Writing Files, Format Operator; Command Line Arguments, Errors and Exceptions, Handling Exceptions, Modules, Packages; Illustrative Programs: Word Count, Copy File.

**Total Hours: 45**

**Text Books:**

- 1 Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2<sup>nd</sup> Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
- 2 Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python" – Revised And updated for Python 3.2, Network Theory Ltd., 2011.

**Reference Books:**

- 1 Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
- 2 Timothy A. Budd, "Exploring Python", Mc-GrawHillEducation (India) PrivateLtd., 2015.
- 3 John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013

**Web References:**

- 1 <https://www.wileyindia.com/introduction-to-computer-science-using-python.html>
- 2 <https://www.programiz.com/python-programming>
- 3 <https://www.fullstackpython.com/best-python-resources>
- 4 <https://www.tutorialspoint.com/python/>
- 5 <https://www.geeksforgeeks.org/python-programming-language/>

**Online Resources:**

- 1 <http://nptel.ac.in/courses/106106145/>
- 2 <https://www.codecademy.com/learn/learn-python>

<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy)</b>			
<b>Formative assessment based on Capstone Model (16%)</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component</b>	<b>Marks</b>
C201.1	Understand	Assignment	4
C201.2	Apply	Quiz	4
C201.3 & C201.4	Apply	Tutorial	4
C201.5	Apply	Case Studies	4
<b>Summative assessment based on Continuous and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Continuous Assessment (24%)</b>		<b>End Semester Examination (60%) [60 Marks]</b>
	<b>CIA1 [12 Marks]</b>	<b>CIA2 [12 Marks]</b>	
Remember	20	20	20
Understand	50	40	30
Apply	30	40	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Summative assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%)					End Semester Examination (60 %)	
CA 1 (20 Marks)			CA 2 (20 Marks)			Theory Examination (60 Marks)
SA 1 (12 Marks)	FA 1		SA 2 (12 marks)	FA 2		
	Component -I (4 marks)	Component -II (4 marks)		Component -I (4 marks)	Component -II (4 marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C201.1	2	2	1						2		2	3	2	3	2
C201.2	2	2	1						2		2	3	2	2	2
C201.3	3	3	2						3		3	3	3	3	3
C201.4	3	3	2						3		3	3	3	3	3
C201.5	3	3	2						3		3	3	3	3	3

**Nature of Course** F (Theory Programming)

**Pre requisites** C Programming

**Course Objectives:**

1. To demonstrate the comprehensive view of ADT and their significance in problem solving.
2. To construct the linear data structures – lists, stacks, and queues in real world applications.
3. To describe the nonlinear data structures such as tree and graph
4. To explain the sorting, searching and hashing algorithms.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C202.1	Choose appropriate data structures like linked list, stack and queue to the specified problem definition.	[AP]
C202.2	Examine and manipulate data using trees and graphs and choose data structure to suit application requirement.	[AP]
C202.3	Practice various searching and sorting techniques.	[AP]
C202.4	Discuss the various hashing techniques.	[U]
C202.5	Apply the fundamental knowledge of various data structures to implement algorithm for any real time problem.	[AP]

**Course Contents:**

**Module 1:**

**20 Hours**

**Linear Data Structures – List, Stack, Queues:** Abstract Data Types (ADTs) – List ADT – Array implementation – Linked list implementation – Singly linked lists - Circularly linked lists - Doubly-linked lists – Applications of lists – Polynomial Manipulation. Stack ADT – Operations – Applications – Evaluating arithmetic expressions - Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue – Priority Queue – Applications of queues.

**Module 2:**

**20 Hours**

**Non Linear Data Structures – Trees, Graphs:** Tree ADT – Tree traversals – Binary Tree ADT – Expression trees – Applications of trees – Binary search tree ADT – Threaded Binary Trees- AVL Trees – Red Black Tree, Splay Tree, B-Tree – B+ Tree – Heap – Applications of heap. Graph - Definition – Representation of Graph – Types of graph – Breadth-first traversal – Depth-first traversal – Topological Sort – Bi-connectivity – Euler circuits – Applications of graphs.

**Module 3:**

**20 Hours**

**Searching, Sorting and Hashing Techniques:** Searching- Linear Search – Binary Search - Trie–Tree Map – Hash map. Sorting – Bubble sort – Selection sort – Insertion sort – Shell sort– Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing. Case Study: Using appropriate data structures for Contact book application, Dictionary, Navigation map, Compiler design.

**Total Hours:**

**60**

**Text Books:**

- 1 Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education India, 3<sup>rd</sup> Edition, 2013.
- 2 Debasis Samanta, "Classic data structures", Prentice Hall, 2<sup>nd</sup> Edition, 2014.
- 3 Peter Brass, "Advanced Data Structures", Cambridge University Press, 2008.

**Reference Books:**

- 1 Seymour Lipschutz "Data Structures by Schaum Series" 2<sup>nd</sup> Edition, McGraw Hill, 2013.
- 2 Narasimha Karumanchi, "Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles", 5<sup>th</sup> Edition, CareerMonk, 2016.
- 3 Reema Thareja, "Data Structures Using C", 2<sup>nd</sup> Edition, Oxford University Press, 2011.

**Web References:**

- 1 <http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures>
- 2 <http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms>
- 3 <https://www.geeksforgeeks.org/data-structures/>

**Online Resources:**

- 1 <https://www.edx.org/course/foundations-of-data-structures>.
- 2 <https://www.udemy.com/topic/data-structures/>.
- 3 <https://nptel.ac.in/courses/106102064/>.
- 4 <https://www.coursera.org/specializations/data-structures-algorithms>.

<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy)</b>			
<b>Formative assessment based on Capstone Model (16%)</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component</b>	<b>Marks</b>
C202.1,2	Understand	Assignment	4
C202.1,2	Understand	Quiz	4
C202.3,4	Apply	Tutorial	4
C202.5	Apply	Case Studies	4
<b>Summative assessment based on Continuous and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Continuous Assessment (24%)</b>		<b>End Semester Examination (60%) [60 Marks]</b>
	<b>CIA1 [12 Marks]</b>	<b>CIA2 [12 Marks]</b>	
Remember	30	30	20
Understand	40	30	30
Apply	30	40	50
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-



Summative assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%)					End Semester Examination (60 %)	
CA 1 (20 Marks)			CA 2 (20 Marks)			Theory Examination (60 Marks)
SA 1 (12 Marks)	FA 1		SA 2 (12 marks)	FA 2		
	Component -I (4 marks)	Component -II (4 marks)		Component -I (4 marks)	Component -II (4 marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C202.1	3	3	2									3	3	3	3
C202.2	3	3	2									3	3	3	3
C202.3	3	3	2									3	3	3	3
C202.4	2	2	1									2	2	3	2
C202.5	3	3	2									3	3	3	3

**Nature of Course** G (Theory analytical)

**Pre requisites** -

**Course Objectives:**

1. To equip students with a basic understanding of Electrical circuits
2. To learn the working principle of transformers
3. To understand the DC and AC Machine working principles and to have a knowledge on selection of machine for specific types of applications.
4. To give a comprehensive exposure to electrical installations.
5. To equip students with an ability to understand basics of analog and digital electronics.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C201.1	Analyze the concepts in ac circuit and dc circuits.	[A]
C201.2	Understand the working principle of single phase and three phase transformers.	[U]
C201.3	Understand the working principle of DC and AC machines.	[U]
C201.4	Illustrate the basic components used for electrical installations.	[AP]
C201.5	Understand the basic concepts of analog and digital electronics.	[U]

**Course Contents:**

**Module 1:**

**15 Hours**

**DC Circuits and AC Circuits**

DC Circuits-Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, Star Delta Transformation, analysis of simple circuits with dc excitation, Mesh, Nodal Analysis Superposition, Thevenin, Norton and Maximum Power Transfer theorem. AC Circuits- Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor.

**Module 2:**

**15 Hours**

**Electrical Machines and Installations**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections (Qualitative only). Construction and working principle of DC motor. Construction and working principle of Synchronous motor and three phase Induction motor. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption.

**Module 3:**

**15 Hours**

**Basics of Analog and Digital Electronics**

Semiconductor, PN junction diode, Zener diode, rectifier- Half wave, full wave and Bridge rectifier, Introduction to Number system, basic Boolean laws, reduction of Boolean expressions and implementation with logic gates.

## Lab Component

1	Familiarization of Electrical Elements, Sources, Measuring Devices and Verification of ohm's law	[R]
2	Estimation of voltage and current by KVL and KCL in Electric Circuits	[U]
3	Determination of mesh current and node voltage by Mesh and Nodal Analysis	[AP]
4	Application of Superposition theorem in electrical circuits	[AP]
5	Application of the venin's and maximum power transfer theorem in electrical circuits.	[U]
6	Demonstration of cut-out sections of machines: dc machine (Commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine	[AP]
7	Load test on dc shunt motor.	[AP]
8	Demonstration of components of LT Switch Gears	[U]
9	Construction of bridge rectifier	[U]
10	Verification of logic gates.	[U]

**Total Hours: 75**

## Text Books:

- 1 Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, "Electric Machinery", Tata McGraw Hill, 6<sup>th</sup> Edition 2015.
- 2 Vincent. Del. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2<sup>nd</sup> Edition, 2015.
- 3 E. Hughes, "Electrical and Electronics Technology", Pearson, 10<sup>th</sup> Edition, 2011
- 4 Sudhakar. A and Shyam Mohan. SP "Circuits and Network Analysis & Synthesis" 5<sup>th</sup> Edition, Tata McGraw Hill, 2015.
- 5 Salivhanan, "Electron Devices and Circuits", 4<sup>th</sup> Edition, McGraw Hill Education India Private Ltd., 2016
- 6 M. Morris Mano, "Digital Logic and Computer Design", Prentice Hall of India, 5<sup>th</sup> Edition, 2007

## Reference Books:

- 1 Charles A.Gross, Thaddeus A.Roppel, "Fundamentals of Electrical Engineering", CRC press, 2012.
- 2 D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 5<sup>th</sup> Edition 2011.
- 3 Schaum's Series, "Basic Circuit Analysis", 2<sup>nd</sup> Edition, McGraw Hill India Private Ltd., 2011 (Reprint)

## Web References:

- 1 <http://nptel.ac.in/course.php?disciplineId=108>
- 2 <https://ocw.mit.edu/courses/find-bytopic/#cat=engineering&subcat=electricalengineering&spec=electricpower>
- 3 <https://nptel.ac.in/video.php?subjectId=117103063>
- 4 <https://onionesquereality.wordpress.com/.../more-video-lectures-iit-open>
- 5 [https://nptel.iitg.ernet.in/Elec\\_Comm\\_Engg/.../Video-ECE.pdf](https://nptel.iitg.ernet.in/Elec_Comm_Engg/.../Video-ECE.pdf)

### Online Resources:

1. Electrical Knowhow@lifeneverask
2. Electricity & Magnetism, Part 1- PHYS 102.1x(edx.in)
3. Fundamentals of Electrical Engineering@coursera
4. Circuits and Electronics@edxonline
5. <https://www.coursera.org/learn/electronics>
6. NPTEL e learning courses

Summative assessment based on Continuous and End Semester Examination							
Continuous Assessment (50%)							End Semester Examination (50%)
CA 1 (10 Marks)			CA 2 (10 Marks)			Practical Exam (30 Marks)	Theory Examination (50 Marks)
SA 1 (6 Marks)	FA 1		SA 2 (6 Marks)	FA 2		FA (22 Marks)	SA (8 Marks)
	Component -I (2 Marks)	Component -II (2 Marks)		Component -I (2 Marks)	Component -II (2 Marks)		

Assessment Methods & Levels (based on Blooms' Taxonomy) – Theory				
Formative assessment based on Capstone Model (8%)				
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list – Quiz, Assignment, Case study, Seminar, Group Assignment)		Marks
C201.1	Analyze	Component – I	Assignment	2
C201.2	Understand	Component – II	Tutorial	2
C201.3	Understand	Component - III	Quiz	2
C201.4	Apply	Component - IV	Simulation	2
C201.5	Understand			

Summative assessment based on Continuous and End Semester Examination			
Bloom's Level	Continuous Assessment (12%)		End Semester Examination (50%) [50 Marks]
	CIA1 [6 Marks]	CIA2 [6 Marks]	
Remember	10	10	10
Understand	10	30	30
Apply	40	50	30
Analyse	40	10	30
Evaluate	-	-	-
Create	-	-	-

Summative assessment based on Continuous and End Semester Examination - Practical		
Bloom's Level	Continuous Assessment (30%)	
	FA (22 Marks)	SA (8 Marks)
Remember	10	10
Understand	30	30
Apply	20	20
Analyse	40	40
Evaluate	-	-
Create	-	-

Formative Assessment	Summative Assessment		Total
	Continuous Assessment	End Semester Examination	
30	20	50	100

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C202.1	2	1			2							2	3	3	
C202.2	3	3	2	2	2							2	3	3	
C202.3	3	2	1	1	2							2	3	3	
C202.4	3	3	2	2	2							2	3	3	
C202.5	2	1			2							2	3	3	

**Nature of Course** G (Theory Analytical)

**Pre requisites** -

**Course Objectives:**

1. To understand how computers operate at the most basic level.
2. To gain familiarity of the principles of combinational logic and the design of combinational circuits.
3. To understand the basics of sequential logic devices and the design of sequential circuits.
4. To understand the concepts of Programmable logic devices.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C201.1:	Interpret information in binary and to manipulate Boolean functions using Boolean algebra, minimize Boolean Functions and implement using Logic gates.	[AP]
C201.2:	Analyze and design different combinational logic circuits.	[A]
C201.3:	Analyze and design various sequential logic circuits.	[A]
C201.4:	Illustrate digital logic circuits using programmable logic devices.	[AP]

**Course Contents:**

**Module 1: 15 Hours**

**Introduction:** Number Systems- Binary codes – Binary Arithmetic - Boolean algebra - Boolean functions – Minimization of Boolean Functions using Karnaugh Maps and Tabulation Methods – Implementation of Logic Circuits using Gates (Two Level/Multilevel Implementation) – NAND, NOR Implementation.

**Module 2: 15 Hours**

**Combinational Logic:** Analysis and Design Procedures - Circuits for Arithmetic Operations-Code conversion-Parity Checker and Generator-Multiplexer- Boolean function implementation using multiplexer- Demultiplexer - Decoder – Encoders-Combinational Logic Implementation using decoder.

**Module 3: 15 Hours**

**Sequential Logic & Programmable Logic devices:** Latches-Flip flops-Analysis and Synthesis of Clocked Sequential Circuits – Shift Registers — Ripple Counters – Synchronous Counters-Special Counters – Analysis and Design of Asynchronous Sequential Circuits- Memory and Programmable Logic Devices–RAM-Memorydecoding-PROM,ProgrammableLogicArray,ProgrammableArrayLogic.



<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy) – Theory</b>				
			<b>Formative assessment based on Capstone Model (8%)</b>	
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component (Choose and map components from the list – Quiz, Assignment, Case study, Seminar, Group Assignment)</b>		<b>Marks</b>
C201.1	Analyze	Component – I	Assignment	2
C201.2	Understand	Component – II	Tutorial	2
C201.3	Understand	Component - III	Quiz	2
C201.4	Apply	Component - IV	Simulation	2
C201.5	Understand			

**Summative assessment based on Continuous and End Semester Examination**

<b>Bloom's Level</b>	<b>Continuous Assessment (12%)</b>		<b>End Semester Examination (50%) [50 Marks]</b>
	<b>CIA1 [6 Marks]</b>	<b>CIA2 [6 Marks]</b>	
<b>Remember</b>	10	10	10
<b>Understand</b>	10	30	30
<b>Apply</b>	40	50	30
<b>Analyse</b>	40	10	30
<b>Evaluate</b>	-	-	-
<b>Create</b>	-	-	-

**Summative assessment based on Continuous and End Semester Examination - Practical**

<b>Bloom's Level</b>	<b>Continuous Assessment (30%)</b>	
	<b>FA (22 Marks)</b>	<b>SA (8 Marks)</b>
Remember	10	10
Understand	30	30
Apply	20	20
Analyse	40	40
Evaluate	-	-
Create	-	-

<b>Formative Assessment</b>	<b>Summative Assessment</b>		<b>Total</b>
	<b>Continuous Assessment</b>	<b>End Semester Examination</b>	
<b>30</b>	<b>20</b>	<b>50</b>	<b>100</b>

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C201.1</b>	3	3	3		2								3	3	3
<b>C201.2</b>	2	2	1		1								2	2	2
<b>C201.3</b>	2	2	2		1								2	2	2
<b>C201.4</b>	3	3	2		2								3	3	3



**Nature of Course** M (Practical application)

**Pre requisites** -

**Course Objectives:**

- 1 To write, test, and debug simple Python programs.
- 2 To build Python programs with conditionals and loops.
- 3 To use functions for structuring Python programs.
- 4 To represent compound data using Python lists, tuples, and dictionaries.
- 5 To read and write data from/to files in Python.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C203.1	Build simple Python programs	[AP]
C203.2	Implement Python programs using control flow structures.	[AP]
C203.3	Develop Python programs step-wise by defining functions and calling them.	[AP]
C203.4	Construct Python lists, tuples, dictionaries for representing compound data	[AP]
C203.5	Read and write data from/to files in Python.	[AP]

**List of Experiments:**

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

45

**Total Hours:**

**Text Books:**

- 1 Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2<sup>nd</sup> Edition, Updated for Python 3, Shroff/O'Reilly Publishers,2016
- 2 Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python" – Revised and updated for Python 3.2, Network Theory Ltd.,2011.



**Nature of Course** M (Practical application)

**Pre requisites** C Programming

**Course Objectives:**

- 1 To demonstrate the comprehensive view of ADT and their significance in problem solving.
- 2 To construct the linear data structures – lists, stacks, and queues in real world applications.
- 3 To describe the non linear data structures such as tree and graph
- 4 To explain the sorting, searching and hashing algorithms.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C204.1 | Choose appropriate data structures like linked list, stack and queue to the specified problem definition.     | [AP] |
| C204.2 | Examine and manipulate data using trees and graphs and choose data structure to suit application requirement. | [AP] |
| C204.3 | Implement various techniques for searching and sorting.   | [AP] |
| C204.4 | Discuss the various hashing techniques.   | [U]  |
| C204.5 | Apply the fundamental knowledge of various data structures to implement algorithm for any real time problem.  | [AP] |

**List of Experiments:**

1. Students of a Programming class arrive to submit assignments. Their register numbers are stored in a LIFO list in the order in which the assignments are submitted. Write a program using array to display the register number of the ten students who submitted first. Register number of the ten students who submitted first will be at the bottom of the LIFO list. Hence pop out the required number of elements from the top so as to retrieve and display the first 10students.
2. To facilitate a thorough net surfing, any web browser has back and forward buttons that allow the user to move backward and forward through a series of web pages. To allow the user to move both forward and backward two stacks are employed. When the user presses the back button, the link to the current web page is stored on a separate stack for the forward button. As the user moves backward through a series of previous pages, the link to each page is moved in turn from the back to the forward stack. When the user presses the forward button, the action is the reverse of the back button. Now the item from the forward stack is popped, and becomes the current web page. The previous web page is pushed on the back stack. Simulate the functioning of these buttons using array implementation of Stack. Also provide options for displaying the contents of both the stacks whenever required.
3. Design a program to employ a stack for balancing symbols such as parentheses, flower braces and square brackets, in the code snippet given below.

```
for(i=0;i<n;i++)
```

```
{
```

```

if(i<5)
{
z[i]=x[i]+y[i];
p=(((a+b)*c)+(d/(e+f)*g));
}

```

Ensure that your program works for any arbitrary expression.

4. Most of the bugs in scientific and engineering applications are due to improper usage of precedence order in arithmetic expressions. Thus it is necessary to use an appropriate notation that would evaluate the expression without taking into account the precedence order and parenthesis.
  
5. a) Write a program to convert the given arithmetic expression into
  - i) Reverse Polish notation
  - ii) Polish notation
 b) Evaluate the above notations with necessary input.
  
6. Some priests are given three poles and a stack of 4 gold disks, each disk a little smaller than the one beneath it. Their assignment is to transfer all 4 disks from one of the 3 pole to another with 2 important constraints. They can move only one disk at a time, and they can never place a larger disk on top of a smaller one. Design a recursive program for the above Towers of Hanoi puzzle using stack.
  
7. In a theme park, the Roller-Coaster ride is started only when a good number of riders line up in the counter (say 20 members). When the ride proceeds with these 20 members, a new set of riders will line up in the counter. This keeps continuing. Implement the above scenario of lining up and processing using arrays with Queue ADT.
  
8. When burning a DVD it is essential that the laser beam burning pits onto the surface is constantly fed with data, otherwise the DVD fails. Most leading DVD burn applications make use of a circular buffer to stream data from the hard disk onto the DVD. The first part, the 'writing process' fills up a circular buffer with data, then the 'burning process' begins to read from the buffer as the laser beam burns pits onto the surface of the DVD. If the buffer starts to become empty, the application should continue filling up the emptied space in the buffer with new data from the disk. Implement this scenario using Circular Queue.
  
9. a) There is a garage where the access road can accommodate any number of trucks at one time. The garage is built in such a way that only the last truck entered can be moved out. Each of the trucks is identified by a positive integer (a truck\_id). Implement dynamically to handle truck moves, allowing for the following

commands:

- i) On\_road (truck\_id); ii) Enter\_garage (truck\_ id);
- iii) Exit\_garage (truck\_id); iv) Show\_trucks (garage or road);

If an attempt is made to get a truck out which is not the closest to the garage entry, the error message “Truck x cannot be moved” should be displayed.

- b) For the aforementioned scenario, assume now a circular road and two entries: one for entry, another for exit. Trucks can get out only in the order they got in. Write a program dynamically to handle truck moves allowing for the following commands

- i) Enter garage (truck name)
- ii) Exit garage (truckname)
- iii) Show trucks

- 10. Imagine an effective dynamic structure for storing polynomials. Write operations for addition, subtraction, and multiplication of polynomials.

Input:

$$p1=3x^7+5x^6+22.5x^5+0.35x^2$$

$$p2=0.25x^3+0.33x^2 -0.01$$

- 11. Given two sorted lists L1 and L2 write a program to merge the two lists in sorted order after eliminating duplicates.
- 12. Write a program to implement Bubble sort, Heap sort and Quick sort techniques to arrange the following sequence of elements in descending order.

9,-4, 5, 8,-3, 7, 0, 4, 1, 2.

best, true, hill, dove, van, good, egg, lap

Display the count of number of comparisons and swaps made in each method. Apply the same sorting techniques for sorting a large dataset [Randomly generate 5000 integers within the range -50000 to 50000 to build the data set]. From your observation and analysis, determine the best sorting technique for working with large numbers.

- 13. Mini projects – File Archive, Tetris Game Player, Simulation of Buffer pool in Virtual Memory, Document retrieval from health care records, Implement a city database using suitable data structure.

**Total Hours: 45**

**Text Books:**

- 1 Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education India, 3<sup>rd</sup> Edition, 2013.
- 2 Debasis Samanta, "Classic data structures", Prentice Hall, 2<sup>nd</sup> Edition, 2014.
- 3 Peter Brass, "Advanced Data Structures", Cambridge University Press, 2008.

**Reference Books:**

- 1 Seymour Lipschutz "Data Structures by Schaum Series" 2<sup>nd</sup> Edition, McGraw Hill, 2013.
- 2 Narasimha Karumanchi, "Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles", 5<sup>th</sup> Edition, CareerMonk, 2016.
- 3 Reema Thareja, "Data Structures Using C", 2<sup>nd</sup> Edition, Oxford University Press, 2011

**Web References:**

- 1 <http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures>.
- 2 <http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms>.
- 3 <https://www.geeksforgeeks.org/data-structures/>

**Online Resources:**

- 1 <https://www.edx.org/course/foundations-of-data-structures>.
- 2 <https://www.udemy.com/topic/data-structures/>.
- 3 <https://nptel.ac.in/courses/106102064/>.
- 4 <https://www.coursera.org/specializations/data-structures-algorithms>.

Summative assessment based on Continuous and End Semester Examination			
Bloom's Level	Continuous Assessment (60%)		End Semester Examination (40%)
	FA (45 Marks)	SA (15 Marks)	Practical Examination (40 Marks)
Remember	10	10	10
Understand	20	20	20
Apply	30	30	30
Analyse	40	40	40
Evaluate	-	-	-
Create	-	-	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C204.1	3	3	2					3	3	2	2	3	3	3	3
C204.2	3	3	3					3	3	3	2	3	3	2	3
C204.3	3	3	2					3	3	2	2	3	3	3	3
C204.4	2	2	1					2	2	1	2	2	2	3	2
C204.5	3	3	3					3	3	3	2	3	3	3	3

**Nature of Course**

C (Theory Concept)

**Pre requisites**

Basics in Environmental Studies

**Course Objectives:**

- 1 To learn the integrated themes on various natural resources.
- 2 To gain knowledge on the type of pollution and its control methods.
- 3 To have an awareness about the current environmental issues and the social problems.

**Course Outcomes:****Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C102.1 | Recall and play an important role in transferring a healthy environment for future generation. | [R]  |
| C102.2 | Understand the importance of natural resources and conservation of biodiversity.               | [U]  |
| C102.3 | Understand and analyze the impact of engineering solutions in a global and societal context.   | [U]  |
| C102.4 | Apply the gained knowledge to overcome pollution problems.                                     | [AP] |
| C102.5 | Apply the gained knowledge in various environmental issues and sustainable development.        | [AP] |

**Course Contents:****Natural Resources:**

Introduction-Forest resources: Use and abuse, case study-Major activities in forest-Water resources-over utilization of water, dams-benefits and problems. Mineral resources-Use and exploitation, environmental effects of mining- case study-Food resources- World food problems, case study. Energy resources -Renewable and non-renewable energy sources Land resources- Soil erosion and desertification – Role of an individual in conservation of natural resources.

**Environmental Pollutions:**

Definition – causes, effects and control measures of: a. Air pollution-Acid rain - Green house effect-Global warming- Ozone layer depletion – case study- Bhopal gas tragedyb. Water pollution c. Soil pollution - Solid waste management-Recycling of plastics-Pyrolysis method-causes, effects and control measures of municipal solid wastes d. Noise pollution. e. Nuclear hazards-case study-Chernobyl nuclear disaster-Role of an individual in prevention of pollution.

**Social issues and the Environment:**

Sustainable development-water conservation, rain water harvesting, E-Waste Management – Environmental ethics: 12 Principles of green chemistry-Scheme of labelling of environmental friendly products (Eco mark) – Emission standards – ISO 14001 standard.

**Total Hours: 30****Text Books:**

- 1 Anubha Kaushik and C P Kaushik “Perspectives in Environmental Studies”4<sup>th</sup> Edition, New age International (P) Limited, Publisher Reprint 2014. New Delhi
- 2 Rajagopalan, R, “Environmental Studies-From Crisis to Cure”, Oxford University Press 2015.

**Reference Books:**

- 1 Tyler Miller, Jr., “Environmental Science”, Brooks/Cole a part of Cengage Learning, 2014.
- 2 William Cunningham and Mary Cunningham, “Environmental Science”, 13<sup>th</sup> Edition, McGraw Hill,2015.
- 3 Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, Third Edition, Pearson Education, 2014.

**Web References:**

- 1 <http://nptel.ac.in/courses/104103020/20>
- 2 <http://nptel.ac.in/courses/120108002>
- 3 <http://nptel.ac.in/courses/122106030>
- 4 <http://nptel.ac.in/courses/120108004/>
- 5 <http://nptel.ac.in/courses/122102006/20>

**Online Resources:**

- 1 <https://www.edx.org/course/subject/environmental-studies>
- 2 [www.environmentalscience.org](http://www.environmentalscience.org)

<b>Assessment Methods &amp; Levels (based on Bloom's Taxonomy)</b>			
<b>Formative assessment based on Capstone Model (Max. Marks:50)</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component</b>	<b>Marks</b>
C102.1	Remember	Quiz	10
C102.2	Understand	Mini project based on environmental aspect	20
C102.3	Understand	Class Presentation	10
C102.4	Apply	Group Assignment	10
<b>Summative assessment based on Continuous Assessment</b>			
<b>Bloom's Level</b>	<b>Continuous Assessment</b>		
	<b>CIA-I [0 marks]</b>	<b>CIA-II [0 marks]</b>	<b>Term End Assessment [50 marks]</b>
Remember	-	-	30
Understand	-	-	40
Apply	-	-	30
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>C102.1</b>						2	2						2		
<b>C102.2</b>						2	2						2		
<b>C102.3</b>						2	2							2	
<b>C102.4</b>						3	3						2		
<b>C102.5</b>						3	3						2		



**Nature of Course** J (Problem analytical)

**Pre requisites** -

**Course Objectives:**

- 1 To study the concepts needed to test the logic of a program.
- 2 To learn the working on class of functions which transform a finite set into another finite set which relates to input and output functions in computer science.
- 3 To know the fundamental concepts of Group theory.
- 4 To use number theory in computer networks and security.

**Course Outcomes :**

**Upon completion of the course, students shall have ability to**

C301.1	Recall the basic concepts of sets, groups and truth table	[R]
C301.2	Find the validity of arguments.	[U]
C301.3	Use the concepts of Discrete Mathematics in software development and hardware design.	[AP]
C301.4	Demonstrate and understand the fundamental Concepts of a mathematical function and all of its properties.	[AP]
C301.5	Apply operator-algebraic techniques to reformulate and solve group theoretic problems	[AP]

**Course Contents**

**Module 1 Propositional and Predicate calculus**

**20 Hours**

Basic concepts – propositions - connectives– Truth tables – Tautologies and contradictions - Contrapositive – Logical equivalences and implications –Normal forms – Principal conjunctive and disjunctive normal forms– Rules of inference – Validity of arguments - Predicates – Statement function – Variables – Free and bound variables – Quantifiers– Universe of discourse – Theory of inference – The rules of universal specification and generalization – Validity of arguments

**Module 2 Sets and Functions**

**20 Hours**

**Sets:** Sets- Operations on Sets – Law on Sets - Cartesian product of sets – Relations on sets Types of relations and their properties– Relational matrix and the graph of a relation – Equivalence relations – Partial ordering

**Functions:** Definitions of functions – Classification of functions–Composition of functions– Inverse function-Characteristic function of a set – Hashing functions – Recursive functions – Permutation functions.

**Module 3 Group Theory and Number Theory**

**20 Hours**

Binary operation-Semi group – Monoid – Group – Subgroup-Abelian group-Group homomorphism and isomorphism-Normal subgroup-Quotient group-Lagrangian theorem. Division algorithm-Base-b representations- Number patterns-Prime and composite numbers - GCD-Euclidean algorithm-Fundamental theorem of arithmetic – LCM-Wilson’s Theorem-Fermat’s Theorem-Tau and Sigma Function.

**Total Hours 60**

**Text Books:**

1. Tremblay J.P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 30<sup>th</sup> Reprint, 2011
2. Kenneth H.Rosen, "Discrete Mathematics and its Applications", 7<sup>th</sup> Edition, Tata McGraw Hill, New Delhi, 2012
3. Koshy .T, "Elementary Number Theory with Applications", Elsevier Publications, New Delhi,2002.

**Reference Books:**

1. Ralph.P.Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", 5<sup>th</sup> Edition, Pearson Education Asia, New Delhi,2014
2. Bernard Kolman, Robert C. Busby, Sharan Cutler Ross, "Discrete Mathematical Structures", 6<sup>th</sup> Edition , Pearson Education Pvt Ltd., New Delhi, 2014
3. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Publications, 2004.

**Web References:**

- 1 <http://www.nptel.ac.in/courses/111105035>
- 2 <http://www.nptel.ac.in/courses/122104017>
- 3 <http://nptel.ac.in/courses/122102009>
- 4 <http://freevidelectures.com/Course/2267/Mathematics-I/22>

**Online Resources:**

- 1 [www.edx.org/Probability](http://www.edx.org/Probability)
- 2 <https://ocw.mit.edu/courses/.../18-440-probability-and-random-variables-spring-2014/>
- 3 [https://onlinecourses.nptel.ac.in/noc15\\_ec07/](https://onlinecourses.nptel.ac.in/noc15_ec07/)

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C301.1	Remember	Quiz	20
C301.2	Understand	Seminar	20
C301.3 – C301.5	Apply	Tutorial	20
C301.3 – C301.5	Apply	Assignment	20

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C301.1</b>	2	2	1							1	1		3	1	
<b>C301.2</b>	3	3	1							1	1		3	1	
<b>C301.3</b>	2	2	1							1	1		3	1	
<b>C301.4</b>	3	3	1							1	1		3	1	
<b>C301.5</b>	3	3	1							1	1		3	1	

**Nature of Course** G (Theory analytical)

**Prerequisites** -

**Course Objectives:**

1. To describe the structure and functions of Operating System.
2. To explain about Processes, Threads and Scheduling algorithms.
3. To identify the principles of Concurrency and Deadlocks.
4. To list various Memory Management schemes.
5. To discuss I/O management and File systems.

**Course Outcomes**

Upon successful completion of this course, the student will be able to

- |        |   |      |
|--------|---|------|
| C301.1 | Review the basic concepts and operations of Operating Systems.  | [U]  |
| C301.2 | Illustrate the Process management concepts including scheduling, synchronization deadlocks and multithreading.  | [AP] |
| C301.3 | Relate concepts of memory management including virtual Memory and Page replacement to the issues that occur in Real time applications – Traffic control System. | [AP] |
| C301.4 | Analyze issues related to file system interface, implementation, disk management and protection and security mechanisms.  | [A]  |
| C301.5 | Practice administrative tasks on Linux Servers.   | [AP] |

**Course Contents**

**Module 1 Introduction**

**15 Hours**

Review of computer organization - Introduction to popular operating systems - OS structure - System calls - System Programs – POST - System Boot - Functions of OS - Evolution of Operating Systems – Multitasking - Multiuser, parallel, distributed & Real-time OS – GUI - Types of servers - Computer organization interface - Interrupt handler mechanism.

**Module 2 Process and Memory Management**

**15 Hours**

Process Concept - Process Scheduling - Operations on Processes – Inter process Communication - Threads - Overview - Multicore Programming - Multithreading Models - CPU Scheduling - Process Synchronization - Critical Section Problem - Mutex Locks – Semaphores – Monitors – Deadlocks. Main Memory- Contiguous Memory Allocation – Segmentation – Paging - 32 and 64 bit architecture examples - Virtual Memory - Demand Paging - Page Replacement – Allocation of frames – Thrashing - Allocating Kernel Memory.

**Module 3 Files and I/O Systems**

**15 Hours**

File-System Interface - File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection - File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management - Mass Storage Structure - disk space management - disk scheduling – NFS – RAID - Protection and Security. **CASE STUDY** - Linux System - Basic Concepts - System Administration - Requirements for Linux System Administrator - Setting up a LINUX Multifunction Server - Setting Up Local Network Services – Virtualization - Basic Concepts - Setting Up Xen - VMware on Linux Host and Adding Guest OS - UNIX Shell.

**Total Hours 45**

**Text Books:**

1. Abraham Silberschatz, Peter B. Galvin, GregGagne, "Operating System Concepts", 10<sup>th</sup> Editon, Wiley, 2018.
2. D.M.Dhamdhere, "Operating systems- A Concept based Approach" 3<sup>rd</sup> Edition, McGraw Hill, 2017.

**Reference Books:**

1. Andrew S. Tanenbaum, "Modern Operating Systems", 5<sup>th</sup> Edition, Pearson Education, 2016.
2. Gary Nutt, "Operating Systems", 3<sup>rd</sup> Edition, Pearson Education, 2004.
3. Harvey M. Deital, "Operating Systems", 3<sup>rd</sup> Edition, Pearson Education, 2004.

**Web References:**

1. <http://geeksforgeeks.org/OperatingSystems/>
2. [https://www.tutorialspoint.com/operating\\_system/](https://www.tutorialspoint.com/operating_system/)

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C301.1	Understand	Quiz	20
C301.2,3	Apply	Tutorial	20
C301.4	Analyse	Assignment	20
C301.5	Apply	Case Study	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	30	20	20
Understand	40	30	30
Apply	30	30	40
Analyse	-	20	10
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]					End Semester Examination (60%) [100 Marks]	
CA 1: 100 Marks			CA 2: 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C301.1	1	1	1									2	1	2	1
C301.2	3	3	2									3	2	3	2
C301.3	3	3	2									2	3	3	3
C301.4	3	3	2									3	3	2	3
C301.5	3	3	1									3	3	3	3

**Nature of Course** G (Theory analytical)

**Pre requisites** Data Structures

**Course Objectives:**

1. To explain asymptotic analysis for computer algorithms.
2. To discuss the different algorithm design techniques.
3. To examine the efficiency of various algorithm design techniques.
4. To identify the limitations of Algorithm's power.

**Course Outcomes:**

Upon completion of the course, students shall have ability to

C302.1	Discuss the general principles and algorithm design techniques for developing efficient algorithms.	[U]
C302.2	Analyze the time and space complexities of algorithms.	[A]
C302.3	Choose appropriate design techniques for solving problems.	[AP]
C302.4	Interpret the limitations of algorithm's power and to choose suitable approximation algorithms.	[AP]
C302.5	Examine the efficiency of alternative algorithmic solutions for the same problem	[A]

**Course Contents:**

**Module 1 Fundamentals of Algorithm Analysis**

**15 Hours**

Notion of an Algorithm – Importance & role of algorithms in computing – General steps in Algorithmic problem solving – **Analysis of Algorithm efficiency:** Analysis Framework or Parameters, Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis for Non - Recursive and Recursive Algorithms, Empirical Analysis of Algorithm. **Brute Force Approach:** Selection Sort - Bubble Sort - Sequential Search - String Matching.

**Module 2 Advanced Design Paradigms**

**15 Hours**

**Decrease and Conquer Technique:** Insertion sort - Topological sort. **Divide and Conquer Technique:** Merge sort - Quick sort - Binary search - Strassen's Matrix Multiplication. **Dynamic Programming:** Knapsack Problem and Memory functions - Optimal Binary Search Trees - Warshall's and Floyd's Algorithms. **Greedy Technique:** Prims Algorithms - Kruskal's Algorithm - Dijkstra's Algorithm - Huffman Trees and Codes. **Iterative Improvement:** Maximum Flow Problem – Maximum matching in Bipartite graph – Stable Marriage Problem.

**Module 3 Limitations and Coping with the Limitations of Algorithm Power**

**15 Hours**

Lower Bound Arguments - P, NP and NP-Complete Problems. Backtracking: n-Queen Problem - Hamiltonian Circuit Problem - Subset Sum Problem. Branch and Bound Technique: Assignment Problem - Knapsack Problem - Travelling Salesman Problem. Approximation Algorithms: Vertex-cover problem - Travelling Salesman Problem. Case Study – Bloom Filter.

**Total Hours: 45**

**Text Books:**

- 1 Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Publications, 3<sup>rd</sup> Edition, 2012.
- 2 Thomas H. Cormen, Charles E. Leiserson, R.L. Rivest, "Introduction to Algorithms", Prentice Hall of India Publications, 3<sup>rd</sup> Edition, 2009.

**Reference Books:**

- 1 Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2015.
- 2 Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Computer Algorithms/ C++", 2<sup>nd</sup> Edition, Universities Press, 2008.
- 3 Sara Baase and Allen Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", Pearson Publications, 3<sup>rd</sup> Edition, 2008.

**Web References:**

- 1 [https://www.tutorialspoint.com/design\\_and\\_analysis\\_of\\_algorithms/](https://www.tutorialspoint.com/design_and_analysis_of_algorithms/)
- 2 <https://www.geeksforgeeks.org/fundamentals-of-algorithms/>
- 3 <https://www.cs.usfca.edu/~galles/visualization/Algorithms.html>

**Online Resources:**

- 1 <https://www.edx.org/course/algorithmic-design-techniques-uc-san-diegox-algs200x>
- 2 <http://nptel.ac.in/courses/106106131/>
- 3 <https://www.edx.org/course/algorithm-design-analysis-pennx-sd3x>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C302.1	Understand	Quiz	20
C302.2	Analyse	Tutorial	20
C302.3,4	Apply	Assignment	20
C302.5	Analyse	Case Study	20



<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	30	20	20
Understand	20	30	30
Apply	30	30	30
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C302.1</b>	3	3	3	2								3	3	2	2
<b>C302.2</b>	3	3	3	2								3	3	2	2
<b>C302.3</b>	3	3	3	2								3	3	2	2
<b>C302.4</b>	3	3	3	2								3	3	2	2
<b>C302.5</b>	3	3	3	2								3	3	2	2

**Nature of Course** C (Theory Concept)

**Pre requisites** -

**Course Objectives:**

- 1 To explain the basic structure and operational concepts of a computer.
- 2 To demonstrate the logic design of control unit.
- 3 To examine the concept of pipelining and multi-core architectures.
- 4 To describe the components and organization of memory.
- 5 To identify different ways of communication with I/O devices.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C303.1	Describe the functionalities of various units of a computer.	[R]
C303.2	Illustrate the logic design of Control Unit.	[AP]
C303.3	Illustrate various memory components and memory mapping techniques	[AP]
C303.4	Choose different ways of communication with I/O devices using various interconnection networks	[AP]
C303.5	Infer the processor concepts by introducing multi-core, cluster, shared and distributed architecture concepts.	[U]

**Course Contents:**

**Module 1 Architecture Fundamentals and Memory Organization**

**15 Hours**

**Architecture Fundamentals:** Organization of the Von Neumann Machine - Basic operational concepts of a machine - Memory locations and addresses – Instruction format - Instruction Sets, Addressing modes and Assembly language. **Memory Organization:** Basic concepts - Semiconductor RAMs – ROMs - Cache memories - Performance consideration - Virtual memory and Memory Management requirements - Secondary storages.

**Module 2 Control Unit and Pipelining**

**15 Hours**

**Control Unit:** Execution of a Complete Instruction - Hardwired Control, Micro Programmed and Nano programmed Control. **Pipelining:** Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets, Data Path and Control Consideration and Superscalar Operation. Case study: Intel Pentium.

**Module 3 Interfacing, Multicore Architecture and ILP**

**15 Hours**

**I/O Interfacing:** I/O fundamentals - Handshaking, Buffering - I/O techniques - programmed I/O, interrupt-driven I/O, vectored and prioritized Interrupts and DMA. Buses: bus protocols, local and geographic arbitration. **Multicore Architecture:** Multicore Processors - Centralized and Distributed shared memory architecture - Cluster computers. **Instruction Level Parallelism:** Basic concepts of ILP – Hardware and Software Approaches – Dynamic Scheduling. **Case Study:** HP Moonshot, Architecture of Quad core 7<sup>th</sup> Generation Processors.

**Total Hours: 45**

**Text Books:**

- 1 Carl Hamachar, ZvoncoVranesic and SafwatZaky, "Computer Organization", McGraw Hill, 6<sup>th</sup> Edition 2018.
- 2 John P. Hayes, "Computer Architecture and Organization", McGraw Hill, 3<sup>rd</sup> Edition, 2013
- 3 David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface, Elsevier", 5<sup>th</sup> Edition, 2013.

**Reference Books:**

- 1 John L. Hennessy and David A. Patterson, "Computer Architecture: A Quantitative Approach", Morgan Kaufmann, 5<sup>th</sup> Edition 2011.
- 2 John Paul Shen and Mikko H. Lipasti, "Modern Processor Design: Fundamentals of Superscalar Processors", Tata McGraw Hill, 1<sup>st</sup> Edition 2013.
- 3 M. J. Flynn, Computer Architecture: Pipelined and Parallel Processor Design, Narosa Publishing House.
- 4 Kai Hwang, "Advanced Computer Architecture: Parallelism, Scalability, Programmability", McGraw Hill, 2011

**Web References:**

- 1 [http://www.hp.com/hpinfo/newsroom/press\\_kits/2013/hpmoonshot2013/DS\\_Moonshot\\_System.pdf](http://www.hp.com/hpinfo/newsroom/press_kits/2013/hpmoonshot2013/DS_Moonshot_System.pdf)
2. <https://www.geeksforgeeks.org/computer-organization-and-architecture-tutorials/>
3. <https://www.studytonight.com/computer-architecture/>

**Online Resources:**

1. <https://www.coursera.org/learn/comparch>
2. <http://nptel.ac.in/courses/>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C303.1	Understand	Quiz	20
C303.2,3	Apply	Tutorial	20
C303.4	Apply	Assignment	20
C303.5	Understand	Case Study	20

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	30	20	30
Understand	40	40	40
Apply	30	40	30
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>C303.1</b>	1	1	1				2						1	2	1
<b>C303.2</b>	3	3	2				3						2	3	2
<b>C303.3</b>	3	3	2				2						3	3	3
<b>C303.4</b>	3	3	2				3						3	2	3
<b>C303.5</b>	2	2	1				2						2	3	2

**Nature of Course** F (Theory Programming)

**Pre requisites** C Programming

**Course Objectives:**

1. To understand the object-oriented approach and design software solutions.
2. To employ the UML notation and symbols to create effective and efficient system designs.
3. To understand Object Oriented programming concepts.
4. To analyze different types of constructor and inheritance.
5. To understand and apply package, Interface concepts.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C304.1 | Interpret the contemporary issues and discuss about analysis and coding standards. | [AP] |
| C304.2 | Select appropriate UML diagrams for real time problems.                            | [A]  |
| C304.3 | Identify and reproduce the features of Object Oriented programming paradigm.       | [U]  |
| C304.4 | Illustrate arrays, inheritance, packages and interface concepts.                   | [AP] |
| C304.5 | Analyze the usage of interaction and sequence diagrams for real world scenarios    | [A]  |

**Course Contents:**

**Module 1 Introduction to Object Oriented Technologies and the UML Method 15 Hours**

Description of the real world using the Objects Model - Classes, inheritance and multiple configurations - Quality software characteristics - Description of the Object Oriented Analysis process vs. the Structure Analysis Model - Introduction to the UML Language. Analysis of system requirements - Actor definitions - Writing a case goal. Use Case Diagram - Use Case Relationships - Requirements Analysis Using Case Modeling Analysis of system requirements - Actor definitions - Writing a case goal - Use Case Diagrams - Use Case Relationships.

**Module 2 Introduction to Object Oriented Programming 15 Hours**

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

**Module 3 Analysis to Design in the Characterization Stage 15 Hours**

Interaction Diagrams: Description of goal - Defining UML Method – Operation - Object Interface – Class - Sequence Diagram - Finding objects from Flow of Events - Describing the process of finding objects using a Sequence Diagram.

**Total Hours: 45**

**Lab Exercises:**

1. Programs using classes and methods.
2. Sort the strings in ascending order using constructors.
3. Design a package to perform bank accounting transactions.
4. Payroll processing using Inheritance for n employees.
5. To develop a mini-project by following the 4 exercises listed below.
  - a. To develop a problem statement.
  - b. Identify Use Cases and develop the Use Case model.
  - c. Identify the conceptual classes and develop a domain model with UML Class diagram.

d. Using the identified scenarios find the interaction between objects and represent them using UML Sequence diagrams.

**Suggested domains for Mini-Project:**

1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. Online course reservation system
6. E-ticketing
7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system

**Total hours: 75**

**Text Books:**

1. Bernd Bruegge and AllenH.Dutoit, "Object-Oriented Software Engineering using UML Patterns and Java", Pearson, 3<sup>rd</sup> Edition, 2013.
2. Herbert Schildt, "Java : The Complete Reference", 9<sup>th</sup> Edition, Tata McGraw Hill, 2014.

**Reference Books:**

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development", Pearson Education, 3<sup>rd</sup> Edition, 2005.
2. Martin Fowler ,Kendall Scott, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Addison Wesley, 3<sup>rd</sup> Edition, 2003.
3. Paul Deitel, Harvey Deitel, "Java How To Program", 10<sup>th</sup> Edition, Prentice Hall Publications, 2014.
4. Y. Daniel Liang , "Introduction to Java Programming", 9<sup>th</sup> Edition , Prentice Hall Publications, 2015.

**Web References:**

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

**Online Resources:**

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

Continuous Assessment							Total (A+B)	Total Continuous Assessment	End Semester Examination	Total
Theory			Practical							
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)				
80	120	200	100	75	25	100	200	50	50	100

<b>Formative Assessment based on Capstone Model - Theory</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)</b>	<b>FA (10%) [80 Marks]</b>
C304.1, C304.2	Analyse	Tutorial	20
C304.3	Understand	Quiz	20
C304.4	Apply	Assignment	20
C304.5	Analyse	Case Study	20
<b>Assessment based on Summative and End Semester Examination - Theory</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (15%) [120 Marks]</b>		<b>End Semester Examination (35%) [100 Marks]</b>
	<b>CIA1: (60 Marks)</b>	<b>CIA2: (60 Marks)</b>	
Remember	20	20	20
Understand	30	30	30
Apply	30	30	30
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-
<b>Assessment based on Continuous and End Semester Examination - Practical</b>			
<b>Bloom's Level</b>	<b>Continuous Assessment (25%) [100 Marks]</b>		<b>End Semester Examination (15%) [100 Marks]</b>
	<b>FA: (75 Marks)</b>	<b>SA: (25 Marks)</b>	
Remember	20	20	20
Understand	30	30	30
Apply	30	30	30
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>								
<b>Continuous Assessment (50%)</b>							<b>End Semester Examination (50%)</b>	
<b>CA 1 (100 Marks)</b>			<b>CA 2 (100 Marks)</b>			<b>Practical Exam (100 Marks)</b>		<b>Theory Examination (35%) Practical Examination (15%)</b>
<b>SA 1 (60M)</b>	<b>FA 1</b>		<b>SA 2 (60M)</b>	<b>FA 2</b>		<b>FA (75M)</b>	<b>SA (25M)</b>	
	<b>Component-I (20 Marks)</b>	<b>Component-II (20 Marks)</b>		<b>Component-I (20 Marks)</b>	<b>Component-II (20 Marks)</b>			

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C304.1</b>	3	3	2		2			3	3	3		2	3	3	3
<b>C304.2</b>	3	3	3		2			3	3	3		3	3	3	3
<b>C304.3</b>	2	2	2		1			2	2	2		3	2	2	2
<b>C304.4</b>	3	3	3		2			3	3	3		3	3	3	3
<b>C304.5</b>	3	3	3		2			3	3	3		3	3	3	3



**Nature of Course M** (Practical Application)

**Pre requisites** -

**Course Objectives:**

1. To understand the basic Unix commands and shell programming.
2. To construct and debug various functionalities of operating System such as System Calls, Process Synchronization Process Scheduling.
3. To examine the deadlock, memory management and disk scheduling techniques for real world problems.
4. To categorize the behavior of simulation models using GDB debugger.

**Course Outcomes**

Upon completion of the course, students shall have ability to

C305.1	Demonstrate the use of basic Unix commands and shell programming	[AP]
C305.2	Compute synchronization techniques to processes.	[AP]
C305.3	Write programs for disk scheduling, Memory management and File organization Techniques.	[AP]
C305.4	Practice simple applications using operating system functionalities and debug using GDB debugger.	[AP]
C305.5	Calculate the efficiency of CPU Scheduling algorithms.	[A]
C305.6	Examine the efficiency of Deadlock Prevention and avoidance mechanisms.	[A]

**List of Experiments**

1. Analysis and Synthesis of Basic Linux Commands.
2. Programs using Shell Programming.
3. Implementation of Unix System Calls.
4. Simulation and Analysis of Non Preemptive and Preemptive CPU Scheduling Algorithms.
5. i. Simulation of Producer – Consumer Problem using Semaphores  
ii. Implementation of Dining Philosopher’s Problem to demonstrate Process Synchronization.
6. Simulation of Banker’s Algorithm for Deadlock Avoidance.
7. Analysis and Simulation of Memory Allocation and Management Techniques.
8. Implementation of Page Replacement Techniques.
9. Simulation of Disk Scheduling Algorithms.
10. Implementation of File organization Techniques.
11. Simulate Shared memory and IPC.
12. Design an efficient Traffic Control System to avoid traffic congestion in Metro cities. Use Process Synchronization, Scheduling, Deadlock and Memory Management concepts to implement the system. Use GDB tool to debug the system designed.

**Total Hours: 45**

**Text Books:**

1. Abraham Silberschatz, Peter B. Galvin, GregGagne, "Operating System Concepts", 10<sup>th</sup> Edition, Wiley, 2018.
2. D.M.Dhamdhere, "Operating systems- A Concept based Approach" 3<sup>rd</sup> Edition, McGraw Hill, 2017.

**Reference Books:**

1. Andrew S. Tanenbaum, "Modern Operating Systems", 5<sup>th</sup> Edition, Pearson Education, 2016.
2. Gary Nutt, "Operating Systems", 3<sup>rd</sup> Edition, Pearson Education, 2004.
3. Harvey M. Deital, "Operating Systems", 3<sup>rd</sup> Edition, Pearson Education, 2004.

**Web References:**

1. <http://geeksforgeeks.org/OperatingSystems/>
2. [https://www.tutorialspoint.com/operating\\_system/](https://www.tutorialspoint.com/operating_system/)

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination			
Bloom's Level	Continuous Assessment (60%) [100 Marks]		End Semester Practical Examination (40%) [100 Marks]
	FA (75 Marks)	SA (25 Marks)	
Remember	20	20	20
Understand	20	20	20
Apply	40	40	40
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C305.1	3	3	2					3	3	3		3	3	3	3
C305.2	3	3	2					3	2	3		3	3	2	3
C305.3	3	3	2					3	3	3		3	3	3	3
C305.4	3	3	2					3	3	3		3	3	3	3
C305.5	2	3	1					2	3	2		3	3	3	2
C305.6	3	2	2					3	2	3		3	2	3	3

**Nature of Course** M (Practical Application)

**Pre requisites** Data Structures

**Course Objectives:**

1. To experiment the various design techniques of algorithms.
2. To construct the time efficiency of algorithms.

**Course Outcomes:**

Upon completion of the course, students shall have ability to

C306.1	Identify the suitable algorithm design techniques to suit efficiency requirements.	[U]
C306.2	Test the code with best, worst and average case inputs.	[A]
C306.3	Illustrate empirical analysis of algorithms.	[AP]
C306.4	Interpret the order of growth of running time, for different sets of inputs using GNU plot.	[AP]

**Course Contents:**

1. Implement recursive and non-recursive algorithms for an application and analyze the same.
2. Implement and analyze Sorting, Searching and String-matching algorithms using Brute Force approach.
3. Design algorithms using Divide and Conquer technique for different real -world scenarios.
4. Use different algorithm techniques to find the valuable set of items in a Knapsack. Analyze the same.
5. Implement and analyze an algorithm to find the shortest path between every pair of cities using Dynamic Programming.
6. Using different algorithms based on Greedy technique, implement and analyze a real-world application.

**Scenarios:**

1. An array has exactly 'n' nodes. They are filled from the set {0, 1, 2, .....,n-1, n}. There are no duplicates in the list. Design an O(n) worst case time algorithm to find which one of the elements from the above set is missing in the array.
2. Write a C program to solve given recursive function:  
$$x(n) = x(n - 1) + 5 \text{ for } n > 1,$$
$$x(1) = 0$$

Further, analyze the time complexity of the algorithm.
3. Implement a suitable Brute Force algorithm for given scenario:  
Consider a multi-national organization having a list of employee IDs and we want to look up an employee ID 'X' suppose the list has 'n' IDs. Further, analyze the time complexity of the algorithm and plot a graph of the time taken versus 'n' for Empirical Analysis.
4. For a large local area network with a lot of switches, implement an algorithm to find the minimum number of packets that need to be relayed across the network and avoid multiple copies of the same packet from arriving via different paths.
5. Use suitable algorithms to deal with the following Scenario and analyze the same:

A vendor car has capacity 'K' kg. There are some bundles having respective weights  $c_1, c_2, \dots, c_n$  kg which are to be transported by that vendor car. The problem is to pick up those bundles and load them in the car so that the car capacity is maximum utilized, if not fully.

6. Implement an algorithm for the Huffman-tree construction. Analyze the time efficiency class of the algorithm for constructing a Huffman tree as a function of the alphabet's size.
7. Implement a suitable Backtracking algorithm to find a tour:  
A person has to travel from island 'A' to another island 'B' crossing 'n' bridges and return to 'A'. A person can plan a walk in such a way that he will cross each of these bridges once but not more than once.
8. Implement a suitable Branch and Bound algorithm to find the shortest tour:  
A robot is involved in cutting the metal surface with laser. The sequence of movements for the robot arm should be minimal.
9. Implement a suitable Dynamic Programming algorithm for given scenario: A thief enters a house for robbing it. He can carry a maximal weight of 'W' kg into his bag. There are 'N' items in the house with the respective weights ( $w_i$ ) and values ( $v_i$ ). What items should thief take? He either takes or leaves the item.

**Total Hours: 45**

**Text Books:**

- 1 Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Publications, 3<sup>rd</sup> Edition, 2012.
- 2 Thomas H. Cormen, Charles E. Leiserson, R.L. Rivest, "Introduction to Algorithms", Prentice Hall of India Publications, 3<sup>rd</sup> Edition, 2009.

**Reference Books:**

- 1 Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2015.
- 2 Ellis Horowitz, SartajSahni and SanguthevarRajasekaran, "Computer Algorithms/ C++", 2<sup>nd</sup> Edition, Universities Press, 2008.
- 3 Sara Baase and Allen Van Gelder, "Computer Algorithms: Introduction to Design and Analysis", Pearson Publications, 3<sup>rd</sup> Edition, 2008.

**Web References:**

- 1 [https://www.tutorialspoint.com/design\\_and\\_analysis\\_of\\_algorithms/](https://www.tutorialspoint.com/design_and_analysis_of_algorithms/)
- 2 <https://www.geeksforgeeks.org/fundamentals-of-algorithms/>
- 3 <https://www.cs.usfca.edu/~galles/visualization/Algorithms.html>

**Online Resources:**

- 1 <https://www.edx.org/course/algorithmic-design-techniques-uc-san-diegox-algs200x>
- 2 <http://nptel.ac.in/courses/106106131/>
- 3 <https://www.edx.org/course/algorithm-design-analysis-pennx-sd3x>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination			
Bloom's Level	Continuous Assessment (60%) [100 Marks]		End Semester Practical Examination (40%) [100 Marks]
	FA (75 Marks)	SA (25 Marks)	
Remember	20	20	20
Understand	30	30	30
Apply	30	30	30
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C306.1	2	2	1					1	2	1		2	2	2	2
C306.2	3	3	2					3	2	3		3	3	3	3
C306.3	3	3	2					2	2	2		3	2	3	3
C306.4	3	3	2					3	3	3		2	3	3	2

21MAI401

**APPLIED PROBABILITY**

3/1/0/4

**Nature of Course** J ( Problem analytical)

**Pre requisites** -

**Course Objectives:**

- 1 To study the basic probability concepts.
- 2 To understand and have a well – founded knowledge of standard distributions which can be used to describe real life phenomena.
- 3 To acquire skills in handling situations involving more than one random variable.
- 4 To learn the concept of testing hypothesis using statistical analysis.

**Course Outcomes :**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C401.1 | Recall the concepts of basic probability  | [R]  |
| C401.2 | Understand how to handle situations involving random variable                         | [U]  |
| C401.3 | Apply the probability concepts in transition from real problem to a probability model | [AP] |
| C401.4 | Use distribution in cluster analysis of similar binary variables                      | [AP] |
| C401.5 | Derive the logic and attain the knowledge of hypothesis testing.                      | [AP] |

**Course Contents:**

**MODULE 1 PROBABILITY AND RANDOM VARIABLES**

**20 Hours**

Introduction - Addition and Multiplication law of probability – Conditional probability - Total probability theorem - Bayes theorem – One dimensional random variable-Discrete and Continuous Random Variables - Probability mass function - Probability density function – Moment Generating Function – Two dimensional random variables - Joint distributions - Marginal and conditional distributions – Covariance – Correlation- Regression.

**MODULE 2 STANDARD DISTRIBUTIONS**

**20 Hours**

Discrete distributions – Binomial, Poisson and Geometric distribution – Continuous distributions: Uniform, Exponential and Normal distributions

**MODULE 3 STATISTICS**

**20 Hours**

Introduction to Statistics - Measures of central tendency - Testing of hypothesis - Types of errors, critical region, rejection of region - Test statistics for small samples: Student's t-test-F-test- $\chi^2$ -test-goodness of fit-independence of attributes - Test statistics for large samples: Z test for single proportion, Difference of proportion, Mean and Difference of Means.

**Total Hours**

**60**

**Text Books:**

1. Gupta, S.C., & Kapoor, V.K., "Fundamentals of Mathematical Statistics", Sultan Chand & sons, 2000, Reprint 2014
2. Peebles Jr. P.Z., "Probability Random Variables and Random Signal Principles", Tata McGraw-Hill Publishers, 4<sup>th</sup> Edition, New Delhi, 2016
3. Palaniammal, S., "Probability and Random Processes", Prentice hall of India, New Delhi, 2014

**Reference Books:**

1. Ross, S., "A First Course in Probability", 9<sup>th</sup> Edition, Pearson Education, Delhi, 2014.
2. Henry Stark and John W. Woods, "Probability and Random Processes with Applications to Signal Processing"
3. Richard A. Johnson, Irwin Miller, John Freund, "Miller & Freund's Probability and Statistics for Engineers", 9<sup>th</sup> Edition, 2016

**Web References:**

- 1 <http://nptel.ac.in/courses/111104079/>
- 2 <http://nptel.ac.in/video.php/subjectId=117105085>
- 3 <http://nptel.ac.in/syllabus/111105041/>
- 4 <http://freevideolectures.com/Course/3028/Econometric-Modelling/22#>

**Online Resources:**

- 1 [www.edx.org/Probability](http://www.edx.org/Probability)
- 2 <https://ocw.mit.edu/courses/.../18-440-probability-and-random-variables-spring-2014/>
- 3 [https://onlinecourses.nptel.ac.in/noc15\\_ec07/](https://onlinecourses.nptel.ac.in/noc15_ec07/)

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Casestudy, Seminar, Group Assignment)	FA (16%) [80 Marks]
C401.1	Remember	Quiz	20
C401.2	Understand	Seminar	20
C401.3 – C401.5	Apply	Tutorial	20
C401.3 – C401.5	Apply	Assignment	20

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C401.1</b>	2	2	1							1	1		3		
<b>C401.2</b>	3	3	1							1	1		3		
<b>C401.3</b>	2	2	1							1	1		3		
<b>C401.4</b>	3	3	1							1	1		3		
<b>C401.5</b>	3	2	1							1	1		3		



**Nature of Course** G (Theory Analytical)

**Pre requisites** -

**Course Objectives:**

- 1 To understand the basic concepts of Database.
- 2 To apply effective relational database design concepts.
- 3 To know the fundamental concepts of transaction processing, concurrency control techniques and recovery procedure.
- 4 To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.
- 5 To implement efficient computing trends in databases.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C401.1 | Differentiate database systems from file systems by enumerating the features of database system.                     | [U]  |
| C401.2 | Apply transaction processing and concurrency control techniques.   | [AP] |
| C401.3 | Illustrate SQL Programming language and Normalization.   | [AP] |
| C401.4 | Correlate database management system for a real database application.  | [A]  |
| C401.5 | Evaluate a data base model expressed in the form of an entity relation diagram and transform into relational Schema. | [A]  |

**Course Contents:**

**Module 1:**

**20 Hours**

**Introduction & Data Modelling:** Concept of Database & Overview of DBMS - Characteristics of databases, Database Language, Types of DBMS architecture–3 Schema Architecture - Introductions to data models –types- ER Model- ER Diagrams – Extended ER Diagram –reducing ER to table Applications: ER model of University Database Application. Design a DB for Car Insurance Company - Draw ER diagram and convert ER model to relational schema. Evaluating data model quality - The relational Model– Schema – Keys- Relational Algebra – Domain Relational Calculus- Tuple Relational Calculus - Fundamental operations. Relational Database Design And Querying– Undesirable Properties of Relations – Functional Dependency: Closures- Single Valued Dependency Single valued Normalization (1NF, 2NF 3NF & BCNF)- Desirable properties of Decompositions – 4NF - 5NF- De-normalization- Client Server database Implementation.

**Module 2:**

**15 Hours**

**Storage Techniques and Query Processing:** SQL fundamentals – Views - Integrity Procedures, Functions, Cursor and Triggers–Embedded SQL – Dynamic SQL –Plan statement execution - Transaction Concepts – Transaction model – ACID Properties –serial and concurrent schedules, conflict serializability, Two-phase locking. Overview of physical storage structure-stable storage, failure classification -log based recovery, deferred database modification, check-pointing-File Structures:- Index structures-Primary, Secondary and clustering indices. Single andmultilevelindexing -Introduction to Query Processing – Issues in query optimization – Steps in query processing – heuristics based query optimization.

**Module 3:****10 Hours**

**Database Implementation and Recent trends:** Distributed database Implementation- Concurrent transactions - Concurrency control – Lock based –Time stamping-Validation based. NoSQL, NoSQL Categories - Designing an enterprise database system.

**Total Hours:****45****Text Books:**

- 1 Elmasri R. and S. Navathe, Database Systems: Models, Languages, Design and Application Programming, Pearson Education, 2013.
- 2 Gupta G K, “Database Management Systems”, Tata McGraw Hill Education Private Limited, New Delhi, 2011.
- 3 Abraham Silberschatz, Henry F.Korth, S.Sudharshan, “Database System Concepts”,6<sup>th</sup> Edition, Tata McGraw Hill,2011.

**Reference Books:**

- 1 Raghu Ramakrishnan, Gehrke, “Database Management Systems”, 3<sup>rd</sup> Edition, McGraw Hill,2006.
- 2 Maqsood Alam, Aalok Muley, Chaitanya Kadaru, Ashok Joshi “Oracle NoSQL Database”, McGraw Hill Professional,2013
- 3 Plunkett T., B. Macdonald, et al., Oracle Big Data Hand Book, Oracle Press, 2013.

**Web References:**

- 1 <http://nptel.ac.in/video.php?subjectId=106106093>
- 2 <http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-830-database-systems-fall-2010/>
- 3 [www.tutorialspoint.com/dbms/](http://www.tutorialspoint.com/dbms/)

**Online Resources:**

- 1 <https://www.udemy.com/database-management-system/>
- 2 <http://www.nptelvideos.in/2012/11/database-management-system.html>
- 3 <http://nptel.ac.in/courses/106106093/>
- 4 <https://alison.com/courses/IT-Management-Software-and-Databases>
- 5 [https://mva.microsoft.com/en-us/training-courses/database-fundamentals-8243?l=TEBiexJy\\_5904984](https://mva.microsoft.com/en-us/training-courses/database-fundamentals-8243?l=TEBiexJy_5904984)
- 6 <http://www.sqlcourse.com/>
- 7 <https://www.coursera.org/learn/database-management>
- 8 <http://www.joyofdata.de/blog/free-and-certified-mongodb-online-courses-mooc/>
- 9 <https://www.lynda.com/NoSQL-training-tutorials/1473-0.html>
- 10 <https://www.udemy.com/learn-nosql-database-design-from-scratch/>
- 11 <https://www.class-central.com/tag/nosql>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

### Assessment Methods & Levels (based on Blooms' Taxonomy)

#### Formative Assessment based on Capstone Model

Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C401.1	Understand	Assignment	20
C401.2	Apply	Quiz	20
C401.3 & C401.4	Apply	Tutorial	20
C401.5	Analyze	Case Studies	20

#### Assessment based on Summative and End Semester Examination

Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	20	20	20
Understand	30	30	30
Apply	30	30	30
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

#### Assessment based on Continuous and End Semester Examination

Continuous Assessment (40%) [200 Marks]					End Semester Examination (60%) [100 Marks]
CA 1: 100 Marks			CA 2: 100 Marks		
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)	
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C401.1</b>	3	3	3	2	1					3		3	3	3	2
<b>C401.2</b>	3	3	3	3	3					3		3	3	3	2
<b>C401.3</b>	3	3	3	3	3					3		3	3	3	3
<b>C401.4</b>	3	3	3	3	3					3		3	3	3	2
<b>C401.5</b>	3	3	3	3	3					3		3	3	3	3

**Nature of Course** F (Theory Programming)

**Pre requisites** -

**Course Objectives:**

- 1 To recall the features of Java Programming
- 2 To apply the concepts of Multithreading and Exception handling to develop error free codes.
- 3 To provide the ability to design console and web applications.
- 4 To understand integrated development environment to create, debug and run multi-tier and enterprise-level applications
- 5 To develop programs for real word scenarios.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C402.1 | Illustrate the features of java programming language and function overloading                   | [AP] |
| C402.2 | Demonstrate JDBC, file system and command line arguments  | [AP] |
| C402.3 | Apply the concepts of inheritance, exception handling and multithreading in real world scenario | [AP] |
| C402.4 | Illustrate I/O streams, packages, interfaces, Generic, Collection framework                     | [AP] |
| C402.5 | Analyze the new features in java  | [A]  |

**Course Contents:**

**Module1 FUNDAMENTALS OF JAVA TECHNOLOGY AND PROGRAMMING 15 Hours**

JVM Internals – JVM Architecture, JDK, JRE, JIT, JVM Memory. Class fundamentals: Declaring objects, Assigning object reference variable, Methods & Method Signatures, Method retuning Values, Method with parameters, Variable argument, - I/O Basics: Byte stream& Character Stream, Getting user input: Reading console input & Writing console output, Reading and Writing files-new file system API NIO2. Access control, static and final keyword, - Nested and Inner classes , Command Line argument - String and String Buffer class, Java Bean standards, Naming conventions, Interface, JDBC connection.

**Module 2 EXCEPTION, CONCURRENCY, ENUMERATION AND ANNOTATIONS 15 Hours**

Exception handling mechanism. New look try/catch mechanism. Thread class & Runnable Interface. Inter Thread Communication, Synchronization of threads using Synchronized keyword and lock method. Thread pool and Executors framework, Futures and callable, Fork-Join in Java. Deadlock conditions. Enumeration - usage. Annotations: basics of annotation. The Annotated element Interface. Using Default Values, Marker Annotations. Single-Member Annotations. The Built- In Annotations-Some Restrictions.

**Module 3 GENERICS 15 Hours**

Basics , Generics and type safety Collections Interfaces –Collection, Set, List, Queue, Collections Classes – Array List, Hash Set, Tree Set. Accessing a Collection via Iterators. MapInterfaces. MapClasses– AbstractMap, HashMap, TreeMap. New Java Features: Enhancement for

switch expression, lambda expressions, functional interface, Garbage Collection, Compact Number formatting, Java Strings New Methods – indent(), transform(), describeConstable(), and resolveConstantDesc(), Optional Class.

**Total Hours: 45**

**Text Books:**

- 1 Herbert Schildt, “Java The Complete Reference”, 8<sup>th</sup> Edition, McGraw-Hill Osborne Media, 2018.
- 2 Kathy Sierra, “SCJP/OCJP Sun Certified Programmer for Java 6 Study Guide”, Dream tech press, Kogent Learning Solutions Inc., 2011.
- 3 Paul Deitel, Harvey Deitel, “Java How To Program”,10<sup>th</sup> Edition, Prentice Hall Publications,2014
- 4 Cay S. Horstmann and Gary Cornell, “Core Java, Vol.2: Advanced Features”, 9<sup>th</sup> Edition, Prentice Hall, 2013.

**Reference Books:**

- 1 Cay S.Horstmann and Gary Cornell, “Core Java, Volume I Fundamentals”, 9<sup>th</sup> Edition, PrenticeHall,2012
- 2 Y. Daniel Liang, "Introduction to Java Programming",9<sup>th</sup> Edition, Prentice Hall Publications,2015

**Web References:**

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

**Online Resources:**

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

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy)</b>			
<b>Formative Assessment based on Capstone Model</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)</b>	<b>FA (16%) [80 Marks]</b>
C402.1	Understand	Assignment	20
C402.2	Apply	Quiz	20
C402.3 & C402.4	Apply	Tutorial	20
C402.5	Analyze	Case Study	20

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	30	20	30
Understand	30	30	30
Apply	20	30	20
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>					<b>End Semester Examination (60%) [100 Marks]</b>	
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>		<b>Component - II (20 Marks)</b>

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C402.1</b>	3	3	2						2		3	3	2	3	3
<b>C402.2</b>	2	3	2						3		3	3	3	3	2
<b>C402.3</b>	3	2	2						2		3	3	2	3	3
<b>C402.4</b>	2	3	2						3		3	3	3	3	2
<b>C402.5</b>	3	2	2						3		3	3	2	3	3



**Nature of Course**

C (Theory Concept)

**Pre requisites**

Interpersonal Communication and Value Sciences

**Course Objectives:**

- 1 Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- 2 Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- 3 Strengthening of self-reflection.
- 4 Development of commitment and courage to act.
- 5 Helping the students to appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings
- 6 Highlighting plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature

**Course Outcomes:****Upon completion of the course, students shall have ability to**

C201.1	Understand about themselves and their surroundings (family, society, nature).	[U]
C201.2	Understand and take responsibilities in life and handle problems to attain sustainable solutions while keeping human relationships and human nature in mind.	[U]
C201.3	Apply responsibilities towards their commitments (human values, human relationship and human society).	[AP]
C201.4	Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.	[AP]
C201.5	Analyse ethical and unethical practices, and formulate strategies to actualize a harmonious environment wherever they work.	[A]
C201.6	Understand the harmony in nature and existence, and work out mutually on fulfilling participation in the nature.	[U]

**Course Contents:**

**Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education, Understanding Harmony in the Human Being - Harmony in Myself!**

**15 Hours**

Purpose and motivation for the course. Self-Exploration—Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Understanding human being as a co-existence of the sentient 'I' and the 'Material Body'. Understanding the needs of Self ('I') and 'Body' - happiness and physical Facility. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of 'I' with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail-Programs to ensure Sanyam and Health.

**Module 2: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship, Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**  
**15 Hours**

Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and Competence. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

**Module 3: Implications of the above Holistic Understanding of Harmony on Professional Ethics**  
**15 Hours**

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

**Total Hours: 45**

**Text Books:**

- 1 Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
- 2 Rajni Setia, Priyanka Sharma, "Human Values", Genius Publication", Jaipur,2019.

**Reference Books:**

- 1 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
- 2 The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
- 3 India Wins Freedom - Maulana Abdul Kalam Azad.

**Web References:**

- 1 <https://examupdates.in/professional-ethics-and-human-values/>
- 2 <http://hvpe1.blogspot.com/2016/06/notes-human-values-and-professional.html>
- 3 <https://www.yourmorals.org/schwartz.2006.basic%20human%20values.pdf>

**Online Resources:**

- 1 <https://nptel.ac.in/courses/109/104/109104068/>
- 2 <https://medium.com/the-mission/the-12-important-life-skills-i-wish-id-learned-in-school-f4593b49445b>
- 3 <https://www.thebalancecareers.com/life-skills-list-and-examples-4147222>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C201.1	Understand & Apply	Online Quiz	20
C201.2	Understand & Apply	Group Assignment	20
C201.3	Understand	Presentation	20
C201.4	Apply		
C201.5	Apply	Seminar	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	10	10	10
Understand	10	20	20
Apply	40	40	40
Analyse	40	30	30
Evaluate	-	-	-
Create	-	-	-



21ECI401

**MICROCONTROLLERS AND EMBEDDED SYSTEMS**

3/0/0/3

**Nature of Course** D (Theory Application)  
**Pre requisites** Digital Principles and System Design

**Course Objectives:**

1. To understand the architecture and Instruction set of 8051
2. To know about different peripheral devices and their interfacing to 8051
3. To understand the architecture and programming of ARM Processor
4. To know about various peripheral devices and its interfacing with ARM.
5. To apply and understand the principles and working of Arduino Processor.
6. To learn the architecture and process of embedded systems

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |     |
|--------|---|-----|
| C401.1 | Understand the concepts of microcontroller 8051 and apply the programming concepts in microcontroller | [U] |
| C401.2 | Design 8051 microcontroller and to interface the controller with the external circuits.               | [A] |
| C401.3 | Understand the concepts of a RISC Machine & ARM architecture  | [U] |
| C401.4 | Analyze the peripherals interfacing with ARM  | [A] |
| C401.5 | Get an insight into the overall landscape and characteristics of Embedded systems                     | [A] |

**Course Contents:**

**Module 1 8 BIT MICROCONTROLLER**

**15 Hours**

Introduction to 8051 micro-controller, Architecture, Special Function Registers, I/O Pins ports circuits, Instruction set, Addressing modes, Interrupts Assembly language programming-Timer/Counter. 8051 Interfacing -LCD –keyboard, External memory, ADC, DAC & Sensor interfacing: Temperature sensor and Gas sensor

**Module 2 ARM PROCESSOR**

**15 Hours**

RISC Vs CISC, RISC properties and Evolution, ARM architecture, ARM Bus architecture ARM7TDMI, ARM programming Model, ARM Instruction Set, The Thumb Instruction Set, Memory mapping, Pipelining. Interfacing-LED, Seven segment display, Stepper Motor.

**Module 3 INTRODUCTION TO EMBEDDED SYSTEMS**

**15 Hours**

Characteristics-Challenges of Embedded Systems –design process - Categories of embedded systems, overview of embedded architecture, specialties of embedded systems, recent trends in embedded systems Hardware and Software architecture, application software, communication software, process of generating executable.

**Total Hours:45**

**Text Books:**

1. Mohamed Ali Mazidi, Janice GillispieMazidi, "The 8051 microcontroller and embedded systems", PearsonEducation, 2006
2. Andrew N.Sloss, Dominic Symes and Chris Wright "ARM System Developer's Guide: Designing and Optimizing System Software", 1<sup>st</sup> Edition, Morgan Kaufmann Publishers, 2004.
3. Dr KVKK Prasad," Embedded/Real time systems: Concepts, design and programming", 25<sup>th</sup> Edition, Pearson education, Dreamtech press,2014

**Reference Books:**

1. Steve Furber, "ARM System –On –Chip architecture", Addison Wesley,2000.
2. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", Third Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012

**Web References:**

1. <https://www.elprocus.com/peripherals-interfacing-to-the-microcontroller-8051-in-electronics/>
2. <https://developer.arm.com/products/architecture/cpu-architecture>
3. <https://exploreembedded.com>
4. [www.ee.ic.ac.uk/pcheung/teaching/ee2\\_computing/ARMbasics4](http://www.ee.ic.ac.uk/pcheung/teaching/ee2_computing/ARMbasics4)

**Online Resources:**

1. <https://freevideolectures.com/course/3018/microprocessors-and-microcontrollers/22>
2. [www.infocobuild.com/education/audio-video-courses/electronics/.../lecture-05.html](http://www.infocobuild.com/education/audio-video-courses/electronics/.../lecture-05.html)
3. <https://www.edx.org/course/embedded-systems-shape-world-utaustinx-ut-6-03x>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C401.1	Understand	Assignment	20
C401.2	Apply	Quiz	20
C401.3 & C401.4	Understand and Analyse	Tutorial	20
C401.5	Apply	Case Study	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	30	20	30
Understand	30	30	30
Apply	20	30	20
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1: 100 Marks			CA 2: 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C401.1	2	2	1		1			2	2	1		2	2	3	2
C401.2	3	3	2		2			3	3	2		3	3	3	3
C401.3	3	3	2		2			3	3	2		2	3	3	3
C401.4	2	2	1		1			2	2	1		3	2	2	2
C401.5	2	2	1		1			2	2	1		2	2	3	2

**Nature of Course** M (Practical Application)

**Pre requisites** -

**Course Objectives:**

- 1 To learn the fundamentals of data models to conceptualize and depict a database system using ER diagram.
- 2 To introduce the concepts of basic SQL as a universal Database language
- 3 To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.
- 4 To understand the internal storage structures using different file and indexing techniques which will help in physical DB design along with Query optimization techniques

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C403.1 | Demonstrate and implement a database schema for a given problem-domain  | [AP] |
| C403.2 | Identify user needs and take them into account in the selection, creation, evaluation and administration of computer-based systems. | [AP] |
| C403.3 | Apply stored programming Concepts (PL-SQL)  | [AP] |
| C403.4 | Use graphical user interface, Event Handling and Database connectivity to Implement and deploy applications.                        | [AP] |
| C403.5 | Demonstrate Database model to solve a given problem.  | [AP] |

**Course Contents:**

1. Implementation of SQL commands DDL, DML, DCL and TCL
2. Queries to demonstrate implementation of Integrity Constraints, Reports Normalization.
3. Practice of Inbuilt functions
4. Implementation of Join and Nested Queries AND Set operators.
5. Implementation of Aggregate functions in SQL.
6. Implementation of Order By, Group By& Having clause.
  
7. Implementation of virtual tables using Views
8. Practice of Procedural extensions ( Procedure, Function, Cursors, Triggers)
9. Application Development using front end tools
10. Mini project (Application Development)
  - a. Inventory Control System.
  - b. Material Requirement Processing.
  - c. Hospital Management System.
  - d. Railway Reservation System.
  - e. Personal Information System.
  - f. Web Based User Identification System.
  - g. Timetable Management System.
  - h. Hotel Management System.



**Text Books:**

- 1 Elmasri R. and S. Navathe, Database Systems: Models, Languages, Design and Application Programming, Pearson Education, 2013.
- 2 Gupta G K, "Database Management Systems", Tata McGraw Hill Education Private Limited, New Delhi, 2011.
- 3 Abraham Silberschatz, Henry F.Korth, S.Sudharshan, "Database System Concepts", 6<sup>th</sup> Edition, Tata McGraw Hill, 2011.

**Reference Books:**

- 1 Raghu Ramakrishnan, Gehrke, "Database Management Systems", 3<sup>rd</sup> Edition, McGraw Hill, 2006.
- 2 Maqsood Alam, Aalok Muley, Chaitanya Kadaru, Ashok Joshi, "Oracle NoSQL Database", McGraw Hill Professional, 2013
- 3 Plunkett T., B. Macdonald, et al., Oracle Big Data Hand Book, Oracle Press, 2013.

**Web References:**

1. [www.tutorialspoint.com/dbms/](http://www.tutorialspoint.com/dbms/)
2. <http://www.sqlcourse.com/>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination			
Bloom's Level	Continuous Assessment (60%) [100 Marks]		End Semester Practical Examination (40%) [100 Marks]
	FA (75 Marks)	SA (25 Marks)	
Remember	20	20	20
Understand	30	30	30
Apply	30	30	30
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C403.1	3	3	2		2			3	3	2		3	3	3	3
C403.2	2	3	2		2			3	2	2		3	2	3	3
C403.3	3	3	2		2			3	3	2		3	3	3	2
C403.4	3	2	2		2			2	3	2		3	3	3	3
C403.5	3	3	2		2			3	3	2		3	2	3	3

**Nature of** : K (Problem Programming)

**Prerequisites** : -

**Course Objectives:**

- 1 To Analyse different kinds of constructor, Inheritance and polymorphism
- 2 To Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem
- 3 To Implement Object Oriented programming concepts using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C404.1	Demonstrate the use of object oriented concepts in real world problems	[AP]
C404.2	Construct java programs to solve the given problems using basic programming Constructs	[AP]
C404.3	Apply the concepts of inheritance, constructor, exception handling	[AP]
C404.4	Develop and debug java programs using Package, multithreading, Exceptions and interface concepts	[AP]
C404.5	Illustrate and establish JDBC connectivity with different SQL packages	[AP]

**List Of Experiments**

1. Simple Java programs
2. Implementation of Election Contest using class and object.
3. Implementation of Bank Loan Processing using Constructors.
4. Implementation of Single and Multilevel Inheritance for library management systems.
5. Develop Oil Wells sales details for demonstrating the concept of Hierarchical Inheritance.
6. Implementation of String Operations.
7. Implementation of exception handling mechanism using try and catch block.
8. Implementation of Multi-threading for generation of Prime numbers and Fibonacci Series.
9. Design Java Package for numbers. Develop two different classes that belongs to two package, one to check whether the given string is palindrome or not and the other to check whether the given number is odd or even and access these package using one main file
10. Implement a java program to include all types of annotations.
11. Implement function interface using Lambda expressions.
12. Implementation of tourism information system using JDBC.

**Total Hours:**

**45**

**Text Books:**

- 1 Herbert Schildt, "Java The Complete Reference", 8<sup>th</sup> Edition, McGraw-Hill Osborne Media, 2018.
- 2 KathySierra, "SCJP/OCJP Sun Certified Programmer for Java6 Study Guide", Dream tech press, Kogent Learning Solutions Inc., 2011.
- 3 Paul Deitel, Harvey Deitel, "JavaHowToProgram", 10<sup>th</sup> Edition, Prentice HallPublications, 2014
- 4 CayS.Horstmann and GaryCornell, "Core Java, Vol.2: Advanced Features", 9<sup>th</sup> Edition, Prentice Hall, 2013.

**Reference Books:**

- 1 CayS.Horstmann and Gary Cornell, "Core Java, Volume I Fundamentals", 9<sup>th</sup> Edition, PrenticeHall, 2012
- 2 Y. Daniel Liang, "Introduction to Java Programming", 9<sup>th</sup> Edition, Prentice Hall Publications, 2015

**Web References:**

- 1 <https://www.w3schools.com/java/>
- 2 <https://www.geeksforgeeks.org/java/>

**Online Resources:**

- 1 <https://www.udemy.com/topic/java-certification/>
- 2 <https://www.edx.org/learn/java>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination			
Bloom's Level	Continuous Assessment (60%) [100 Marks]		End Semester Practical Examination (40%) [100 Marks]
	FA (75 Marks)	SA (25 Marks)	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C404.1</b>	3	3	2		2			3	3	2		3	3	3	3
<b>C404.2</b>	2	3	2		2			3	2	2		3	2	3	3
<b>C404.3</b>	3	3	2		2			3	3	2		3	3	3	2
<b>C404.4</b>	3	2	2		2			2	3	2		3	3	3	3
<b>C404.5</b>	3	3	2		2			3	3	2		3	2	3	3

**Nature of Course**            M (Practical Application)  
**Pre requisites**              Digital Principles and System Design

**Course Objectives:**

1. To understand the architecture and Instruction set of 8051
2. To know about different peripheral devices and their interfacing to 8051
3. To understand the architecture and programming of ARM Processor
4. To know about various peripheral devices and its interfacing with ARM.
5. To apply and understand the principles and working of Arduino Processor.
6. To learn the architecture and process of embedded systems

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C402.1	Understand the concepts of microcontroller 8051 and apply the programming concepts in microcontroller	[U]
C402.2	Design 8051 microcontroller and to interface the controller with the external circuits.	[AP]
C402.3	Understand the concepts of a RISC Machine & ARM architecture	[U]
C402.4	Analyze the peripherals interfacing with ARM	[A]
C402.5	Get an insight into the overall landscape and characteristics of Embedded systems	[A]

**List of Exercises**

<b>S.No.</b>	<b>List of Experiments:</b>	<b>BT</b>
1.	Arithmetic operations using 8051 Microcontroller	[AP]
2.	Finding Largest and smallest element using 8051 Microcontroller.	[AP]
3.	Code conversion using 8051 Microcontroller.	[AP]
4.	Data transfer and Data Exchange using 8051 Microcontroller.	[AP]
5.	Stepper motor control using 8051 Microcontroller	[AP]
6.	Programmable Peripheral interface using 8051	[AP]
7.	Interfacing 8051 with DAC	[AP]
8.	Study of keil µVision.	[AP]
9.	Basic programming using ARM processor	[AP]

**Total Hours:30**

**Text Books:**

1. Mohamed Ali Mazidi, Janice Gillispie Mazidi, "The 8051 microcontroller and embedded systems", Pearson Education, 2006
2. Andrew N. Sloss, Dominic Symes and Chris Wright "ARM System Developer's Guide: Designing and Optimizing System Software", 1<sup>st</sup> Edition, Morgan Kaufmann Publishers, 2004.
3. Dr KVKK Prasad, "Embedded/Real time systems: Concepts, design and programming", 25<sup>th</sup> Edition, Pearson education, Dreamtech press, 2014

**Reference Books:**

1. Steve Furber, "ARM System –On –Chip architecture", Addison Wesley, 2000.
2. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", Third Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012

**Web References:**

1. <https://www.elprocus.com/peripherals-interfacing-to-the-microcontroller-8051-in-electronics/>
2. <https://developer.arm.com/products/architecture/cpu-architecture>
3. <https://exploreembedded.com>
4. [www.ee.ic.ac.uk/pcheung/teaching/ee2\\_computing/ARMbasics4](http://www.ee.ic.ac.uk/pcheung/teaching/ee2_computing/ARMbasics4)

**Online Resources:**

1. <https://freevideolectures.com/course/3018/microprocessors-and-microcontrollers/22>
2. [www.infocobuild.com/education/audio-video-courses/electronics/.../lecture-05.html](http://www.infocobuild.com/education/audio-video-courses/electronics/.../lecture-05.html)
3. <https://www.edx.org/course/embedded-systems-shape-world-utaustinx-ut-6-03x>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination			
Bloom's Level	Continuous Assessment (60%) [100 Marks]		End Semester Practical Examination (40%) [100 Marks]
	FA (75 Marks)	SA (25 Marks)	
Remember	10	10	10
Understand	30	30	30
Apply	60	60	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C402.1	2	2	1		1			2	2	1		2	2	3	2
C402.2	3	3	2		2			3	3	2		3	3	3	3
C402.3	3	3	2		2			3	3	2		2	3	3	3
C402.4	2	2	1		1			2	2	1		3	2	2	2
C402.5	2	2	1		1			2	2	1		2	2	3	2

21CSI501

**DATA WAREHOUSING AND MINING**

3/0/0/3

**Nature of Course** G (Theory analytical)

**Pre requisites** -

**Course Objectives:**

- 1 To learn the fundamentals of data warehouse and OLAP
- 2 To acquire knowledge in data pre-processing and association rule mining
- 3 To perform data classification and clustering
- 4 To gain knowledge about the emerging trends in data mining

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C501.1	Describe data warehousing design process and OLAP operations	[U]
C501.2	Illustrate data pre-processing techniques	[AP]
C501.3	Practice association and classification methods	[AP]
C501.4	Employ clustering algorithms to examine the data	[A]
C501.5	Analyze data mining techniques for real world problems	[A]

**Course Contents:**

**Module 1: Data Warehousing**

**15 Hours**

Basic Concepts – Architecture – Data warehouse modeling – Data cube and OLAP – Data warehouse design and usage – Framework for data warehouse design – Data warehouse design process - Data warehouse implementation – Efficient data cube computation – Indexing OLAP data – Efficient processing of OLAP queries – OLAP server architectures. **Data Mining** - Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data transformation and discretization – Mining frequent patterns, associations and correlations – Basic concepts - Frequent Item set mining methods – Pattern evaluation methods – Pattern mining in multilevel, multidimensional space - Constraint-based frequent pattern mining.

**Module 2: Classification**

**20 Hours**

Classification - Basic concepts - Decision Tree Induction – Bayesian Classification – Rule Based Classification – Model evaluation and selection – Techniques to improve classification accuracy – Bayesian belief networks - Classification by Back propagation – Support Vector Machines – Classification using frequent patterns – Lazy Learners – Other classification methods – Genetic algorithms – Rough set approach – fuzzy set approach. **Cluster Analysis** - Overview of basic clustering methods - Partitioning Methods – k-Means – k-Medoids- Hierarchical methods- Agglomerative & Divisive Clustering – Density-Based Methods – DBSCAN – OPTICS – DENCLUE - Grid-Based Methods – STING – CLIQUE – Evaluation of clustering – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis – Outlier detection methods – Statistical, proximity and clustering based approaches.

**Module 3: Current Trends**

**10 Hours**

Graph mining – Temporal data mining – Spatial data mining – Distributed data mining – Web Mining - Privacy, security and legal aspects of data mining – Data mining applications – Financial data analysis – Telecommunication industry – Retail industry – Health care and biomedical research.

**Total Hours: 45**



**Text Books:**

- 1 Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining Concepts and Techniques", 3<sup>rd</sup> Edition, Elsevier, 2012.
- 2 M. Kantardzic, "Data Mining: Concepts, Models, Methods, and Algorithms", 2<sup>nd</sup> Edition, Wiley-IEEE Press, 2011.

**Reference Books:**

- 1 Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", McGraw Hill, 2012.
- 2 Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2012.

**Web References:**

- 1 [www.cs.purdue.edu/homes/clifton/cs490d/](http://www.cs.purdue.edu/homes/clifton/cs490d/)
- 2 [www.tutorialspoint.com/data\\_mining/dm\\_cluster\\_analysis.htm](http://www.tutorialspoint.com/data_mining/dm_cluster_analysis.htm)
- 3 [www.cs.waikato.ac.nz/ml/weka/](http://www.cs.waikato.ac.nz/ml/weka/)

**Online Resources:**

- 1 <http://www.mhssce.ac.in/ACADEMIC/syllabus/comp/sem6.pdf>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C501.1	Understand	Quiz	20
C501.2	Apply	Assignment	20
C501.3	Apply	Tutorial	20
C501.4 & C501.5	Analyse	Case Study	20

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	30	20	30
Understand	30	30	30
Apply	40	30	20
Analyse	-	20	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>					
<b>Continuous Assessment (40%) [200 Marks]</b>					<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>		
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>	
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C501.1</b>	3	3	3		2							3	2	3	2
<b>C501.2</b>	3	3	3		2							3	3	3	2
<b>C501.3</b>	3	3	3		2							3	2	3	3
<b>C501.4</b>	3	3	3		2							3	3	3	2
<b>C501.5</b>	3	3	3		2							3	3	3	2

**Nature of Course** G (Theory analytical)

**Pre requisites** -

**Course Objectives:**

1. Understand the concepts of AI and Intelligent Agents.
2. Explore Problem solving using search techniques in AI.
3. Understand Logical Agents and First-Order logic.
4. Explore knowledge Representation issues.
5. Understand concepts of learning from examples.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C502.1 | Understand the basic concepts of AI and Intelligent Agents.                 | [U]  |
| C502.2 | Identify Searching techniques for problem solving in AI.                    | [U]  |
| C502.3 | Apply First-order Logic and chaining techniques for problem solving.        | [AP] |
| C502.4 | Demonstrate knowledge representation techniques for problem solving         | [AP] |
| C502.5 | Examine supervised learning and Neural Networks for solving problems in AI. | [A]  |

**Course Contents:**

**Module 1: Introduction**

**15 Hours**

Foundations of Artificial Intelligence - History of Artificial Intelligence - State of the Art. Intelligent Agents: Agents and Environments - Good Behaviour: The Concept of Rationality - The Nature of Environments - The Structure of Agents. Solving Problems by Searching: Problem-Solving Agents - Uninformed Search Strategies - Informed (Heuristic) Search Strategies - Heuristic Functions. Beyond Classical Search: Local Search Algorithms and Optimization Problems - Searching with Nondeterministic Actions and Partial Observations - Online Search Agents and Unknown Environments. Constraint Satisfaction Problems: Definition - Constraint Propagation - Backtracking Search - Local Search - The Structure of Problems.

**Module 2: Logical Agents**

**15 Hours**

Knowledge-Based Agents - Propositional Logic - Propositional Theorem Proving - Effective Propositional Model Checking - Agents Based on Propositional Logic. First- Order Logic: Syntax and Semantics - Knowledge Engineering in FOL - Inference in First-Order Logic - Unification and Lifting - Forward Chaining - Backward Chaining - Resolution. Planning: Definition – Algorithms - Planning Graphs - Hierarchical Planning - Multi-agent Planning. Knowledge Representation: Ontological Engineering - Categories and Objects - Events, Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information - The Internet Shopping World.

**Module 3: Learning from Examples**

**15 Hours**

Forms of Learning - Supervised Learning - Learning Decision Trees - Evaluating and Choosing the Best Hypothesis - Theory of Learning - Regression and Classification with Linear Models - Artificial Neural Networks. Applications: Human computer interaction (HCI) - Knowledge management technologies - AI for customer relationship management - Expert systems - Data mining - Text mining - Web mining.

**Total Hours: 45**

**Text Books:**

- 1 Russel S, Norvig P, Artificial Intelligence: A Modern Approach, 3<sup>rd</sup> Edition, Pearson Education, 2010.
- 2 Margaret H. Dunham, Data Mining: Introductory and Advanced Topics, Prentice Hall, 2003.

**Reference Books:**

1. Rich E, Knight K, Nair S B, Artificial Intelligence, 3<sup>rd</sup> Edition, Tata McGraw-Hill, 2009.
2. Luger George F, Artificial Intelligence: Structures and Strategies for Complex problem solving, 6<sup>th</sup> Edition, Pearson Education, 2009
3. S.Balakrishnan, J.Janet, Artificial Intelligence and Expert Systems, LAP LAMBERT Academic Publishing, 2017.

**Web References:**

1. [https://www.tutorialspoint.com/artificial\\_intelligence/](https://www.tutorialspoint.com/artificial_intelligence/)
2. <https://developer.ibm.com/articles/cc-beginner-guide-machine-learning-ai-cognitive/>

**Online Resources:**

1. <https://nptel.ac.in/courses/106105077/>
2. <https://swayam.gov.in/course/4193-artificial-intelligence-i>
3. <https://swayam.gov.in/course/3827-ai-search-methods-for-problem-solving>
4. <https://www.class-central.com/course/edx-cs188-1x-artificial-intelligence-445>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C502.1	Understand	Assignment	20
C502.2	Understand	Quiz	20
C502.3 & C502.4	Apply	Tutorial	20
C502.5	Analyse	Case Study	20

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	30	20	30
Understand	30	30	30
Apply	20	30	20
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>					<b>End Semester Examination (60%) [100 Marks]</b>	
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>		<b>Component - II (20 Marks)</b>

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C502.1</b>	3	3	3									3	2	2	2
<b>C502.2</b>	3	3	3									3	2	2	2
<b>C502.3</b>	3	3	3									3	3	3	3
<b>C502.4</b>	3	3	3									3	3	3	3
<b>C502.5</b>	3	3	3									3	3	3	3

**Nature of Course** G (Theory analytical)

**Pre requisites** Java Programming

**Course Objectives:**

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

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C503.1 | Understand the concepts of JEE and build tools like maven.                            | [U]  |
| C503.2 | Apply core Technologies in real world application                                     | [AP] |
| C503.3 | Demonstrate real world application in different frameworks like spring and spring MVC | [AP] |
| C503.4 | Illustrate data persistence and logging process                                       | [AP] |
| C503.5 | Examine the Web Security in real world applications                                   | [A]  |

**Course Contents:**

**Module 1: Introduction to Jakarta Enterprise Edition (formerly called as Java EE) 15 Hours**

Java EE 8 Platform Overview- Distributed Multi tiered Applications- Web & Business Components- Java EE Containers – services & types- Java EE Application Assembly & Deployment – Packaging Applications, Java EE modules - Getting Started with Web applications - Model View Controller (MVC)2 Architecture & Packaging – Web application deployment descriptor (web.xml file)- Web Application Archive (\*.WAR file), Java ARchive (\*.JAR), Enterprise Application aRchive(\*.EAR). **Build Tools:** Maven, Configuration, Archetype, Local Maven Repository and Mvn Repository, Dependency Plugins.

**Module 2: Core Technologies and Frameworks**

**15 Hours**

Introduction to Spring Core, Spring Architecture, Bean Container, Inversion of Control, IOC Container, Bean Definition, Bean Scope, Bean Life Cycle, Dependency Injection- Constructor Injection & property Injection, Auto-wiring, Aspect Object Programming(AOP), Spring MVC, Building a REST services with spring, using http calls (GET, POST, PUT, etc) with annotations: Controller, Rest Controller, Get Mapping, Post Mapping, Put Mapping and Delete Mapping, Error handling for REST, Logging with Log4J. Case Study: Performing CRUD operation using spring MVC and RESTFUL services. **Introduction to Tools:** Postman and SoapUI.

**Module 3: Data Persistence**

**15 Hours**

Object/Relation Mapping using Simple JDBC Integration with native sql commands, JNDI(Java Naming and Directory Interface), JNDI Datasource Configuration, Application Deployment in Tomcat with JNDI, Hibernate: Introduction, Integrating and configuring Hibernate, understanding connection pool, ORM Architecture, Spring Data, JPA vs Hibernate, JPA annotations, Entity Manager, Entity Relationships – ManyToOne Relation, OneToMany Relation, OneToOne Relation

and ManyToMany Relation. Building a sample application using JPA. **Web Security Framework:** JSON Web Token (JWT), JWT structure and configuration. OAUTH2, Architecture, Authentication grant, Obtaining Access Token, Accessing a protected resource, OAuth Registry, Extensibility. Case Study: Develop a Spring based application with JWT-OAUTH2

**Total Hours : 45**

**Text Books:**

- 1 Kogent Learning Solutions Inc., "Java Server Programming Java EE7 (J2EE 1.7): Black Book", Dream Tech Press, 2014.
- 2 Jim Keogh, "J2EE: The Complete Reference", McGraw Hill, 2002
- 3 Geoffroy Warin, "Mastering Spring MVC 4", Packet Publishing, 2015
- 4 Christian Bauer, Gavin King, and Gary Gregory, "Java Persistence with Hibernate", Second Edition, Manning publication, 2015
- 5 Joseph B.Ottinger, Jeff Lin Wood, Dave Minter, " Beginning Hibernate: for Hibernate 5", 4<sup>th</sup> Edition, A press, 2016
- 6 Laurentiu Spilca, "Spring Security in Action, Manning Publication, 2020

**Reference Books:**

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

**Web References:**

- 1 <https://www.baeldung.com/rest-with-spring-series>
- 2 <https://www.coursera.org/courses?query=spring%20framework>
- 3 <https://www.gangboard.com/spring-and-hibernate-courses>
- 4 <https://www.progress.com/tutorials/jdbc/understanding-jta>
- 5 <https://www.ibm.com/developerworks/library/j-jndi/index.html>

**Online Resources:**

- 1 <https://jeemainonline.in/>
- 2 <https://www.udemy.com/share/101Wc4/>
- 3 <https://www.udemy.com/topic/java-ee/>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
<b>80</b>	<b>120</b>	<b>200</b>	<b>40</b>	<b>60</b>	<b>100</b>

<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy)</b>			
<b>Formative Assessment based on Capstone Model</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)</b>	<b>FA (16%) [80 Marks]</b>
C503.1	Understand	Quiz	20
C503.2	Apply	Assignment	20
C503.3 & C503.4	Apply	Tutorial	20
C503.5	Analyse	Case Study	20

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	30	20	30
Understand	30	30	30
Apply	20	30	20
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C503.1</b>	2	3	3						2		2	3	2	2	2
<b>C503.2</b>	2	3	3						2		2	3	2	2	2
<b>C503.3</b>	2	3	3						2		2	3	3	3	3
<b>C503.4</b>	2	3	3						2		2	3	3	3	3
<b>C503.5</b>	2	3	3						2		2	3	3	3	3



21CSI504

PHP AND JS FRAMEWORK

3/0/0/3

**Nature of Course** G (Theory analytical)

**Pre requisites** -

**Course Objectives:**

- 1 To understand PHP Scripting Language for web development
- 2 To acquire knowledge in JS
- 3 To learn the features of React
- 4 To illustrate session management and chat application using Node.js
- 5 To create a webpage and implementing both Frontend and Backend for the application

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C504.1 | Develop PHP programs for web based applications             | [AP] |
| C504.2 | Apply the structure of Java Script for real time examples   | [AP] |
| C504.3 | Illustrate the features of React                            | [AP] |
| C504.4 | Use Node.js for connectivity and session management         | [AP] |
| C504.5 | Develop web page and implement for Book Lending application | [A]  |

**Course Contents:**

**Module 1: PHP**

**15 Hours**

Installing PHP(WAMP SERVER),Lexical Structure, Data Types, Variables, Expressions and Operators, Flow Control Statements, Including Code, Embedding PHP in Web Pages, Functions, Strings, Arrays, Classes, Introspection and Serialization, JSON

**Module 2: JavaScript fundamentals**

**15 Hours**

An introduction to JavaScript – Data Types – Conditionals and Loops –Functions – Classes and Objects – Inbuilt Methods – Arrays – Regular Expressions – Arrow Functions – Debugging in browsers – JS HTML DOM – JS Browser BOM – Introduction to AJAX and JSON – JS vs JQuery – Why JS Frameworks – Scope & Function Context - Closures - JavaScript Design Pattern.

**Module 3: React**

**15 Hours**

React features – JSX – Component Life Cycle – Working with Forms – Event Handling in React – Introduction to Flux and Redux – State Management – Hooks and Context – Axios - Unit Testing. **Node.js:** Node.js Generators - Serving Static files Using Node.js - Session Management in Node.js - Connecting Node.js to Angular.js using Web sockets. **Project:** Responsive application - MyReads: A Book Lending App.

**Total Hours : 45**

**Text Books:**

- 1 Steven Holzner, "PHP:The Complete Reference", McGraw Hill Education, 2017
- 2 Artemij Fedosejev, "React.js Essentials", Packet publishing, 2015, 3Basarat Ali Syed, "Beginning Node.js", Apress, 2014

**Reference Books:**

- 1 Rasmus Lerdorf, Kevin Tatroe, Peter MacIntyre, "Programming PHP", O'Reilly Publications, 3rd Edition, 2002.
- 2 Anthony Accomazzo, Ari Lerner, Nate Murray, Clay All sopp, David Gutman, and Tyler McGinnis , "Fullstack React: The Complete Guide to ReactJS and Friends", Fullstack.io, 2017.

- 3 Valentin Bojinov, David Herron, Diogo Resende, "Node.js Complete Reference Guide", Packt Publishing, 2018.

**Web References:**

- 1 <https://www.w3schools.com/nodejs/>
- 2 <https://www.w3schools.com/angular/>
- 3 <https://reactjs.org/tutorial/>
- 4 <https://hackr.io/tutorials/learn-php>

**Online Resources:**

- 1 <https://www.edx.org/course/angularjs-framework-fundamentals>
- 2 <https://www.udemy.com/introduction-to-php-programming-training-course/>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C504.1	Apply	Assignment	20
C504.2	Apply	Quiz	20
C504.3 & C504.4	Apply	Tutorial	20
C504.5	Apply	Case Study	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	30	20	20
Understand	30	30	30
Apply	40	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]					End Semester Examination (60%) [100 Marks]	
CA 1: 100 Marks			CA 2: 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C504.1	2	3	3						2		2	3	2	2	2
C504.2	2	3	3						2		2	3	2	2	2
C504.3	2	3	3						2		2	3	3	3	3
C504.4	2	3	3						2		2	3	3	3	3
C504.5	2	3	3						2		2	3	3	3	3

**Nature of Course:** G (Theory analytical)

**Pre requisites** -

**Course Objectives:**

1. To explain networks, topologies and the key concepts.
2. To discuss the layered communication architectures and its functionalities.
3. To demonstrate the concepts of error control, addressing and routing mechanisms.
4. To identify the functions, protocols and communication between layers.
5. To describe user-oriented services and advanced networking technologies.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C505.1	Describe the fundamentals of data communications, topologies and functions of layered model.	[U]
C505.2	Practice the error detection and correction methods and explain data link layer functionalities.	[AP]
C505.3	Examine the logical addressing schemes and routing strategies.	[A]
C505.4	Demonstrate the process-to-process delivery models and congestion control principles.	[AP]
C505.5	Illustrate the services of application layer and emerging networking technologies.	[AP]

**Course Contents:**

**Module 1: Overview of data communication, Networking and physical layer** **15 Hours**

Introduction - Networks topologies, Protocols and standards, Reference models: OSI reference model, TCP/IP reference model, Overview of data (analog& digital), Overview of signal (analog& digital), Transmission Impairment, Performance, Transmission (analog& digital), Transmission media, Switching

**Module 2: Data link layer** **15 Hours**

Error detection (Parity, CRC, Hamming code), Sliding Window, Stop and Wait protocols, Multiple access protocols. Traditional Ethernet, Gigabit Ethernet, FDDI, Wi-Fi; Wi-Max, Bluetooth. **Network layer:** Logical Addressing, Internet Protocol(IPV4, IPV6), subnetting, Protocols: Address Mapping, ICMP; Routing algorithms: shortest path algorithm, flooding, distance vector routing, link state routing; Unicast and Multicast routing protocols.

**Module 3: Transport layer** **15 Hours**

Process to process delivery, UDP, TCP, Congestion control algorithms, Quality of service - Socket Programming. **Application layer:** DNS, E-Mail, SNMP, FTP, HTTP & WWW. Modern topics: ISDN services, DSL technology, VLAN.

**Total Hours: 45**

**Text Books:**

1. Behrouz A. Forouzan, "Data communication and Networking", 5<sup>th</sup> Edition, Tata McGraw-Hill, 2016.
2. AS Tanenbaum, DJ Wetherall, "Computer Networks", 5<sup>th</sup> Edition, Prentice-Hall, 2016.
3. Thomas D. Nadeau and Ken Gray, "SDN: Software Defined Networks", O'Reilly Media, Inc., 2013

**Reference Books:**

1. Peterson & Davie, "Computer Networks, A Systems Approach", 3<sup>rd</sup> Edition, Harcourt, 2013
2. William Stallings, "Data and Computer Communications", 8<sup>th</sup> Edition, PHI, 2006
3. Bertsekas and Gallager "Data Networks, PHI, 2000
4. JF Kurose, KW Ross, "Computer Networking: A Top-Down Approach", 5<sup>th</sup> Edition, Addison-Wesley, 2009.

**Web References:**

1. <https://www.howtoforge.com/tutorial/software-defined-networking-sdn-architecture-and-role-of-openflow/>
2. <https://www.sdxcentral.com/sdn/network-virtualization/definitions/data-center-networking-explained/>

**Online Resources:**

1. <http://nptel.ac.in/courses/106105082/>
2. <https://nptel.ac.in/courses/106105183/>
3. <https://www.udacity.com/course/computer-networking--ud436>
4. <https://www.free-online-training-courses.com/networking/>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C505.1	Understand	Assignment	20
C505.3	Analyse	Quiz	20
C505.2 & C505.4	Apply	Tutorial	20
C505.5	Apply	Case Study	20

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	30	20	30
Understand	30	30	30
Apply	20	30	20
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>C505.1</b>	3	3	3						2			3	2	2	2
<b>C505.2</b>	3	3	3						2			3	2	2	2
<b>C505.3</b>	3	3	3						2			3	3	3	3
<b>C505.4</b>	3	3	3						2			3	3	3	3
<b>C505.5</b>	3	3	3						2			3	3	3	3

**Nature of Course** G (Theory analytical)

**Pre requisites** -

**Course Objectives:**

- 1 To introduce the basic concepts of Agile Software Process.
- 2 To provide an insight to different areas of Agile Methodologies.
- 3 To explore the roles of prototyping in the software process
- 4 To perform a detailed examination and demonstration of Agile development and testing techniques.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |   |      |
|---|------|
| C506.1 Understand the background and driving forces for taking an Agile approach to software development  | [U]  |
| C506.2 Apply design principles, refactoring, version control and continuous integration to achieve Agility  | [AP] |
| C506.3 Demonstrate how an iterative, incremental development process leads to faster delivery of more useful software   | [AP] |
| C506.4 Recognize the importance of interacting with business stakeholders in determining the requirements for a software system                                       | [U]  |
| C506.5 Interpret Software process improvement as an ongoing task for development teams thereby showing how agile approaches can be scaled up to the enterprise level. | [AP] |

**Course Contents:**

**Module 1: Agile and its Significance**

**20 Hours**

Agile development – Classification of methods – The agile manifesto and principles – Agile project management – Embrace communication and feedback - Simple practices and project tools – Empirical vs defined and prescriptive process – Principle-based versus Rule-Based – Sustainable discipline. The human touch – Team as a complex adaptive system – Agile hype – Specific agile methods. The facts of change on software projects – Key motivations for iterative development – Meeting the requirements challenge iteratively – Problems with the waterfall. Research evidence – Early historical project evidence – Standards-Body evidence – Expert and thought leader evidence – A Business case for iterative development – The historical accident of waterfall validity.

**Module 2: Agile Methodology**

**20 Hours**

Method overview – Lifecycle – Work products, Roles and Practices values – Common mistakes and misunderstandings – Sample projects – Process mixtures – Adoption strategies – Fact versus fantasy – Strengths versus “Other” history.

**Module 3: Agile Practicing and Testing**

**20 Hours**

Project management – Environment – Requirements – Test – The agile alliances – The manifesto – Supporting the values – Agile testing – Nine principles and six concrete practices for testing on agile teams. **Case Study:** Agile – Motivation – Evidence – Scrum – Extreme Programming – Unified Process – Practice Tips.

**Total Hours : 60**

**Text Books:**

- 1 Mark C. Layton, Steven J. Ostermiller, Dean J. Kynaston, "Agile Project Management", Wiley, 2020
- 2 Elisabeth Hendrickson, "Agile Testing" Quality Tree Software Inc 2008.
- 3 Angel Medinilla, "Agile Management: Leadership in an Agile Environment", Springer, 2012

**Reference Books:**

- 1 Craig Larman "Agile and Iterative Development – A Manager's Guide" Pearson Education – 2004
- 2 James shore, Shane Warden, "The Art of Agile Development (Pragmatic guide to agile software development)", O'Reilly Media, 2008
- 3 Neil Perkin, Peter Abraham, Building the Agile Business Through Digital Transformation, Kogan Page, 2020

**Web References:**

- 1 [www.agileintro.wordpress.com/2008](http://www.agileintro.wordpress.com/2008)
- 2 <http://www.serena.com/docs/repository/solutions/intro-to-agile-devel.pdf>
- 3 [www.qualitytree.com](http://www.qualitytree.com)

**Online Resources:**

- 1 <https://www.edx.org/course/agile-software-development>
- 2 <https://itacademy.harvard.edu/agile>
- 3 <https://www.coursera.org/specializations/agile-development>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C506.1 & C506.4	Understand	Quiz	20
C506.2	Apply	Assignment	20
C506.3	Apply	Tutorial	20
C506.5	Apply	Case Study	20



<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	30	20	30
Understand	30	30	30
Apply	20	30	20
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>					<b>End Semester Examination (60%) [100 Marks]</b>	
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>		<b>Component - II (20 Marks)</b>

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>C506.1</b>	2	3	3		3	2			2	2	2	3	2	2	2
<b>C506.2</b>	2	3	3		3	2			2	2	2	3	2	2	2
<b>C506.3</b>	2	3	3		3	2			2	2	2	3	3	3	3
<b>C506.4</b>	2	3	3		3	2			2	2	2	3	3	3	3
<b>C506.5</b>	2	3	3		3	2			2	2	2	3	3	3	3

**Nature of Course** M (Practical Application)

**Pre requisites** Java Programming

**Course Objectives:**

- 1 To learn the fundamentals of JEE concepts and usage of build tools like Maven.
- 2 To develop and deploy application in frameworks like Spring, Spring MVC and Building REST Services with spring MVC
- 3 To understand Logging process, ORM framework and build secure applications using JWT and OAUTH
- 4 To acquire knowledge in React and Node.js
- 5 To illustrate event handling and session management

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C507.1	Apply core JEE concepts in real world application	[AP]
C507.2	Demonstrate different frameworks like spring and spring MVC	[AP]
C507.3	Write programs for web based applications	[AP]
C507.4	Design forms and handle events	[AP]
C507.5	Build responsive application	[AP]

**List of Exercises**

1. Developing simple application in Maven.
2. Implement Spring IOC and Spring JDBC.
3. Create a web application using Spring MVC.
4. Implement Data Persistence using JPA and Hibernate.
5. Creating RESTFUL services and Test using Postman or SoapUI
6. Usage of Java Naming and Directory Interface
7. Implement Logging using Log4j.
8. Implement Spring Security using JWT and OAUTH2.
9. Write a PHP script to decode a JSON string
10. Working with JS forms and filters
11. Building Single Page Application using JS
12. Form and event handling using React
13. Simple animations using React
14. Serving Static files and Session Management using Node.js
15. Developing responsive application

**Total Hours:60**

**Text Books:**

1. Geoffroy Warin, "Mastering Spring MVC 4", Packet Publishing, 2015
2. Christian Bauer, Gavin King, and Gary Gregory, "Java Persistence with Hibernate", Second Edition, Manning publication, 2015
3. Artemij Fedosejev, "React.js Essentials", Packet publishing, 2015,
4. Basarat Ali Syed, "Beginning Node.js", Apress, 2014

### Reference Books:

1. Elder Moraes, "Java EE 8 Cookbook", Packt Publishing, 2018
2. Valentin Bojinov, David Herron, Diogo Resende, "Node.js Complete Reference Guide", Packt Publishing, 2018

### Web References:

1. <https://www.baeldung.com/rest-with-spring-series>
2. <https://www.w3schools.com/nodejs/>
3. <https://www.w3schools.com/angular/>

### Online Resources:

1. <https://www.coursera.org/courses?query=spring%20framework>
2. <https://www.udemy.com/topic/java-ee/>
3. <https://www.edx.org/course/angularjs-framework-fundamentals>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination			
Bloom's Level	Continuous Assessment (60%) [100 Marks]		End Semester Practical Examination (40%) [100 Marks]
	FA (75 Marks)	SA (25 Marks)	
Remember	10	10	10
Understand	30	30	30
Apply	60	60	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C507.1</b>	3	3	2		2			3	3	2		3	3	3	3
<b>C507.2</b>	2	3	2		2			3	2	2		3	2	3	3
<b>C507.3</b>	3	3	2		2			3	3	2		3	3	3	2
<b>C507.4</b>	3	2	2		2			2	3	2		3	3	3	3
<b>C507.5</b>	3	3	2		2			3	3	2		3	2	3	3

**Nature of Course** M (Practical Application)  
**Pre requisites** Digital Principles and System Design

**Course Objectives:**

- 1 To explain networks, topologies and the key concepts.
- 2 To discuss the layered communication architectures and its functionalities.
- 3 To demonstrate the concepts of error control, addressing and routing mechanisms.
- 4 To identify the functions, protocols and communication between layers.
- 5 To describe user-oriented services and advanced networking technologies.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C508.1	Describe the system administration and network administration commands	[U]
C508.2	Practice the error detection and correction methods	[AP]
C508.3	Implement sliding window protocols, subnetting, remote command and DNS.	[AP]
C508.4	Perform remote command execution.	[AP]
C508.5	Discuss the features of Network Simulator	[U]

**List of Exercises**

1. Study of system administration and network administration commands
2. Study of socket programming and client server model using TCP and UDP
3. Implementation bit stuffing and hamming code algorithms
4. Implementation of sliding window protocols
5. Implementation of Subnetting
6. Implementation of Remote Command Execution
7. Implementation of Domain name system
8. Implementation of File Transfer Protocol
9. Study of Network Simulator -2

**Total Hours:30**

**Text Books:**

1. Behrouz A. Forouzan, "Data communication and Networking", 5<sup>th</sup> Edition, Tata McGraw-Hill, 2016.
2. AS Tanenbaum, DJ Wetherall, "Computer Networks", 5<sup>th</sup> Edition, Prentice-Hall, 2016.
3. Thomas D. Nadeau and Ken Gray, "SDN: Software Defined Networks", O'Reilly Media, Inc., 2013

**Reference Books:**

1. Peterson & Davie, "Computer Networks, A Systems Approach", 3<sup>rd</sup> Edition, Harcourt, 2013
2. William Stallings, "Data and Computer Communications", 8<sup>th</sup> Edition, PHI, 2006
3. Bertsekas and Gallager "Data Networks, PHI, 2000
4. JF Kurose, KW Ross, "Computer Networking: A Top-Down Approach", 5<sup>th</sup> Edition, Addison-Wesley, 2009.

**Web References:**

1. <https://www.howtoforge.com/tutorial/software-defined-networking-sdn-architecture-and-role-of-openflow/>
2. <https://www.sdxcentral.com/sdn/network-virtualization/definitions/data-center-networking-explained/>

**Online Resources:**

1. <http://nptel.ac.in/courses/106105082/>
2. <https://nptel.ac.in/courses/106105183/>
3. <https://www.udacity.com/course/computer-networking--ud436>
4. <https://www.free-online-training-courses.com/networking/>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination			
Bloom's Level	Continuous Assessment (60%) [100 Marks]		End Semester Practical Examination (40%) [100 Marks]
	FA (75 Marks)	SA (25 Marks)	
Remember	10	10	10
Understand	30	30	30
Apply	60	60	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C508.1</b>	2	2	2		2			3	3	2		3	3	3	3
<b>C508.2</b>	3	3	2		2			3	3	2		3	2	3	3
<b>C508.3</b>	3	3	2		2			3	3	2		3	3	3	2
<b>C508.4</b>	3	3	2		2			3	3	2		3	3	3	3
<b>C508.5</b>	2	2	2		2			3	3	2		3	2	3	3

**Nature of Course** D (Theory Design)

**Pre requisites** -

**Course Objectives:**

1. To introduce the major concept areas of language translation and compiler design
2. To predict, design and construct a lexical analyzer and parser.
3. To employ code generation schemes
4. To perform optimization of codes and gain knowledge about runtime environments
5. To provide practical programming skills necessary for constructing a compiler using LEX and YACC tools

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C601.1 | Construct a lexical analyzer to identify the tokens in a program.                  | [AP] |
| C601.2 | Deduce a parser through the application of grammar.                                | [A]  |
| C601.3 | Demonstrate intermediate code generation and symbol table organization techniques. | [AP] |
| C601.4 | Illustrate the code generation techniques with a simple program.                   | [AP] |
| C601.5 | Estimate the code optimization strategies.   | [A]  |

**Course Contents:**

**Module 1: Introduction to Compilers and Syntax Analysis**

**15 Hours**

The Structure of Compiler – Evolution of Programming Languages – Application of Compiler Technology – Programming Languages Basics - Phases of a compiler; Cousins of the Compiler - Grouping of Phases - Compiler Construction Tools - role of assemblers - macroprocessors – loaders - linkers **Lexical Analysis:** Role of Lexical Analyzer - Input Buffering - Specification of Tokens - Recognition of Tokens - Lexical Analyzer Generators -A language for Specifying Lexical Analyzer - Finite Automata - From a regular expression to an NFA and **DFA.Syntax Analysis:** Role of the parser; Writing Grammars; Context-Free Grammars - Derivation Trees – Ambiguity in Grammars and Languages - Top Down parsing - Recursive Descent Parsing - Predictive Parsing - Bottom-up parsing - Shift Reduce Parsing - LR Parsers - SLR Parser - Canonical LR Parser - LALR Parser - YACC-Parser Generators - Design of a parser generator.

**Module 2: Intermediate Code Generation and Code Generation**

**15 Hours**

**Intermediate languages:** Three address code – Types of Three address code – Declarations - Assignment Statements - Boolean Expressions - Case Statements – Quadruples – Triples - Arrays – Loops - Back patching - Syntax directed Definitions – Inherited and Synthesized Attributes - Syntax Directed Translation - Construction of Syntax Tree - Applications of Syntax Directed Translation - Type Checking - Type system - Type checker; Type expression - Type conversion. The Target Machine – Runtime Storage Management – Basic Blocks and Flow Graphs - Next-use Information - Register allocation - Issues in the design of code generator – A simple Code generator – Data Structures for simple code generator, Labelling algorithm - Code generator using DAG – Dynamic programming based code generation - Loop Optimization - Peephole Optimization. **Case Study:** Bootstrapping a Compiler.

**Module 3: Code Optimization and Run Time Environments**

**15 Hours**

Introduction - Principal Sources of Optimization - Optimization of Basic Blocks – DAG representation of Basic Blocks - Structure Preserving transformation – functional transformation - Introduction to Global Data Flow Analysis – Runtime Environments – Source Language Issues – Symbol Tables - Storage Organization – Storage Allocation strategies – Access to non-local names – Heap Management - Parameter Passing; Error handling - Error Detection and Recovery - Lexical phase error management – Syntax phase error management - Error recovery routines. **Case Study:** Just-in-time compilation with adaptive optimization for dynamic languages.

**Total Hours:45**

**Text Books:**

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Second Edition, Pearson Education Limited, 2014.

**Reference Books:**

1. Allen I. Holub, "Compiler Design in C", Prentice Hall of India, 2016.
2. C.N.Fischer and R.J.Le Blanc, "Crafting a compiler with C", Benjamin Cummings, 2010.
3. Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.
4. Kenneth C.Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003.
5. Dhamdhere, D.M., "Compiler Construction Principles and Practice", 2nd edition, Macmillan India Ltd., New Delhi, 2008.

**Web References:**

1. [gatecse.in/category/compiler-design/](http://gatecse.in/category/compiler-design/)
2. [www.tutorialspoint.com/compiler\\_design](http://www.tutorialspoint.com/compiler_design)

**Online Resources:**

1. <http://nptel.ac.in/syllabus/syllabus.php?subjectId=106108113>
2. [nptel.ac.in/courses/106104123/](http://nptel.ac.in/courses/106104123/)
3. <https://online.stanford.edu/courses/soe-yccscs1-compilers>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C601.1	Apply	Assignment	5
C601.2, C601.3	Analyse	Tutorial	10
C601.4, C601.5	Analyse	Case Study	5

Assessment based on Summative and End Semester Examination			
Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	20	20	20
Understand	30	30	30
Apply	30	20	30
Analyse	20	30	20
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1: 100 Marks			CA 2: 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C601.1	2	3	3	2	2							2	2	2	2
C601.2	2	2	3	3	2							2	2	2	2
C601.3	2	2	2	2								2	2		2
C601.4	2	3	3	3								3	2	3	3
C601.5	3	3	3	2								3	2		3



21CSI602

**BIG DATA ANALYTICS**

3/0/0/3

**Nature of Course** G (Theory analytical)  
**Pre requisites** Database Management Systems, Probability

**Course Objectives:**

- 1 To explore the fundamental concepts of data analytics
- 2 To learn the principles and methods of statistical analysis.
- 3 Discover interesting patterns, analyze supervised and unsupervised models and Estimate the accuracy of the algorithms.
- 4 To understand the various search methods and visualization techniques
- 5 To learn Data analytics using Hadoop framework.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C602.1 | Identify the real world business problems and model with analytical solutions.                       | [U]  |
| C602.2 | Solve analytical problem with relevant mathematics background knowledge.                             | [AP] |
| C602.3 | Convert any real world decision making problem to hypothesis and apply suitable statistical testing. | [A]  |
| C602.4 | Explain and Analyse the Big Data using Map-reduce programming in Hadoop and Spark framework.         | [AP] |
| C602.5 | Use open source frameworks for modelling and storing data.   | [A]  |

**Course Contents:**

**Module 1: Introduction to Big Data**

**15 Hours**

Data Science – Fundamentals and Components –Types of Digital Data – Classification of Digital Data – Introduction to Big Data – Characteristics of Data – Evolution of Big Data – Big Data Analytics – Classification of Analytics – Top Challenges Facing Big Data – Importance of Big Data Analytics  
**DESCRIPTIVE ANALYTICS USING STATISTICS:** Mean, Median and Mode – Standard Deviation and Variance – Probability – Probability Density Function – Percentiles and Moments – Correlation and Covariance – Conditional Probability – Bayes’ Theorem – Introduction to Univariate, Bivariate and Multivariate Analysis – Dimensionality Reduction using Principal Component Analysis(PCA) and LDA.

**Module 2: Predictive Modeling and Machine Learning**

**15 Hours**

Linear Regression – Polynomial Regression – Multivariate Regression –Bias/Variance Trade Off – K Fold Cross Validation – Data Cleaning and Normalization – Cleaning Web Log Data – Normalizing Numerical Data – Detecting Outliers – Introduction to Supervised And Unsupervised Learning – Reinforcement Learning – Dealing with Real World Data – Machine Learning Algorithms –Clustering.

**Module 3: Big Data Hadoop Framework**

**15 Hours**

Introducing Hadoop –Hadoop Overview – RDBMS versus Hadoop – HDFS (Hadoop Distributed File System): Components and Block Replication – Processing Data with Hadoop – Introduction to MapReduce – Features of MapReduce – Introduction to NoSQL: CAP theorem – MongoDB: RDBMS Vs MongoDB – Mongo DB Database Model – Data Types and Sharding – Introduction to Hive – Hive Architecture – Hive Query Language (HQL). **Case study:** Using R – Python – Hadoop - Spark and Reporting tools to understand and Analyze the Real world Data sources in the following domain-financial – Insurance - Healthcare in Iris - UCI datasets.

**Total Hours: 45**

**Text Books:**

- 1 EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley publishers, 2015.
- 2 Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, Second Edition, 2014.
- 3 An Introduction to Statistical Learning: with Applications in R (Springer Texts in Statistics) Hardcover – 2017

**Reference Books:**

- 1 Bart Baesens , “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications“, Wiley Publishers, 2014
- 2 Bill Franks, “Taming the Big Data Tidal Wave: Finding opportunities in Huge Data Streams with Advanced Analytics”, John Wiley & sons, 2012
3. Probability And Statistics For Engineers And Scientists 9<sup>th</sup> Edition by Walpole and R E and Myers and R H , Pearson India

**Web References:**

- 1 <https://bigdatauniversity.com/>
- 2 <http://www.statistics.com/data-analytics- courses>
- 3 [www.ibm.com/Data Analytics/](http://www.ibm.com/Data Analytics/)
- 4 <https://www.youtube.com/watch?v=bAyrObI7TYE>
- 5 <https://www.youtube.com/watch?v=k7zu3NXEiGY>
- 6 <https://www.youtube.com/watch?v=1vbXmCrkT3Y>
- 7 <https://www.youtube.com/watch?v=XnNzck5-HdQ>

**Online Resources:**

- 1 <https://www.edx.org/course/subject/data-analysis- statistics>
- 2 <https://www.coursera.org/browse/data-science/data- analysis?languages=en>
- 3 <http://online-learning.harvard.edu/course/big- data-analytics>
- 4 <https://www.cse.iitm.ac.in/~ravi/courses/Introduction%20to%20Data%20Analytics.html>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms’ Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom’s Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C602.1	Understand	Assignment	5
C602.2, C602.3	Apply	Tutorial	10
C602.4, C602.5	Analyse	Case Study	5

Assessment based on Summative and End Semester Examination			
Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	20	20	20
Understand	20	20	20
Apply	40	40	40
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination					
Continuous Assessment (40%) [200 Marks]					End Semester Examination (60%) [100 Marks]
CA 1: 100 Marks			CA 2: 100 Marks		
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)	
		Component - I (20 Marks)		Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C602.1	3	3	2		2				2	2		3	3	3	2
C602.2	3	3	2		2				2	2		3	3	3	2
C602.3	3	3	2		2				2	2		3	3	3	2
C602.4	3	3	2		3				2	2		3	3	3	2
C602.5	3	3	2		3				2	2		3	3	3	2

21CSI603

**CRYPTOGRAPHY, NETWORK SECURITY AND  
APPLICATION SECURITY**

3/1/0/4

**Nature of Course** G (Theory Analytical)

**Pre requisites** Computer Networks

**Course Objectives**

- 1 To identify the different types of modern cryptographic techniques.
- 2 To identify the concepts of public key encryption and number theory.
- 3 To apply public key encryption and hash functions.
- 4 To understand various protocols for network security to protect against the threats in the networks.
- 5 To apply various network security and application security to analyze major security threats.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C603.1 | Identify network security threats and the associated attacks.                         | [R]  |
| C603.2 | Identify classical encryption techniques for secure data transit across data networks | [U]  |
| C603.3 | Understand security protocols for protecting data on networks                         | [U]  |
| C603.4 | Apply various public key encryption and hash functions.                               | [AP] |
| C603.5 | Analyze the various types of security in applications and network security.           | [A]  |

**Course Contents**

**Module 1: Introduction**

**20 Hours**

Security goals-OSI Security Architecture(attacks, services, mechanisms)- Symmetric ciphers: Classical Encryption techniques- Block Ciphers and Data Encryption Standard – Finite fields- Advanced Encryption Standard – Multiple Encryption and Triple DES - Block cipher modes of operations – Confidentiality using Symmetric Encryption.

**Module 2: Public-Key Encryption and Hash Functions**

**20 Hours**

Fermat's and Euler's theorem-Testing of primality- The Chinese remainder theorem – Public Key Cryptography and RSA – Key Management and other Public Key Cryptosystems – Message Authentication and Hash Functions – Hash and Mac Algorithms - MAC - HMAC,CMAC,SHA-3– Digital Signatures and Authentication Protocols. **Authentication Applications:** Kerberos – X.509 Authentication Service – Public key Infrastructure.

**Module 3: Network Security and Application Security**

**20 Hours**

Electronic Mail Security: PGP – S/MIME IP Security: Architecture-Authentication header - Encapsulating security payloads. Web Security: SSL, TLS, SET. **System Security:** Intrusion – Malicious Software – Firewalls. Application Security: Basics of Bitcoin and Blockchain: Bitcoins – Ecosystem – Ethereum – Forks – Digital Tokens – Blockchain Technology – Initial Coin Offerings (ICOs) – Investing. E-Commerce Security.

**Total Hours: 60**

**Text Books:**

1. William Stallings, "Cryptography and Network Security – Principles and Practices", 7<sup>th</sup> edition, Prentice Hall of India, 2017
2. Antony Lewis, "The Basics of Bitcoins and Block chains", Mango Publishing Coral Gables, 2018.

**Reference Books:**

- 1 Behrouz A. Forouzon, "Cryptography and network security", 3<sup>rd</sup> edition, Tata McGraw-Hill, 2015.
- 2 Atul Kahate, "Cryptography and Network Security", 3<sup>rd</sup> edition, Tata McGraw-Hill, 2013.

**Web References:**

- 1 <https://crypto.stanford.edu/~dabo/cs255/syllabus.html>
- 2 <http://www.iitg.ac.in/icdcn2006/isg.pdf>
- 3 <http://www.tutorialspoint.com/cryptography/>
- 4 <https://blockgeeks.com/guides/what-is-blockchain-technology/>
- 5 [https://www.youtube.com/playlist?list=PL96A74njP\\_C8arW6NeU1o0e1NKjAWj0HA](https://www.youtube.com/playlist?list=PL96A74njP_C8arW6NeU1o0e1NKjAWj0HA)

**Online Resources:**

- 1 [https://onlinecourses.nptel.ac.in/noc18\\_cs07/preview](https://onlinecourses.nptel.ac.in/noc18_cs07/preview)
- 2 <http://www.nptelvideos.in/2012/11/cryptography-and-network-security.html>
- 3 <http://freevideolectures.com/Course/3027/Cryptography-and-Network-Security>
- 4 <https://www.coursera.org/learn/crypto>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C603.1	Apply	Assignment	5
C603.2, C603.3	Analyse	Tutorial	5
C603.4, C603.5	Analyse	Case Study	10

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	10	10	30
Understand	40	30	30
Apply	50	20	20
Analyse	-	40	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
C603.1	3	3	3		2			2				2		1	3
C603.2	3	3	3		2			2				3		2	2
C603.3	3	2	3		2			3				3		2	2
C603.4	3	3	3		3			3				2		3	3
C603.5	3	2	2		2			2				2		2	2

**Nature of Course** F (Theory Programming)

**Pre requisites** Agile Technology

**Course Objectives:**

1. To learn fundamental concepts in software testing
2. To identify various software testing issues and solutions in software unit test; integration, regression, system, performance, system and vulnerability testing.
3. Test project, design test cases and data.
4. To plan and execute a testing project for use modern software testing tools to support software testing projects
5. Analyse test management and test automation techniques

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C604.1 | Apply software testing knowledge and engineering methods.  | [AP] |
| C604.2 | Examine and solve various functionality problems by designing and selecting testing models and methods | [A]  |
| C604.3 | Develop construct the complementary techniques to dynamic testing for improving the software quality   | [AP] |
| C604.4 | Design and experiment a software test process for a software project                                   | [A]  |
| C604.5 | Apply debugging process and techniques for software engineering problems                               | [AP] |

**Course Contents:**

**Module 1: Introduction**

**15 Hours**

Software Testing- Evolution of Software testing–Software Testing Models- -Software testing Life cycle – Testing methodology- Behavior Driven Development(BDD)- Software testing principles - The Tester’s Role in a Software Development Organization-Origin of defects - Cost of defects-Defect classes - the defect Repository and Test Design- Defect Examples.

**Module 2: Verification and Validation Testing, Object Oriented Testing**

**15 Hours**

Black box and white box testing techniques- Inspection-Structured walkthrough- technical reviews-Unit Testing (JUnit and Mockito Framework) – Integration Testing –System Testing–Acceptance testing- Performance Testing-Security and vulnerability testing-Object Oriented Testing: OO Testing Basic- OO testing methods- Class level testing - Interclass test case design.

**Module 3: Debugging and Test Maturity models, Test Automation**

**15 Hours**

Debugging- Process – Techniques-Correction of Bugs – debuggers.-Need for process maturity – Measurement and Improvement of test process-Test process maturity models- Software test automation - skills needed for automation - design and architecture for automation - requirements for a test tool.

**Total Hours: 45**

**Text Books:**

1. Naresh Chauhan, “Software Testing Principles and Practices”, Oxford University Press, 2010
2. Srinivasan Desikan, Gopaldaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education, 2006.
3. Ilene Burnstein, “Practical Software Testing”, Springer Verlag International Edition, Springer (India) Pvt Ltd - (Indian reprint edition 2013)

**Reference Books:**

1. William E- Perry, “Effective methods for software testing”, Wiley publications, 2006.
2. Ali Behforooz, Frederick J Hudson, “Software Engineering Fundamentals”, Oxford University Press, New York, 2003.
3. Aditya P. Mathur, “Foundations of Software Testing Fundamental Algorithms and Techniques”,

- Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.
- Boris Beizer, "Software Testing Techniques", Second Edition, Van Nostrand Reinhold, New York, 1990
  - Georgia Weidman "Penetration Testing: A Hands-On Introduction to Hacking", 1st Edition (June 8, 2014), nostartch press
  - John Ferguson Smart, "BDD in Action: Behavior-driven development for the whole software lifecycle", 2014, Manning publications

**Web References:**

- <https://www.ibm.com/topics/software-testing>
- <https://www.utest.com/academy>
- <https://docs.angularjs.org/guide/unit-testing>
- <https://site.mockito.org/>

**Online Resources:**

- <https://nptel.ac.in/courses/106/105/106105150/>
- <https://www.coursera.org/specializations/software-testing-automation>
- <https://alison.com/courses/software-testing>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C604.1	Apply	Assignment	5
C604.2, C604.3	Analyse	Quiz	5
C604.4, C604.5	Analyse	Case Study	10



<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	20	20	20
Understand	40	40	20
Apply	20	20	30
Analyse	20	20	30
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
C604.1	2	3	3		2	2	2	2	3	2		2	3	2	2
C604.2	2	3	3		2	2	3	2	3	2		3	3	2	2
C604.3	2	3	3		2	2	2	2	3	2		3	3	3	2
C604.4	2	3	3		2	2	3	2	3	2		3	3	3	2
C604.5	2	3	3		2	2	2	2	3	2		3	3	3	2

**Nature of Course** F (Theory Programming)

**Pre requisites** -

**Course Objectives:**

1. To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
2. To understand how to work with various mobile application development frameworks.
3. To learn the basic and important design concepts and issues of development of mobile applications.
4. To model and manage mobile application development.
5. To explore the techniques for deploying and analyzing mobile applications to enhance the performance and security.

**Course Outcomes**

Upon completion of the course, students shall have ability to

C605.1	Design and Develop Android application by setting up Android development environment	[R]
C605.2	Implement adaptive, responsive user interfaces that work across a wide range of devices.	[AP]
C605.3	Explain long running tasks and background work in Android applications.	[U]
C605.4	Demonstrate and analyze the methods in storing, sharing and retrieving data in Android applications.	[A]
C605.5	Discuss the performance of android applications and understand the role of permissions and security.	[A]

**Course Contents:**

**Module 1: Introduction to Android Development Environment**

**15 Hours**

Get started –Introduction to Mobile Computing–Frameworks and Tools–Generic UI Development–Android User–Characteristics of Mobile Applications–Build your first app – Activities, Testing, debugging and using support libraries.

**Module 2: Graphics and UI Performance**

**15 Hours**

User Interaction – Delightful user experience – Testing your UI – Background Tasks –Triggering, scheduling and optimizing background tasks – Responsive layout – Integration with Hardware Components – Cross Platform Development – PhoneGap – Crash analytics – Offline and Online Mode – Native Apps / Hybrid Model / Web Based Apps using Container – Mobile Architecture.

**Module 3: Android Storing and Retrieving Data**

**15 Hours**

All about data–Preferences and Settings–Storing data using SQLite–Sharing data with content providers–Loading data using Loaders–Permissions, Performance and Security–Firebase and AdMob–Publish.

**Total Hours 45 hours**

**Text Books:**

1. Google Developer Training, “Android Developer Fundamentals Course – Concept Reference, Google Developer Training Team, 2017. <https://www.gitbook.com/book/google-developer-training/android-developer-fundamentals-course-concepts/details>
2. Erik Hellman, Android Programming – Pushing the Limits, 1st Edition, Wiley India Pvt Ltd, 2014.
3. Bintu Harwani, PhoneGap Build - Developing Cross Platform Mobile Applications in the Cloud, 1st Edition, Auerbach Publications, 2014.
4. Dawn Griffiths and David Griffiths, Head First Android Development, 1st Edition, O’Reilly SPD Publishers, 2015.
5. Michel Gregg, “BUILD YOUR OWN SECURITY LAB: A FIELD GUIDE FOR NETWORK TESTING”, John Wiley & Sons, 2008.

**Reference Books:**

1. J F DiMarzio, Beginning Android Programming with Android Studio, 4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126565580
2. Anubhav Pradhan, Anil V Deshpande, Composing Mobile Apps using Android, Wiley 2014, ISBN: 978-81-265-4660-2

**Web References:**

1. <https://developer.android.com/training/basics/firstapp>
2. <https://www.ibm.com/cloud/learn/mobile-application-development-explained>
3. <https://buildfire.com/mobile-app-development-tools/>

**Online Resources:**

1. [https://www.tutorialspoint.com/mobile\\_development\\_tutorials.htm](https://www.tutorialspoint.com/mobile_development_tutorials.htm)
2. <https://www.udemy.com/course/learn-android-application-development-y/>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

<b>Assessment Methods &amp; Levels (based on Blooms' Taxonomy)</b>			
<b>Formative Assessment based on Capstone Model</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)</b>	<b>FA (16%) [80 Marks]</b>
C605.1 & C605.2,	Apply	Assignment	10
C605.3	Analyse	Quiz	5
C605.4, C605.5	Analyse	Case Study	5

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	10	10	10
Understand	20	20	20
Apply	30	30	30
Analyse	40	40	40
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>					<b>End Semester Examination (60%) [100 Marks]</b>	
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>		<b>Component - II (20 Marks)</b>

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C605.1	3	3	3	3	3				3			2	3	3	2
C605.2	3	3	2	2	3				2			3	3	3	2
C605.3	3	3	3	3	3				3			2	3	2	2
C605.4	3	3	2	3	2				3			3	3	3	2
C605.5	3	3	3	3	2				2			3	3	3	2

**Nature of Course** G (Theory analytical)

**Pre requisites** Database Management Systems, Probability

**Course Objectives:**

- 1 To explore the fundamental concepts of data analytics
- 2 To learn the principles and methods of statistical analysis.
- 3 Discover interesting patterns, analyze supervised and unsupervised models and Estimate the accuracy of the algorithms.
- 4 To understand the various search methods and visualization techniques
5. To learn Data analytics using Hadoop framework.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C606.1 | Identify the real world business problems and model with analytical solutions.                       | [U]  |
| C606.2 | Solve analytical problem with relevant mathematics background knowledge.                             | [AP] |
| C606.3 | Convert any real world decision making problem to hypothesis and apply suitable statistical testing. | [A]  |
| C606.4 | Explain and Analyse the Big Data using Map-reduce programming in Hadoop and Spark framework.         | [AP] |
| C606.5 | Use open source frameworks for modelling and storing data.   | [A]  |

**Lab Exercises:**

1. R Data Types and R Matrix Tutorial , Arithmetic & Logical Operators with Example
2. R Data Frame: Create, Append, Select, Subset and Data Frames
3. R Exporting Data to Excel, CSV, SAS, STATA, Text File
4. R Aggregate Function: Summarise & Group\_by() Example
5. Using Python Read data from text file, Excel and web. and explore various commands for doing descriptive analysis in Iris dataset
6. Use the data sets from UCI and Perform the following
  - (i) Univariate analysis: Frequence, Mean, Median, Mode, Variance, Standard deviation,
  - (ii) Bivariate analysis :Linear and logistics regression.
  - (iii) Multiple Regression.
7. HDFS Commends Map Reduce Program to show the need of Combiner
8. Map Reduce I/O Formats-Text, key-value Map Reduce I/O Formats –Nline, Multiline.
9. Sequence file Input /Output Formats Secondary sorting
10. Distributed Cache & Map Side Join, Reduce side Join Building and Running a Spark Application  
Word count in Hadoop and Spark Manipulating RDD

**Total Hours: 45**

**Text Books:**

- 1 EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
- 2 Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition, 2014.
- 3 An Introduction to Statistical Learning: with Applications in R (Springer Texts in Statistics) Hardcover – 2017

**Reference Books:**

- 1 Bart Baesens , "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2014
- 2 Bill Franks, "Taming the Big Data Tidal Wave: Finding opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012
3. Probability And Statistics For Engineers And Scientists 9<sup>th</sup> Edition by Walpole and R E and Myers and R H , Pearson India

**Web References:**

- 1 <https://bigdatauniversity.com/>
- 2 <http://www.statistics.com/data-analytics- courses>
- 3 [www.ibm.com/Data Analytics/](http://www.ibm.com/Data Analytics/)
- 4 <https://www.youtube.com/watch?v=bAyrObI7TYE>
- 5 <https://www.youtube.com/watch?v=k7zu3NXEiGY>
- 6 <https://www.youtube.com/watch?v=1vbXmCrkT3Y>
- 7 <https://www.youtube.com/watch?v=XnNzck5-HdQ>

**Online Resources:**

- 1 <https://www.edx.org/course/subject/data-analysis- statistics>
- 2 <https://www.coursera.org/browse/data-science/data- analysis?languages=en>
- 3 <http://online-learning.harvard.edu/course/big- data-analytics>
- 4 <https://www.cse.iitm.ac.in/~ravi/courses/Introduction%20to%20Data%20Analytics.html>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination			
Bloom's Level	Continuous Assessment (60%) [100 Marks]		End Semester Practical Examination (40%) [100 Marks]
	FA (75 Marks)	SA (25 Marks)	
Remember	10	10	10
Understand	30	30	30
Apply	40	40	40
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C606.1	3	3	2		2				2	2		3	3	3	2
C606.2	3	3	2		2				2	2		3	3	3	2
C606.3	3	3	2		2				2	2		3	3	3	2
C606.4	3	3	2		3				2	2		3	3	3	2
C606.5	3	3	2		3				2	2		3	3	3	2

**Nature of Course** F (Theory Programming)

**Pre requisites** -

**Course Objectives:**

1. To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
2. To understand how to work with various mobile application development frameworks.
3. To learn the basic and important design concepts and issues of development of mobile applications.
4. To model and manage mobile application development.
5. To explore the techniques for deploying and analyzing mobile applications to enhance the performance and security.

**Course Outcomes**

Upon completion of the course, students shall have ability to

C607.1	Design and Develop Android application by setting up Android development environment	[R]
C607.2	Implement adaptive, responsive user interfaces that work across a wide range of devices.	[AP]
C607.3	Explain long running tasks and background work in Android applications.	[U]
C607.4	Demonstrate and analyze the methods in storing, sharing and retrieving data in Android applications.	[A]
C607.5	Discuss the performance of android applications and understand the role of permissions and security.	[A]

**Laboratory Component:**

**S. No**

**List of Experiments**

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Write an application that draws basic graphical primitives on the screen.
4. Develop an application that makes use of databases.
5. Develop an application that makes use of Notification Manager.
6. Implement an application that uses Multi-threading.
7. Develop a native application that uses GPS location information using PhoneGap.
8. Implement an application that creates an alert upon receiving a message.
9. Develop a mobile application to send an email.



- Develop a Mobile application for simple needs using Android Studio and Angular FireBase (Mini Project).

**Total Hours 45 Hours**

**Text Books:**

- Google Developer Training, “Android Developer Fundamentals Course – Concept Reference, Google Developer Training Team, 2017. <https://www.gitbook.com/book/google-developer-training/android-developer-fundamentals-course-concepts/details>
- Erik Hellman, Android Programming – Pushing the Limits, 1st Edition, Wiley India Pvt Ltd, 2014.
- Bintu Harwani, PhoneGap Build - Developing Cross Platform Mobile Applications in the Cloud, 1st Edition, Auerbach Publications, 2014.
- Dawn Griffiths and David Griffiths, Head First Android Development, 1st Edition, O’Reilly SPD Publishers, 2015.
- Michel Gregg, “BUILD YOUR OWN SECURITY LAB: A FIELD GUIDE FOR NETWORK TESTING”, John Wiley & Sons, 2008.

**Reference Books:**

- J F DiMarzio, Beginning Android Programming with Android Studio, 4th Edition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126565580
- Anubhav Pradhan, Anil V Deshpande, Composing Mobile Apps using Android, Wiley 2014, ISBN: 978-81-265-4660-2

**Web References:**

- <https://developer.android.com/training/basics/firstapp>
- <https://www.ibm.com/cloud/learn/mobile-application-development-explained>
- <https://buildfire.com/mobile-app-development-tools/>

**Online Resources:**

- [https://www.tutorialspoint.com/mobile\\_development\\_tutorials.htm](https://www.tutorialspoint.com/mobile_development_tutorials.htm)
- <https://www.udemy.com/course/learn-android-application-development-y/>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
75	25	100	60	40	100

<b>Assessment based on Continuous and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Continuous Assessment (60%) [100 Marks]</b>		<b>End Semester Practical Examination (40%) [100 Marks]</b>
	<b>FA (75 Marks)</b>	<b>SA (25 Marks)</b>	
Remember	10	10	10
Understand	20	20	20
Apply	30	30	30
Analyse	40	40	40
Evaluate	-	-	-
Create	-	-	-

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
C607.1	3	3	3	3	3				3			2	3	3	2
C607.2	3	3	2	2	3				2			3	3	3	2
C607.3	3	3	3	3	3				3			2	3	2	2
C607.4	3	3	2	3	2				3			3	3	3	2
C607.5	3	3	3	3	2				2			3	3	3	2

**Nature of Course** H(Theory Technology)

**Pre requisites** Computer Networks

**Course Objectives:**

- 1 To understand the principles of sensor networks and mobile ad hoc networks, and their impact on protocol design
- 2 To develop MAC and routing protocols for sensor and mobile networks
- 3 To develop efficient protocols for sensor and mobile networks
- 4 To understand and develop information dissemination protocols for sensor and mobile network

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C911.1	Demonstrate the Knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid	[AP]
C911.2	Identify the issues and challenges in providing QoS.	[AP]
C911.3	Interpret the energy management techniques in adhoc networks.	[A]
C911.4	Demonstrate various types of mesh networks.	[AP]
C911.5	Discuss about sensor networks.	[U]

**Course Contents:**

**Module 1: Introduction**

**15 Hours**

Cellular and Ad hoc wireless networks – Issues of MAC layer and Routing – Proactive - Reactive and Hybrid Routing protocols – Multicast Routing – Tree based and Mesh based protocols – Multicast with Quality of Service Provision. **QUALITY OF SERVICE:** Real-time traffic support – Issues and challenges in providing QoS – Classification of QoS Solutions – MAC layer classifications – QoS Aware Routing Protocols – Ticket based and Predictive location based QoS Routing Protocols

**Module 2 : Energy Management Ad Hoc Networks**

**15 Hours**

Need for Energy Management – Classification of Energy Management Schemes – Battery Management and Transmission Power Management Schemes – Network Layer and Data Link Layer Solutions – System power Management schemes.

**Module 3: Mesh Networks**

**15 Hours**

Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture – Opportunistic Routing – Self Configuration and Auto Configuration - Capacity Models – Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks. **SENSOR NETWORKS:** Introduction – Sensor Network architecture – Data Dissemination – Data Gathering –MAC Protocols for sensor Networks – Location discovery – Quality of Sensor Networks –Evolving Standards – Other Issues – Recent trends in Infrastructure less Networks

**Total Hours: 45**

**Text Books:**

- 1 C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education - 2008.
- 2 Amitabh Mishra "Security and Quality of Service in Adhoc Wireless Networks", Cambridge University Press, 2008.

3 Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2008.

**Reference Books:**

- 1 Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks”, Morgan Kaufman Publishers, 2004.
- 2 C.K. Toh, “Adhoc Mobile Wireless Networks”, Pearson Education, 2002.
- 3 Thomas Krag and Sebastin Buettrich, ‘Wireless Mesh Networking’, O’ Reilly Publishers

**Web References:**

- 1 <https://tutorialspoint.dev/computer-science/computer-network-tutorials/manet-mobile-ad-hoc-network>
- 2 <https://www.geeksforgeeks.org/introduction-of-mobile-ad-hoc-network-manet/>

**Online Resources:**

- 1 <https://nptel.ac.in/courses/106/105/106105160/>
- 2 <https://www.coursera.org/lecture/iot/lecture-3-2-manets-ED6nz>
- 3 <https://ict.iitk.ac.in/courses/wireless-ad-hoc-and-sensor-networks/>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms’ Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom’s Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C911.1	Apply	Case Study	5
C911.2	Apply	Case Study	5
C911.3 & C911.5	Understand	Quiz	5
C911.4	Apply	Group Assignment	5

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	20	20	20
Understand	20	20	20
Apply	30	30	30
Analyse	30	30	30
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
C911.1	3		3	2		3	3	2		3		2	3	2	
C911.2		3			3									3	2
C911.3	3	3	3	3		3	2			2				2	
C911.4		2			3								3	3	2
C911.5	3	2	2	2	2	2	2			2		2	3	3	2

**Nature of Course** H (Theory Technology)

**Pre requisites** Computer Networks

**Course Objectives:**

- 1 To learn the fundamental concepts of mobile computing.
- 2 To understand the technologies and architecture of mobile telecommunication system
- 3 To be familiar with the network layer protocols and ad hoc networks.
- 4 To know the basis of transport and application layer protocols.
- 5 To gain knowledge about different mobile platforms and application development.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C912.1 | Describe the basics of mobile computing and mobile communications technologies.  | [U]  |
| C912.2 | Determine mobility support architecture, mobility management and location management.  | [U]  |
| C912.3 | Interpret the functionalities of network, application and transport layers and identify routing protocols for adhoc networks | [AP] |
| C912.4 | Focus and apply working knowledge on mobile computing platforms, technologies and mobile application protocols               | [A]  |
| C912.5 | Illustrate use of mobile transaction models and mobile commerce to develop mobile content applications. .                    | [AP] |

**Course Contents:**

**Module 1: Introduction**

**15 Hours**

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA. Mobile Telecommunication System: Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover – handoff - types of handoffs - Location management - HLR-VLR scheme - hierarchical scheme - predictive location management schemes -Security.

**Module 2: Mobile Network Layer:**

**15 Hours**

Mobile Computing, Mobile IP, Cellular IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks ( VANET) –MANET Vs VANET – Security. **Mobile Transport And Application Layer** :Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML.

**Module 3: Mobile Platforms, Applications, Mobile Transaction Models**

**15 Hours**

Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit. Mobile Computing-technological prospective: 1G, 2G and 3G,4G,5G Communications network and services - the Internet - mobile computing and cellular telephony - voice and data services on 3G networks - battery problem and power dissipation, low energy processors. Mobile Transaction and Commerce:-Models for mobile transaction-Kangaroo and joey transactions - team transaction. Recovery model for mobile transactions. Electronic payment and protocols for mobile commerce- MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues. **Case study:** Evolution of 5G and 6G Technologies.

**Total Hours: 45**

**Text Books:**

1. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals Of Mobile Computing", Second Edition, PHI Learning, 2015.
2. Jochen Schiller, "Mobile Communications", Pearson Education, 2008.
3. Raj Kamal," Mobile Computing", Third Edition, Oxford University Press, 2018.
4. William Stallings, "Wireless Communications and Networks", Pearson Education, 2013.

**Reference Books:**

1. Frank Adelstein, S.K.S. Gupta, Golden G. Richard III and Loren Schwiebert, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional, 2005.
2. Asoke K Telukder, Roopa R Yavagal, "Mobile Computing", TMH, 2011.
3. Kumkum Garg, "Mobile Computing Theory and Practice", Pearson Education, 2010.

**Web References:**

1. <http://www.mi.fu-berlin.de/inf/groups/ag-tech/teaching/resources/Course-Material.html#MC>
2. [https://www.mi.fu-berlin.de/inf/groups/ag-tech/teaching/resources/Mobile\\_Communications/course\\_Material/C01-Introduction.pdf](https://www.mi.fu-berlin.de/inf/groups/ag-tech/teaching/resources/Mobile_Communications/course_Material/C01-Introduction.pdf)

**Online Resources:**

1. <https://www.coursera.org/learn/smart-device-mobile-emerging-technologies>
2. [https://www.cse.iitb.ac.in/~mythili/teaching/cs653\\_spring2014/index.html](https://www.cse.iitb.ac.in/~mythili/teaching/cs653_spring2014/index.html)
3. [https://www.tutorialspoint.com/mobile\\_computing/index.htm](https://www.tutorialspoint.com/mobile_computing/index.htm)
4. <https://www.coursera.org/lecture/iot-wireless-cloud-computing/5-12-mec-mobile-edge-computing-gVlbr>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C912.1-2	Understand	Quiz	5
C912.3	Apply	Assignment	5
C912.4	Analyse	Case Study	5
C912.5	Apply	Group Assignment	5

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	20	20	20
Understand	30	30	30
Apply	30	30	30
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C912.1	3	2	3				2	2				3	3	2	2
C912.2	2	2	3		2	2	2					3	2	2	2
C912.3	2	2	3	2	3		2			2		3	2	3	2
C912.4	2	2	3	2		2	2		2				2	2	2
C912.5	2	2		2	3	3	2		2	2	2	3	2	3	2



**Nature of Course** G (Theory Analytical)

**Pre requisites** -

**Course Objectives:**

- 1 To understand the foundations of distributed systems
- 2 To discuss the various communications in distributed systems
- 3 To learn issues related to clock synchronization and the need for global state in distributed systems
- 4 To explore the fault tolerance and deadlock handling mechanisms.
- 5 To learn the characteristics of distributed shared memory and distributed file systems

**Course Outcomes:**

Upon completion of the course, students shall have ability to:

C913.1	Understand the representation, challenges and system models for distributed systems	[U]
C913.2	Illustrate the communication in distributed systems.	[AP]
C913.3	Understand the significance of synchronization, consistency and replication.	[U]
C913.4	Analyze fault tolerance and recovery in distributed systems	[A]
C913.5	Apply distributed algorithms for deadlock prevention and detection.	[AP]
C913.6	Analyze the design and functioning of distributed shared memory and distributed file systems	[A]

**Course Contents:**

**Module 1: Introduction and Communication**

**15 Hours**

Definition, Examples - Resource sharing and the Web – Challenges - System models - External data representation and marshaling. **Communication:** Message Passing - Message format - Message Buffering- Remote Procedure Call - Remote Object Invocation - Message Oriented Communication - Stream oriented communication and Multicast Communication

**Module 2: Synchronization and Fault tolerance**

**15 Hours**

Clock synchronization - Logical clocks - Mutual exclusion - Global positioning of nodes - Election algorithms. **Consistency and Replication:** Consistency models - Replica management - Consistency protocols. **Fault tolerance:** Introduction - process resilience - reliable client server communication - reliable group communication - distributed commit - recovery.

**Module 3: Deadlocks, DSM, DFS**

**15 Hours**

System model - Handling deadlocks - Deadlock avoidance - Deadlock prevention - Centralized deadlock detection - Distributed deadlock detection. **Distributed Shared Memory:** Introduction - General architecture - Design issues - Design and implementation of DSM. **Distributed File Systems:** Requirements - File service architecture - Scalable performance -Load balancing and availability. **Case Studies:** Dropbox - Google FS (GFS) - Resilient Distributed Datasets (RDDs)

**Total Hours: 45**

**Text Books:**

- 1 George Coulouris, Jean Dollimore, Tim Kindberg and Gordon Blair, "Distributed Systems: Concepts & Design", Pearson Education, 5th Edition, 2017
- 2 Andrew Tanenbaum, Maarten Van Steen, "Distributed Systems: Principles and Paradigms", Prentice Hall, 3rd Edition, 2017
- 3 Singhal and Shivratri, "Advanced Concept in Operating Systems", McGraw Hill, 2015.

**Reference Books:**

- 1 Sunita Mahajan, Seema Shah, " Distributed Computing", Oxford, second edition, 2013
- 2 Pradeep K. Sinha, "Distributed Operating Systems", Prentice Hall of India Private, 2012.
- 3 Fokink W., "Distributed algorithms: an intuitive approach", MIT Press, 2nd Edition, 2018

**Web References:**

- 1 <https://nptel.ac.in/courses/106106168/>
- 2 <https://www.udemy.com/share/102IB2/>
- 3 <https://www.classcentral.com/course/distributed-database-11170>

**Online Resources:**

- 1 <https://www.wiziq.com/tutorials/distributed-computing>
- 2 [https://www.tutorialspoint.com/apache\\_spark/apache\\_spark\\_rdd.htm](https://www.tutorialspoint.com/apache_spark/apache_spark_rdd.htm)
- 3 [https://www.tutorialspoint.com/hadoop/hadoop\\_introduction.htm](https://www.tutorialspoint.com/hadoop/hadoop_introduction.htm)

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C913.2-5	Apply	Assignment	10
C913.6	Analyse	Case Study	5
C913.1-6	Understand	Online Quiz	5

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	20	20	20
Understand	30	30	30
Apply	30	30	40
Analyse	20	20	10
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C913.1	3	3	3			2						2	3		2
C913.2	2	2	2			2						2	2		2
C913.3	2	2	2			2						2	2		2
C913.4	2	2	2			2						2	2		2
C913.5	3	3	3			2						2	3		2
C913.6	3	3	3			2						2	3		2

21CSI914

## WIRELESS SENSOR NETWORKS

3/0/0/3

**Nature of Course** G (Theory Analytical)

**Pre requisites** Computer Networks

### Course Objectives:

1. To obtain a broad understanding of the technologies and applications for the emerging and exciting domain of wireless sensor networks
2. To study the challenges and latest research results related to the design and
3. To focus on network architectures and energy efficiency
4. To study the concept of Time Synchronization and Localization
5. To focus on Routing Protocols and Operating Systems

### Course Outcomes

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C914.1 | Learn the basics of wireless sensor networks and its applications in enabling technologies.          | [R]  |
| C914.2 | Understand the architecture and elements of wireless sensor networks                                 | [U]  |
| C914.3 | Analyzing the idea on MAC protocols for wireless sensor networks.                                    | [A]  |
| C914.4 | Apply the concept of Topologies, Synchronization and Localization for sensor networks                | [AP] |
| C914.5 | To be able to understand the various routing protocols and tools needed to establish sensor networks | [U]  |

### Course Contents:

#### Module 1: Overview of Wireless Sensor Networks

**15 Hours**

Challenges for Wireless Sensor Networks - Enabling Technologies for Wireless Sensor Networks – WSN Standards-IEEE 802.15.4 -Zigbee.Single-Node Architecture: Hardware Components - Energy Consumption of Sensor Nodes - Operating Systems and Execution Environments -Network Architecture: Sensor Network Scenarios - Optimization Goals and Figures of Merit -Gateway Concepts

#### Module 2: Time Synchronization and Localization

**15 Hours**

MAC Protocols for Wireless Sensor Networks - S-MAC –B-MAC- Wakeup radio concepts -Introduction to the time synchronization problem - Protocols based on sender/receiver synchronization - Single-hop localization - Positioning in multi-hop environments - Topology-control: Aspects of topology-control algorithms

#### Module 3: Routing Protocols and Operating Systems

**15 Hours**

Energy-Efficient unicast - Broadcast and multicast - Geographic Routing- Mobile nodes -Operating Systems for Wireless Sensor Networks: Operating System Design Issue - Examples of Operating Systems: Tiny OS, Mate, Magnet OS and OSPM - Application specific support: Target detection and tracking, Sensor Node Hardware –Tmote - Micaz.

**Total Hours: 45 Hours**

### Text Books:

- 1 Holger Karl and Andreas Willig, Protocols And Architectures for Wireless Sensor Networks, John Wiley,2007.
- 2 Kazem Sohraby, Daniel Minoli and Taieb Znati, Wireless Sensor Network- Technology, Protocols and Applications, John Wiley, 2007

### Reference Books:

- 1 Feng Zhao and Leonidas J. Guibas, Wireless Sensor Networks - An Information Processing Approach", Elsevier, 2007.
- 2 Anna Hac, Wireless Sensor Network Designs, John Wiley, 2004.
- 3 Bhaskar Krishnamachari, Networking Wireless Sensors, Cambridge Press, 2009.

### Web References:

- 1 <http://www.tfb.edu.mk/amarkoski/WSN/Kniga-w02>
- 2 <http://profsite.um.ac.ir/~hyaghmae/ACN/WSNbook.pdf>

- 3 <https://www.semanticscholar.org/paper/Protocols-and-Architectures-for-Wireless-Sensor-Karl-Willig/d223f7f7b11c10a7e3fd84bad731acda5277378d>
- 4 <http://ijcttjournal.org/Volume4/issue-8/IJCTT-V4I8P194.pdf>
- 5 <https://cse.iitkgp.ac.in/~smisra/course/wasn.html>
- 6 [https://www.iith.ac.in/~ubdesai/WSN\\_Roadmap\\_Final\\_%20Report.pdf](https://www.iith.ac.in/~ubdesai/WSN_Roadmap_Final_%20Report.pdf)

**Online Resources:**

- 1 <https://www.coursera.org/lecture/internet-of-things-history/sensor-networks>
- 2 <https://nptel.ac.in/courses/108/108/108108147/>
- 3 <https://nptel.ac.in/courses/106/105/106105160/>
- 4 <https://www.coursera.org/learn/wireless-communications>
- 5 <https://www.coursera.org/lecture/computer-networking/introduction-to-wireless-networking-technologies-RgXEN>
- 6 <https://www.youtube.com/watch?v=PvH1K1EocZ0>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C914.1	Remember	Quiz	3
C914.2	Understand	Quiz	3
C914.3	Analyse	Group Assignment	5
C914.4	Apply	Group Assignment	5
C914.5	Understand	Class Presentation	4

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	20	30	30
Understand	20	30	30
Apply	30	20	20
Analyse	30	20	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
C914.1	3	3			2	1	1			2		1	3	1	1
C914.2	3	3	2		2	2	1			2		2	3	2	1
C914.3	3	2	2		2	2	2			2		2	3	2	3
C914.4	3	3	3		2	2	2			3		3	2	3	1
C914.5	3	3	3		3	2	2			2		3	2	2	2

**Nature of Course** D (Theory Application)

**Pre requisites** Computer Networks, Operating systems

**Course Objectives:**

- 1 To provide the knowledge on foundations and vulnerabilities of Cyber Security
- 2 To introduce symmetric and Asymmetric Cryptography and message authentication techniques
- 3 To create awareness on cyber laws and forensics.
- 4 To deliver insights on Ethical Hacking and various attacks.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C915.1 | Discuss the foundations of Cyber Security Concepts.           | [U]  |
| C915.2 | Identify the vulnerabilities in the given Information system. | [AP] |
| C915.3 | Demonstrate the cryptography techniques.                      | [AP] |
| C915.4 | Interpret Cyber law and Forensics                             | [U]  |
| C915.5 | Discriminate ethical hacking techniques                       | [A]  |

**Course Contents:**

**Module 1: Foundations of Cyber Security Concepts**

**15 Hours**

Essential Terminologies: CIA – Risks – Breaches – Threats – Attacks - Exploits. **Cyber Security Vulnerabilities:** Internet Security - Cloud Computing & Security - Social Network sites security - Cyber Security Vulnerabilities-Overview - vulnerabilities in software - System administration - Complex Network Architectures - Open Access to Organizational Data - Weak Authentication – Authorization - Unprotected Broadband communications - Poor Cyber Security Awareness. OWASP & application vulnerabilities.

**Module 2: Cyber Laws and Forensics**

**15 Hours**

Introduction - Cyber Security Regulations - Roles of International Law - the state and Private Sector in Cyberspace - Cyber Security Standards. The INDIAN Cyberspace - National Cyber Security Policy 2013. Introduction to Cyber Forensics - Need of Cyber Forensics - Cyber Evidence - Documentation and Management of Crime Scene - Image Capturing and its importance - Partial Volume Image - Web Attack Investigations - Denial of Service Investigations - Internet Crime Investigations - Internet Forensics - Steps for Investigating Internet Crime, Email Crime Investigations.

**Module 3: Introduction to Ethical Hacking**

**15 Hours**

LINUX and Networking, Doxing - Website/ IP information Gathering - Network Mapping o Google Hacking - d Discovering IP Range and Open Port - Identifying Target Operating System and Services - Secure Bypassing Firewalls while Scanning - Understanding Wireless Networks - Deauthentication attack - Fragmentation Attacks - Chop Chop attack - Fake authentication - Evil Twin Attack - Cafe-latte attack - Reveal Hidden SSID's - WPA and WPA2 wireless password - hacking techniques - Cracking Wireless Passwords using Rainbow tables - Brute force techniques

**Total Hours: 45**

**Text Books:**

1. William Stallings, Cryptography and Network Security, 7th Edition, Pearson Education, March 2017.
2. Bothra Harsh, "Hacking", Khanna Publishing House, Delhi, 2017.
3. V.K. Pachghare, "Cryptography and Information Security", PHI Learning, 2019.
4. Gupta Sarika, "Information and Cyber Security", Khanna Publishing House, Delhi.

**Reference Books:**

1. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill, 2011.
2. Nina Godbole, "Information System Security", Wiley, 2008
3. The basic of Hacking and Penetration testing : Ethical hacking and penetration by Patrick Engbretson, 2013
4. The Art of service, "OWASP A Complete Guide", OWASP publishing- 2021 edition

**Web References:**

1. <https://www.eckovation.com/course/ethical-hacking-and-cyber-security>
2. <https://nptel.ac.in/courses/106105217/>
3. [https://owasp.org/www-project-web-security-testing-guide/assets/archive/OWASP\\_Testing\\_Guide\\_v4.pdf](https://owasp.org/www-project-web-security-testing-guide/assets/archive/OWASP_Testing_Guide_v4.pdf)

**Online Resources:**

1. [https://swayam.gov.in/nd2\\_nou19\\_cs08](https://swayam.gov.in/nd2_nou19_cs08)
2. [https://swayam.gov.in/nd1\\_noc19\\_cs68](https://swayam.gov.in/nd1_noc19_cs68)

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C915.1-2	Apply	Quiz	5
C915.3	Apply	Assignment	5
C915.4	Understand	Case Study (Indian Cyberspace)	5
C915.5	Analyse	Mini Project	5



Assessment based on Summative and End Semester Examination			
Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	20	20	20
Understand	30	30	30
Apply	30	30	30
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1: 100 Marks			CA 2: 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C915.1	3	3	3				2	3				3	3	2	2
C915.2	3	3	3		2	2	2	2				3	2	2	3
C915.3	3		3	3	3		2			2		3	2	3	3
C915.4	3		3	2		2	2	3	2				2	2	3
C915.5	3	3		3	3	3	2	2	2	2	2	3		3	3

**Nature of Course** D (Theory Application)

**Pre requisites** Database Management Systems

**Course Objectives:**

- 1 To distinguish the parallel and distributed database
- 2 To classify the different types of NoSQL database
- 3 To understand the usage and applications of object relational database
- 4 To explain the importance of temporal and spatial database

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C916.1	Distinguish parallel and distributed database and Identify the database based on the application	[U]
C916.2	Define, compare and use the four types of NoSQL Databases	[U]
C916.3	Design the model to represent the real world data using object oriented database	[AP]
C916.4	Design a semantic based database to meaningful data access	[AP]
C916.5	Test the rule set in the database to implement intelligent databases	[A]

**Course Contents:**

**Module 1: Parallel and Distributed Databases**

**15 Hours**

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures –Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Design of Parallel Systems- Distributed Database Concepts –Distributed Data Storage –Transaction management in distributed data storage- Transaction compensation mechanism – Commit Protocols – Concurrency control in Distributed Query Processing-In memory database-Data as Service- Basic Properties of NoSQL- Eventual Consistency-CAP theorem- Types of NoSQL.

**Module 2: Object Relational Database**

**15 Hours**

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems: Object Relational features in SQL/Oracle

**Module 3: Intelligent Databases**

**15 Hours**

Active Databases: Syntax and Semantics (Starburst, Oracle, DB2)- Taxonomy- Applications- Design Principles for Active Rules- Temporal Databases: Overview of Temporal Databases- TSQL2- Deductive Databases: Logic of Query Languages – Datalog- Recursive Rules- Syntax and Semantics of Datalog Languages- Implementation of Rules and Recursion- Recursive Queries in SQL- Spatial Databases- Spatial Data Types- Spatial Relationships- Spatial Data Structures-Spatial Access Methods- Spatial DB Implementation.

**Total Hours: 45**

**Text Books:**

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan, "Database System Concepts", Seventh Edition, McGraw-Hill, 2020
2. Ramez Elmasri and Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2016.
3. Gaurav Vaish, "Getting Started with NoSQL", Packt Publishing, March 2013
4. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, "Advanced Database Systems", Morgan Kaufmann publishers,2006.

**Reference Books:**

1. Peter Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, Third Edition 2014
2. Peter Morris, Rob, Carlos Coronel, "Database Systems – Design, Implementation and Management", 9th Edition, Thomson Learning, 2009.

**Web References:**

1. [https://link.springer.com/chapter/10.1007%2F0-387-27544-4\\_6](https://link.springer.com/chapter/10.1007%2F0-387-27544-4_6)
2. <https://www.comp.nus.edu.sg/~lingtw/cs4221/oodbms.concepts.pdf>
3. <https://www.youtube.com/playlist?list=PLwZJHGjgrZqJ9yQZ-WJb5gBJcKMr9iXP>
4. <https://docs.microsoft.com/en-us/sql/relational-databases/in-memory-database?view=sql-server-ver15>

**Online Resources:**

1. <https://www.udemy.com/database-management-system>
2. <https://www.coursera.org/learn/database-management>
3. <https://www.coursera.org/learn/introduction-mongodb>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C916.1 & C916.2	Understand	Quiz	5
C916.3	Apply	Assignment	5
C916.4	Apply	Case Study	5
C916.5	Analyse	Assignment	5

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	20	20	20
Understand	30	30	30
Apply	30	20	30
Analyse	20	30	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>C916.1</b>	3	3	3	2	2	2						3	3	3	1
<b>C916.2</b>	3	3	3	3	2	2						3	3	3	1
<b>C916.3</b>	3	3	3	3	2	2						3	3	3	1
<b>C916.4</b>	3	3	3	3	2	2						3	3	3	1
<b>C916.5</b>	3	3	3	2	2	2						3	3	2	1

**Nature of Course** J (Problem Analytical)  
**Pre requisites** Design and Analysis of Algorithm, Probability

**Course Objectives:**

- 1 Analyze the asymptotic performance of algorithms.
- 2 Write rigorous correctness proofs for algorithms.
- 3 Demonstrate a familiarity with major algorithms analysis.
- 4 Apply important algorithmic design paradigms and methods of analysis.

**Course Outcomes:****Upon completion of the course, students shall have ability to**

C917.1	Analyze efficient algorithms for a range of computational problems, along with the analysis of probabilistic randomized techniques	[A]
C917.2	Apply the algorithms and design techniques to solve problems, and mathematically evaluate the quality of the solutions using multithreaded and parallel algorithmic techniques	[AP]
C917.3	Interpret various problems and solutions to online algorithmic strategy	[AP]
C917.4	Illustrate the knowledge of string matching algorithms and their design paradigm	[A]
C917.5	Interpret the understanding on a wide range of advanced algorithmic problems, their relations and variants, and application to real-world problems.	[AP]

**Course Contents:****Module 1: Probabilistic Analysis and Advanced Randomization****15 Hours**

Hiring Problem - Indicator Random Variables - Randomization - Probabilistic Analysis. Algorithm for Bipartite Matching - Constructing Perfect Matching - Randomized Markov Chains - Ergodicity - Time Reversal.

**Module 2: Multithreaded and Parallel Algorithms****15 Hours**

Dynamic Multithreaded Algorithms - Performance Measures and Scheduling - Analyzing Multithreaded Algorithms - Parallel Loops and Race Conditions - Multithreaded Matrix Multiplication - Merge Sort. Parallel Algorithms- PRAM, Pointer Jumping and Parallel Prefix.

**Module 3: Online Algorithms and String Matching****15 Hours**

Streaming and Dynamic Algorithms - River Search Problem – Paging- The k-Server Problem - List Ordering and Move-to-Front. String Matching: Notations - Naive String Matching Algorithm - Rabin-Karp Algorithm - String Matching with Finite Automata - Knuth-Morris-Pratt Algorithm.

**Total Hours:45****Text Books:**

- 1 Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Publications, 3rdEdition, 2012.
- 2 Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, Introduction to AlgorithmsII, MIT Press, England, 2009.

**Reference Books:**

- 1 Mark Allen Weiss, Data structures and Algorithm Analysis in CII, Pearson Education, New Delhi, 2006.
- 2 Ellis Horowitz and Sartaj Sahni, Fundamentals of Data StructuresII, Galgotia Publications, New Delhi, 2000.
- 3 Allan Borodin and Ran El-Yaniv, Online Computation and Competitive AnalysisII,

Cambridge-UK, Cambridge University Press, 1998

**Web References:**

- 1 <http://www.cs.yorku.ca/~andy/courses/4101/lecture-notes/Goemans-MIT-94.pdf>
- 2 <http://www.cs.bu.edu/~gacs/papers/cs530-09-notes.pdf>

**Online Resources:**

- 1 <https://nptel.ac.in/courses/106101060/>
- 2 <https://nptel.ac.in/courses/106104019/>
- 3 <https://www.coursera.org/learn/advanced-algorithms-and-complexity>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

**Assessment Methods & Levels (based on Blooms' Taxonomy)**

**Formative Assessment based on Capstone Model**

Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C917.1 & C917.4	Analyse	Online Quiz	5
C917.2	Apply	Assignment	5
C917.3	Apply	Assignment	5
C917.5	Apply	Tutorial	5

**Assessment based on Summative and End Semester Examination**

Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	20	20	20
Understand	20	20	20
Apply	30	30	30
Analyse	30	30	30
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]					End Semester Examination (60%) [100 Marks]	
CA 1: 100 Marks			CA 2: 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
<b>C917.1</b>	3		3	3		3	3	2		3		2	3	2	
<b>C917.2</b>		3			3									3	2
<b>C917.3</b>	3	3	3	3		3	2			2				2	
<b>C917.4</b>		2			3								3	3	2
<b>C917.5</b>	3	2	2	2	2	2	2			2		2	3	3	2

**Nature of Course** G (Theory Analytical)

**Pre requisites** -

**Course Objectives:**

1. To understand the fundamentals of product design, practical management concepts like leadership and motivation.
2. To induce entrepreneurial intent as well as understand the practical issues faced by entrepreneurs.
3. To practice software product management techniques in software development process.
4. To induce the qualities of software product manager in the software management process.
5. To discuss the notion of risks and the risk management process

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C918.1	Relate software product management to better software products.	[U]
C918.2	Recognize the role of a software product manager.	[U]
C918.3	Reflect on how the management principles will improve software projects.	[AP]
C918.4	Devise various software design techniques in software and measure the applicability of process models.	[A]
C918.5	Apply techniques to measure and visualize project progress	[AP]

**Course Contents:**

**Module 1: Software Product**

**15 Hours**

Terms and Characteristics - External and Internal views – Software Product as type - Attributes of software products - Elements of Software Product Management - Role of software product manager - Framework - Market analysis - Product analysis - Product Strategy - Product planning – development

**Module 2: Software Pricing**

**15 Hours**

- Elements of product pricing - The Role of the Software Pricing Manager - The Software Pricing Framework - Pricing Strategy - Price Structure, Policy and Level - Pricing in Distribution Channels - Pricing for Large Customer Accounts - Negotiation - Pricing in the Global Market - Business-to-Consumer (B2C) Software - Software as a Service - Pricing for Corporate IT Organizations

**Module 3: Software Product Management and Pricing in the Corporate Structure**

**15 Hours**

Product Design - Importance - Objectives - Factors influencing product design - Characteristics of a good product design -Software Product Management in the Internal Environment - Software Pricing in the Internal Environment - Organizational Alternatives - Scenarios

**Total Hours: 45**

**Text Books:**

1. Software Product Management and Pricing: Key Success Factors for Software Organization, Hans-Bernd Kittlaus, Peter N. Clough, 2011, Springer Science & Business Media.
2. Software Product Management: The ISPMA-Compliant Study Guide and Handbook, Hans-Bernd Kittlaus, Samuel A. Fricker, 2017, Springer Science & Business Media.

**Reference Books:**

1. Software Project Management, K. Sutha & T. Jebeula, 2<sup>nd</sup> Edition, Margham Publications, 2018.
2. Software Product Management Essentials, Alyssa S. Dver, Meghan Kiffer Pr, 2003.
3. Entrepreneurship, Robert D. Hisrich, 6th Edition, Tata McGraw Hill Publications, 2014.
4. Entrepreneurial Development, Jayshree Suresh, 5th Edition, Margham Publications, 2010.



**Web References:**

1. [https://cs.stanford.edu/people/eroberts/cs181/projects/201011/Licensure/indexba53.html?page\\_id=2](https://cs.stanford.edu/people/eroberts/cs181/projects/201011/Licensure/indexba53.html?page_id=2)
2. <https://www.uvic.ca/engineering/assets/docs/professional-behaviour.pdf>

**Online Resources:**

1. <http://nptel.ac.in/courses/106101061/29>
2. <http://nptel.ac.in/courses/106105087/>
3. <http://www.acm.org/about/se-code>

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C918.1	Understand	Online Quiz	5
C918.2	Understand	Assignment	5
C918.3 & C918.4	Analyse	Case Study	5
C918.5	Apply	Class Presentation	5

Assessment based on Summative and End Semester Examination			
Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	20	20	20
Understand	40	30	30
Apply	30	30	30
Analyse	10	20	20
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1: 100 Marks			CA 2: 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C918.1	3	3	3		2	2	2					2	3	2	2
C918.2	3	3	3		2	2	3	2				3	3	2	3
C918.3	3	3	3		2	2	2	2				3	3	3	2
C918.4	3	3	3		2	2	3					3	3	3	3
C918.5	3	3	3		2	2	2					3	3	3	3

21CSI919

**INFORMATION ETHICS AND CYBER LAWS**

3/0/0/3

**Nature of Course** D (Theory Application)

**Pre requisites** -

**Course Objectives:**

- 1 To provide the knowledge on ethics in IT sector
- 2 To explain the basic information on standards.
- 3 To have knowledge on copy right issues of software's.
- 4 To understand the issues those are specific to amendment rights.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C919.1	Discuss the foundations of ethics in IT sector.	[U]
C919.2	Demonstrate the Deontological Theory	[AP]
C919.3	Interpret Intellectual Property Rights and Cyber laws	[U]
C919.4	Discriminate computer Attacks and Risk Analysis	[A]
C919.5	Survey the cybercrimes happenings in a region	[A]

**Course Contents:**

**Module 1: Ethics in IT**

**15 Hours**

Definition - Ethics in the business world: Corporate social responsibility – Improving corporate ethics – Ethical work environment - Ethics in Information Technology domain -Ethical considerations in decision making - Software engineering code of ethics and practices: IEEE-CS –ACM Joint task force.

**Module 2: Ethical Theories**

**15 Hours**

Utilitarianism, Intrinsic and instrumental value, Acts Vs. rules, Critique of utilitarianism, Deontological theory, Rights, Rights and social contract theory, Virtue ethics, Analogical reasoning in computer ethics

**Module 3: Intellectual Property and Cyber Laws**

**15 Hours**

Copyrights, Patents, Trade secrets - Ethics of IT organizations: Key ethical issues for organization - Contingent workers – Outsourcing – Whistle blowing – Green computing - Types of Professional relationships - Conflicting responsibilities. **CYBER LAWS:** Information privacy – Privacy laws, applications and court rulings, Key privacy and anonymity issues: Data breaches – Electronic discovery – Consumer profiling – Workplace monitoring – Advanced surveillance technology - Licensing – Selling software – Piracy - Federal laws for prosecuting computer attacks - Risk assessment.

**Total Hours: 45**

**Text Books:**

1. George Reynolds, "Ethics in Information Technology" 6th Edition, Thomson Asia Pvt. Ltd., Chennai, 2019.
2. Deborah G Johnson, "Computer Ethics", Pearson Education, New Delhi, 2009.
3. Akash Kamal Mishra, "Cyber Laws in India- Fathoming your Lawful Perplex", Xpress Publishing., Chennai, 2020.
4. Richard A. Spinello, "Cyber Ethics, Morality and Law in Cyber Space", 5th Edition, Jones & Bartlett Learning., MA, 2020.
5. William Stallings, Cryptography and Network Security, 7th Edition, Pearson Education, March 2017.  
Gupta Sarika, "Information and Cyber Security", Khanna Publishing House, Delhi.

**Reference Books:**

1. Caroline Whitback, "Ethics in Engineering Practice and Research", Cambridge University Press, UK,2011.
2. Penny Duquenoy, Simon Jones and Barry G Blundell, "Ethical, legal and professional issues in computing", Middlesex University Press,UK, 2008.

**Web References:**

1. <https://www.eckovation.com/course/ethical-hacking-and-cyber-security>
2. <https://nptel.ac.in/courses/106105217/>

**Online Resources:**

1. [https://swayam.gov.in/nd2\\_nou19\\_cs08](https://swayam.gov.in/nd2_nou19_cs08)
2. [https://swayam.gov.in/nd1\\_noc19\\_cs68](https://swayam.gov.in/nd1_noc19_cs68)

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C919.1	Apply	Quiz	5
C919.2	Apply	Assignment	5
C919.3	Understand	Quiz	5
C919.4 & C919.5	Analyse	Case Study	5

<b>Assessment based on Summative and End Semester Examination</b>			
<b>Bloom's Level</b>	<b>Summative Assessment (24%) [120 Marks]</b>		<b>End Semester Examination (60%) [100 Marks]</b>
	<b>CIA1 : [60 Marks]</b>	<b>CIA2 : [60 Marks]</b>	
Remember	20	20	20
Understand	30	30	30
Apply	30	30	30
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

<b>Assessment based on Continuous and End Semester Examination</b>						
<b>Continuous Assessment (40%) [200 Marks]</b>						<b>End Semester Examination (60%) [100 Marks]</b>
<b>CA 1: 100 Marks</b>			<b>CA 2: 100 Marks</b>			
<b>SA 1 (60 Marks)</b>	<b>FA 1 (40 Marks)</b>		<b>SA 2 (60 Marks)</b>	<b>FA 2 (40 Marks)</b>		
	<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>		<b>Component - I (20 Marks)</b>	<b>Component - II (20 Marks)</b>	

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
C919.1	1	3					2	3				3	1	2	3
C919.2	1	2				2	2	2				3	1	2	3
C919.3	1						2	3		2		3	1	3	3
C919.4	1					2	2	3	2				1	2	3
C919.5	1					2	2	3	2				1	2	3

21VA110

**SERVERLESS STACK**

2/0/0/2

**Nature of Course** : F (Theory Programming)

**Pre requisites** : Core Java Programming

**Course Objectives:**

- 1 To understand the basic concepts of Serverless Computing
- 2 To know the fundamental concept of AWS Serverless stack.
- 3 To design a simple API using Lamda Function
- 4 To build a React API to demonstrate Serverless Stack

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C110.1 | Outline the basic concepts of Serverless computing                         | [R]  |
| C110.2 | Illustrate the use serverless architecture in AWS.                         | [AP] |
| C110.3 | Employ a serverless API in AWS Amplify CLI.                                | [AP] |
| C110.4 | Apply the React API to implement Serverless Stack                          | [AP] |
| C110.5 | Interpret the functionalities of Serverless API to manage the application. | [AP] |

**Course Contents:**

**Module 1: Full Stack Development in Serverless Computing** **10 Hours**

**Modern Serverless:** Characteristics - Serverless Architecture - Implementations of Serverless.  
**Introduction to AWS:** Serverless on AWS - Amplify CLI. **Introduction to the AWS Amplify CLI:** Installing, Configuring and creating and Amplify CLI

**Module 2: Creating and deploying AWS Amplify** **10 Hours**

**Creating and Deploying a Serverless Function:** React Application and Installing Dependencies - Creating a New Serverless Function with the Amplify CLI. **Adding the API:** Creating API, Deploying API and Lambda Function. **Deployment of React in AWS:** Configuring the Client App to Work with Amplify. **Updating the Function to Call Another API:** Installing Axios- Function - Client App.

**Module 3: Building your First React API** **10 Hours**

Introduction to GraphQL - GraphQL API - GraphQL Operations. Creating the GraphQL API - Viewing and Interacting with the GraphQL API - **Building the React Application:** Listing Notes (GraphQL Query) - Creating Notes (GraphQL Mutation) - Deleting Notes (GraphQL Mutation) - Updating Notes (GraphQL Mutation) - Real-Time Data (GraphQL Subscriptions)

**Total Hours:** **30**

**Reference Books:**

- 1 Nader Dabit, Full Stack Serverless-Modern Application Development with React, AWS, and GraphQL, 1<sup>st</sup> Edition, O'Reilly Media, Inc, 2020.
- 2 Eric Evans, Domain-Driven Design: Tackling Complexity in the Heart of Software, Addison-Wesley; 1<sup>st</sup> edition, 2003
- 3 Sam Newman, Building Microservices: Designing Fine-Grained Systems, O'Reilly Media; 1<sup>st</sup> edition, 2015.

**Web References:**

- 1 <https://serverless-stack.com/>
- 2 The Ultimate Guide to Serverless | Better Programming
- 3 The Serverless Stack - Introduction to Serverless | Coursera
- 4 Go and AWS - Code and Deploy a Serverless API - Bing video

**Nature of Course** : C (Theory Concept)

**Pre requisites** : Nil

**Course Objectives:**

- 1 To understand the basics and features of Salesforce.
- 2 To introduce the concept of management of data and creation of events using salesforce.
- 3 To perform the integration of several applications with salesforce
- 4 To create and manage leads and learn the configuration of the leads.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C111.1	Discuss the basics of Salesforce	[U]
C111.2	Identify the featured of Salesforce	[U]
C111.3	Demonstrate the process of managing data	[AP]
C111.4	Interpret the method of creation of events	[AP]
C111.5	Discriminate creating and managing lead techniques	[A]

**Course Contents:**

**Module 1: Introduction to Salesforce**

**10 Hours**

Customer Relationship Management - Discovering Salesforce Products. Navigating Salesforce – Personalizing Salesforce - Working in Salesforce -Collaborating in the Cloud - Tracking Leads- Opportunities- Products and Price Books - Managing Your Partners-Building Custom Apps.

**Module 2:Managing Data and Understanding Salesforce Activities**

**10 Hours**

Measuring Business Performance - Analyzing Data with Reports -Dashboards - Navigating to activities - Business use case - Creating tasks Logging a call - Creating events and calendar entries - Salesforce calendar - Sending emails and integration options -Using Gmail and Outlook integration

**Module 3:Creating and Managing Leads**

**10 Hours**

Understanding and Creating leads -Working on forms -Setting up auto-response rules - Lead settings and processes - Understanding how accounts work -Creating an account and contact-Understanding relationships –Enabling and Adding relationships -Removing relationships- Analyzing data with Reports

**Total Hours: 30**

**Reference Books:**

- 1 Sharif Shaalan,“Salesforce for Beginners: A step-by-step guide to creating, managing, and automating sales and marketing processes”, Packt Publishing Ltd, 2020
- 2 Paul Goodey ,“Salesforce CRM – The Definitive Admin Handbook: Build, configure, and customize Salesforce CRM and mobile solutions” Packt Publishing Ltd ,2016
- 3 Jon Paz ,“Salesforce.com For Dummies For Dummies” , Liz Kao , 2016
- 4 David Masri , “Developing Data Migrations and Integrations with Salesforce: Patterns and Best Practices” , Apress 2018

**Web References:**

- 1 <https://www.asagarwal.com/salesforce-video-channels/>
- 2 <https://www.salesforce.com/in/services/learn/overview/>
- 3 <https://www.coursera.org/salesforce>
- 4 <https://docs.microsoft.com/en-us/sharepoint/dev/general-development/step-2-adding-a-web-reference>

**21VA112**

**OCTAVE PL**

**2/0/0/2**

**Nature of Course** : F (Theory Programming)

**Pre requisites** : Nil

**Course Objectives:**

- 1 To understand Octave environment
- 2 To acquire knowledge on Numeric, Non-Numeric computation and operators
- 3 To learn features of arrays in octave
- 4 To illustrate Data through File Reading and Writing
- 5 To demonstrate the concepts of Loops and Functions in Octave

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C112.1 | Outline the basic concepts of Octave environment          | [R]  |
| C112.2 | Illustrate Numeric, Non-Numeric computation and operators | [AP] |
| C112.3 | Implement arrays in octave                                | [AP] |
| C112.4 | Manipulate Data through File Reading and Writing          | [A]  |
| C112.5 | Demonstrate Loops and Functions in Octave                 | [AP] |

**Course Contents:**

**MODULE I : Introduction to Octave**

**10 Hours**

Introduction to Numerical Computing - History – Installation - Octave sessions –

**Mathematical Expressions:** Octave and Math, Rational Numbers, Complex Numbers, Mathematical Functions, Data types, Variables, Arithmetic operators, Relational operators, Logical operators.

**MODULE II : Arrays**

**10 Hours**

Arrays and Matrices - operations on vectors -Automatic array creation - Random matrices -Large array - Triangular Matrix - Diagonal Matrix - Manipulating arrays - Plotting.

**MODULE III : Data, Functions and Loops**

**10 Hours**

File operations - Printing and saving plots – Loops - Functions - Numerical Computing Formalism - Numerical Approximations – Tolerance - Taylor series - Taylor Polynomials - Computational error - Real number to floating point numbers.

**Total Hours: 30**

**Reference Books:**

- 1 Sandeep Nagar “Introduction to Octave - For Engineers and Scientists” Apress 2018
- 2 Jesper Schmidt Hansen “GNU Octave Beginner’s Guide” Packt Publishing Ltd. June 2011
- 3 Jason Lachniet “Introduction to GNU Octave” 3rd Edition 2020
- 4 Dr.P.J.G.Long “Introduction to Octave” Department of Engineering University of Cambridge 2005

**Web References:**

- 1 <https://octave-online.net>
- 2 [https://www.tutorialspoint.com/matlab/matlab\\_gnu\\_octave.htm](https://www.tutorialspoint.com/matlab/matlab_gnu_octave.htm)
- 3 <http://math.jacobs-university.de/oliver/teaching/iub/resources/octave/octave-intro/octave-intro.html>
- 4 <https://www.mygreatlearning.com/blog/octave-tutorial/>



21VA113

LARAVEL

2/0/0/2

**Nature of Course** : F (Theory Programming)

**Pre requisites** : PHP

**Course Objectives:**

- 1 To understand the basic concepts in laravel.
- 2 To explain the principles of laravel for web development
- 3 To discuss the different migration techniques.
- 4 To examine the efficiency of various form design strategies.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C113.1 | Understand the foundations of laravel.                               | [R]  |
| C113.2 | Illustrate efficient methodology for Setting up and install Laravel. | [AP] |
| C113.3 | Implement the core concepts of connecting laravel with the database  | [AP] |
| C113.4 | Interpret the usage of forms and gathering/validating inputs.        | [AP] |
| C113.5 | Create an authentication system for your application.                | [AP] |

**Course Contents:**

**Module 1: Laravel PHP Framework andLaravel Blade Template** **10 Hours**

Installing Laravel Artisan CLI (command-line interface)-Laravel Directory- Structure-Configuring a new Laravel project-Basic routing -Call a controller method from a route-Passing variables from controllers to views - Executing PHP functions in the blade - Displaying Your Views-Creating and using basic views-Loading a view into another view/nested views - Adding assets

**Module-2 Migrations** **10 Hours**

Introduction - Requirements for running migrations-Artisan migration command-Migration structure - How to create a table using a migration-Laravel migration rollback - Database Seeding -Migrations for our project database.

**Module-3 Using Forms and Gathering Input** **10 Hours**

Creating contact us form - Validating user input-Sending email - Creating a file uploader - Validating a file uploader - Creating a custom error message - Using Artisan command to create an inbuilt user register and login system – Authenticating Your Application - Adding Custom Fields to Registration Form - Creating a user profile page

**Total Hours: 30**

**Reference Books:**

- 1 Karamvir Singh “*Laravel for Beginners*”, Publisher, 2021.
- 2 Sanjib Sinha Beginning Laravel- “A beginner's guide to application development with Laravel 5.3” , A Press ,
- 3 Martin Bean “Laravel 5 Essentials” Packt Publishing, 2015.

**Web References:**

- 1 <https://www.tutorialspoint.com/laravel/index.htm>
- 2 <https://laravel.com/docs/5.1/quickstart>
- 3 <https://www.javatpoint.com/laravel>
- 4 <https://www.guru99.com/laravel-tutorial.html>
- 5 <https://laravel-news.com/your-first-laravel-application>

21VA130

**EFFECTIVE COMMUNICATION SKILLS**

2/0/0/2

**Nature of Course** E (Theory skill based)  
**Pre-Requisites** Basics of English Language

**Course Objectives:**

- 1 To become self-confident individuals by mastering interpersonal skills, team management skills, and leadership skills.
- 2 To develop effective communication skills.
- 3 To train students to use the language with confidence and without committing errors.
- 4 To improve the fluency of the students when speaking English.
- 5 To focus on pronunciation, dialect, intonation, interaction, practice and communication.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C130.1 | Remember correct usage of English grammar in speaking.  | [U]  |
| C130.2 | Apply and improve their speaking ability in English both in terms of fluency and comprehensibility. | [AP] |
| C130.3 | Understand and communicate effectively in personal and professional situations.                     | [U]  |
| C130.4 | Understand and analyze oral presentations and receive feedback on their performance.                | [U]  |
| C130.5 | Apply reading fluency skills through extensive reading.   | [AP] |

**Course Contents:**

**Module I**

**10 Hours**

**Pre-Test - Vocabulary Building-** Connecting Phrases- Exercises and **Activities-Conversation Practices-** Greetings-exchanging ideas - Asking for information - questioning techniques / answering techniques - Getting people to do things - requesting/agreeing/refusing – **Activity-Common Expressions** (Individual)- Talking about Favorites - Talk Show **Activity - Impromptu Speaking-** Personal Interest - Talking about Past Events and Future/Talking about Everyday Life (Family, Hobbies, Work, Travel and Current Events) – **Activity.**

**Module II**

**10 Hours**

**Listening-** Trials of a Good Listener- Listening to Texts, Listening for Specific Purpose-**Activity- 21st Century Skills**– Communication with Critical Thinking and Creativity-Role Play-**Activity-Personality Development-** Manners and Etiquettes. Building Confidence and Developing Presentation Skills-**Activity- Singing a Song (Group)-Activity.**

**Module III**

**10 Hours**

**Story Telling-** Use of Charts and Graphs-**Activity -Persuasive Speech-** Handling Criticism-Justifying Opinions-Conflict-Resolution-Situational Role Play **Activity--News reading and Pronunciation- Activity -Satori-** Intuitive Approach-**Activity-Post Test.**

**Total: 30 Hours**

**Text Books:**

- 1 English and Soft skills Orient Black Swan Publishers (S. P. Dhanavel) 2010
- 2 Remedial English Grammar. F.T. Wood. Macmillan.2007
- 3 On Writing Well. William Zinsser. Harper Resource Book. 2001
- 4 DrSumanth S, English for Engineers, Vijay Nicole Imprints Private Limited 2015.

**Reference Books:**

- 1 Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
- 2 Busch, B., & Oakley, B. (2017). Emotional intelligence: why it matters and how to teach it. Retrieved from <https://www.theguardian.com/teacher->

network/2017/nov/03/emotional-intelligence-why-it-matters-and-how-to-teach-it.

- 3 Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

**Web References:**

- 1 <https://www.udemy.com/course/english-speaking-complete/>  
 2 <https://www.cambridgeenglish.org/exams-and-tests/linguaskill/>

**Online Resources:**

- 1 <https://www.lingoda.com/en/linguaskill-from-cambridge/>  
 2 <https://www.icd.org.pk/linguaskill/>

**Summative assessment based on Continuous and End Semester Examination  
 Internal Components - 10**

S.No	Components	Marks
1.	Vocabulary Building	10 Marks
2.	Conversation Practices	10 Marks
3.	Common Expressions	10 Marks
4.	Impromptu Speaking	10 Marks
5.	Listening	10 Marks
6.	21st Century Skills	10 Marks
7.	Presentation Skills	10 Marks
8.	Singing a Song (Group)	10 Marks
9.	News Reading and Pronunciation	10 Marks
10.	Satori	10 Marks
<b>Total</b>		<b>100 Marks</b>

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
C130.1										3						
C130.2										3						
C130.3										3	3				3	
C130.4										3						
C130.5										3						

**21MC103**

**SOFT SKILLS**

**2/0/0/0**

**Nature of Course** Theory Concept

**Pre requisites** Technical Communication Skills

**Course Objectives:**

1. To develop the students competency level and their capabilities.
2. To teach the students to be effective in workplace and social environments.
3. To create self confidence among the students and to resolve stress and conflict within themselves.
4. To help the students to enhance their career skills by increasing their productivity and performances.
5. To concentrate more on conversation skills, presentation skills, verbal ability, critical and creative thinking.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C103.1 | Remember the principles of soft skills required for their profession.   | [R]  |
| C103.2 | Understand the importance of Interpersonal communication Skills among individuals, groups and cultures.                                       | [U]  |
| C103.3 | Apply verbal and non-verbal communication skills in corporate environment.  | [AP] |
| C103.4 | Analyse and apply creativity skills, critical thinking skills and problem solving skills.   | [A]  |
| C103.5 | Articulate oral and written messages in an appropriate and persuasive manner to suit specific purposes, audiences and contexts at work place. | [AP] |
| C103.6 | Apply good teamwork skills and Leadership Skills  | [AP] |

**Course Contents:**

**Module 1: Professional Communication Skills**

**10 Hours**

Introduction to the Soft Skills, Performance Evaluation 1 –Significance of Soft Skills- Understanding the basic Communication Principles –Listening Skills- Listening Exercises- Speaking Skills- How to start and Sustain a Conversation- Speaking in Groups- Understanding self and Personal Branding, attitude, types of attitude, Positive Attitude, Self Confidence and Self-Motivation - Personal Application/Action Taken. Advanced Writing Skills-Principles of Business Writing- E mails- Writing Reports- Types of Reports- Strategies for Report Writing- Personal Application/Action Taken. Verbal Ability- Analogy- Classification- Odd One Out- Idioms and Phrases- Sentence Correction- Empathy and its importance in career -Personal Application/Action Taken.

**Module 2: Interpersonal Communication**

**10 Hours**

Nonverbal Communication- Individual, Groups and Cultures- Body Language- Attire and Etiquettes- Interpersonal Skills- dealing with diverse People- Networking- Emotional Intelligence and its importance. Personal Application/Action Taken. Developing Creativity- Critical Thinking and Problem Solving Skills- Making the Right Choice- Never Give Up- Begin to Grow- Personal Application/Action Taken. Interviews- Facing Job Interviews - Planning and Preparing- Effective Resume along with Covering Letter- Planning and Preparing- Personal Application/Action Taken. Self-Discipline - Self Presentation - Personal Application/Action Taken.

### Module 3: Teamwork and Leadership Skills

10 Hours

Industry Expectations- Universal Hiring Rule- Personal Application/Action Taken.Importance of Human Values-Importance of Team Work- Developing Key Traits in Motivation, Persuasion, Negotiation and Leadership Skills- Being an Effective Team Player- Personal Application/Action Taken.Planning- Prioritization - Delegation- Conflict Management- Decision and its necessity in crucial situations- Group Discussion- Personal Application/Action Taken.Essential Skills in working Strategies- Presentation and Interaction Skills- What to Present and How- Being Assertive- Multimedia Presentation-Making Effective Presentations.

Interview Skills- Do's and Don'ts - Body Language – Answering the Common Questions of Interview- Performance Evaluation 2- Mock Interview

**Total Hours: 30**

#### Text Books:

1. Penrose, "Business Communication for managers: An advanced approach", Cengage learning.
2. H.E. Sales, "Professional Communication in Engineering", Palgrave Macmillan 2009.
3. W. P. Scott, Bertil Billing, "Communication for Professional Engineers", Thomas Telford, 1998.

#### Reference Books:

1. Peter Davson-Galle, "Reason and Professional Ethics", Ashgate Publishing, Ltd., 2009.
2. William B. Gudykunst, "Cross Cultural and Inter Cultural Communication", Sage Publications India Pvt Ltd, New Delhi, 2003.
3. Joep Cornelissen, "Corporate Communications: Theory and Practice", Sage Publications India Pvt Ltd, New Delhi, 2004.

#### Web References:

- 1 [https://onlinecourses.nptel.ac.in/noc16\\_hs15/preview](https://onlinecourses.nptel.ac.in/noc16_hs15/preview)
- 2 <https://www.getinternship.switchidea.com/NTAT/syllabus/Interpersonal-Communication>.
- 3 <https://smude.edu.in/smude/programs/bca/soft-skills.html>

#### Online Resources:

- 1 <https://swayam.gov.in/course/4047-developing-soft-skills-and-personality>
- 2 <https://www.clearias.com/interpersonal-skills-including-communication-skills-for-csat/>
- 3 <https://www.bizlibrary.com/soft-skills-training/>

<b>Assessment Methods &amp; Levels (based on Revised Bloom's Taxonomy)</b>			
<b>Formative assessment based on Capstone Model (Max. Marks:40)</b>			
<b>Course Outcome</b>	<b>Revised Bloom's Level</b>	<b>Assessment Component</b>	<b>Marks</b>
C103.1	Remember	Group Discussion	10
C103.2 & C103.3	Understand	Listening Skills	10
C103.4	Apply	Interview	10
C103.5 & C103.6	Apply	Formal Presentation	10

<b>Summative assessment based on Continuous Assessment</b>	
<b>Revised Bloom's Level</b>	<b>Tentative End Assessment [60 marks]</b>
Remember	30
Understand	40
Apply	30
Analyse	-
Evaluate	-
Create	-

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>C103.1</b>						1	1	2	2	3	2	2			1
<b>C103.2</b>							1	1	3	3	2	2			1
<b>C103.3</b>									2	3	2	2			1
<b>C103.4</b>						1	1	1	2	3	3	2			1
<b>C103.5</b>						1	1		2	3	2	2			1
<b>C103.6</b>							1	2	3	3	2	2			1

21MC104

MANAGEMENT ORGANIZATIONAL BEHAVIOUR

2/0/0/0

Nature of Course Theory Concept

Pre requisites -

Course Objectives:

1. The objective of the course is to provide basic knowledge about management to familiarize the students with the management principles and organizational behavior.
2. The course is designed to enable the students to adapt and apply theoretical concepts in business
3. To know about the role of manager in the area of management.
4. To create and implement team building strategies for organization building.

Course Outcomes:

Upon completion of the course, students shall have ability to

C104.1	Identify and understand different management principles techniques in business environment.	[U]
C104.2	Apply management fundamentals and planning to solve organization problems and make effective decisions.	[AP]
C104.3	Understand and analyze the changes within an individual will change the group as well as the organization	[AN]
C104.4	Understand and analyze the leadership style and organization theories to create a productive environment to workforce.	[AN]
C104.5	Analyze the organizational climate and change management strategies and tactics	[AN]
C104.6	Apply the empowerment strategy and tactics for productivity	[AP]

Course Contents:

**Module 1 Fundamentals of Management, Planning and Decision Making 10 Hours**

Introduction to Management- Concept and functions- Thought Managerial roles and styles-Principles of Management - Levels of Management- Theories of Management - Classical, Scientific, Administrative, Behavioral, Management Sciences Theories. Organizational planning - Vision, Mission and goals, Types of plans, steps in planning process, Approaches to planning, Planning in Dynamic Environment. Decision making process, types of decisions, decision making styles, Behavioural influences on decision making - Group decision making - Vroom's Participative decision-making model.

**Module 2 Individual, interpersonal and group behavior 10 Hours**

Definition, need and importance of Organizational behavior –Learning-Nature -Importance of Learning-Introduction and theories Motivation: Content and process theories-Leadership: Styles and Theories - Perception-Personality — Attitudes- Definition, need and importance - Nature and scope-Importance of Groups and Teams- Role relationships and conflict-Group dynamics- Work values. Organization Theories: Maslow's needs hierarchy theory, two factor theory of motivation, McGregor's theory, ERG theory, McClelland's needs theory, Valance Theory.

**Module 3 Organizational Development 10 Hours**

Organizational culture: Elements - Organizational climate— Factors affecting organizational climate-Organizational Commitment, Organizational change- Importance- Stability Vs Change-Proactive Vs Reaction change- Change process— Resistance to change- Managing changes- Managing International Workforce - Productivity- Alternative change management approaches and cultural contingencies - power to manage effectively; Empowerment and Participation strategies and tactics.

**Total Hours: 30**

Text Books:

1. Nelson, Quick, Khandelwal, "Organizational Behavior", 2nd edition, Cengage Learning, 2016.
2. Williams, Tripathy, "Principles of Management", Cengage Learning, 2016.
3. Aswathappa, K, "Organizational Behavior", 12th Edition, Himalaya Publication, 2016.

- Stephen Robbins, Timothy A. Judge, "Organizational Behavior", 16th edition, Prentice Hall India Pvt. Ltd, 2014.

**Reference Books:**

- Chandrani Singh, Aditi Khatri, "Principles and Practices of Management and Organizational Behavior", Sage Publications, 2016.
- Richard L. Daft, "Understanding the Theory and Design of Organizations", 11th edition, Cengage Learning, 2013.
- John M Ivancevich and Robert Konopaske, "Organizational Behavior and Management", McGraw-Hill Education, 2013.
- UdaiPareek, Sushama Khanna, "Organization Behavior", 3rd edition, Oxford Publishing, 2012.

**Web References:**

- <https://iedunote.com/fundamental-concepts-of-organizational-behavior>
- <https://nscpolteksby.ac.id/ebook/>
- [https://ebooks.lpude.in/management/mba/term\\_1/DMGT402\\_MANAGEMENT\\_PRACTICES\\_AND\\_ORGANIZATIONAL\\_BEHAVIOUR.pdf](https://ebooks.lpude.in/management/mba/term_1/DMGT402_MANAGEMENT_PRACTICES_AND_ORGANIZATIONAL_BEHAVIOUR.pdf)
- <https://www.studocu.com/in/document/vellore-institute-of-technology/organizational-behaviour/lecture-notes/ob-notes/3208134/view>

**Online Resources:**

- <https://nptel.ac.in/syllabus/110105034/>
- <https://nptel.ac.in/courses/110/105/110105033/>
- <https://freevideolectures.com/course/3502/organizational-behaviour-i>
- <https://nptel.ac.in/courses/110/106/110106145/>

<b>Assessment Methods &amp; Levels (based on Revised Bloom's Taxonomy)</b>			
<b>Formative assessment based on Capstone Model (Max. Marks:40)</b>			
<b>Course Outcome</b>	<b>Revised Bloom's Level</b>	<b>Assessment Component</b>	<b>Marks</b>
C104.1	Understand	Group Discussion	30
C104.2 & C104.6	Apply	Listening Skills	20
C104.3 & C104.4	Analyse	Interview	20
C104.5	Apply	Formal Presentation	30

<b>Summative assessment based on Continuous Assessment</b>	
<b>Revised Bloom's Level</b>	<b>Tentative End Assessment [60 marks]</b>
Remember	30
Understand	30
Apply	20
Analyse	20
Evaluate	-
Create	-



Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C104.1						2	2	1	2		2	1			1
C104.2						2	2	1	2		2	1			1
C104.3						2	2	1	2		2	1			1
C104.4						2	2	1	2		2	1			1
C104.5						2	2	1	2		2	1			1
C104.6						2	2	1	2		2	1			1

**21MC105**

**GENERAL APTITUDE**

**2/0/0/0**

**Nature of Course**

Problem analytical

**Pre requisites**

Basic Mathematical calculations

**Course Objectives:**

- 1 To ensure that students learn to think critically about mathematical models for relationships between different quantities and use those models effectively to solve problems and reach conclusions about them.
- 2 To impart skills that enable students to effectively use and interpret data, formulas, and graphs in the workplace.
- 3 To instills confidence in facing technical aptitude questions interviewed by recruiters.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

C105.1	To teach the basics of Quantitative Techniques in a graded manner.	[R]
C105.2	Understand the verbal and non-verbal nature of problems in reality and know the shortcut methods of solving it.	[U]
C105.3	Solve problems using their general mental ability.	[AP]
C105.4	To give intense focus on improving and increasing the ability of solving real problems.	[AP]
C105.5	Think critically about mathematical models for relating different quantities to reach conclusion.	[AP]
C105.6	Enable effective use of data interpretation, formulas, graphs and assumptions.	[AP]

**Course Contents:**

**Module 1: Number Theory and Statistics**

**14 Hours**

Number Systems– HCF and LCM of Numbers – Decimal Fractions – Simplification – Square Root and Cube Root of a number – Surds and Indices – Problems on numbers – Percentage – Ratio and Proportion – Divisibility – Mixtures – Averages- Polynomials – Solving Equations and Inequalities – Discard’s rule of signs – Problems on ages – Chain rule – Time and Work – Time and Distance – Problems on Trains – Problems on Boats and Streams- Measures of central tendency – Mean, Median and Mode – Variance and Standard deviation Logarithms – Profit and Loss – Simple Interest – Compound Interest.

**Module 2: Logic and Decision Making**

**8 Hours**

Analogy – Classification – Series completion – Coding and Decoding – Blood Relations – Puzzle Test – Direction Sense test – Logical Venn Diagrams - Number Ranking and Time Sequence Test – Decision Making – Assertion and Reason– Inserting the missing one – Logical Sequence of words – Syllogisms.

**Module 3: Reasoning**

**8 Hours**

Logic – Statement and Arguments – Statements and Assumptions – Statements and Course of Action – Statements and Conclusions – Deriving conclusions from passages – Functions – Different kinds of functions – Miscellaneous sets- Series – Analogy – Classifications – Analytical Reasoning – Problems on Cubes and Dice – Mirror Images – Water Images – Rule Detection.

**Total Hours: 30**

**Text Books:**

- 1 Aggarwal R. S, “Quantitative Aptitude” Revised Edition, S. Chand Publication.
- 2 Abhijit Guha, “Quantitative Aptitude” 5<sup>th</sup> Edition, McGraw Hill Education.

**Reference Books:**

- 1 Edgar Thorpe “Mental Ability & Quantitative Aptitude” 3<sup>rd</sup> Edition, McGraw Hill Education.

**Web References:**

- 1 <https://www.wiziq.com/tutorial/815468-quantitative-aptitude-reasoning-data-interpretation-video-lectures>
- 2 <https://learningpundits.com/contest?referrer=harsh.cse15@nituk.ac.in>
- 3 <https://nptel.ac.in/courses/114106041/8>
- 4 <https://nptel.ac.in/courses/111103020/2>

**Online Resources:**

- 1 <http://aptitudetraining.in/home/index.php>
- 2 <https://www.udemy.com/vedicmaths/>
- 3 [https://www.youtube.com/channel/UCtmn-DsF4BhPug-ff9LiDAA?disable\\_polymer=true](https://www.youtube.com/channel/UCtmn-DsF4BhPug-ff9LiDAA?disable_polymer=true)

<b>Tentative Assessment Methods &amp; Levels (based on Revised Bloom’s Taxonomy)</b>			
<b>Formative assessment based on Capstone Model (Max. Marks:40)</b>			
<b>Course Outcome</b>	<b>Revised Bloom’s Level</b>	<b>Assessment Component</b>	<b>Marks</b>
C105.1	Remember	Classroom or Online Quiz	10
C105.2 & C105.3	Understand	Formal presentation	10
C105.4, C105.5 & C105.6	Apply	Formal interview tests	20
<b>Summative assessment based on Continuous Assessment</b>			
<b>Bloom’s Level</b>	<b>Term End Assessment [60 marks]</b>		
Remember	20		
Understand	40		
Apply	40		
Analyse	-		
Evaluate	-		
Create	-		

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>			
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>	
<b>C105.1</b>	3	3	1													
<b>C105.2</b>	3	2	1													
<b>C105.3</b>	3	3	1													
<b>C105.4</b>	3	2	1										2			
<b>C105.5</b>	3	3	1										2			
<b>C105.6</b>	3	2	1										2			

**21MC106**

**LIFE SKILLS AND ETHICS**

**2/0/0/0**

**Nature of Course** Theory Concept

**Pre requisites** -

**Course Objectives:**

- 1 To develop communication competence in prospective engineers.
- 2 To enable them to convey thoughts and ideas with clarity and focus.
- 3 To develop report writing skills.
- 4 To equip them to face interview & Group Discussion.
- 5 To inculcate critical thinking process.
- 6 To prepare them on problem solving skills.
- 7 To provide symbolic, verbal, and graphical interpretations of statements in a problem description.

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |  |      |
|--------|--|------|
| C106.1 | Define and identify different life skills required in personal and professional life.                | [U]  |
| C106.2 | Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress. | [AP] |
| C106.3 | Explain the basic mechanics of effective communication and demonstrate these through presentations.  | [A]  |
| C106.4 | Use appropriate thinking and problem-solving techniques to solve new problems.                       | [AP] |
| C106.5 | Understand the basics of teamwork and leadership   | [U]  |

**Course Contents:**

**Communication Skill:**

Introduction to Communication, The Process of Communication, Barriers to Communication, Listening Skills, Writing Skills, Technical Writing, Letter Writing, Job Application, Report Writing, Non-verbal Communication and Body Language, Interview Skills, Group Discussion, Presentation Skills, Technology-based Communication.

**Critical Thinking & Problem Solving:**

Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats Mind Mapping & Analytical Thinking. Teamwork: Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts.

**Ethics, Moral & Professional Values:**

Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE. **Leadership Skills:** Leadership, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, DART Leadership, Leadership Grid & leadership Formulation

**Total Hours: 30**

**Reference Books:**

- 1 Barun K. Mitra, "Personality Development & Soft Skills", First Edition, Oxford Publishers, 2011.
- 2 Kalyana, "Soft Skill for Managers", 1<sup>st</sup> Edition, Wiley Publishing Ltd, 2015.
- 3 Larry James, "The First Book of Life Skills", 1<sup>st</sup> Edition, Embassy Books, 2016
- 4 Shalini Verma, "Development of Life Skills and Professional Practice", 1<sup>st</sup> Edition, Sultan Chand (G/L) & Company, 2014
- 5 John C. Maxwell, "The 5 Levels of Leadership", Centre Street, A division of Hachette Book Group Inc, 2014.

**Web References:**

- 1 <https://www.coursera.org/courses?query=ethics>

<b>Assessment Methods &amp; Levels (based on Bloom's Taxonomy)</b>			
<b>Formative assessment based on Capstone Model (Max. Marks:40)</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component</b>	<b>Marks</b>
C106.1	Remember	Quiz	<b>5</b>
C106.2	Understand	Assignment	<b>15</b>
C106.3	Understand	Presentation	<b>10</b>
C106.4 C106.5	Apply	Group Discussion	<b>10</b>
<b>Summative assessment based on Continuous Assessment</b>			
<b>Revised Bloom's Level</b>	<b>Term End Assessment [60 marks]</b>		
Remember	30		
Understand	40		
Apply	30		
Analyse	-		
Evaluate	-		
Create	-		

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>C106.1</b>								1	2	1		2	1		
<b>C106.2</b>								1	2	1		2	1		
<b>C106.3</b>								2	2	3		1	1		
<b>C106.4</b>								1	1	1		1	3		
<b>C106.5</b>								1	3	2		2	1		

**22MC107**

**STRESS MANAGEMENT**

**2/0/0/0**

**Nature of Course** Theory Concept

**Pre requisites** -

**Course Objectives:**

- 1 Understand the basic principles of stress management
- 2 Recognize your stress triggers and how to manage them
- 3 Develop proactive responses to stressful situations
- 4 Use coping tips for managing stress both on and off the job
- 5 Learn to manage stress through diet, sleep and other lifestyle factors
- 6 Develop a long term action plan to minimize and better manage stress
- 7 Understand the basic principles of stress management

**Course Outcomes:**

**Upon completion of the course, students shall have ability to**

- |        |   |      |
|--------|---|------|
| C107.1 | Understand the basic principles of stress management                                | [U]  |
| C107.2 | Apply the concept of recognizing your stress triggers and find ways to manage them. | [AP] |
| C107.3 | Develop proactive responses to stressful situations                                 | [A]  |
| C107.4 | Develop a long term action plan to minimize and better manage stress                | [AP] |

**Course Contents:**

**Scientific Foundations of Stress:**

What is stress? – Sources of Stress – Types of Stress – Personality Factors and stress – Stress and the college student. Stress Psychophysiology: Stress and nervous system – Hypothalamic – Pituitary – Adrenal (HPA) Axis – Effect of Stress on Immune system – Health risk associated with chronic stress – Stress and Major Psychiatric disorders.

**Developing Resilience to Stress:**

Understanding your stress level – Role of personality pattern, Self-esteem, Locus of control – Role of Thoughts Beliefs and Emotions – I & II – Life situation Intrapersonal: (Assertiveness, Time Management).

**Strategies for Relieving Stress:**

Developing cognitive coping skills – Autogenic training, imagery and progressive relaxation – Other relaxation techniques – Exercise and Health – DIY strategies stress management.

**Total Hours: 30**

**Reference Books:**

- 1 Jonathan C. Smith, "Stress Management: A Comprehensive Handbook of Techniques and Strategies", 1<sup>st</sup> Edition, Springer Publishing Company, 2011.
- 2 Bob Stahl, Elisha Goldstein, Jon Kabat-Zinn, "A Mindfulness-based Stress Reduction Workbook", 2<sup>nd</sup> Edition, New Harbinger Publications, 2019.
- 3 Ryan M. Niemiec, "The Strengths-based Workbook for Stress Relief", 1<sup>st</sup> Edition, New Harbinger Publications, 2019.

**Web References:**

- 1 <https://thiswayup.org.au/courses/coping-with-stress-course/>
- 2 <https://www.classcentral.com/course/swayam-stress-management-14309>

<b>Assessment Methods &amp; Levels (based on Bloom's Taxonomy)</b>			
<b>Formative assessment based on Capstone Model (Max. Marks:40)</b>			
<b>Course Outcome</b>	<b>Bloom's Level</b>	<b>Assessment Component</b>	<b>Marks</b>
C107.1	Remember	Quiz	<b>10</b>
C107.2	Understand	Group Discussion	<b>10</b>
C107.3	Understand	Class Presentation	<b>10</b>
C107.4	Apply	Assignment	<b>10</b>

<b>Summative assessment based on Continuous Assessment</b>	
<b>Revised Bloom's Level</b>	<b>Term End Assessment [60 marks]</b>
Remember	30
Understand	40
Apply	30
Analyse	-
Evaluate	-
Create	-

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes(PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>C107.1</b>								1	3			1	1		
<b>C107.2</b>								1	2	1		1	1		
<b>C107.3</b>								1	3	1		2	2		
<b>C107.4</b>								1	3	1		3	2		

22MC108

CONSTITUTION OF INDIA

2/0/0/0

Nature of Course Theory

Pre Requisites -

Course Objectives:

- 1 To familiarize with basic information about Indian constitution
- 2 To understand the fundamental rights and duties as citizens of India

Course Outcomes:

Upon completion of the course, students shall have ability to

- C108.1 Explain the objectives of the Constitution of India and its formation [U]
- C108.2 Recall state and central policies (Union and State Executive), fundamental Rights and their duties. [R]
- C108.3 Make use of legal directions in developing solutions to societal issues [AP]
- C108.4 Utilized for competitive exams that requires knowledge of Indian Constitution [AP]

Course Contents:

Module 1

10 Hours

Historical perspective, The making of the Constitution, The Role of the Constituent Assembly - Preamble and Salient features of the Constitution of India. Fundamental Rights, Directive Principles of State Policy, Fundamental Duties, Citizenship Article 5-11.

Module 2

10 Hours

Federal structure, Powers of the Union and the states, Centre-State Relations, Union Executive – President, Prime Minister, Union Cabinet, Parliament, Supreme Court of India, State Executives – Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Elections, Electoral Process, and Election Commission of India, Election Laws. Powers and Functions of Municipalities and Panchayat

Module 3

10 Hours

Amendments - Methods, Emergency Provisions, National Emergency, President Rule, Financial Emergency, Provisions for SC & ST, OBC, women, children and backward classes, Right to Property, Freedom of Trade and Commerce. Agricultural Law

Total Hours: 30

Text Books:

- 1 Dr.D.D.Basu, "Introduction to the Constitution of India", LexisNexis, New Delhi, 22<sup>nd</sup> Edition, 2016.
- 2 "Bare act-constitution of India", The universal Publications, LexisNexis 2020, New Delhi, India.

Reference Books:

- 1 Subhash.C.Kashyap, "Our Constitution: An Introduction to India's Constitution and Constitutional Law", National Book Trust, India, 5<sup>th</sup>Edition, 2019.
- 2 M. Laxmikanth, "Constitution of India", Cengage Learning India, 1<sup>st</sup>Edition 2018.

Web References:

- 1 <https://unacademy.com/course/the-indian-constitution/NSKQ8XXQ>
- 2 <https://unacademy.com/goal/upsc-civil-services-examination-ias-preparation/KSCGY>

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:20)			
Course Outcome	Bloom'sLevel	Assessment Component	Marks
C108.1	Remember	Test	10
C108.4	Understand	Quiz	10
C108.3	Apply	Presentation	10
C108.2	Apply	Group Assignment	10



<b>Summative assessment based on Continuous Assessment</b>	
<b>Revised Bloom's Level</b>	<b>Term End Assessment [60 marks]</b>
Remember	30
Understand	40
Apply	30
Analyse	-
Evaluate	-
Create	-

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>C108.1</b>						3	1	1	1			1	1	1	
<b>C108.2</b>						3	1	1	1			1	1	2	
<b>C108.3</b>						3	2	2	1			1	1	2	
<b>C108.4</b>						3	1	1	1			2	1	1	

**22MC109 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE 2/0/0/0****Nature of Course** Theory**Pre Requisites** -**Course Objectives:**

- 1 To make understand the contribution of Indian mind in various fields.
- 2 To cultivate critical appreciation of the thought content and provide insights relevant for promoting cognitive ability, health, good governance, aesthetic appreciation and right values.

**Course Outcomes:****Upon completion of the course, students shall have ability to**

- C109.1 Relate classical Indian traditions with contemporary traditions and culture. [R]  
 C109.2 Outline the thoughts of Indians in different disciplines. [U]  
 C109.3 Apply the knowledge to the present context. [AP]  
 C109.4 Develop a better appreciation and understanding of Indian traditions. [C]

**Course Contents:**

Indian Ethics: Individual and Social – Society state and Polity (Survey) - Education systems – Agriculture (Survey) – Early & Classical Architecture – Medieval & Colonial Architecture.

Astronomy in India – Martial Arts Traditions (Survey) - Indian Literatures - Indian Philosophical Systems - Indian Traditional Knowledge on Environmental Conservation

Ayurveda for Life, Health and Well-being - The Historical Evolution of Medical Tradition in Ancient India- Music in India - Classical & Folk

**Total hours: 30****Text Books:**

- 1 Kapil Kapoor and Michel Danino, “Knowledge Traditions and Practices of India”, Central Board of Secondary Education, 2017.
- 2 Yogesh Atal, “Indian Society: Continuity and Change”, Pearson Education India, 2016.

**Reference Books:**

- 1 Douglas Osto, “An Indian Tantric Tradition and Its Modern Global Revival”, Routledge publications, 2020.
- 2 Rao C.N. Shankar, “Sociology: Principles of Sociology with an Introduction to Social Thoughts”, S Chand Publisher, 2019.

**Web References:**

- 1 <http://nopr.niscair.res.in/handle/123456789/43>
- 2 <https://nptel.ac.in/courses/109/104/109104102/>

<b>Assessment Methods &amp; Levels (based on Blooms’ Taxonomy)</b>			
<b>Formative assessment based on Capstone Model (Max. Marks:100)</b>			
<b>Course Outcome</b>	<b>Bloom’s Level</b>	<b>Assessment Component</b>	<b>Marks</b>
C109.1	Remember	Quiz	10
C109.2	Understand	Group Assignment	10
C109.3	Apply	Presentation	10
C109.4	Create	Survey	10

<b>Summative assessment based on Continuous Assessment</b>	
<b>Revised Bloom's Level</b>	<b>Term End Assessment [60 marks]</b>
Remember	30
Understand	40
Apply	30
Analyse	-
Evaluate	-
Create	-

<b>Course Outcome (CO)</b>	<b>Programme Outcomes (PO)</b>												<b>Programme Specific Outcomes (PSO)</b>		
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>C109.1</b>						2	1	1	1			2	3	1	
<b>C109.2</b>						2	1	1	2			1	2	1	
<b>C109.3</b>						1	1	1	1			1	1	1	
<b>C109.4</b>						2	1	1	2			2	1	1	