MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE
MADANAPALLE
(UGC-AUTONOMOUS)
www.mits.ac.in

Estd 1998

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Course Structure

For the students admitted to

B. Tech. Regular Four-Year Degree Programme from the academic year 2018-19

and

B. Tech. Lateral Entry Scheme from the academic year 2019-20

B.TECH. COMPUTER SCIENCE & ENGINEERING

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

B. Tech Four Year Curriculum Structure

Branch: COMPUTER SCIENCE & ENGINEERING

Total Credits: 160 (4 Year Course)

I.   Induction Program and Holistic Development Activities

Sl.No.	Title	Duration
1	Induction Program (Mandatory)	Three weeks duration at the start of First Year (Refer Annexure - I)
2	Holistic Development Activities (Every Student from Semester 2 – 8 should register for at least one activity)	Three hours per week (Activity list is enclosed in Annexure - I)
3	Virtual Laboratory (Students are encouraged to choose and register for any of the Virtual laboratories he /she is interested)	As specified by the Virtual Laboratory

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II. Semester-wise Structure of Curriculum
(L = Lecture, T = Tutorial, P = Practical, C = Credit)

I Year I Semester

Sl.No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Basic Science Course	18MAT101	Engineering Calculus	3	1	0	4	4
2	Basic Science Course	18PHY102	Modern Physics	3	1	0	4	4
3	Engineering Science Course	18EEE101	Basic Electrical Engineering	3	0	0	3	3
4	Engineering Science Course	18CSE101	Programming for Problem Solving (Python)	2	0	2	4	3
5	Basic Science Course	18PHY201	Physics Laboratory	0	0	3	3	1.5
6	Engineering Science Course	18EEE201	Electrical Engineering Laboratory	0	0	3	3	1.5
			Total	**11**	**2**	**8**	**21**	**17**

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I Year II Semester

Sl.No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Humanities, Social Sciences including Management	18ENG101	Professional English	2	0	2	4	3
2	Basic Science Course	18MAT110	Linear Algebra	3	1	0	4	4
3	Basic Science Course	18CHE101	Engineering Chemistry	3	0	0	3	3
4	Engineering Science Course	18CSE102	C Programming and Data Structures	3	0	0	3	3
5	Engineering Science Course	18ME101	Engineering Graphics	2	0	3	5	3.5
6	Basic Science Course	18CHE201	Chemistry Laboratory	0	0	3	3	1.5
7	Engineering Science Course	18CSE201	C Programming and Data Structures Laboratory	0	0	3	3	1.5
8	Engineering Science Course	18CSE202	Engineering and IT Workshop	0	0	3	3	1.5
			Total	**13**	**1**	**14**	**28**	**21**

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II Year I Semester

Sl.No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Humanities, Social Sciences including Management	18HUM102	Principles of Management	3	0	0	3	3
2	Basic Science Course	18MAT111	Probability Models and Statistics	3	1	0	4	4
3	Professional Core Course	18CSE103	Data Structures	3	0	0	3	3
4	Professional Core Course	18CSE104	Object Oriented Programming using JAVA	3	0	0	3	3
5	Professional Core Course	18CSE105	Database Management Systems	2	1	0	3	3
6	Professional Core Course	18CSE203	Data Structures Laboratory	0	0	3	3	1.5
7	Professional Core Course	18CSE204	Object Oriented Programming using JAVA Laboratory	0	0	3	3	1.5
8	Professional Core Course	18CSE205	Database Management Systems Laboratory	0	0	3	3	1.5
9	Mandatory non-credit Course		Mandatory Course – I (Refer Annexure - V)	2	0	0	2	0
			Total	**16**	**2**	**9**	**27**	**20.5**

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II Year II Semester

Sl. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Humanities, Social Sciences including Management	18HUM101	Economics and Financial Accounting for Engineers	3	0	0	3	3
2	Basic Science Course	18MAT112	Discrete Mathematical Structures	3	0	0	3	3
3	Basic Science Course	18BIO101	Life Sciences for Engineers	3	0	0	3	3
4	Engineering Science Course	18CSE106	Digital Logic Design	2	1	0	3	3
5	Professional Core Course	18CSE107	Design and Analysis of Algorithms	2	1	0	3	3
6	Professional Core Course	18CSE108	Operating Systems	3	0	0	3	3
7	Humanities, Social Sciences including Management	18ENG201	English Communication – Listening and Speaking Laboratory	0	0	3	3	1.5
8	Professional Core Course	18CSE206	Design and Analysis of Algorithms Laboratory	0	0	3	3	1.5
9	Professional Core Course	18CSE207	Operating Systems Laboratory	0	0	3	3	1.5
10	Mandatory non-credit Course		Mandatory Course – II (Refer Annexure - V)	2	0	0	2	0
			Total	**18**	**2**	**9**	**29**	**22.5**
			Summer Internship					

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III Year I Semester

Sl. No.	Category	Course Code	Course Title	L	T	P	Total Contact Hours	Credits
				Hours Per Week				
1	Professional Core Course	18CSE109	Formal Language and Automata Theory	2	1	0	3	3
2	Professional Core Course	18CSE110	Computer Organization and Architecture	3	0	0	3	3
3	Professional Core Course	18CSE111	Computer Networks	3	0	0	3	3
4	Professional Core Course	18CSE112	Software Engineering	3	0	0	3	3
5	Professional Elective Course		Discipline Elective-I (Refer Annexure - III)	3	0	0	3	3
6	Open Elective Course		Open Elective – I(Refer Annexure - II)	3	0	0	3	3
7	Humanities, Social Sciences including Management	18ENG202	Corporate Communication Laboratory	0	0	2	2	1
8	Professional Core Course	18CSE208	Computer Networks Laboratory	0	0	3	3	1.5
9	Professional Core Course	18CSE209	Software Engineering Laboratory	0	0	3	3	1.5
10	Mandatory non-credit Course		Mandatory Course – III (Refer Annexure - V)	2	0	0	2	0
			Total	**19**	**1**	**8**	**28**	**22**

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III Year II Semester

Sl. No.	Category	Course Code	Course Title	L	T	P	Total Contact Hours	Credits
				Hours Per Week				
1	Humanities, Social Sciences including Management	18ENG102	English Communication - Reading and Writing	2	0	0	2	2
2	Professional Core Course	18CSE113	AI Tools, Techniques and Applications	3	0	0	3	3
3	Professional Core Course	18CSE114	Compiler Design	2	1	0	3	3
4	Professional Elective Course		Discipline Elective - II(Refer Annexure - III)	3	0	0	3	3
5	Professional Elective Course		Discipline Elective-III(Refer Annexure - III)	3	0	0	3	3
6	Open Elective Course		Open Elective – II (Refer Annexure - II)	3	0	0	3	3
7	Professional Core Course	18CSE210	AI Tools, Techniques and Applications Laboratory	0	0	3	3	1.5
8	Professional Core Course	18CSE211	Compiler Design Laboratory	0	0	3	3	1.5
9	Professional Core Course		Virtual Laboratory (Refer Annexure - IV)	0	0	2	2	0
10	Mandatory non-credit Course		Mandatory Course – IV (Refer Annexure - V)	2	0	0	2	0
			Total	**18**	**1**	**8**	**27**	**20**
			Summer Internship					

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IV Year I Semester

Sl.No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	**T**	**P**	**Total Contact Hours**	
1	Engineering Science Course	18CSE115	Internet of Things	3	0	0	3	3
2	Professional Core Course	18CSE116	Mobile Application Development	3	0	0	3	3
3	Professional Elective Course		Discipline Elective –IV (Refer Annexure - III)	3	0	0	3	3
4	Professional Elective Course		Discipline Elective –V (Refer Annexure - III)	3	0	0	3	3
5	Open Elective Course		Open Elective –III (Refer Annexure - II)	3	0	0	3	3
6	Engineering Science Course	18CSE212	Internet of Things Laboratory	0	0	2	2	1
7	Professional Core Course	18CSE213	Mobile Application Development Laboratory	0	0	2	2	1
8	PROJ-CSE	18CSE701	Project Work – I	0	0	4	4	2
			Total	**15**	**0**	**8**	**23**	**19**

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IV Year II Semester

Sl.No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
1	Professional Elective Course		Discipline Elective –VI (Refer Annexure - III)	3	0	0	3	3
2	Open Elective Course		Open Elective –IV (Refer Annexure - II)	3	0	0	3	3
3	PROJ-CSE	18CSE702	Project Work – II	0	0	24	24	12
			Total	**6**	**0**	**24**	**30**	**18**

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THREE WEEK MANDATORY INDUCTION PROGRAMME

- Yoga and Meditation
- Sports and Games
- NSS
- NCC
- MITS Social Responsibility Club
- Management module
- Design Thinking
- Spoken and Written Communication

- *Proficiency modules*

- Basic Computer Proficiency
- Interpersonal skills
- Computer Graphics
- Web programming
- Mobile Apps
- Vocabulary enhancement

HOLISTIC DEVELOPMENT ACTIVITIES

Description of Activities

1. Physical and Health
2. Culture
3. Literature and Media
4. Social Service
5. Self-Development
6. Nature and Environment
7. Innovation

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		OPEN ELECTIVE – I	
		(To be offered under MOOC's Category from SWAYAM – NPTEL) Students can opt to be assessed either in Conventional mode or through proctored exams conducted by Swayam NPTEL	
Sl.No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	18ENG3M01/ 18ENG3M01C	Soft Skills	English & Training
2	18ENG3M02/ 18ENG3M02C	Developing Soft Skills and Personality	English & Training
3	18ENG3M03/ 18ENG3M03C	Soft Skill Development	English & Training
4	18HUM3M01/ 18HUM3M01C	Project Management for Managers	Humanities
5	18HUM3M02/ 18HUM3M02C	Ethics in Engineering Practice	Humanities
6	18CE3M01/ 18CE3M01C	Integrated Waste Management for Smart City	Civil
7	18CE3M02/ 18CE3M02C	Soil and Water Conservation Engineering	Civil
8	18CE3M03/ 18CE3M03C	Engineering Geology	Civil
9	18ME3M01/ 18ME3M01C	Six Sigma	Mechanical
10	18ME3M02/ 18ME3M02C	Operations Research	Mechanical
11	18ME3M03/ 18ME3M03C	Design Thinking and Innovation	Mechanical
12	18EEE3M01/ 18EEE3M01C	Non-Conventional Energy Sources	EEE
13	18EEE3M01/ 18EEE3M01C	Design of Photovoltaic Systems	EEE
14	18ECE3M01/ 18ECE3M01C	Semiconductor Opto-Electronics	ECE
15	18ECE3M02/ 18ECE3M02C	Digital VLSI Testing	ECE
16	18ECE3M03/ 18ECE3M03C	Microprocessor and Interfacing	ECE
		Any new Interdisciplinary Course offered by SWAYAM NPTEL can be appended in future.	

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	OPEN ELECTIVE – II		
	(To be offered under Conventional Mode)		
Sl.No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	18MAT301	Advanced Numerical Methods	Mathematics
2	18MAT302	Engineering Optimization	Mathematics
3	18PHY301	Optical Physics and its Applications	Physics
4	18PHY302	LASER Physics and Advanced LASER Technology	Physics
5	18CHE301	Introduction to Petroleum Industry	Chemistry
6	18CHE302	Green Chemistry and Catalysis for Sustainable Environment	Chemistry
7	18HUM301	Intellectual Property Rights	Humanities
8	18HUM302	Human Resource Development	Humanities
9	18HUM304	National Cadet Corps	Humanities
10	18CE301	Ground Improvement Techniques	Civil
11	18CE302	Environmental Impact Assessment	Civil
12	18CE303	Watershed Management	Civil
13	18ME301	Material Science for Engineers	Mechanical
14	18ME302	Elements of Mechanical Engineering	Mechanical
15	18ME303	Basic Thermodynamics	Mechanical
16	18EEE301	Industrial Electrical Systems	EEE
17	18EEE302	Introduction to MEMS	EEE
18	18ECE301	Bio-Medical Electronics	ECE
19	18ECE302	VLSI Design	ECE

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		OPEN ELECTIVE – III	
		(To be offered under MOOC's Category from SWAYAM – NPTEL) Students can opt to be assessed either in Conventional mode or through proctored exams conducted by Swayam NPTEL	
Sl.No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	18ENG3M04/ 18ENG3M04C	Speaking Effectively	English
2	18HUM3M03/ 18HUM3M03C	Management Information System	Humanities
3	18CE3M03/ 18CE3M03C	Remote Sensing and GIS	Civil
4	18CE3M04/ 18CE3M04C	Waste Water Treatment and Recycling	Civil
5	18ME3M04/ 18ME3M04C	Power Plant Engineering	Mechanical
6	18ME3M05/ 18ME3M05C	Mechatronics and Manufacturing Automation	Mechanical
7	18EEE3M03/ 18EEE3M03C	Introduction to Smart Grid	EEE
8	18ECE3M03/ 18ECE3M03C	Introduction to Embedded Systems	ECE
9	18ECE3M04/ 18ECE3M04C	Embedded System Design with ARM	ECE
10	18ECE3M05/ 18ECE3M05C	Advanced Computer Architecture	ECE
11	18IE3M01/ 18IE3M01C	Introduction to Research	General
	Any new Interdisciplinary Course offered by SMAYAM NPTEL can be appended in future		

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	OPEN ELECTIVE – IV		
	(To be offered under Conventional Mode)		
Sl.No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	18ENG301	Creative Writing	English
2	18HUM303	Entrepreneurship Development	Humanities
3	18MAT303	Graph Theory	Mathematics
4	18MAT304	Mathematical Modeling and Numerical Simulation	Mathematics
5	18PHY303	Thin Film Technology and its Applications	Physics
6	18CHE303	Introduction to Nano Science and Technology	Chemistry
7	18CHE304	Computational Methods in Materials Science and Engineering	Chemistry
8	18CE304	Green Building and Energy Conservation	Civil
9	18CE305	Environmental Engineering	Civil
10	18ME304	Internet of Manufacturing Things	Mechanical
11	18ME305	Entrepreneurship	Mechanical
12	18ME306	Total Quality Management	Mechanical
13	18EEE303	Robotics	EEE
14	18EEE304	Electrical Safety	EEE
15	18ECE303	Nano Electronics	ECE
16	18ECE304	Wireless Sensor Networks	ECE

List of Discipline Electives

Discipline Elective – I		
Sl. No.	**Course Code**	**Course Title**
1.	18CSE401	Data Mining and Data Warehousing
2.	18CSE402	Mobile Computing
3.	18CSE403	Artificial Intelligence
4.	18CSE404	Web Technologies
5.	18CSE405	Digital Image Processing
6.	18CSE406	Multimedia Technologies
Any advanced courses can be appended in future.		

Discipline Elective – II (To be offered under MOOC's Category from SWAYAM – NPTEL) Students can opt to be assessed either in Conventional mode or through proctored exams conducted by Swayam NPTEL		
Sl. No.	**Course Code**	**Course Title**
1.	18CSE4M01/ 18CSE4M01C	Block Chain Architecture Design and Use Case
2.	18CSE4M02/ 18CSE4M02C	Deep Learning
3.	18CSE4M03/ 18CSE4M03C	Model Checking
4.	18CSE4M04/ 18CSE4M04C	Social Network
5.	18CSE4M05/ 18CSE4M05C	Reinforcement Learning
6.	18CSE4M06/ 18CSE4M06C	Programming in C++
7.	18CSE4M07/ 18CSE4M07C	Ethical Hacking
8.	18CSE4M08/ 18CSE4M08	Privacy and Security in Online Social Media
9.	18CSE4M09/ 18CSE4M09C	Microprocessors and Interfacing
Any other new Disciplinary Course which doesn't exist in the Curriculum can be appended in future.		

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Discipline Elective – III		
Sl. No.	**Course Code**	**Course Title**
1.	18CSE407	Soft computing
2.	18CSE408	Real Time Systems
3.	18CSE409	Distributed and Cloud Computing
4.	18CSE410	Adhoc Wireless Networks
5.	18CSE411	Service Oriented Architecture
6.	18CSE412	E-Learning Technologies
Any advanced courses can be appended in future.		

Discipline Elective – IV		
Sl. No.	**Course Code**	**Course Title**
1.	18CSE413	Data Science
2.	18CSE414	Digital Forensics
3.	18CSE415	Cryptography and Network Security
4.	18CSE416	Machine Learning
5.	18CSE417	Crypto Currencies
Any advanced courses can be appended in future.		

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Discipline Elective – V		
Sl. No.	**Course Code**	**Course Title**
1.	18CSE418	Big Data Analytics
2.	18CSE419	Software Quality Assurance
3.	18CSE420	Software Testing
4.	18CSE421	Wireless Network System
5.	18CSE422	Programming Paradigms
6.	18CSE423	Human Computer Interaction
Any advanced courses can be appended in future.		

Discipline Elective –VI		
Sl. No.	**Course Code**	**Course Title**
1.	18CSE424	Software Defined Networking
2.	18CSE425	Software Project Management
3.	18CSE426	C# and .Net Programming
4.	18CSE427	High Speed Networks
5.	18CSE428	Cyber Security
6.	18CSE429	Computer Graphics
Any advanced courses can be appended in future.		

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COMPUTER SCIENCE & ENGINEERING - VIRTUAL LABS

Sl.No.	Course Code	Course Title
1	18CSE214	Data Mining Laboratory
2	18CSE215	Pattern Recognition Laboratory
3	18CSE216	Cryptography Laboratory
4	18CSE217	Advanced Network Technologies Laboratory
5	18CSE218	Natural Language Processing Laboratory

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COMPUTER SCIENCE & ENGINEERING –MANDATORY COURSES

Sl. No.	Course Code	Course Title
1.	18CHE901	Environmental Sciences
2.	18HUM902	Indian Constitution
3.	18HUM903	Essence of Indian Traditional Knowledge
4.	18CE904	Disaster Management

Dept. of Computer Science & Engineering

HONORS IN COMPUTER SCIENCE & ENGINEERING

SI.No	Category	Course Code	Course Title	Hours Per Week			Total Contact Hours	Credits
				L	T	P		
			III Year I Semester					
1	**Professional Elective Course (Choose any two from three courses)**	18HDCSE101	Data Visualization	3	0	0	3	3
2		18HDCSE102	Fundamentals of Information Systems Security	3	0	0	3	3
3		18HDCSE103	Virtualization and Cloud Computing	3	0	0	3	3
			Sub Total	**6**	**0**	**0**	**6**	**6**
			III Year II Semester					
4	**Professional Elective Course (Choose any two from three courses)**	18HDCSE104	Data Analytics	3	0	0	3	3
5		18HDCSE105	Block-Chain Technology and Applications	3	0	0	3	3
6		18HDCSE106	Cloud Design - Performance, Scalability and Security	3	0	0	3	3
			Sub Total	**6**	**0**	**0**	**6**	**6**
			IV Year I Semester					
7	**Professional Elective Course (Choose any one from three courses)**	18HDCSE107	Natural Language Processing	3	0	0	3	3
8		18HDCSE108	Cyber Forensics	3	0	0	3	3
9		18HDCSE109	Computer Vision and Deep Learning	3	0	0	3	3
10	**Project**	18HDCSE701	Mini Project	0	0	10	10	5
			Sub Total	**3**	**0**	**10**	**13**	**8**
			Total	**15**	**0**	**10**	**25**	**20**

Dept. of Computer Science & Engineering

MINORS IN COMPUTER SCIENCE & ENGINEERING

(Applicable to CE, EEE, ME and ECE)

Stream Name: Artificial Intelligence (AI)

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
III Year I Semester								
1	**Professional Core Course**	18MDCSE101	AI: Knowledge Representation and Reasoning	3	0	0	3	3
2		18MDCSE102	Computer Vision	3	0	0	3	3
III Year II Semester								
3	**Professional Core Course**	18MDCSE103	Machine Learning	3	0	0	3	3
4		18MDCSE104	Advanced Python	3	0	0	3	3
5		18MDCSE201	Advanced Python Laboratory	0	0	4	4	2
IV Year I Semester								
6	**Professional Core Course**	18MDCSE105	Deep Learning	3	0	0	3	3
7		18MDCSE701	Mini Project	0	0	6	6	3
			Total	**15**	**0**	**10**	**25**	**20**

MINORS IN COMPUTER SCIENCE & ENGINEERING

(Applicable to CE, EEE, ME and ECE)

Stream Name: Cyber Security (CS)

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
III Year I Semester								
1	**Professional Core Course**	18MDCSE106	Cryptography	3	0	0	3	3
2		18MDCSE107	Network Security	3	0	0	3	3
III Year II Semester								
3	**Professional Core Course**	18MDCSE108	Cyber Laws and Security Policies	3	0	0	3	3
4		18MDCSE109	Cyber Crime Investigation and Digital Forensics	3	0	0	3	3
5		18MDCSE202	Cryptography and Network Security Laboratory	0	0	4	4	2
IV Year I Semester								
6	**Professional Core Course**	18MDCSE110	Penetration Testing and Vulnerability Assessment	3	0	0	3	3
7		18MDCSE701	Mini Project	0	0	6	6	3
			Total	**15**	**0**	**10**	**25**	**20**

MINORS IN COMPUTER SCIENCE & ENGINEERING

(Applicable to CE, EEE, ME and ECE)

Stream Name: Block-Chain (BC)

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	**T**	**P**	**Total Contact Hours**	
III Year I Semester								
1	**Professional Core Course**	18MDCSE111	Distributed Systems	3	0	0	3	3
2		18MDCSE112	Blockchain Technology	3	0	0	3	3
III Year II Semester								
3	**Professional Core Course**	18MDCSE113	Ethereum and Smart Contracts	3	0	0	3	3
4		18MDCSE114	Hyperledger Fabric	3	0	0	3	3
5		18MDCSE203	Smart Contracts and Hyperledger Laboratory	0	0	4	4	2
IV Year I Semester								
6	**Professional Core Course**	18MDCSE115	Solidity Programming	3	0	0	3	3
7		18MDCSE701	Mini Project	0	0	6	6	3
			Total	**15**	**0**	**10**	**25**	**20**

MINORS IN COMPUTER SCIENCE & ENGINEERING

(Applicable to CE, EEE, ME and ECE)

Stream Name: Full Stack Development (FSD)

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
III Year I Semester								
1	**Professional Core Course**	18MDCSE116	Fundamentals of Web Design	3	0	0	3	3
2		18MDCSE117	Multimedia and Web Technology	3	0	0	3	3
III Year II Semester								
3	**Professional Core Course**	18MDCSE118	Advanced Web Design	3	0	0	3	3
4		18MDCSE119	Web Programming	3	0	0	3	3
5		18MDCSE204	Web Programming Laboratory	0	0	4	4	2
IV Year I Semester								
6	**Professional Core Course**	18MDCSE120	Full Stack Development	3	0	0	3	3
7		18MDCSE701	Mini Project	0	0	6	6	3
			Total	**15**	**0**	**10**	**25**	**20**

MINORS IN COMPUTER SCIENCE & ENGINEERING

(Applicable to CE, EEE, ME and ECE)

Stream Name: Software Development (SD)

SI.No	Category	Course Code	Course Title	L	T	P	Total Contact Hours	Credits
				Hours Per Week				
III Year I Semester								
1	**Professional Core Course**	18MDCSE121	Data Structures and Algorithms	3	0	0	3	3
2		18MDCSE122	Database Management Systems	3	0	0	3	3
III Year II Semester								
3	**Professional Core Course**	18MDCSE123	Software Engineering	3	0	0	3	3
4		18MDCSE104	Advanced Python	3	0	0	3	3
5		18MDCSE201	Advanced Python Laboratory	0	0	4	4	2
IV Year I Semester								
6	**Professional Core Course**	18MDCSE103	Machine Learning	3	0	0	3	3
7		18MDCSE701	Mini Project	0	0	6	6	3
			Total	**15**	**0**	**10**	**25**	**20**

B. Tech I Year I Semester

B.Tech. I Year I Semester

18MAT101   ENGINEERING CALCULUS

	L	T	P	C
Course Prerequisite: Intermediate | 3 | 1 | 0 | 4 |

Course Description:
The course introduces the concepts of single variable and multivariable calculus with the view of its applications in various engineering fields. The course will well prepare the students to develop the solution methods and enrich their experience in critical analysis and problem solving.

Course Objectives:
The objective of this course is to familiarize the prospective engineers with techniques in calculus and multivariate analysis. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

UNIT I: CALCULUS
Definite integrals; Applications of definite integrals to evaluate area and length of curves, surface areas and volumes of revolutions; Beta and Gamma functions and their properties   **(12)**

UNIT II: CALCULUS
Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms, Maxima and minima.   **(12)**

UNIT III: SEQUENCES AND SERIES
Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.   **(12)**

UNIT IV: MULTIVARIABLE CALCULUS (DIFFERENTIATION)
Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers.   **(12)**

UNIT V: MULTIVARIABLE CALCULUS (INTEGRATION)
Multiple Integration: double integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration), triple integrals, curl and divergence, Theorems of Green, Gauss and Stokes (without proofs).   **(12)**

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Evaluate the definite integrals to curvatures and infer the Beta and Gamma functions.
2. Analyze the fundamental theorems of calculus to Engineering problems.
3. Use the power series and Fourier series for learning advanced Engineering Mathematics.
4. Apply the functions of several variables and geometrical ideas to engineering.
5. Calculate the area and volume of quantities and connecting them to single double and triple integrals.

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Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42th Edition, 2012.
2. G. B. Thomas, Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas' Calculus Pearson education 11th Edition, 2004.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech. I Year I Semester

18PHY102   MODERN PHYSICS

L T P C
3 1 0 4

Course Prerequisite: Intermediate

Course Description:
Waves & optics is a basic physics course, which will cover Waves, Optics, Quantum Mechanics, Semiconductors and Lasers.

Course Objectives:
1. Expose students to recognize and use a mathematical wave equation using the principles of oscillations and waves understanding the basic laws of nature through physics.
2. Educate students to think and participate deeply, creatively, and analytically in applying various kinds of forces in day today life.
3. Demonstrate the ability to identify and apply the appropriate analytic, numerical, computational and other mathematical reasoning, to situations of the physical world.
4. Analyze and understand the subjects Mechanics, Oscillations, Waves and Optics in preparing the students for advanced level courses.
5. Expose students to theoretical and mathematical aspects of Interference, Diffraction techniques and Lasers for mechanical testing of materials.
6. Adaptability to new developments in science and technology by successfully completing or pursuing graduate education in engineering.

UNIT I: WAVES
Simple Harmonic Motion, damped harmonic oscillations, forced harmonic oscillations, resonance, and quality factor. Superposition of vibrations along same direction (equal frequency) and in perpendicular directions, Lissajous figures. Transverse waves, solution of wave equation, velocity of a transverse wave along a stretched string, modes of vibration of stretched string, standing waves, standing wave ratio.   **(12)**

UNIT II: OPTICS
Light as an electromagnetic wave, Huygens' Principle, superposition of waves, interference of light by division of wavefront- Young's double slit experiment, expression for fringe width, intensity distribution graph, interference of light by division of amplitude- interference in thin film by reflection, Newton's rings experiment, Michelson interferometer,Mach Zehnder interferometer. Diffraction, Diffraction grating, Farunhofer diffraction due to single slit, double slit and N-slit, Rayleigh criterion for limit of resolution-resolving power.   **(12)**

UNIT III: QUANTUM MECHANICS
Introduction to Quantum Mechanics, Wave nature of Particles, Time-dependent and time-independent Schrodinger equations for wave function, Free-particle wave function and wave-packets, Uncertainty principles. Solution of Wave Equation. Solution of stationary-state Schrodinger equation for one dimensional problems–particle in a box, square-well potential, linear harmonic oscillator. Scattering from a potential barrier and tunnelling-scanning tunnelling microscope.   **(12)**

UNIT IV: SEMICONDUCTORS

Introduction to Solids and Semiconductors, Free electron theory of metals, Fermi level, density of states, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands, metals, semiconductors, and insulators. Direct and indirect bandgap semiconductors, Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination (radiative and non-radiative), Carrier transport: diffusion and drift, p -n junction.

(12)

UNIT V: LASERS

Introduction to Lasers, characteristics of Laser, interaction of radiation with matter-spontaneous and stimulated emission, Einstein's coefficients; amplification of light by population inversion, excitation mechanisms, types of lasers: solid-state lasers – ruby laser, gas lasers - He-Ne Laser, semiconductor p-n junction diode laser, dye laser; applications of lasers **(12)**

Course Outcomes:
Upon successful completion of this course, the students should be able to:
1. Describe a mathematical wave equation using the principles of oscillations and waves and explain the behaviour of the oscillations.
2. Define and evaluate the fundamentals of mechanical testing of materials using Interference and Diffraction techniques.
3. Understand the idea of wave function and to solve Schroedinger equation for simple potentials.
4. Explain the role of semiconductors in different realms of physics and their applications in both scientific and technological systems.
5. Identify the four elements of different lasers and estimate laser operation parameters for material processing.

Text Books:

1. H. J. Pain, "The physics of vibrations and waves", Wiley, 2006.
2. A. Ghatak, "Optics", McGraw Hill Education, 2012.
3. D. J. Griffiths, "Quantum mechanics", Pearson Education, 2014.
4. B.G. Streetman, "Solid State Electronic Devices", Prentice Hall of India, 1995.
5. O. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010

Reference Books:

1. H. J. Pain, "The physics of vibrations and waves", Wiley, 2006.
2. Physics Vol I & II, Halliday/Resnick/Krane 5th Edition, John Wiley, 2003.
3. D. A. Neamen, "Semiconductor Physics and Devices", Times Mirror High Education Group, Chicago, 1997.
4. Berkeley Physics Course Volume I, Tata-McGraw Hill.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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B. Tech. I Year I Semester

18EEE101   BASIC ELECTRICAL ENGINEERING

Course Prerequisite: Nil

	L	T	P	C
	3	0	0	3

Course Description:
This course equips the students with a basic understanding of Electrical circuits and machines for specific applications. In specific, the course covers basic of DC circuit & its analysis, introduction to single-phase and three-phase AC Systems, magnetic circuits, transformers, DC & AC electrical machines, basic converters and Components of LT Switchgear.

Course Objectives:
1. To learn the basics of the D.C. circuit analysis.
2. To have an idea about single-phase and three-phase A.C. electrical circuits.
3. To gain knowledge about basic magnetic circuits and transformers.
4. To learn the construction and operation of D.C. and A.C. machines.
5. To understand the operation of basic rectifiers and various components of LT Switchgear.

UNIT I: DC CIRCUIT ANALYSIS
Electrical circuit elements (R, L and C), voltage and current sources, Series and parallel resistive circuits, Kirchhoff's current and voltage laws, Nodal and Mesh analysis of simple circuits with dc excitation. Source Transformation, Star-Delta Transformation, Superposition Theorem.   **(9)**

UNIT II: AC CIRCUIT ANALYSIS
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations. Three phase balanced circuits, voltage and current relations in star and delta connections.   **(9)**

UNIT III: MAGNETIC MATERIALS AND TRANSFORMERS
Magnetic materials, B-H characteristics, ideal and practical transformer, principle of operation, emf equation, equivalent circuit, losses in transformers, regulation and efficiency.   **(9)**

UNIT IV: DC AND AC MACHINES
Construction, working, emf equation of DC generator, methods of excitation, speed control of dc motor. Generation of rotating magnetic fields, construction and working of a three-phase induction motor. Introduction of Single-phase induction motor.   **(9)**

UNIT V: RECTIFIERS AND ELECTRICAL INSTALLATIONS
PN junction diode, half wave, full wave and bridge rectifiers. Components of LT Switchgear: switch fuse unit (SFU), MCB, ELCB, MCCB, types of wires and cables, earthing.   **(9)**

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Course Outcomes:

Upon successful completion of the course, students will be able to
1. To understand and analyze basic DC electric circuits.
2. To measure and analyze various electrical quantities of single phase and three AC electric circuits.
3. To develop magnetic circuits to experiment and analyze the transformers.
4. To study the working principles of electrical machines.
5. To create power converters for domestic applications with LT switchgear.

Text Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
3. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
4. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

References:

1. Abhijit Chakrabarti, "Circuit Theory : Analysis and Synthesis", Dhanpat Rai & Co., 2014
2. J.B. Gupta, "Theory & Performance of Electrical Machines", S. K. Kataria & Sons, 2013.
3. John Bird, "Electrical Circuit Theory and Technology", Fourth edition, Elsevier Ltd., 2010.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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B. Tech I Year I Semester

18CSE101   PROGRAMMING FOR PROBLEM SOLVING (PYTHON)

Course Prerequisite: None

L	T	P	C
2	0	2	3

Course Description:
Python is a language with a simple syntax, and a powerful set of libraries. It is an interpreted language, with a rich programming environment. While it is easy for beginners to learn, it is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience. This course provides knowledge on how to implement programs in python language and to solve computational problems using the various programming constructs including data structures, functions, string handling mechanisms and file handling concepts.

Course Objectives:
1. Learn Python programming constructs.
2. Implement Python programs with conditional structures and loops.
3. Use functions for structuring Python programs.
4. Handle compound data using Python lists, tuples, and dictionaries.
5. Manipulate data using files handling in Python.

UNIT-I
Introduction: Algorithms, building blocks of algorithms (flow chart), History of Python, features of Python Programming, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. **Data Types** - Integers, Strings, Boolean.

   a) Develop a flowchart for the various arithmetic operations on numbers.
   b) Develop a flowchart to check whether the number is positive or negative.
   c) Develop a flowchart for finding whether a given number is even or odd.
   d) Develop a flowchart for finding biggest number among three numbers.
   e) Develop a flowchart for displaying reversal of a number.
   f) Develop a flowchart to print factorial of a number using function.
   g) Develop a flowchart to generate prime numbers series up to N using function.
   h) Develop a flowchart to check given number is palindrome or not using function.
   i) Alexa travelled 150 kms by train. How much distance in miles she actually covered?

(12)

UNIT-II
Operators and Expressions: Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations. **Control Flow** - if, if-elif-else, for, while, break, continue, pass.
   a) Swapping of two number with and without using temporary variable.
   b) If the age of Ram, Sam, and Khan are input through the keyboard, write a python program to determine the eldest and youngest of the three.

c) Develop a program that performs arithmetic operations (Addition, Subtraction, Multiplication, and Division) on integers. Input the two integer values and operator for performing arithmetic operation through keyboard. The operator codes are as follows:
   - For code '+', perform addition.
   - For code '-', perform subtraction.
   - For code '*', perform multiplication.
   - For code '/', perform division.
d) Implement the python program to generate the multiplication table.
e) Implement Python program to find sum of natural numbers
f) If the first name of a student is input through the keyboard, write a program to display the vowels and consonants present in his/her name.
g) The marks obtained by a student in 5 different subjects are input through the keyboard. Find the average and print the student grade as per the MITS examination policy as shown below.

% OBTAINED	GRADE
90 - 100	O (Outstanding)
80 - 89	A+ (Excellent)
70 - 79	A (Very Good)
60 - 69	B+ (Good)
50 - 59	B (Above)
45 - 49	C (Average)
40 - 44	P (Pass)
< 40	F (Fail)

h) Implement Python Script to generate prime numbers series up to N.
i) Given a number x, determine whether it is Armstrong number or not. Hint: For example, 371 is an Armstrong number since $3**3 + 7**3 + 1**3 = 371$. Write a program to find all Armstrong number in the range of 0 and 999. **(12)**

UNIT-III
Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions. **Functions** - Defining Functions, Calling Functions, Passing Arguments, variable in python-Global and Local Variables.
   a) Write a Python script to
      - create a list
      - access elements from a list
      - slice lists
      - change or add elements to a list
      - delete or remove elements from a list
   b) Write a Python script to read the values from a list and to display largest and smallest numbers from list.
   c) Write a Python script to compute the similarity between two lists.
   d) Write a Python script to read set of values from a Tuple to perform various operations.
   e) Write a Python script to perform basic dictionary operations like insert, delete and display.
   f) Write a Python program to count the occurrence of each word in a given sentence.
   g) Define a dictionary named population that contains the following data.

Keys	Values
Shanghai	17.8
Istanbul	13.3
Karachi	13.0
Mumbai	12.5

h) Write a Python script to create Telephone Directory using dictionary and list to perform basic functions such as Add entry, Search, Delete entry, Update entry, View and Exit.

i) Implement Python script to display power of given numbers using function.

j) Implement a Python program that takes a list of words and returns the length of the longest one using function. **(12)**

UNIT-IV
String Handling -Modules: Creating modules, import statement, from.import statement, name spacing-**Files and Directories**

a) Implement Python program to perform various operations on string using string libraries.

b) Implement Python program to remove punctuations from a given string.

c) Write a Python program to change the case of the given string (convert the string from lower case to upper case). If the entered string is "computer", your program should output "COMPUTER" without using library functions.

d) Implement Python program to capitalize each word in a string. For example, the entered sentence "god helps only people who work hard" to be converted as "God Helps Only People Who Work Hard"

e) Write a Python script to display file contents.

f) Write a Python script to copy file contents from one file to another.

g) Write a Python script to combine two text files contents and print the number of lines, sentences, words, characters and file size.

h) Write a Python commands to perform the following directory operations.
- List Directories and Files
- Making a New Directory
- Renaming a Directory or a File
- Removing Directory or File **(12)**

UNIT-V
Python packages, Introduction to PIP, Installing Packages via PIP(Numpy, Pandas etc.., Using PythonPackages. **Brief Tour of the Standard Library** - Dates and Times, Data Compression, Turtle Graphics.

a) Create a package named Cars and build three modules in it namely, BMW, Audi and Nissan. Illustrate the modules using class. Finally we create the __init__.py file. This file will be placed inside Cars directory and can be left blank or we can put the initialization code into it.

b) Write a python script to display following shapes using turtle.
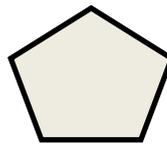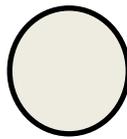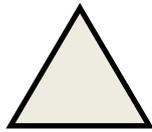
 (12)

Course Outcomes:

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

1. Understand problem solving techniques and their applications
2. Understand the syntax and semantics of python.
3. Demonstrate the use of Python lists and dictionaries.
4. Demonstrate the use of Python File processing, directories.
5. Describe and apply object-oriented programming methodology and Standard Library.

Text Books:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

References:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013.
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers,LLC,2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

Mode of Evaluation: Model Lab Examinations, External Lab End Examination.

Dept. of Computer Science & Engineering

B. Tech I Year I Semester

18PHY201   PHYSICS LABORATORY

Course Prerequisite: Nil

L T P C
0 0 3 1.5

Course Description:
Physics Practical course is meant for making the students to gain practical knowledge to co relate with the theoretical studies. It covers experiments on Principles of Mechanics and Optics, Measurement of Magnetic field and studying Resonance using LCR Circuit.

Course Objectives:
1. Elucidate the concepts of Physics through involvement in the experiment by applying theoretical knowledge.
2. Illustrate the basics of mechanics, waves and opticsto analyze the behavior and characteristics of various materials for its optimum utilization.
3. Develop an ability to apply the knowledge of physics experiments in the later studies.

LIST OF EXPERIMENTS: (Any 10 Out of 12)

1. Spring constant - Coupled Pendulums
2. Study of resonance effect in series and parallel LCRcircuit
3. Determination of radius of curvature of a curved surface - Newton's Rings
4. Wavelength of a laser - Diffraction Grating
5. Wavelength of the spectral lines - Diffraction Grating
6. Magnetic field along the axis of a current carrying coil - Stewart Gees' Apparatus
7. Ferroelectric hysteresis
8. Thickness of a given wire - Wedge Method
9. Dispersive power of prism – Spectrometer
10. Frequency of the tuning fork - Melde's apparatus
11. Energy gap of a material of p-n junction.
12. Width of single slit - Diffraction due to Single Slit

Course Outcomes:
Upon successful completion of this course, the students should be able to:
1. Apply the scientific process in the conduct and reporting of experimental investigations.
2. Understand measurement technology, usage of new instruments and real time applications in engineering studies.
3. Verify the theoretical ideas and concepts covered in lecture by doing hands on in the experiments.
4. Know about the characteristics of various materials in a practical manner and gain knowledge about various optical technique methods.
5. Acquire and interpret experimental data to examine the physical laws.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

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B. Tech. I Year I Semester

18EEE201   ELECTRICAL ENGINEERING LABORATORY

		L	T	P	C
		0	0	3	1.5

Course Prerequisite: Nil

Course Description:

The laboratory facilitates the students to deal with electrical instruments which further strengthen the concepts & operation of various AC & DC circuits, and machines, and their characteristics. The lab also reinforce the concepts discussed in class with a hands-on approach which enable the students to gain significant experience with electrical instruments such as ammeter, voltmeter, digital multimeters, oscilloscopes, tachometer, switches, fuses and power supplies.

Course Objectives:
1. To provide hands on experience in setting up simple electrical circuits (DC and AC).
2. To get exposure to handle different electrical equipment's.
3. To measure various electrical parameters with different measuring instruments.
4. To get hands on experience in operating DC and AC machines.
5. To understand the operation of basic converters and various components of LT Switchgear.

LIST OF LABORATORY EXPERIMENTS/DEMONSTRATIONS

DEMONSTRATIONS:
1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Demonstration of voltage and current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). In star and delta connections.
3. Demonstration of cutout sections of transformer and DC & AC machines.
4. Demonstration of induction machine. Motor operation and generator operation of an induction machine driven at super-synchronous speed.
5. Familiarization of (i) different types of cables/wires and switches and their uses, (ii) different types of fuses & fuse carriers; MCB, ELCB, MCCB their ratings and uses (components of LT switchgear).

EXPERIMENTS:
1. Wiring of a simple circuit for controlling a lamp/fan point.
2. Wiring of a power circuit for controlling an electrical appliance (16A Socket).
3. Verification of Kirchhoff's current and voltage laws (KCL & KVL).
4. Verification of superposition theorem
5. Sinusoidal steady state response of R-L, and R-C circuits (impedance calculation and verification).
6. Measurement of voltage, current and power in a single phase circuit using voltmeter, ammeter and wattmeter. Also, calculate the power factor of the circuit.
7. Measurement of active power for star and delta connected balanced loads (single wattmeter method).
8. Open-circuit and short-circuit test on a single phase transformer.
9. Speed control of separately excited DC motor.
10. Wiring of a power distribution arrangement using single phase MCB distribution board with ELCB, main switch and energy meter (or residential house wiring).

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Course Outcomes:
Upon successful completion of the course, the students are expected to
1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.
5. Get an exposure to the working of various power electronic converters.

Mode of evaluation: Continuous Internal Evaluation and End Semester Examination.

B. Tech I Year II Semester

B. Tech I Year II Semester

18ENG101   PROFESSIONAL ENGLISH
(Common to all branches)

L T P C
2 0 2 3

Course Prerequisite: Nil

Course Description: Communication takes place in many forms, however the major impact and effectiveness is in its professionalism. This course defines, enlightens and enables learners to engage in Professional Communication by addressing all the areas of communication – Listening, Speaking, Reading and Writing. This course also deals with various types of communication – Verbal, Non-verbal, Storytelling, Crucial Conversations, Written Communication, Vocalics, Eye Contact, Posture, etc.

Course Objectives:
This course enables the student to:
1. Engage effectively in a professional environment
2. Understand the intricacies and implications of professional communication
3. Use linguistic skills in any given context
4. Conduct self in a learning environment
5. Be better prepared for employment

UNIT I GRAMMAR & VOCABULARY
Grammar - Tense, Reported Speech, Modals, Conditionals; Vocabulary development - prefixes, suffixes, compound words, synonyms & antonyms.   **(6)**
Practical: Dumb Charade, Giving Direction, Talking about an experiment (Tenses), Running Commentary.   **(6)**

UNIT II READING SKILLS & WRITTEN COMMUNICATION
Reading - short comprehension passages, practice in skimming, scanning and predicting;
Writing- completing sentences, developing hints; Paragraph writing- topic sentence, main ideas, coherence.   **(6)**
Practical: Short Passages – Reading Comprehension, Paragraph Writing, Skit Writing.   **(6)**

UNIT III VERBAL & NON-VERBAL ASPECTS
Verbal - Introducing oneself, exchanging personal information, Using 'Wh'- Questions, asking and answering, yes or no questions- asking about routine actions and expressing opinions;
Non-Verbal – Use of body language, combating nervousness.   **(6)**
Practical: Daily Activities, Role Play, JAM   **(6)**

UNIT IV CONVERSATIONS
Listening-short texts & conversing, formal and informal conversations, short group conversations, speaking about oneself, speaking about one's friend.   **(6)**

Practical: Speaking: formal and informal conversations, short group conversations, speaking about oneself, speaking about one's friend, Character Portrayal.
Listening: Listening/watching interviews, conversations, documentaries, etc.; Listening to lectures ,discussions from TV/Radio/Podcast.   **(6)**

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UNIT V BUSINESS ENVIRONMENT & ETIQUETTES

Sharing information of a personal kind - greeting & taking leave; Writing e-mails, memos, reports, etc. **(6)**

Practical: Mock Interview, Oral Presentation **(6)**

Course Outcomes: At the end of the course, learners will be able to
1. Read articles and understand professional communication
2. Participate effectively in informal conversations
3. Introduce themselves and their friends and express opinions in English
4. Comprehend conversations and short talks delivered in English
5. Write short essays of a general kind and personal letters and emails in English.

Suggested Reading/Textbooks:
1. Guy Brook Hart & Norman Whitby; *Cambridge English-Business Benchmark: Pre-Intermediate to Intermediate*; Published by: Cambridge University Press.
2. Adrian Doff, Craig Thaine, Herbert Puchta, et al; *Empower: Intermediate (B1+)*; Published by: Cambridge University Press.

References:
1. AJ Thomson & AV Martinet; *A Practical English Grammar*; Oxford University Press, 2015.
2. Raymond Murphy; *English Grammar in Use with CD*; Cambridge University Press, 2013.
3. K.S. Yadurajan; *Modern English Grammar*; Oxford University Press, 2014.
4. William Strunk Jr; *The Elements of Style*; ITHACA, N.Y.; W.P. HUMPHREY, 2006.
5. Joseph Devlin; *How to Speak and Write Correctly*; ITHACA, N.Y.; W.P. HUMPHREY, 2006
6. Anjana Agarwal; *Powerful Vocabulary Builder*; New Age Publishers, 2011.
7. *Writing Tutor*; Advanced English Learners' Dictionary; Oxford University Press, 2012.
8. www.cambridgeenglish.org/in/
9. https://learnenglish.britishcouncil.org/en/english-grammar
10. https://www.rong-chang.com/

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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B.Tech. I Year II Semester

18MAT110   LINEAR ALGEBRA
(Common to CSE,CSIT & CST)

Course Prerequisite: 18MAT101

L	T	P	C
3	1	0	4

Course Description:
Linear algebra is one of the most important subjects in the study of engineering because of its widespread applications in electrical, communications and computer science. The objective of this course is to give a presentation of basic concepts of linear algebra to illustrate its power and utility through applications to computer science and engineering.

Course Objectives:
1. Understanding basic concepts of linear algebra (systems of linear equations, matrix calculus, vectors and basic vector operations).
2. Learn about vector spaces and sub spaces.
3. To become proficiency in solving computational problems of linear algebra.
4. To understand the axiomatic structure of modern mathematics and learn to construct simple proof.
5. Learn to solve Engineering problem.

UNIT I :   LINEAR EQUATIONS AND MATRICES
System of linear equations – Gaussian elimination/Jordan – block matrices –finding inverse of matrices – elementary matrices – permutation matrix – LDU factorization – applications to cryptography and electrical network   **(12)**

UNIT II: VECTOR SPACE
The n-space R^n and vector space – subspaces – bases – linear combination– span linearly dependent – independent – dimensions – finite dimensional – Row and column spaces – Rank and nullity – Bases for subspace – invertibility – application in interpolation.   **(12)**

UNIT III :   LINEAR TRANSFORMATIONS
Basic Properties of Linear transformations – invertible linear transformation – matrices of linear transformations.   **(12)**

UNIT IV: VECTOR SPACE OF LINEAR TRANSFORMATIONS
Vector space of linear transformations – change of bases – similarity – application to computer graphics.   **(12)**

UNIT V: INNER PRODUCT SPACES
Dot Products and Inner products–the lengths and angles of vectors–matrix representations of inner products–Gram-Schmidt orthogonalization–orthogonal projections–relations of fundamental subspaces–orthogonal matrices and isometrics–applications to least square solutions.   **(12)**

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Course Outcomes:

This course meets the following student outcomes:
1. Solve systems of linear equations using Gaussian elimination and matrix inversion.
2. Demonstrate understanding of the concepts of vector space and subspace, linear independence, span, and basis.
3. Apply principles of matrix algebra to linear transformations.
4. Apply principles of vector space to linear transformations.
5. Demonstrate understanding of inner products and associated norms.

Text Book:

1. Jin Ho Kwak and Sungpyo Hong, "Linear Algebra", Second edition, Birkhaüser, 2004

Reference Books:

1. Stephen Andrilli and David Hecher, Elementary Linear Algebra, 3rd Edition, Academic Press(2006)
2. Charles W. Curtis, Linear Algebra, Springer (2004)
3. Howard Anton and Robert C Busby, Contemporary linear algebra, John Wiley (2003).
4. Gilbert Strang, Introduction to Linear Algebra.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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B. Tech I Year II Semester

18CHE101   ENGINEERING CHEMISTRY

L T P C
3 0 0 3

Course Pre-requisite: Basic Chemistry at Intermediate or equivalent level.

Course Description:
Deals with the basic principles of various branches of chemistry like physical, organic, analytical and nanomaterial chemistry.

Course Objectives:
1. Students will understand, analyse and determine the impurities present in the water.
2. Appreciate the synthetic organic reactions used in daily life
3. Learn the principles of spectroscopies to analyse them.
4. Value the basic concepts of thermodynamics and electrochemistry.
5. Be exposed to the importance of nano and engineering materials used in their daily life.

UNIT I :   IMPURITIES PRESENT IN WATER AND WATER TREATMENT
Impurities in water (BIS and WHO standards), Hardness of water, determination of hardness by EDTA Method (numerical problems), Disadvantages (industry level) of using hard water, Alkalinity of water and its importance, Chlorides, Softening of water by Reverse Osmosis method. Water treatment for civic applications: coagulation, sedimentation, filtration, sterilization - chlorination and ozonization. Concept of break point chlorination.   **(9)**

UNIT II: PERIODIC PROPERTIES AND ORGANIC REACTIONS
Electronic configurations, atomic and ionic sizes, ionization energies, oxidation states, molecular geometries.
Introduction to substitution, addition, elimination, oxidation and reduction reactions.   **(9)**

UNIT III: SPECTROSCOPY
Basic principle and applications of Electronic, Fluorescence, Vibrational and Rotational spectroscopy. Magnetic resonance imaging.   **(9)**

UNIT IV: FREE ENERGY IN CHEMICAL EQUILIBRIA
Thermodynamics: Systems, State Functions, Thermodynamic functions: Work, Energy, Entropy and Free energy. Estimations of entropy in various processes and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Batteries (Pb-acid, Li-ion) and Fuel-Cells (H_2-O_2). Corrosion: Factors influencing Corrosion, Protective coatings.   **(9)**

UNIT V: ENGINEERING   MATERIALS,   NANOSCIENCE   & NANOTECHNOLOGY
Cement Materials - Lime, Cement, Gypsum. Lubricants – definition, classification, Extreme pressure lubrication mechanism, important properties – viscosity, viscosity index, saponification number, flash point and pour point. Nanomaterials: Introduction, Classes/Types, Structure-Property relationship; Chemical synthesis of nanomaterials: sol-gel, Hydrothermal and Chemical Vapor Deposition method, Characterization by powder XRD (Scherrer's equation), SEM. Applications of nanomaterials – Catalysis, Electronics & Telecommunication, Medicines, Energy and Environmental Sciences.   **(9)**

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Course Outcomes:
At the end of the course, the students will be able to
1. Analyze and determine the impurities in water such as hardness, alkalinity for sustainable development.
2. Prepare organic compounds/polymers for environmental, safety and society need.
3. Comprehend the principles and applications of spectroscopies
4. Apply the concept of free energy in thermodynamics, electrochemistry for solving the problems evolve in the engineering processes.
5. Acquire spotlight to the nanomaterials and basic engineering materials used in academics, industry and daily life.

Text Books:

1. "Atkins' Physical Chemistry", P.W. Atkins & Julio de Paula, Ninth edition (Oxford University Press, Oxford 2010).
2. Fundamentals of Molecular Spectroscopy, by C. N. Banwell, Fourth Edition, (Tata McGraw Hill, 2008).
3. Engineering Chemistry, Dr. S. S. Dara and Dr. S. S. Umare, (S. Chand & Company Ltd., 2013).
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan.

Reference Books:

1. 'Physical Chemistry', D. W. Ball, First Edition, India Edition (Thomson, 2007).
2. Perry's Chemical Engineers' Handbook, Perry and Green, 9th Edition, Section 2, McGraw Hill
3. Engineering Chemistry, Dr. Suba Ramesh and others, 1st Edition, Wiley India, 2011.
4. Engineering chemistry, K. N Jayaveera, G. V. Subba Reddy and C. Rama Chandraiah, 1st Edition, McGraw Hill education 2013.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

B. Tech. I Year II Semester

18CSE102   C PROGRAMMING AND DATA STRUCTURES

Course Prerequisite: 18CSE101

L	T	P	C
3	0	0	3

Course Description:
This course includes C program basics, control structures, arrays, files, pointers and data structures.

Course Objectives:
1. To make the student understand problem solving techniques and their applications
2. Students will be able to understand the syntax and semantics of C programming language
3. Develop algorithms for manipulating linked lists, stacks, queues, searching and sorting.

UNIT I C PROGRAMMING
Structure of C Program, C Tokens: Variables, Data types, Constants, Identifiers, key words and Operators, Expressions.
Control Structures: Conditional Statements (Simple if, if-else, Nested -if-else, Switch). Iterative Statements (for, While, Do-While), Jump Statements (break, Continue).   **(9)**

UNIT II FUNCTIONS & ARRAY
Functions Introduction, User defined function, accessing a function, Function prototypes, Recursion, storage classes **Arrays**: Defining an array, processing an array, one dimensional arrays, two dimensional arrays. **Searching:** Linear and Binary search **Sorting:** Bubble Sort and Insertion Sort.   **(9)**

UNIT III POINTERS, STRUCTURES
Pointers: Fundamentals of pointer, Pointer Declarations, Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference. Dynamic memory allocation. **Structures:** Defining a structure, Processing a structure.   **(9)**

UNIT IV STACK AND QUEUE
Classification of Data Structure, **Stack and Queues:** stack, stack operations, stack implementations using arrays. Queue, queue operations, queue implementations using array, types of queues, applications of stack and queue.   **(9)**

UNIT V STRINGS & FILES
Declaring and Defining a string, Initialization of strings, Strings Library functions
Files: File Definition, Opening and closing a data file, Reading and Writing a data file, Files I/O Functions.   **(9)**

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Understand problem solving techniques for a wide-range of problems.
2. Design and implement applications using functions, arrays, searching and sorting techniques.
3. Design and implement applications using pointers, structure and list.
4. Choose appropriate data structure depending on the problem to be solved.
5. Design and implement applications using Strings, Pointers and File processing.

Text Books:

1. The C Programming Language, Kernighan and Ritchie, 2 nd Edition, Prentice Hall, India 1988.
2. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms, Pearson Education, New Delhi, 2006.

References:

1. Programming in ANSI C, E. Balagurusamy, Sixth Edition, Tata Mc-Graw Hill Publishing Co.Ltd.-New Delhi
2. Problem Solving & Program Design in C, Hanly, Jeri R and Elliot. B Koffman, Pearson Education,5th edition, 20007.
3. K. N. King ,"C Programming ": A Modern Approach, 2nd Edition 2nd Edition
4. Byron Gottfried , Jitender Chhabra , Programming with C (Schaum's Outlines Series)

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech I Year II Semester

18ME101   ENGINEERING GRAPHICS

Course Prerequisite: None

	L	T	P	C
	2	0	3	3.5

Course Description:
Introduction to AutoCAD commands, simple drawings, orthographic projections, projection of points, lines, planes; auxiliary projections; projections and sections of solids; development and intersection of surfaces; isometric projections.

Course Objectives:
1. Engineering Graphics is the primary medium for development and communicating design concepts.
2. Through this course the students are trained in Engineering Graphics concepts with the use of AutoCAD.
3. The latest ISI code of practice is followed while preparing the drawings using AutoCAD.
4. Computerized drawing is an upcoming technology and provides accurate and easily modifiable graphics entities.
5. Storage and Retrieval of Drawings is also very easy and it takes very less time to prepare the drawings. Also enhances the creativity.

UNIT I: INTRODUCTION TO AUTO CAD
Introduction to AutoCAD commands, simple drawings, Orthographic Projections-Theory, techniques, first angle projections and third angle projections.   **(10)**

UNIT II: PROJECTIONS OF POINTS & LINES
Projections of points: Positions, notation system and projections.
Projections of lines: positions, terms used, different cases, traces of lines and finding true lengths, auxiliary projections.   **(10)**

UNIT III: PROJECTIONS OF PLANES & SOLIDS
Projections of planes: positions, terms used, different cases and projections procedure. Projections of Solids: Projections of Regular Solids inclined to one planes.   **(10)**

UNIT IV: SECTIONS AND DEVELOPMENTS OF SOLIDS
Section Planes and Sectional View of Right Regular Solids-Prism, cylinder. True shapes of the sections. Development of Surfaces of Right Regular Solids-Prism, Cylinder and their Sectional Parts.   **(10)**

UNIT V: INTERSECTIONS & ISOMETRIC PROJECTIONS
Intersections of surfaces of solids: Intersection between: Line-plane, Plane-plane, line-solid, solid-solid. **Isometric Projections**: Theory of isometric drawing, construction of isometric projection from orthographic.   **(10)**

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Course Outcomes:
The students after completing the course will be able to:
1. Identify various commands in AutoCAD and their usage for engineering graphics
2. Draw the projections of points and straight lines with AutoCAD
3. Draw the projections of the planes and sections of solids.
4. Sketch the intersections of surfaces and developments of solids
5. Draw the conversion of the orthographic views to isometric views and vice versa.

Text Book:

1. D.M. Kulkarni, A.P. Rastogi and A.M. Sarkar., Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi 2009.

References:

1. Dhananjay A Jolhe, Engineering Drawing: with an introduction to AutoCAD, Tata McGraw Hill, 2008
2. Warren J. Luzadder& Jon M. Duff Fundamentals of Engineering Drawing, 11th edition, Prentice Hall of India, New Delhi.ss

Mode of Evaluation: Continuous Internal Evaluation, Mid Term Tests and End Semester Examination

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B. Tech I Year II Semester

18CHE201   CHEMISTRY LABORATORY

	L	T	P	C
	0	0	3	1.5

Course Prerequisites: Intermediate

Course Description:
It deals with basic principles of volumetric and instrumental analytical methods.

Course Objective:
This Engineering Chemistry Laboratory is common to all branches of I Year B Tech. At the end of the course the student is expected to Students will learn to estimate the chemical impurities present in water such as hardness, alkalinity, chlorine, etc.
1. Understand and experience the synthetic methods for the preparation of a polymer / inorganic (or) organic compounds.
2. Be trained to use the instruments for to practically understand concepts of electrochemistry.
3. Bridge theoretical concepts and their practical engineering applications, thus highlighting the role of chemistry in engineering
4. Learn and understand the practical implementation of fundamental concepts.

CHOICE OF 10 EXPERIMENTS FROM THE FOLLOWING

1. Estimation of total, permanent and temporary hardness of water by EDTA method.

2. Estimation of Chloride content in bleaching powder.

3. Estimation of alkalinity of water sample.

4. Determination of rate constant of a chemical reaction/process

5. Adsorption of acetic acid by charcoal.

6. Determination of rate of corrosion by colorimetry (Galvanized steel and $CuSO_4$).

7. Synthesis of a polymer and determination of molecular weight by measuring viscosity.

8. Saponification/acid value of an oil.

9. Synthesis of an inorganic complex.

10. Synthesis of a simple organic compound / Preparation of Thiokol Rubber.

11. Determination of strength of an acid Pb-Acid battery by conductometric titration (Neutralisation Titration).

12. Conductometric titration of $BaCl_2$ Vs Na_2SO_4 (Precipitation Titration).

13. Dissociation constant of weak electrolyte by Conductometry.

14. Determination of percentage of Iron in Cement sample by colorimetry.

15. Estimation of ferrous ion by potentiometric titration (Redox Titration).

Course Outcomes:

After the completion of the Engineering Chemistry Laboratory experiments, students will be able to

1. Develop and perform analytical chemistry techniques to address the water related problems (for e.g., hardness, alkalinity, dissolved oxygen present in water) technically.
2. Synthesize and analyse the given chemical compound / material for engineering applications towards the needs of the society, environment, etc.
3. Procure practical skills to handle spectroscopic methods to understand the rate of corrosion, colour and much more topics applicable in industry.
4. Operate various instruments for the analysis of materials and produce accurate results in a given time frame.
5. Think innovatively and improve the creative skills that are essential for solving engineering problems.

Text Books:

1. Engineering Chemistry Lab Manual, Dept. of Chemistry, Madanapalle Institute of Technology and Science, Madanapalle – 517325, Chittoor Dist., Andhra Pradesh, India.
2. "Vogel's Textbook of Qualitative Chemical Analysis", Arthur Israel Vogel, Prentice Hall, 2000.

Mode of evaluation: Continuous Internal Evaluation and End Semester Examination.

B. Tech. I Year II Semester

18CSE201   C PROGRAMMING AND DATA STRUCTURES LABORATORY

Course Prerequisite: 18CSE101

L	T	P	C
0	0	3	1.5

Course Description:
This course includes C program basics, control structures, arrays, files, pointers and data structures.

Course Objectives:
1. To make the student understand problem solving techniques and their applications
2. Students will be able to understand the syntax and semantics of C programming language
3. Develop algorithms for manipulating linked lists, stacks, queues, searching and sorting.

LIST OF EXPERIMENTS

1.   a) Write a C program to swap the two numbers.
        b) Write a C Program to find the eligibility of admission for a Professional course based on
            the following criteria:
                Marks in Maths >=65
                Marks in Physics >=55
                Marks in Chemistry>=50
                     OR
                Total in all three subject >=180

2.   a) Write a C program to compute the factorial of a given number.
        b) Write a program that reads numbers which are in the range 0 to 100, till it encounters -1.

        Print the sum of all the integers that you have read before you encountered -1

3.   a) Given three points (x1, y1), (x2, y2) and (x3, y3), write a program to check if all the three
        points fall on one straight line.
        b) The digital root (also called repeated digital sum) of a number is a single digit value obtained by an iterative process of summing digits. Digital sum of 65536 is 7, because 6+5+5+3+6=25 and 2+5 = 7.Write a program that takes an integer as input and prints its digital root.

4.   a) Write a C program to find the series of prime numbers in the given range.
        b) Write a C program to generate Fibonacci numbers in the given range.

5.   a) Write a c program to check whether a given number is a perfect number or not. (Perfect number is a positive number which sum of all positive divisors excluding that number is equal to that number. For example 6 is perfect number since divisor of 6 are 1, 2 and 3. Sum of its divisor is 1 + 2+ 3 = 6)
        b) Write a C program to find Factorial, GCD, Fibonacci, (Using recursion)

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6.   Write a C program to find sum of digits, base conversions, reversal of numbers.**(using functions).**

7.   Your program should take as input: dimension of a square matrix N, two matrices of size N x N with integer values, and one operator symbol (+, - ,*). It must perform the Corresponding operation given below
      a) Matrix Addition   b) Matrix Subtraction c) Matrix Multiplication

8.   One needs to first input a set of N number of ALPHABETIC Strings each representing a name of a student in an array studname [N]. Assume each string can be Max. 40 Characters long. subsequently, one needs to input Marks obtained by those students in another array marks [N] Assume that studname [I] i.e. ith student in the list of student names has obtained Marks [I] in the Marks List. You need to find out and print the Max Marks obtained by a student and also print the name of the student who has obtained this marks.

9.   Implement the following searching techniques
      a) Linear Search b) Binary Search

10.   a) Bubble sort is a sorting algorithm that works by repeatedly stepping through lists that need to be sorted, comparing each pair of adjacent items and swapping them if they are in the wrong order. This passing procedure is repeated until no swaps are required, indicating that the list is sorted. Bubble sort gets its name because smaller elements bubble toward the top of the list. Consider an array of size 10. It will be filled it by reading 10 integers. The final output will be sorted output in Ascending Order.
      b) Insertion sort is a sorting algorithm in which the elements are transferred one at a time to the right position. Here the first element in the array is considered as sorted, even if it is an unsorted array. Then each element in the array is checked with the previous elements, resulting in a growing sorted output list. With each iteration, the sorting algorithm removes one element at a time and finds the appropriate location within the sorted array and inserts it there. The iteration continues until the whole list is sorted. First an array of size 10 will be taken. We will fill it by reading 10 integers. The final output will be sorted output in Ascending Order.

11   a) Write a C program to swap two integers using pointers. You have to write a swap function that will accept the address of two integer and swap their values
      b) Write a program in C to add two numbers using pointers. You have to write the fsum() function which accepts the address of two variables and returns the sum of their values to the main function.

12.   Write a C program to compute internal marks of students for five different subjects using Structures.

13.   Implement the following Data Structures
      a) Stack ADT b) queue ADT c) Circular queue ADT

14.   Write a C program to implement all string operations (string length, string copy, string compare, string concatenation and string reverse) without using standard string library functions.
      b) Write a C program to count total number of vowel or consonant in a string

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15.   Write a C program to copy the file contents from one file to another file(pass file names as Command line arguments).

Course Outcomes:

After completing this course the students should be able to

1. Understand problem solving techniques for a wide-range of problems.
2. Design and implement applications using functions and arrays.
3. Design and implement applications using Strings, Pointers and File processing.
4. Choose appropriate data structure depending on the problem to be solved.
5. Use appropriate searching and sorting technique to suit the application.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

B. Tech. I Year II Semester

18CSE202   ENGINEERING AND IT WORKSHOP

Course Prerequisite: None

L	T	P	C
0	0	3	1.5

Course Description:
This course will provide students with a hands-on experience on various basic engineering practices CSE and presenting the final product design.

Course Objectives:
1. Introduction to the use of Tools and Machinery in foundry, forging, tinsmith, carpentry, welding, fitting, working, fabrication of plastic components, fabrication of polymer composite materials, simple machine turning and wood turning, basic electrical connections
2. Introduction of basic electrical engineering
3. Fabrication of final product design at end of the semester

LIST OF EXPERIMENTS
1. Carpentry (Cross half lap Joint and Miter Joint)
2. Fitting (Square and'V' fit)
3. Sheet Metal - Tin smithy (Square tray)
4. Foundry (Solid and Split pattern)
5. Welding (Arc and Gas welding) – SingleV Butt Joint, T-fillet Joint
6. Plastic fabrication (Pen Stand)
7. Metrology (Internal and External dimension)
8. Introduction of Power Tools and CNC(Demo Only)
9. Introduction to 3D Printing (Demo Only)

Course Outcomes:
On successful completion of this course, the student will be able to
1. Fabricate carpentry components with suitable joint and pipe connections including plumbing works.
2. Practice the welding equipment to join the structures
3. Effective the basic machining operations
4. Create the models using sheet metal and plastic works.
5. Illustrate the operations of foundry, fitting and smithy
6. Fabrication product in composite material and product in plastic material
7. Conduct experiment basic electrical wire connection
8. Design and fabrication of final product design

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

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Suggested Text/Reference Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – 1" Pearson Education, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998. (v) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

IT WORKSHOP

Course Prerequisite: None

Course Description:
This course helps the students to understand the basic components of a computer, installation of operating systems, working on productivity tools Word power, point excel. Also it gives a basic understanding of using Google tools and various emails setting in Gmail.

Course Objectives:
1. The course focuses on enhancing student knowledge in computer peripherals and assembling.
2. To install operating system on computers and create new email account.
3. To understand basic software like WinRAR, WinZip, PDF readers and web browser.
4. To provide technical training to the students on Google tools like forms, calendar, drive, translate and Photo.
5. To make the students to install software like JDK, Turbo C compiler ,and .net

LIST OF EXPERIMENT

1. Components of Computer & Assembling a Computer:
Learning about the different parts of the computer and its advancement
- Processor
- Memory – Types
- Motherboard
- Peripheral interfaces – I/O devices
- Learn about the proper connectivity among the devices inside the PC
- Assembling the different parts of the computer inside the cabinet

2. Install Operating System
- Partition the disk drive based on the capacity and the OS to be installed using utility tools
- Install Windows
- Install Linux or Ubuntu - use command line installation

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3. Basic PC Troubleshooting
- Awareness on the possible issues in a computer
- Troubleshooting the problems using the available tools
- Removal and repair of existing software
- Identification of suitable Device driver for Hardware Devices.

4. Learning Basic Software:
- Installation of Productivity tools like WinRAR, WinZip, and PDF Reader.
- Installation of Image Editor and Web browsers.
- Basic Software installation in Linux based system.
- Connect the Printer and Scanner Devices perform printing and scanning operation.

5. Productivity Tools (Office 365):
- Generate, manipulate, search, aligning content using MS Word.
- Creation of Excel sheet with various column and rows applying various Excel formulas.
- Create Presentation and Visualization – graphs, charts, 2D, 3D.
- Create a database template using MS Access.
- Draw flowchart using the Drawing tools – Google Quick draw,sketchup,

6. Introduction to Google Tools
- Design a Google form and collect a response date among students using Google Form.
- Schedule One day of your activities using Google Calendar.
- Store and Retrieve Date from cloud storage using Google Drive.
- Translate the English language sentence to Telugu sentence using Google Translate
- Organizing photo and editing photo using Google Photos.

7. Exploring Email
- Creation, Composing and Sending the E-mail.
- Use High Priority setting to categories the mail.
- Create a Folder in different Categories and move the received mail to Folder.
- Unsubscribing unwanted emails
- Enable settings for automatic reply

Add_on content:
- Networking Commands: ping, ssh, ifconfig, scp, ipconfig, traceroute, nslookup, getmac

Technical Stack: Windows 7 / UbantuOs – Winrar, Winzip,PDF reader, Office Package.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Attain complete knowledge of a computer hardware
2. Install Operating Systems and troubleshooting using Utility software.
3. Able to do document task through MS office .
4. Attain technically strong usage of Google Tools and Email handling .
5. Able to install basic computer engineering software.

Mode of Evaluation: Continuous Internal Evaluation, End Semester Practical Examination.

B. Tech II Year I Semester

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B. Tech. II Year I Semester

18HUM102   PRINCIPLES OF MANAGEMENT

L T P C
3 0 0 3

Course Prerequisite: Nil

Course Description: The course provides students with a practical and concrete explanation of management concepts and techniques they will need to manage today's and tomorrow's organizations. The course will follow the "planning, organizing, leading, controlling" format of managerial functions while putting together many small pictures presented by individual modules into one bigger meaningful picture in which managerial knowledge would apply. At the end of the course students are expected to understand role of components of bigger picture and interactions between and among components.

Course Objectives:
The course is intended to:
1. Describe the concepts of Management theories, approaches and their application with organizations around us;
2. Know the concepts of planning and management;
3. Explain the basic concepts of organization, types and structure of organization;
4. Make the students know leading, good communication, theories of motivation; and
5. Explain about controlling, managing operations and functional areas of marketing and financial management.

UNIT I: INTRODUCTION:
Introduction to Management and Organizations- Management definition, skills, roles, goals and functions of a manager, organization, value of studying management - Managing in a Global Environment- Global Perspective, Understanding global environment, - Social Responsibility and Managerial Ethics.   **(9)**

UNIT II: PLANNING
Decision-making process, Types of decisions and decision making conditions, styles, biases and errors, Planning: Meaning of planning, establishing goals and developing plans, contemporary issues in planning.
Strategic Management-Importance of strategic management, strategic management process, types of organizational strategies, current issues in strategic management.   **(9)**

UNIT III: ORGANIZING
Organizational structures - HRM process, Contemporary issues in HRM – Departmentation – decentralization – delegation of Authority - Managing Change and Innovations.   **(9)**

UNIT IV: COMMUNICATION, MOTIVATION AND LEADING
Functions of communication, Inter-personal communication, Barriers of Communication – Understanding Information Technology- Motivation**:** Theories of motivation and current issues in motivation. Leading: Leaders and Leadership, Leadership theories - Leadership issues in twenty first century.   **(9)**

UNIT V: CONTROLLING

Process of control – Types of Control - feed-forward, concurrent and feedback controls, contemporary issues in control – Strategic role of Operations Management - Value Chain Management **(9)**

Course Outcomes:

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

1. Understand the various concepts, approaches and theories of management in the real situation,
2. Analyze the concept of planning and apply on the decisions in strategic management,
3. Compare organization structure designs and chart diligently with theoretical learning concepts,
4. Apply communication and theories of motivation in an organization, and
5. Understand various tools for controlling organizational performance and apply to achieve the corporate objectives.

Text Book:

1. Stephen P. Robbins, Mary Coulter "Management", Pearson Education, 2010, 10th edition.

References:

1. Gary Dessler, "Management", Prentice Hall, Inc., 1998, 1st edition.
2. Daft Richard L. 'Management' Thomson South Western, 5th edition.
3. Koontz H. and Weihrich H., "Essentials of Management", McGraw Hill Int. ed., 2004, 6th edition.

Mode of Evaluation: Assignments, Mid Term Tests, External End Examinations.

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B. Tech. II Year I Semester

<p align="center">**18MAT111   PROBABILITY MODELS AND STATISTICS**</p>
<p align="center">**(Common to CSE,CSIT & CST)**</p>

Course prerequisite: 18MAT101

L T P C
3 1 0 4

Course description:
Probability, conditional probability, Bayes theorem, random variables, mathematical expectation, discrete and continuous distributions, joint distributions, Markov chains, Poisson process; queuing models, data analysis and testing of hypothesis.

Course objectives:
1. Introduce the probability concepts through sets, random variables and univariate probability distributions.
2. Study the joint probability distributions and introduce stochastic processes.
3. Understand the idea of Markov chains and Poisson process.
4. Analyze the queuing systems and data methods.
5. Apply statistical inference involving confidence intervals and hypothesis testing in engineering problems.

UNIT I: PROBABILITY AND RANDOM VARIABLES.

Introduction to probability theory, discrete random variables, continuous random variables and expectation of a random variable.   **(12)**

UNIT II: JOINT DISTRIBUTIONS AND STOCHASTIC PROCESSES.

Jointly distributed random variables, moment generating functions, conditional probability and conditional expectation. Introduction to stochastic processes.   **(12)**

UNIT III: MARKOV CHAINS AND POISSON PROCESS
Introduction to Markov chains, Chapman–Kolmogorov equations, classification of states, limiting probabilities, the Gambler ruin problem. Definition of the Poisson process, inter-arrival and waiting time distributions, properties of Poisson process.   **(12)**

UNIT IV: QUEUING THEORY AND DATA ANALYSIS.

Queueing theory: Introduction, preliminaries- cost equations - steady-state probabilities, exponential models - A single-server exponential queueing system–single server exponential queueing system having finite capacity -birth and death queueing models.
A shoe shine shop -A queueing system with bulk service. Moments, skewness, kurtosis, correlation and linear regression.   **(12)**

UNIT V: **TESTS OF HYPOTHESIS**.
Sampling distribution, tests of significance: Null and alternative hypothesis, errors in sampling, critical region and level of significance. Test of significance for large samples-single and difference of proportions, single and difference of means. Small sample tests: *t*- test for single mean, paired and difference of means, chi-square test for goodness of fit and test for ratio of variances.   **(12)**

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Text Books:

1. S.M. Ross, Introduction to Probability Models, 10thedition, Academic press.
2. B.S. Grewal,Higher Engineering Mathematics, 43rdedition (2014), Khanna publishers.

Reference Books:

1. A M Yagolam, I.M. Yagolam Probability and Information, Hindustan Pub. Corp (1983)
2. J. Jacob, P. Protter, Probability Essentials, Springer Verlag, 2ndedition (2013)
3. Blake, An Introduction to Applied Probability, John Wiley (2011)

Course outcomes:
After taking this course, the students should be able to
1. Understand the concepts of probability, univariate distributions and their importance.
2. Solve the joint distributions and stochastic processes evolving in time or space processes.
3. Avail the knowledge of Markov chains and Poisson process for analysis of random graphs.
4. Analyze the queuing systems and data.
5. Apply hypothesis testing to make decision in practical engineering problems.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

B. Tech. II Year I Semester

18CSE103   DATA STRUCTURES

Course Prerequisite: 18CSE101, 18CSE102

L T P C
3 0 0 3

Course Description:
This course is aimed to provide basic understanding of different data structures and algorithms. This course covers introduction to algorithms, basic data structures like arrays, linked lists, stacks, queues, various types of trees, graphs and their implementation.

Course Objectives:
1. To develop skills to design and analyze linear and nonlinear data structures.
2. Develop algorithms for manipulating linked lists, stacks, queues, trees and graphs.
3**.** Develop recursive algorithms as they apply to trees and graphs.

UNIT I: LIST AND STACK
Introduction: Algorithm specification, growth of functions, Asymptotic notations.
List: Singly Linked List and Its Operations, Doubly Linked List and its operations, Circular Lists.
Stack: Array representations, operations on stack. Applications of Stack. **(9)**

UNIT II: QUEUE
Queue: array and linked list representations, operations on queue, applications of queue, Circular queue, insertion and deletion, Dequeue. Priority queue: Definition and Applications, implementation using Heaps, Max Heap, Min Heap, Insertion into a Max Heap, Deletion from a Max Heap, Heap Sort. **(9)**

UNIT III: SORTING & HASHING
Sorting: Selection Sort, Merge Sort, Quick Sort, Radix Sort
Hashing: Dictionaries, HashTable Representation, Static and Dynamic Hashing, Collision Resolution methods-Open Addressing, Separate Chaining, Double hashing. **(9)**

UNIT IV: TREE
Tree: Introduction, Terminology, Binary Tree, representation, Binary Tree Traversals. **Binary Search Tree:** Properties, Insertion, Deletion, and Searching operations. **(9)**

UNIT V: BALANCE SEARCH TREES AND GRAPHS
Balanced Search Trees: AVL Trees, Red Black Trees, and Splay Trees. **Graphs:** Terminology, Representation, operations, Graph Traversal techniques. **(9)**

Course Outcomes:
At the end of the course, students will be able to:
   1. Design algorithms to implement various data structures.
   2. Choose the appropriate queue to solve real world problems
   3. Categorizes various sorting and hashing techniques.
   4. Implement the various operations of Tree data structure.
   5. Develop applications using Tree and Graph data structures.

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Text Book:

1. Fundamentals of Data Structures using C++, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, Silicon Press, Second Edition. 2007.

References:
1. Data Structures and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffery D.Ulman.Pearson; 1st edition.
2. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
3. Data Structures, Algorithms and Applications in C++ by Sartaj Sahni, McGraw Hill, NY, Second Edition.
4. URL: http://nptel.ac.in/courses/106102064/
5. URL: https://swayam.gov.in/nd2_cec19_cs04
6. URL: https://swayam.gov.in/nd1_noc19_cs40

Mode of Evaluation: Assignments, Mid Term Tests, External End Examinations

Dept. of Computer Science & Engineering

B. Tech. II Year I Semester

18CSE104   OBJECT ORIENTED PROGRAMMING USING JAVA

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

Course Prerequisite: 18CSE101,18CSE102

Course Description:

Basics of Object-Oriented Programming - objects, classes, polymorphism, inheritance, static and dynamic binding. Object Oriented Programming using Java-classes, interfaces, inheritance, polymorphism, method dispatch, features for encapsulation and modularity.

Course Objectives:
1. Understand object-oriented programming concepts, and apply them in solving problems.
2. Learn the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
3. To Introduce the implementation of packages and interfaces
4. Learn the concepts of exception handling and multithreading.
5. Learn the design of Graphical User Interface using applets and swing controls.

Unit – I : INTRODUCTION TO OOPS CONCEPTS AND CLASSES
Introduction to Object Oriented Programming, Java buzzwords, Java Programming Basics, Sample programs, Data types and operators, Control statements. **Classes:** Classes, Objects, Methods, Constructors, this and static keywords, Method and Constructor Overloading, Access modifiers, Polymorphism **Arrays:** One Dimensional and multi dimensional arrays.   **(9)**

Unit – II : STRINGS, INHERITANCE, **INTERFACES, AND PACKAGES**
Strings: Strings, String Handling **Inheritance**: Basics, Usage of Super, Multi level hierarchy, Method overriding, Abstract class, Final keyword. **Packages:** Defining, Finding and Importing packages, Member Access. **Interfaces:** Creating, Implementing, Using, Extending, and Nesting of interfaces.   **(9)**

UNIT III: EXCEPTION HANDLING &MULTI-THREADING
Exception Handling: Fundamentals, Types, Multiple catch clauses, Nested try blocks, Thrown Class, Using Finally and Throws, Built-in exceptions, User-defined exceptions.
Multi-threading: Thread Class, Runnable interface, creating multiple threads, life cycle of thread, thread properties, synchronization, thread communication, suspending, resuming and stopping threads.   **(9)**

Unit – IV : I/O STREAMS AND COLLECTION FRAME WORK CLASSES
I/O Streams: Byte Stream Classes and Character Stream Classes. **Collection Frame work :** Hierarchy of collection framework, ArrayList, LinkedList,Vector, Stack, Queue, Priority Queue, Hash Set, Linked Hash Set, Tree Set.   **(9)**

UNIT V: SWINGS
Swing – Introduction, limitations of AWT, MVC architecture, components, containers, Event Handling- Handling mouse and keyboard events, Exploring Swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.   **(9)**

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Course Outcomes:
At the end of the course, students will be able to:
1. Choose object-oriented programming concepts for problem solving.
2. Create and use packages and interfaces.
3. Develop multithreaded applications with synchronization.
4. Provide computed based solutions by using java collection framework and I/O classes
5. Design GUI based applications

Text Book:

1. Java The Complete Reference, Herbert Schildt, MC GRAW HILL Education, 9th Edition, 2016.

References:

1. "Java Fundamentals - A Comprehensive Introduction", Herbert Schildt and Dale Skrien, Special Indian Edition, McGrawHill, 2013.
2. "Java – How to Program", Paul Deitel, Harvey Deitel, PHI.

3. "Thinking in Java", Bruce Eckel, Pearson Education.
4. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.
5. "A Programmers Guide to Java SCJP", Third Edition, Mughal, Rasmussen, Pearson.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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B. Tech. II Year I Semester

18CSE105   DATABASE MANAGEMENT SYSTEMS

	L	T	P	C
	2	1	0	3

Course Prerequisite: Nil

Course Description:

This course is designed to provide basic understanding on database systems and its design. The course material further used for developing any web based applications in which database is back end. Course covers from all basic and advanced queries of SQL, PL/SQL programs, Relational algebra and calculus, normal forms, low level details such as representing data elements of database and indexed structures, transaction management and data recovery.

Course Objectives:
1. To understand the components of DBMS and to study the database design.
2. To study the retrieval of data using relational algebra and calculus and the concept of normal forms in the design of database.
3. To comprehend the structure of SQL Queries to query ,update, and manage a database.
4. To understand all constraints to develop a business application using cursors, triggers and stored   procedures.
5. To provide knowledge on distributed databases, concurrency techniques.

UNIT I: DATABASE SYSTEM ARCHITECTURE AND RELATIONAL MODEL
Overview of Database Systems: Managing data, File Systems versus a DBMS,
Introduction to Database Design: Database design and ER Diagrams, Entities, Attributes and Entity sets, Relationships and relationship types, Additional features of ER model, conceptual design with the ER Model.
Introduction to Relational Model: Introduction, Integrity Constraints, Logical database design, Introduction to views.
Relational Algebra: Preliminaries, Relational algebra- Selection and Projection, Set Operations, Renaming, Joins, Division.   **(9)**

UNIT II: RELATIONAL CALCULUS AND SQL
Relational Calculus – Expressive power of Algebra and Calculus. The Database Language SQL – Simple Queries in SQL – Queries Involving More than One Relation, Sub Queries, aggregate operators, null values, complex integrity constraints, triggers and active databases Embedded SQL, Dynamic SQL, Cursors, Introduction to JDBC, Stored Procedures.   **(9)**

UNIT III: DATABASE DESIGN
Functional Dependencies– Rules about Functional Dependencies, Keys, Design of Relational Database Schemas, Multivalued Dependencies.   **(9)**

UNIT IV: STORAGE STRATEGIES AND TRANSACTION PROCESSING
Storage strategies: Indices, B-trees, hashing. **Transaction Processing:** Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp-based schedulers, Multi-version and optimistic Concurrency Control schemes.   **(9)**

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UNIT V: DATABASE SECURITY
Database recovery Authentication, Authorization and access control, DAC, MAC and RBAC models, SQL injection. **(9)**

Course Outcomes:
At the end of the course, students will able to
1. Design database structure and represent ER model.
2. Construct relational algebra expressions for the query.
3. Design database and access data from the database using SQL queries.
4. Implement transaction processing techniques in a database.
5. Apply security features in database, data server and data warehouse design.

Text Books:

1. Database Management Systems, Raghu RamaKrishnan, Johannes Gehrke, 3rd Edition, 2003, McGraw Hill.
2. Database Systems, The Complete Book, Hector Garcia-Molina, Jeffrey D. Ullman and Jennifer Widom, 3rd impression, 2009, Pearson.

References:

1. "Data base System Concepts", Silberschatz, Korth, McGraw Hill, V edition
2. The UNIX Programming Environment, B.W. Kernighan & R. Pike, Prentice Hall of India.
3. "Fundamentals of Database Systems", Elmasri Navathe, 6th edition, 2013, Pearson.
4. "Introduction to Database Systems", C. J. Date, Pearson Education.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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B. Tech. II Year I Semester

18CSE203   DATA STRUCTURES LABORATORY

Course Prerequisite: 18CSE102

L T P C
0 0 3 1.5

Course Description:
This course is aimed to provide hands on experience to implement basic linear and nonlinear data structures. This course covers implementation of stack, queue, list, sorting techniques, binary search trees, and balanced search trees.

Course Objectives:
1. To develop skills to analyze and program linear and nonlinear data structures.
2. Develop different data structures with effective usage of arrays and linked lists.
3. Develop recursive algorithms as they apply to trees and graphs.

List of Experiments

1. Write a Program to Implement Singly Linked List and its operations.

2. a) Write a Program to Implement Stack Operations by using Array.
    b) Write a Program to Implement Stack Operations by using Linked List.

3. a) Write a program that uses stack operations to convert a given infix expression into its postfix.
    b) Write a program that uses stack operations to evaluate given postfix expression.

4. a) Write a Program to implement the operations of Queue using array.
    b) Write a Program to implement the operations of Queue using linked list.

5. Write a Program to Implement Circular Queue Operations by using Array.

6. Write a Program to Sort the set of elements by using
    i) Quick Sort. iii) Merge Sort.

7. Write a Program to Implement All functions of a Dictionary by using Hashing.

8. Write a Program to Implement the Binary Search Tree Operations.

9. Write a Program to Perform the Tree Traversal Techniques by using Iterative Method

10. Write a Program to Perform the Tree Traversal Techniques by using recursion.

11. Write a program to Implement Insertion and Deletion Operations on AVL Trees

12. Write a program for implementing the following graph traversal algorithms:
    a) Depth First Search b) Breadth First Search.

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Course Outcomes:
At the end of the course the student will be able to
1. Implement data structures like array, list, stack, queue.
2. Choose appropriate data structure to solve a real world problem.
3. Design algorithms to perform sorting.
4. Apply searching techniques to search an element in a list.
5. Develop applications using tree and graph data structures.

References:

1. Object Oriented Programming with ANSI & Turbo C++, Ashok N.Kamthane, Pearson Education.
2. Data Structures using C++, D.S.Malik, 2nd Edition, Cengage Learning.
3. Data Structures through C++, YashavantP.Kanetkar, BPB Publication.
4. Data Structures using C and C++, YedidyahLangsam.MosheJ.Augenstein Aaron M.Tenenbaum, 2nd Edition, PHI.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

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B. Tech. II Year I Semester

18CSE204   OBJECT ORIENTED PROGRAMMING USING JAVA LABORATORY

L T P C
0 0 3 1.5

Course Prerequisite: 18CSE101,18CSE102

Course Description:

Basics of Object-Oriented Programming - objects, classes, polymorphism, inheritance, static and dynamic binding. Object Oriented Programming using Java-classes, interfaces, inheritance, polymorphism, method dispatch, features for encapsulation and modularity.

Course Objectives:
1. Understand object-oriented programming concepts, and apply them in solving problems.
2. Learn the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes
3. To Introduce the implementation of packages and interfaces
4. Learn the concepts of exception handling and multithreading.
5. Learn the design of Graphical User Interface using applets and swing controls.

LIST OF EXPERIMENTS:

1. a) Write a Java program that prints all real solutions to the quadratic equation $ax2 + bx + c = 0$. Read in a, b, c and use the quadratic formula. If the discriminant b2-4ac is negative, display a message stating that there are no real solutions.
   b) Write a Java program that find prime numbers between 1 to n.
   c) Write a Java Program that find the factorial of a number

2. a) The Fibonacci sequence is defined by the following rule: The fist two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that print the nth value in the Fibonacci sequence.
   b) Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a Palindrome.
   c) Write a Java program for sorting a given list of names in ascending order.

3. a) Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by .part<n> where n is the sequence number of the part file
   b) Write a java program to convert an ArrayList to an Array.
   c) Write a Java program to make frequency count of vowels, consonants, special symbols, digits, words in a given text.

4. a) Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
   b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
   c) Implement Stack using queues.

5. a) Write a java program to make rolling a pair of dice 10,000 times and counts the number of times doubles of are rolled for each different pair of doubles. Hint: Math.random()

b) Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it's not a duplicate of any number already read display the complete set of unique values input after the user enters each new value.

c) Write a java program to read the time intervals (HH:MM) and to compare system time if the system time between your time intervals print correct time and exit else try again to repute the same thing. By using StringToknizer class.

6. a) Write java program to create a super class called Figure that receives the dimensions of two dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub class overridden area() so that it returns the area of a rectangle and a triangle respectively.

b) Write a Java program that creates three threads. First thread displays ―Good Morning‖ every one second, the second thread displays ―Hello‖ every two seconds and the third thread displays ―Welcome‖ every three seconds

7. a) Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.

b) Use inheritance to create an exception super class called EexceptionA and exception sub class ExceptionB and ExceptionC, where ExceptionB inherits from ExceptionA and ExceptionC inherits from ExceptionB. Write a java program to demonstrate that the catch block for type ExceptionA catches exception of type ExceptionB and ExceptionC

8. Write a Java Program to design login window using AWT components.

9. Develop an application for simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result

10. Design & Develop an application that creates a user interface to perform integer divisions. The user enters two numbers in the JtextFields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an ArithmeticException Display the exception in a message dialog box.

11. Design a GUI application that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.

12. Design a GUI application for Cafeteria bill generation.

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Project Based Learning :

Design and Develop a mini project using OOPS concepts

Course Outcomes

At the end of the course, students will be able to:
1. Solve real world problems using OOP techniques.
2. Implement string handling and file handling methods.
3. Design multithreaded applications with synchronization.
4. Develop web applications using AWT components.
5. Create GUI based applications

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

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B. Tech. II Year I Semester

    18CSE205   **DATABASE MANAGEMENT SYSTEMS LABORATORY**

	L	**T**	**P**	**C**
Course Prerequisite: Nil	**0**	**0**	**3**	**1.5**

Course Description:

This course is designed to provide basic understanding on database systems and its design. The course material further used for developing any web based applications in which database is back end. Course covers from all basic and advanced queries of SQL, PL/SQL programs, Relational algebra and calculus, normal forms, low level details such as representing data elements of database and indexed structures, transaction management and data recovery.

Course Objectives:
1. To understand the components of DBMS and to study the database design.
2. To study the retrieval of data using relational algebra and calculus and the concept of normal forms in the design of database.
3. To comprehend the structure of SQL Queries to query ,update, and manage a database.
4. To understand all constraints to develop a business application using cursors, triggers and stored procedures.
5. To provide knowledge on distributed databases, concurrency techniques.

LIST OF EXPERIMENTS:

1. To study DDL-create and DML-insert commands.

    a) Create tables according to the following definition.
    b) Insert the data as shown below.
    c) From the above given tables perform the following queries:

    (1) Describe deposit, branch.
    (2) Describe borrow, customers.
    (3) List all data from table DEPOSIT.
    (4) List all data from table BORROW.
    (5) List all data from table CUSTOMERS.
    (6) List all data from table BRANCH.
    (7) Give account no and amount of depositors.
    (8) Give name of depositors having amount greater than 4000.
    (9) Give name of customers who opened account after date '1-12-96'.

2. Create the below given table and insert the data accordingly.

    Perform following queries
    (1) Retrieve all data from employee, jobs and deposit.
    (2) Give details of account no. and deposited rupees of customers having account opened between dates 01-01-06 and 25-07-06.
    (3) Display all jobs with minimum salary is greater than 4000.
    (4) Display name and salary of employee whose department no is 20. Give alias name to name of employee.
    (5) Display employee no,name and department details of those employee whose department lies in(10,20)

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To study various options of LIKE predicate
(1) Display all employee whose name start with 'A' and third character is ' 'a'.
(2) Display name, number and salary of those employees whose name is 5 characters long and first three characters are 'Ani'.
(3) Display the non-null values of employees and also employee name second character should be 'n' and string should be 5 character long.
(4) Display the null values of employee and also employee name's third character should be 'a'.
(5) What will be output if you are giving LIKE predicate as '%_%' ESCAPE '\'

3. To Perform various data manipulation commands, aggregate functions and sorting concept on all created tables.

(1) List total deposit from deposit.
(2) List total loan from karolbagh branch
(3) Give maximum loan from branch vice.
(4) Count total number of customers
(5) Count total number of customer's cities.
(6) Create table supplier from employee with all the columns.
(7) Create table sup1 from employee with first two columns.
(8) Create table sup2 from employee with no data
(9) Insert the data into sup2 from employee whose second character should be 'n' and string should be 5 characters long in employee name field.
(10) Delete all the rows from sup1.
(11) Delete the detail of supplier whose sup_no is 103.
(12) Rename the table sup2.
(13) Destroy table sup1 with all the data.
(14) Update the value dept_no to 10 where second character of emp. name is 'm'.
(15) Update the value of employee name whose employee number is 103.

4. To study Single-row functions.

(1) Write a query to display the current date.
(2) For each employee, display the employee number, job, salary, and salary increased by 15% and expressed as a whole number. Label the column New Salary
(3) Modify your query no 4.(2) to add a column that subtracts the old salary from the new salary. Label the column Increase
(4) Write a query that displays the employee's names with the first letter capitalized and all other letters lowercase, and the length of the names, for all employees whose name starts with J, A, or M. Give each column an appropriate label. Sort the results by the employees' last names.
(5) Write a query that produces the following for each employee: <employee last name> earns <salary> monthly
(6) Display the name, hire date, number of months employed and day of the week starting with Monday.
(7) Display the hire date of emp in a format that appears as Seventh of June 1994 12:00:00 AM.
(8) Write a query to calculate the annual compensation of all employees (sal+comm)

5. Displaying data from Multiple Tables (join)

(1) Give details of customers ANIL.
(2) Give name of customer who are borrowers and depositors and having living city Nagpur

(3) Give city as their city name of customers having same living branch.
(4) Write a query to display the last name, department number, and department name for all employees.
(5) Create a unique listing of all jobs that are in department 30. Include the location of the department in the output
(6) Write a query to display the employee name, department number, and department name for all employees who work in NEW YORK.
(7) Display the employee last name and employee number along with their manager's last name and manager number. Label the columns Employee, Emp#, Manager, and Mgr#, respectively.
(8) Create a query to display the name and hire date of any employee hired after employee SCOTT.

6. To apply the concept of Aggregating Data using Group functions.

(1) List total deposit of customer having account date after 1-jan-96.
(2) List total deposit of customers living in city Nagpur.
(3) List maximum deposit of customers living in bombay.
(4) Display the highest, lowest, sum, and average salary of all employees. Label the columns Maximum, Minimum, Sum, and Average, respectively. Round your results to the nearest whole number.
(5) Write a query that displays the difference between the highest and lowest salaries. Label the column DIFFERENCE.
(6) Create a query that will display the total number of employees and, of that total, the number of employees hired in 1995, 1996, 1997, and 1998
(7) Find the average salaries for each department without displaying the respective department numbers.
(8) Write a query to display the total salary being paid to each job title, within each department.
(9) Find the average salaries > 2000 for each department without displaying the respective department numbers.
(10) Display the job and total salary for each job with a total salary amount exceeding 3000, in which excludes president and sorts the list by the total salary.
(11) List the branches having sum of deposit more than 5000 and located in city bombay.

7. To solve queries using the concept of sub query.

(1) Write a query to display the last name and hire date of any employee in the same department as SCOTT. Exclude SCOTT
(2) Give name of customers who are depositors having same branch city of mr. sunil.
(3) Give deposit details and loan details of customer in same city where pramod is living.
(4) Create a query to display the employee numbers and last names of all employees who earn more than the average salary. Sort the results in ascending order of salary.
(5) Give names of depositors having same living city as mr. anil and having deposit amount greater than 2000
(6) Display the last name and salary of every employee who reports to ford.
(7) Display the department number, name, and job for every employee in the Accounting department.
(8) List the name of branch having highest number of depositors.
(9) Give the name of cities where in which the maximum numbers of branches are located.

(10) Give name of customers living in same city where maximum depositors are located.

8. Manipulating Data

(1) Give 10% interest to all depositors.
(2) Give 10% interest to all depositors having branch vrce
(3) Give 10% interest to all depositors living in nagpur and having branch city bombay.
(4) Write a query which changes the department number of all employees with empno 7788's job to employee 7844'current department number.
(5) Transfer 10 Rs from account of anil to sunil if both are having same branch.
(6) Give 100 Rs more to all depositors if they are maximum depositors in their respective branch.
(7) Delete depositors of branches having number of customers between 1 to 3.
(8) Delete deposit of vijay.
(9) Delete borrower of branches having average loan less than 1000.

9.
(1) Create a cursor to update the salary of employees in EMP table.
(2) Write a PL/SQL program to raise an Exception
    i.When the bonus exceeds salary
10.
(1) Create a trigger which checks whether employee with Emp_no is present in the Employee table before inserting into EMP.
(2) Write a procedure to insert a record into ORDER table by validating qty limit of the item and also check whether that item exists

Project Based Learning:

Design and implementation of Student Information System

Course Outcomes:

At the end of the course the student will be able to
1. Apply DDL and DML commands in database.
2. Create simple databases and manipulate using SQL.
3. Implement data aggregation, sorting and searching techniques.
4. Make use of cursors, triggers and stored procedures to solve the real time problems.
5. Design transaction processing and data recovery for a real world problem.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

B. Tech. II Year II Semester

B.Tech. II Year II Semester

18HUM101   ECONOMICS AND FINANCIAL ACCOUNTING FOR ENGINEERS

Course Prerequisite: None

L	T	P	C
3	0	0	3

Course Description: The Engineering Economics and Financial Accounting aims to provide an insight into production, cost analysis, market structure, Accounting Basic concepts and financial Statement Analysis. The course is designed to give emphasis on the application of real life examples on various fundamental issues of economics and accounts. This course introduces the accounting system, principles, types of accounts, and financial statements etc. The ratio analysis and financial analysis are useful to know the position of financial statements. Funds flows statements and cash flow statements are explained to know the analysis of financial matters.

Course Objectives: The course is intended to:
1. Describe the nature of engineering economics in dealing with the issues of scarcity;
2. Know the supply, demand, production and cost analysis to analyze the impact of economic events on markets;
3. Explain the performance of firms under different market structures and Price determination in various market conditions.
4. Explain the accounting principles, types of accounting and preparation of final accounts; and
5. Describe the financial analysis through ratios, funds flow and cash flow statements.

UNIT I: DEMAND ANALYSIS:
Scope and Significance of Economics- Understanding the problem of scarcity and choice - Elements of market Economy: Demand, Supply and Market Equilibrium- Theory of Demand, Elasticity of Demand, Supply and Law of Supply.   **(9)**

UNIT II: PRODUCTION AND COST ANALYSIS
Production Function – Short-run and long- run production – Cost Analysis: Cost concepts - Cost Structure of Firms and output decision- Break-Even Analysis (BEA) – Managerial significance and limitations of BEA - Determination of Break Even Point (Simple Problems).   **(9)**

UNIT III: MARKET STRUCTURE:
Classification of Markets - General Equilibrium and efficiency of Perfect competition, Monopoly, Monopolistic, Oligopoly, Duopoly – Price determination and various market conditions.
                                                                                                                           (9)

UNIT IV: BASICS OF ACCOUNTING:
Uses of Accounting - Book Keeping Vs Accounting - Double Entry System - Accounting Principles - Classification Of Accounts - Rules Of Debit & Credit. Accounting Cycle: Journal, Ledger, Trial Balance. Final Accounts: Trading Account - Profit & Loss Account - Balance Sheet with Adjustments, (Simple Problems).   **(9)**

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UNIT V: BASICS OF FINANCIAL ANALYSIS

Ratio Analysis - Liquidity, Leverage, Solvency and Profitability Ratios - Interpretation of Financial Statements - FundS Flow Statement - Capital Budgeting.   **(9)**

Course Outcomes:

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

1. Understand Engineering economics basic concepts,
2. Analyze the concepts of demand, elasticity, supply, Production, Cost Analysis and its essence in floating of an organization,
3. Compare different market structures and identify suitable market,
4. Demonstrate an understanding and analyzing the accounting statements, and
5. Demonstrate the ability to apply knowledge of accounting concepts through Financial Statements Analysis.

Text Books:

1. Case E. Karl & Ray C. Fair, "Principles of Economics", Pearson Education, 8th Edition, 2007
2. Financial Accounting, S.N.Maheshwari, Sultan Chand, 2009
3. Financial Statement Analysis, Khan and Jain, PHI, 2009
4. Financial Management, Prasanna Chandra, T.M.H, 2009

References:

1. Lipsey, R. G. & K. A. Chrystal , "Economics", Oxford University Press, 11th Edition, 2007
2. Samuelson P. A. &Nordhaus W. D. "Economics", Tata McGraw-Hill 18th Edition, 2007
3. Financial Management and Policy, Van Horne, James,C., Pearson ,2009.
4. Financial Management, I.M.Pandey, Vikas Publications

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

B. Tech. II Year II Semester

18MAT112   DISCRETE MATHEMATICAL STRUCTURES
(Common to CSE,CSIT & CST)

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

Course Prerequisite: 18MAT101

Course Description:
This course introduces the concepts of discrete mathematics and their applications in computer science. It covers algebraic structures, combinatorics and finite state machines. It also provides insight into the concepts of graph theory and their applications.

Course Objectives:

1. To introduce the concepts of logic, rules of inference and predicates.
2. To discuss the concepts on combinatorics.
3. To explain the concepts of algebraic structures.
4. To familiarize the principles of Lattices and Boolean algebra.
5. To illustrate the problems in graph theory.

UNIT I: MATHEMATICAL LOGIC AND STATEMENT CALCULUS
Introduction -Statements and Notation - Connectives – Tautologies – Two State Devices and Statement logic - Equivalence - Implications - The Theory of Inference for the Statement Calculus –-The Predicate Calculus - Inference Theory of the Predicate Calculus.   **(9)**

UNIT II: COMBINATORICS
The Basics of Counting- The Pigeonhole Principle -Permutations and Combinations - Binomial Coefficients -Generalized Permutations and Combinations –Generating Permutations and Combinations.   **(9)**

UNIT III: ALGEBRAIC STRUCTURES
Semigroups and Monoids - Grammars and Languages –Types of Grammars and Languages – Groups – Subgroups – Lagranges Theorem –Homomorphism: Introduction –Properties - Group Codes.   **(9)**

UNIT IV: LATTICES AND BOOLEAN ALGEBRA
Partially Ordered Relations-Posets-Hasse Digram - Lattices - Boolean algebra - Boolean Functions - Representation and Minimization of Boolean Functions.   **(9)**

UNIT V: GRAPH THEORY
Basic Concepts of Graph Theory - Matrix Representation of Graphs – Trees - Storage Representation and Manipulation of Graphs-Dijkstra's and Kruskal's algorithms -Introduction to Finite State Machines.   **(9)**

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Course Outcomes

At the completion of the course the students will be able to:
1. Evaluate elementary mathematical arguments and identify fallacious reasoning (not just fallacious conclusions).
2. Understand the concepts of combinatorics.
3. Apply graph theory models of data structures and state machines to solve problems of connectivity under constraints such as scheduling.
4. Synthesize concepts of algebraic structures to represent the real system.
5. Learn elementary proofs and properties of modular arithmetical results; and explain their applications such as in cryptography and hashing algorithms.

Text Books:

1. "Discrete mathematics for computer scientists and mathematicians", Mott, Kandel, Baker, PH
2. Discrete Mathematical Structures with Applications to Computer Science J.P Tremblay, R. Manohar, TMH.

References:

1. Discrete Mathematics and its Applications, seventh edition, Kenneth Rosen, Tata McGrawHill   Education Private Limited.
2. Johnson Baugh R, and Carman R, Discrete mathematics, 6th edition, Person Education, 2003.
3. Kolman B, Busoy R.C, and Ross S.C, Discrete Mathematical Structures, Prentice Hall, 2004.

Mode of Evaluation: Assignments, Internal Mid Examination, End Semester Examination.

Dept. of Computer Science & Engineering

B. Tech. II Year II Semester

18BIO101   LIFE SCIENCES FOR ENGINEERS

L T P C
3 0 0 3

Course Prerequisites: Basic knowledge about sciences up to intermediate or equivalent level.

Course Description: The course deals with basic concepts of life sciences, its impact on human & universe, biological systems and functions, human physiology and metabolism.

Course Objectives:
- Introduce the molecular basis of life.
- Provide the basis for classification of living organisms.
- Describe the transfer of genetic information.
- Introduce the techniques used for modification of living organisms.
- Describe the applications of biomaterials

UNIT I: INTRODUCTION TO LIFE SCIENCES & LIVING ORGANISMS

Why we need to study Life Sciences? Comparison and differences of biological organisms with manmade systems (Eye & Camera, Bird flying & Aircraft), Biological observations of 18th Century that led to major discoveries. Classification of living organisms, Cellular basis of life, differences between prokaryotes and eukaryotes, classification on the basis of carbon and energy sources.   (**8**)

UNIT II: BIOMOLECULES & MACROMOLECULES

Molecules of life: Water, Sugars, Starch, Cellulose, Amino acids, Structure and functions of proteins (primary, secondary, tertiary and quaternary structure), Structure and functions of nucleotides, nucleic acids, DNA (single and double strand) & RNA, hemoglobin, antibodies and enzymes, Industrial applications of enzymes and Fermentation process.   (**10**)

UNIT III: HUMAN PHYSIOLOGY

Bioenergetics, Respiration: Glycolysis and TCA cycle, Electron transport chain and oxidative phosphorylation, Human physiology, Neurons, Synaptic and Neuromuscular junctions.   (**7**)

UNIT IV: GENES, DNA & RNA
Mendel's laws, gene mapping, Mitosis and Meiosis, single gene disorders in humans, Genetic code, DNA replication, Transcription, Translation. Discuss the concept of complementation using human genetics. Recombinant DNA Technology: recombinant vaccines, transgenic microbes, plants and animals, animal cloning, biosensors, biochips.   (**10**)

UNIT V: METABOLISM
Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. ATP as an energy currency. This should include the breakdown of glucose to CO_2 + H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Mechanism of Photosynthesis).
                                                                                    (**10**)

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Course Outcomes:

After studying the course, the student will be able to:

1. Explain the differences between biological organisms and manmade systems and classify organisms (L2)
2. Interpret the relationship between the structure and function of proteins, nucleic acid and summarize the industrial applications of biomolecules (L2)
3. Explain the mechanism of respiration
4. Demonstrate the mapping of genes. (L2) and explain the medical importance of gene disorders. (L2)
5. Apply thermodynamic and kinetic principles to biological systems (L2)

Text books:

1. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018.
2. Arthur T Johnson, Biology for Engineers, CRC press, 2011.
3. Cell and Molecular Biology by De Robetis and De Robertis.

Reference Books:

1. Alberts Et. Al. The molecular biology of the cell, 6/e, Garland Science, 2014.
2. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
3. John Enderle and Joseph Bronzino Introduction to Biomedical Engineering, 3/e, 2012.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech. II Year II Semester

18CSE106   DIGITAL LOGIC DESIGN

Course Prerequisite: Nil

L	T	P	C
2	1	0	3

Course Description: This course provides a modern introduction to logic design and the basic building blocks used in digital systems, in particular digital computers. It starts with a discussion of combinational logic, and also the course deals with sequential circuits, State machines, Different representations including truth table; logic gate, timing diagram, switch representation, and state diagram will be discussed.

Course Objectives:
1. The Objective of this course is to familiarize the student with fundamental principles of digital design.
2. Acquire the skills to manipulate and examine Boolean algebraic expressions, logical operations, Boolean functions and their simplifications.
3. Acquaint with classical hardware design for both combinational and sequential logic circuits.

UNIT I: BINARY SYSTEMS, BOOLEAN ALGEBRA AND LOGIC GATES
Binary Systems: Digital Systems, Binary Numbers, Number Base Conversions, Octal andHexadecimal Numbers, Compliments, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, RTL. Boolean Algebra and Logic Gates:Basic Definitions, Boolean Algebra, Basic Theoremsand properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.   **(9)**

UNIT II: GATE – LEVEL MINIMIZATION
The Map Method, Four Variable Map, Five-Variable Map,Product of Sums Simplification, Don't-Care Conditions, NAND and NOR Implementation, Other Two Level Implementations, EX-OR Function, Other Minimization Methods.   **(9)**

UNIT III: COMBINATIONAL LOGIC
Combinational Circuits, Analysis Procedure, Design Procedure,Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Analysis of arithmetic units.
Multiplication and Division algorithms, Magnitude Comparator, Decoders, Encoders, Multiplexers, Demultiplexers, HDL description.   **(9)**

UNIT IV: SYNCHRONOUS SEQUENTIAL LOGIC
Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Design Procedure, Registers, Shift Registers, Ripple Counters, Synchronous Counters.   **(9)**

UNIT V: MEMORY AND PROGRAMMABLE LOGIC
Memory Hierarchy & different types of memories, Random access memory, memory decoding, Error Detection and Correction, Read-only Memory, Programmable Logic Array, Programmable Array Logic, Design of Digital Systems- Algorithmic State Machines, Digital Integrated Circuits- TTL, MOS Logic families and their characteristics.   **(9)**

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Course Outcomes:

At the end of the course, students will be able to:
1. Compare different number systems and logic gates
2. Understand the logical elements to design various logical units.
3. Design combinational circuits
4. Design synchronous sequential circuits.
5. Illustrate the memory hierarchy and programmable logic.

Text Books:

1. Digital Design, M. Morris Mano, Micheal D. Ciletti, 5th Edition, 2013, Pearson.
2. Digital Logic Design, Leach, Malvino, Saha,TMH

References:

1. Donald D. Givonne, "Digital Principles and Design" TMH, 2003. Digital Logic & State Machine Design, David J. Comer, Oxford University Press, 3rd Reprinted Indian Edition, 2012.
2. Digital Logic Design, R.D. Sudhakar Samuel, Elsevier.
3. Computer System Architecture , M. Morris Mano, 3th Edition, pearson

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

B. Tech. II Year II Semester

18CSE107   DESIGN AND ANALYSIS OF ALGORITHMS

L	**T**	**P**	**C**
2	**1**	**0**	**3**

Course Prerequisite: 18CSE104, 18CSE203

Course Description:
This course emphasis on analysis of various types of algorithms. It provides idea to design the algorithm to solve the problems using complexity analysis.

Course Objectives:
1. To introduce the concepts of Algorithm Analysis, Time Complexity, Space Complexity.
2. To discuss various Algorithm Design Strategies with proper illustrative examples.
3. To introduce Complexity Theory with NP and Linear programming.

UNIT I: INTRODUCTION & DIVIDE AND CONQUER
Introduction: Algorithm specification, growth of functions, Asymptotic notations.
Divide and Conquer: Master Method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Median finding Algorithm, Strassen's matrix multiplication.   **(9)**

UNIT II: GREEDY METHOD & DYNAMIC PROGRAMMING
Greedy Method: General method, Knapsack problem, Huffman Code, Job Scheduling with Deadlines, Minimum cost Spanning Trees.
Dynamic Programming: Fibonacci, LCS, Matrix Chain Multiplication, Stamp Problem, Knapsack problems, The traveling sales person problem.   **(9)**

UNIT III: GRAPH ALGORITHMS & ADVANCED GRAPH ALGORITHMS
Graph Algorithms: BFT, DFT, topological sort, Connected components, Minimum cost Spanning Trees, Kruskal's and Prim's algorithm. **Advanced Graph Algorithms: Shortest Path Algorithm**: Single Source Shortest path Algorithm Dijkstra's, All Pairs Shortest Path Algorithm – Floyd - Warshall's, Algorithm   **(9)**

UNIT IV: BACK TRACKING, BRANCH AND BOUND
Backtracking: Introduction, n-Queens Problem, sum of subset problem
Branch and Bound: The method, Travelling salesperson, 0/1 Knapsack problem.   **(9)**

UNIT V: NETWORK FLOW PROBLEMS, NP–HARD AND NP– COMPLETE PROBLEMS
NP–Hard and NP–Complete Problems: Complexity Class - P, NP, NP Complete, NP Hard. Is P=NP?, Reducibility
Network flow problem: Ford Fulkerson Algorithms for Maximum Flow Problem   **(9)**

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Course Outcomes:
At the end of the course, students will be able to
1. Implement the various sorting techniques.
2. Identify feasible solutions for different problems using greedy method and dynamic programming.
3. Develop applications using graph algorithms.
4. Make use of tree data structure to solve real world problems.
5. Choose appropriate problem solving technique to design algorithm.

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran. Fundamentals of Computer Algorithms, MIT Press, Second Edition (Prentice Hall)
2. Jon Kleinberg and Eva Tardos. Algorithm Design. Pearson Education. (2007)

References:

1. Micheal T. Goodrich and Roberto Tamassia: Algorithm Design: Foundations, Analysis and Internet examples (Algorithms, MIT Press, Second Edition)
2. Cormen T.H., Leiserson, C.E., Rivest, R.L., and C. Stein. Introduction to Algorithms, MIT Press, Second Edition.
3. Sanjoy Das Gupta, Christos Papadimitriou, Umesh Vazirani, Algorithms Tata McGraw-Hill Publishers
4. Alfred V. Aho, John E. Hopcroft, Jeffery D.Ulman. Data Structures and Algorithms

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

B. Tech. II Year II Semester

18CSE108   OPERATING SYSTEMS

Course Prerequisite: Nil

L	T	P	C
3	0	0	3

Course Description:

This course will cover the tradeoffs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), and file systems.

Course Objectives:
1. To learn the mechanisms of OS to handle processes and threads and their communication
2. To give introduction to shell programming.
3. To learn the mechanisms involved in memory management in contemporary OS
4. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
5. To know the components and management aspects of concurrency management

UNIT I: INTRODUCTION
Concept of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Case study on UNIX and WINDOWS Operating System. KORN SHELL PROGRAMMING:Basic Script Concepts,Expressions, Decisions: Making Selections, Repetition, Special Parameters and Variables, Changing Positional Parameters, Argument Validation, Debugging Scripts.   **(9)**

UNIT II: PROCESS CONCEPTS
Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads, Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling.   **(9)**

UNIT III: PROCESS SYNCHRONIZATION AND DEADLOCKS
Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc. Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.
                                                                    (9)

UNIT IV: MEMORY MANAGEMENT STRATEGIES

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition– Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging. Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault , Working Set , Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

(9)

UNIT V: FILE SYSTEM:

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks.   **(9)**

Course Outcomes:
At the completion of the course the students will be able to:
1. Write shell scripts using korn shell.
2. Create processes & threads and implement the various process scheduling techniques.
3. Analyse the concurrent processing and deadlock situations.
4. Design algorithmic solutions to solve memory management problems.
5. Implement the different types of file management techniques.

Text Books:

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2.   Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

References:

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

B. Tech. II Year II Semester

18ENG201   ENGLISH COMMUNICATION – LISTENING AND SPEAKING LABORATORY

(Common to all branches)

L T P C
0 0 3 1.5

Course Prerequisite: 18ENG101

Course Description:
        As the students are being exposed to the global language 'English; it has become a widespread need. This course builds on what was offered in the first semester and facilitates deeper understanding into the mechanics of the English language, especially in regard to two particular skills, i.e. Listening and Speaking. This course is offered in order to help students cultivate and nurture a mind that "thinks in English." Intricate issues of pronunciation, modulation, timbre are dealt with in regard to Speaking and also the sub-skills of Listening, thus the whole course is entirely lab oriented.

Course Objectives:
This course enables students to –
1. Hone in on their listening skills
2. Grasp the differences between native level and mother-tongue influenced pronunciation
3. Develop crucial speaking skills
4. Enhance vocabulary for greater communicative impact
5. Overall development of thinking in the English language

UNIT I: Listening; Understanding key vocabulary; Listening for main ideas; Listening in detail; Syllable stress; Sentence stress; Presentation.   **(12)**

UNIT II: Vocabulary for important places (bank, library, restaurant, etc.); Prepositions for places; Stress determiners (this & that); Intonation.   **(12)**

UNIT III: Using background knowledge; Collocations; Pronouncing clusters of consonants (e.g. –gh, -ing, ph, ck); Mapping ideas; Pronunciation of phrases; Listening for opinion; Vocabulary and collocations for jobs   **(12)**

UNIT IV: Listening for lecture organization; Text organization features; Phrases with make; Evaluating and proposing ideas; Expressing attitudes   **(12)**

UNIT V:
Identifying opposing viewpoints; Silent letters; Idioms; Fixed expressions; Phrasal verbs   **(12)**

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Course Outcomes:

At the end of the course, learners will be able to:

1. Listening with intent
2. Pronounce more fluently
3. Develop crucial thinking skills
4. Enhance vocabulary
5. Overall development in the English language

Suggested Reading/Textbook:

1. Sabina Ostrowska; *Unlock 3 series(B1): Listening & Speaking*; Published by: Cambridge University Press.

References:

1. Gary Buck; *Assessing Listening;* Cambridge University Press, 2010.
2. Adrian Doff, Craig Thaine, Herbert Puchta, et al; *Empower: Upper Intermediate (B2+)*; Published by: Cambridge University Press.
3. Josh Sreedharan; *The Four Skills for Communication;* Cambridge University Press, 2014.
4. William Strunk Jr; *The Elements of Style*; ITHACA, N.Y.; W.P. HUMPHREY, 2006.
5. Joseph Devlin; *How to Speak and Write Correctly*; ITHACA, N.Y.; W.P. HUMPHREY, 2006.
6. Miles Carven; *Listening Extra*; Cambridge University Press, 2008.
7. Jayashree Mohanraj; *Speak Well*; Orient Blackswan, 2013.
8. F. Kipple; *Keep Talking*; Cambridge University Press, 2013.
9. *www.cambridgeenglish.org/in/*
10. https://learnenglish.britishcouncil.org/en/english-grammar
11. https://www.rong-chang.com/

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

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B. Tech. II Year II Semester

18CSE206   DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

L T P C
0 0 2 1

Course Prerequisite: 18CSE201, 18CSE203

Course Description:
This course is aimed to provide hands on experience to analyze the time complexity of sorting, graph, tree, branch and bound algorithms.

Course Objectives:
1. To learn how to analyze a problem & design the solution for the problem.
2. To Strengthen the ability to identify and apply the suitable algorithm for the given real world problem.
3. To develop the optimal solution, i.e., time complexity & space complexity must be very low.

List of Experiments:
1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator.

2. Implement Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted. The elements can be read from a file or can be generated using the random number generator.

3. Implement 0/1 Knapsack problem using Dynamic Programming.

4. Implement Traveling Salesperson problem to find the optimal tour using Dynamic Programming.

5.
   a. Print all the nodes reachable from a given starting node in a digraph using BFS method.
   b. Check whether a given graph is connected or not using DFS method.

6. Find Minimum Cost Spanning Tree of a given undirected graph using Prim'ls algorithm.

7. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

8. Implement the algorithm for Topological ordering of vertices in a DAG..

9. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijikstra'ts algorithm.

10. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.

11. Find a subset of a given set S = { si, s2, ...s.} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {2, 3, 5, 7, 8} and d = 10 there are three solutions {2,3,5}, {3,7}. And {2,8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.

12. Implement N Queen's problem using Back Tracking.

Course Outcomes:
At the end of the course, students will be able to
1. Implement the various sorting techniques.
2. Identify feasible solutions for different problems using greedy method and dynamic programming.
3. Develop applications using graph algorithms.
4. Make use of tree data structure to solve real world problems.
5. Choose appropriate problem solving technique to design algorithm.

Reference Books:

1. Levitin A, "Introduction to the Design And Analysis of Algorithms", Pearson Education, 2008.
2. Goodrich M.T.,R Tomassia, "Algorithm Design foundations Analysis and Internet Examples", John Wileyn and Sons, 2006.
3. Base Sara, Allen Van Gelder ," Computer Algorithms Introduction to Design and Analysis", Pearson, 3rd Edition, 1999.

Web References:

1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2. http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms
3. http://www.facweb.iitkgp.ernet.in/~sourav/daa.html

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

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B. Tech. II Year II Semester

18CSE207   OPERATING SYSTEMS LABORATORY

	L	T	P	C
	0	0	3	1.5

Course Prerequisite: 18CSE102

Course Description:

This course will cover the tradeoffs that can be made between performance and functionality during the design and implementation of an operating system. Particular emphasis will be given to three major OS subsystems: process management (processes, threads, CPU scheduling, synchronization, and deadlock), memory management (segmentation, paging, swapping), and file systems.

Course Objectives:
1. To learn the mechanisms of OS to handle processes and threads and their communication
2. To learn the mechanisms involved in memory management in contemporary OS
3. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
4. To know the components and management aspects of concurrency management.

LIST OF EXPERIMENTS
1. To Study basic concepts in OS with the help of Linux commands.
2. a) Write a shell script that accepts two integers as its arguments and computers the value of first number raised to the power of the second number.
   b) Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.

3. a) Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
   b) Write a shell script that computes the gross salary of a employee according to the following rules:

   i)If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic.

   ii)If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic

   The basic salary is entered interactively through the key board.

4. a) Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
   b) Develop an interactive script that ask for a word and a file name and then tells how many times that word occurred in the file.

5. Simulate the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority

6. Program on process creation and Execution
   a. To display Environment variables.
   b. To implement Different types of exec functions.

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7. a) Write a program to create a chain of Processes.
   b) Demonstration of Zombie and Orphan process.

8. Write a program for Producer Consumer Problem.
9. Write a program to create pipes.
10. Write a Program to find whether a file is having read, write, execute permissions and also check whether a given name is file or directory.
11. Simulate MVT and MFT.
12. Simulate all page replacement algorithms
13. Simulate all file allocation strategies
    a) Sequential b) Indexed c) Linked

Course Outcomes:
At the end of the course the student will be able to
   1. Understand the use of Linux commands
   2. Compare the performance of processor scheduling algorithms
   3. Design algorithmic solutions for process synchronization problems
   4. Analyze the performance of various file management schemes
   5. Implement different page replacement algorithms.

Text Books:

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India

References:

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison-Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

B. Tech. III Year I Semester

Dept. of Computer Science & Engineering

18CSE109   FORMAL LANGUAGE AND AUTOMATA THEORY

                                                                    L T P C
                                                                    2 1 0 3
Course Prerequisite: 18MAT112

Course Description:

      This course aims to introduce the students to the theoretical foundation for the process of computation and to impart an understanding of Automata, Regular Languages, Context Free Languages, Push down Automata and Turing Machine.

Course Objectives:
1. To understand the language hierarchy
2. To construct automata for any given pattern and find its equivalent regular expressions
3. To design CFG for any given language
4. To understand the need for Turing machines and their capability
5. To understand undecidable problems and NP problems

UNIT I : REGULAR LANGUAGES
Finite Automata (FA) – Deterministic Finite Automata (DFA) – Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon Transitions - Equivalence and Minimization of Automata - Regular Expression – FA and Regular Expressions. Pumping Lemma for Regular Languages – Properties of Regular Languages - Decidable problems on regular languages.   **(9)**

UNIT II: CONTEXT FREE LANGUAGES
Context-Free Grammar (CFG) – Derivation Trees – Ambiguity in Grammars and Languages – Equivalence of Parse Trees and Derivation – Simplification of Context-free Grammar –Normal Forms - Closure properties for CFLs - Pumping Lemma for CFLs - Decision problems for CFLs. Definition of the Pushdown Automata – Languages of a Pushdown Automata – Deterministic Pushdown Automata.   **(9)**

UNIT III: TURING MACHINES
Turing Machines – Language of a Turing Machine – Turing Machine as a Computing Device - Two stack PDA and TM – Modifications of Turing Machines – Universal TM – Multi Tape Turing Machines, Non-deterministic Turing machine – Turing thesis - Non-halting TM.   **(9)**

UNIT IV: CHOMSKY HIERARCHY
Types of Grammar – Grammar vs. Language vs. Machines - Regular Grammars – Equivalence of Regular Grammar and Finite Automata - Unrestricted Grammars – Context Sensitive Grammars – Linear Bounded Automata (LBA) – Equivalence of LBA's and CSG's.   **(9)**

UNIT V: UNDECIDABILITY
Properties of Recursive and Recursively enumerable languages – Undecidability – Reducibility - Undecidable problems about TMs - Post's Correspondence Problem (PCP).   **(9)**

Course Outcomes:

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Upon successful completion of the course, students will be able to
1. Construct automata, regular expression for any pattern.
2. Write Context free grammar for any construct.
3. Design Turing machines for any language.
4. Propose computation solutions using Turing machines.
5. Derive whether a problem is decidable or not.

Text Books:

1. John E Hopcroft and Jeffery D Ullman, —Introduction to Automata Theory, Languages and Computations‖, Narosa Publishing House, 2002.

References:

1. H.R. Lewis and C.H. Papadimitriou, —Elements of the theory of Computation‖, Second Edition, Pearson Education, 2003.
2. J. Martin, —Introduction to Languages and the Theory of Computation‖, Third Edition, Tata McGraw Hill, 2003.
3. Micheal Sipser, —Introduction of the Theory and Computation‖, Thomson Brokecole, 1997.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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B. Tech. III Year I Semester

18CSE110   COMPUTER ORGANIZATION AND ARCHITECTURE

Course Prerequisite: 18CSE106

L	T	P	C
3	0	0	3

Course Description:

This course aims at introducing the concepts of computer architecture and organization. It involves design aspects, and deals with the current trends in computer architecture. It also aims to improve system performance by effective utilization of system resources such as memory and I/O subsystems.

Course Objectives:

1. To make students understand the basic structure and operation of digital computer.
2. To understand the hardware-software interface.
3. To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
4. To expose the students to the concept of pipelining.
5. To familiarize the students with hierarchical memory system including cache memories and virtual memory.
6. To expose the students with different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I: OVERVIEW & INSTRUCTIONS

Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing modes   **(9)**

UNIT II: ARITHMETIC OPERATIONS

ALU - Addition and subtraction – Multiplication – division(Fixed point and floating point); Conversion between integer and real numbers; The generation of higher order functions from square roots to transcendental functions; Representation of non-numeric data (character codes, graphical data)   **(9)**

UNIT III: PROCESSOR AND CONTROL UNIT

Basic MIPS implementation – Building data path – Control Implementation scheme – Pipelining – Pipelined data path and control – Handling Data hazards & Control hazards – Exceptions. **(9)**

UNIT IV: PARALLELISM

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification– Hardware multithreading – Multicore processors.   **(9)**

UNIT V: MEMORY AND I/O SYSTEMS

Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.   **(9)**

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Course Outcomes:

1. Students should be able to understand instructions and addressing modes of a computer system.
2. Students should be able to Design arithmetic and logic unit.
3. Students should be able to Design and analyse pipelined control units.
4. Students should be able to Understand parallel processing architectures.
5. Students should be able to Evaluate performance of memory systems.

Text Books:

1. David A. Patterson and John L. Hennessey, "Computer organization and design", Morgan Kauffman / Elsevier, Fifth edition, 2014.
2. V.CarlHamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI th edition, Mc Graw-Hill Inc, 2012.

References:

1. William Stallings "Computer Organization and Architecture", Seventh Edition, Pearson Education, 2006.
2. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.
3. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005.
4. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata Mc Graw Hill, 1998.   http://nptel.ac.in/.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

B. Tech. III Year I Semester

L T P C
3 0 0 3

18CSE111   COMPUTER NETWORKS

Course Prerequisite: Nil

Course Description:
The main emphasis of this course is to introduce to computer communication, TCP/IP layers functionalities, and operations of network protocols.

Course Objectives:
1. To study the evolution of computer networks, foundational principles, architectures, and techniques employed in computer networks.
2. To study the concepts of communication networks from layered perspective
3. To provide students with a theoretical and practical base in computer networks issues
4. Student will be able purse his study in advanced networking courses
5. To Prepare students for easy transfer from academia into future directions of research.

UNIT I: INTRODUCTION
Introduction: Networks, Network Types, Internet History, Standards and Administration, Network Models: Protocol Layering, TCP/IP Protocol Suite, The ISO Model.
THE PHYSICAL LAYER
Data and Signals, Transmission impairment, Data rate limits, Performance, Transmission media: Introduction, Guided Media, Unguided Media, Switching: Introduction, Circuit Switched Networks, Packet switching.   **(9)**

UNIT II: THE DATA LINK LAYER
Introduction, Link layer addressing, Error detection and Correction: Cyclic codes, Checksum, Forward error correction, Data link control: DLC Services, Data link layer protocols, HDLC, Point to Point Protocol, Media Access control: Random Access, Controlled Access, Channelization, connecting devices and virtual LANs: Connecting Devices.   **(9)**

UNIT III: THE NETWORK LAYER
Network layer design issues, Routing algorithms, Congestion control algorithms, Quality of service, Internetworking, The network layer in the Internet: IPV4 Addresses, IPV6, Internet Control protocol, OSPF, BGP, IP, ICMPv4, IGMP.   **(9)**

UNIT IV: THE TRANSPORT LAYER
The Transport Service, Elements of Transport Protocols, Congestion Control, The internet transport protocols: UDP, TCP, Performance problems in computer networks, Network performance measurement.   **(9)**

UNIT V: THE APPLICATION LAYER
Introduction, Client Server Programming, WWW and HTTP, FTP, e-mail, TELNET, Secure Shell, Domain Name System, SNMP. Case study- Computer Networks in health care.   **(9)**

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Course Outcomes:
1. Ability to choose the transmission media depending on the requirements.
2. Ability to identify the different types of network topologies and protocols.
3. Ability to configure a computer network logically, by enumerating the layers of the TCP/IP.
4. Understanding and analyzing the concepts of routing, congestion control
5. Ability to use the protocols, and analyzing it for any network

Text Books:

1. "Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education,5th edition, 2012.
2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson,5th edition, 2010.

References:

1. "Data Communication and Networks", Bhushan Trivedi, Oxford
2. "Internetworking with TCP/IP – Principles, protocols, and architecture", Volume 1, Douglas E. Comer, 5th edition, PHI
3. "Computer Networks", 5E, Peterson, Davie, Elsevier.
4. "Introduction to Computer Networks and Cyber Security", Chawan- Hwa Wu, Irwin, CRC Publications.
5. "Computer Networks and Internets with Internet Applications", Comer.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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B. Tech. III Year I Semester

18CSE112   SOFTWARE ENGINEERING

	L	T	P	C
Course Prerequisite: None.	3	0	0	3

Course Description:
This course presents software engineering techniques and explains the software development life-cycle, including software specification, Requirement analysis, design implementation, testing and maintenance. This course covers on past and current trends in software development practices. This course is designed to cover fundamentals of Software Engineering concepts, requirement analysis, process models, Design issues, modeling, testing strategies, Risk strategy, quality management. The course will present a variety of tools, in the context of team production of publicly releasable software. The main goal of this course for each student to build their ability to do useful applications that could be released for real-world use.

Course Objectives:
1. To make students to learn Different life cycle models.
2. To make students to learn different phases in software engineering.
3. To make students to learn about testing strategies.
4. To provide better understanding of software quality and assurance techniques.

UNIT I: BASIC CONCEPTS OF SOFTWARE ENGINEERING & PROCESS MODEL
Introduction to Software Engineering: Ethics of Software engineering, Type of software, Software characteristics, Software Lifecycle model, Capability Maturity Model Integration (CMMI), **Process models:** The waterfall model, Incremental process models, spiral model, **Agile Development**-Agile Process-Other Agile process Frameworks: Adaptive process models, Scrum, Dynamic Systems Development Method and Crystal   **(9)**

UNIT II: SOFTWARE REQUIREMENT ENGINEERING AND SYSTEM MODELS
Software Requirements: Functional and Non-functional requirements, User requirements, System requirements, Interface specification, and the software requirements specification (SRS).

Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. **System models:** Context Models, Behavioral models, Data models, Object models.   **(9)**

UNIT III: SOFTWARE DESIGN AND ENGINEERING
Design Engineering: Design process and Design quality, Design concepts, the design model, pattern based software design, Object oriented Analysis and Design (using UML): Class diagrams, Use diagrams, Interaction diagrams, activity diagrams. **Modeling component-level design:** Designing class-based components, conducting component-level design, Object constraint language, designing conventional components. **Performing User interface design**: Golden rules, User interface analysis and design, interface analysis.   **(9)**

UNIT IV: SOFTWARE TESTING AND METRIC PROCESS
Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing. **Product metrics**: Software Quality, Frame work for Product metrics, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance. **Metrics for Process and Products:** Software Measurement, Metrics for software quality.   **(9)**

UNIT V: SOFTWARE QUALITY ASSUARANCE
Software Quality: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews. **Software Quality Assurance**: Statistical Software Quality Assurance, Software reliability, The ISO 9000 quality standards**,** Principles of Software Process Change.
                                                                                        (9)

Course Outcomes:
Upon completion of this course the students will be able to:
1. Describe principles, concepts and practice of software engineering.
2. Explain the methods and processes of constructing the different types of software systems.
3. Describe Software design and Engineering process
4. Explain testing strategies of software projects and quality of software systems
5. Understand Project planning and quality management process.

Text Books:

1. Software Engineering: A practitioner's Approach, Roger S Pressman, 9th Edition. McGrawHill International Edition, 2020
2. Engineering Software Products: An Introduction to Modern Software Engineering: Ian Sommerville, First Edition, Pearson Education, 2019.

References:

1. Fundamentals of Software Engineering: Rajib Mall, PHI, 2005.
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
3. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008.
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition,2006.
6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition, 2006.
7. Agile Product Management with Scrum, Pichler Roman, Pearson Education,2010.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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B. Tech III Year I Semester

18ENG202   CORPORATE COMMUNICATION LABORATORY
(Common to all branches)

Course Prerequisite: **18ENG201**

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L  T  P  C
0  0  2  1
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Course Description: English is practical and it is a must for any institution to provide students with opportunities to indulge in actively applying their language skills. Thus the Communication Skills Lab facilitates students with adequate opportunities to put their communication skills in use. It also accommodates peer learning by engaging students in various interactive sessions. This lab will be accompanied by a practical lab component.

Course Objectives:
This course enables the students to –
1. Focus on their interactive skills
2. Develop their communicative competency
3. Fortify their employability skills
4. Empower their confidence and overcome their shyness
5. Become effective in their overall performance in the industry

UNIT I : LISTENING AND SPEAKING SKILLS
Conversational skills (Formal and Informal); Group Discussion; Making effective presentations using Computers; Listening/watching interviews, conversations, documentaries, etc.; Listening to lectures, discussions from TV/Radio/Podcast.   **(9)**

UNIT II: READING AND WRITING SKILLS

Reading different genres of texts ranging from newspapers to creative writing; Writing job applications and resume; Emails; Letters; Memorandum; Reports; Writing abstracts and summaries; Interpreting visual texts.   **(8)**

UNIT III: ACCLIMATIZING STUDENTS TO OTHER EXAMS
Test of English as a Foreign Language (TOEFL); Civil Service Examinations; Verbal- -ability.
                                        (5)

UNIT IV: INTERVIEW SKILLS
Different types of interviews: Answering questions and offering information; Mock interviews; Body Language; Articulation of sounds; Intonation.   **(8)**

Course Outcomes:
At the end of the course, learners will be able to:
1. Read articles from magazines and newspapers
2. Participate effectively in informal conversations
3. Introduce themselves and their friends and express opinions in English
4. Comprehend conversations and short talks delivered in English
5. Write short essays of a general kind, draft Reports and personal letters and emails in English.

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Textbooks:

1. Sanjay Kumar and Pushp Lata; *Communication Skills*; Oxford University Press, 2012.
2. Sabina Pillai and Agna Fernandez; *Soft Skills and Employability Skills*; Cambridge University Press, 2018.

References:

1. Dr. M.Adithan; Study Skills for Professional Students in Higher Education; S.Chand & Co. Pvt., 2014.
2. Guy Brook Hart & Vanessa Jakeman; Complete IELTS: Cambridge University Press, 2014.
3. Vanessa Jakeman & Clare Mcdowell; Action Plan for IELTS: Cambridge University Press, 2006.
4. Guy Brook Hart; Instant IELTS; Cambridge University Press, 2004.
5. S.P.Bakshi & Richa Sharma; Descriptive General English; Arihant Publications, 2012.
6. Charles Browne, Brent Culligan 7 Joseph Phillips; In Focus (level 2); Cambridge University Press.
7. Steven Gershon; Present Yourself 2 (second edition); Cambridge University Press.
8. Leo Jones; Let's Talk 3 (second edition); Cambridge University Press.
9. Nutall J. C.; Reading Comprehension; Orient Blackswan.
10. www.cambridgeenglish.org/in/
11. https://learnenglish.britishcouncil.org/en/english-grammar
12. https://www.rong-chang.com/
13. S.P. Dhanavel; *English and Communication Skills for Students of Science and Engineering*; Orient Blackswan, 2009.
14. M. Ashraf Rizvi; *Effective Technical Communication*; Tata Mc Graw Hill Co. ltd, 2005.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech. III Year I Semester

18CSE208   COMPUTER NETWORKS LABORATORY

Course Prerequisite: 18CSE111

L	T	P	C
0	0	3	1.5

Course Description:
This course helps the students to understand comprising simulation of various protocols and performance; TCP/IP Level Programming, Routing Algorithms and internetworking.

Course Objectives:
1. To provide students with a theoretical and practical base in computer networks issues
2. Student will be able purse his study in advanced networking courses
3. Prepare students for easy transfer from academia into practical life

LIST OF EXPERIMENTS

1. Implementation of stop and wait protocol and sliding window protocol
2. Write a code simulating ARP /RARP protocols
3. Write a code simulating ping/traceroute command
4. Write a program to generate CRC code for checking error.
5. Create a socket for HTTP for webpage upload and download
6. Implementation of subnetting
7. Applications using TCP and UDP Sockets like DNS, SNMP and File Transfer
8. Transferring data between two nodes using NS
9. Simulation of data transfer and packet loss using NS
10. Simulation of Congestion Control Algorithms using NS
11. Protocol analysis with Wireshark
12. Packet Capture & Traffic Analysis with Wireshark

Project Based Learning:

   Design and Develop a mini project using NS simulator

Course Outcomes:
After completing this course, the students should be able to
1. Implementation of congestion control protocols.
2. Implementation of various sockets.
3. Implement error detection and correction techniques.
4. Simulate the various network and transport layer protocols.
5. Analyze packets using packet analyzer tools.

References:
1. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition, Tata McGraw Hill.
2. Understanding Communications and Networks, Third Edition, W.A.Shay, Cengage Learning.
3. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose, K.W.Ross, Third Edition, Pearson Education.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech. III Year I Semester

18CSE209   SOFTWARE ENGINEERING LABORATORY

L	**T**	**P**	**C**
0	0	3	1.5

Course Prerequisite: 18CSE112

Course Description:

This course presents software engineering techniques and explains the software development life-cycle, including software specification, Requirement analysis, design implementation, testing and maintenance. This course covers on past and current trends in software development practices. This course is designed to cover fundamentals of Software Engineering concepts, requirement analysis, process models, Design issues, modeling, testing strategies, project management, Risk strategy, quality management. The course will present a variety of tools, in the context of team production of publicly releasable software. The main goal of this course for each student to build their ability to do useful applications that could be released for real-world use.

Course Objectives:

1. To make students to learn different phases life cycle models in software engineering
2. To make students to learn about functional and nonfunctional requirements.
3. To make students to draw the UML diagram
4. To make students to build the small project.
5. To provide better understanding of splitting of module, designing and building the software project.

Exercises:

       To develop a mini-project following the 13 exercises listed below.

1. To develop a problem statement. and define the functional and non-functional requirements
2. Develop an IEEE standard SRS document. Also develop risk management & project plan.
3. Identify Use Cases and develop the Use Case model.
4. Identify the business activities and develop an UML Activity diagram.
5. Identity the conceptual classes and develop a domain model with UML Class diagram.
6. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
7. Draw the State Chart diagram.
8. Identify the User Interface, Domain objects, and Technical services.
9. Draw the partial layered, logical architecture diagram with UML package diagram notation.
10. Draw the Component and Deployment diagrams.
11. Implement the Domain objects layer.
12. Implement the User Interface layer.
13. Code the Project and show the demo of your project in any IDE.

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List of Experiments:
1. Course Registration system.
2. Student marks analyzing system
3. Online ticket reservation system
4. Platform assignment system for the trains in a railway station

5. Expert system to prescribe the medicines for the given symptoms
6. Online purchase system.
7. ATM system
8. Stock maintenance
9. Quiz System
10. E-mail Client system
11. Online food ordering system.
    and other useful projects not limited to list.

Course Outcomes:
Upon completion of this course the students will be able to:
1. Apply the Software development model to their problem
2. Analysis the problem and their requirements
3. Design software and engineering process.
4. Develop the test cases to test their project.
5. Develop a full working code for small and complex project.

Text Books:

1. Software Engineering: A practitioner's Approach, Roger S Pressman, Sixth Edition. McGrawHill International Edition, 2005
2. Software Engineering: Ian Sommerville, Seventh Edition, Pearson Education, 2004.

References:

1. Fundamentals of Software Engineering: Rajib Mall, PHI, 2005.
2. Software Engineering, A Precise Approach, PankajJalote, Wiley India,2010.
3. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008.
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition,2006.
6. Managing the Software Process: *Watts S. Humphrey*, Pearson Education.
7. Software Project Management: *Walker Royce,* Pearson Education
8. Unified modeling Language User Guide: Grady Booch, James Rumbaugh, Iva Jacobson, Pearson Education.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

B. Tech III Year II Semester

Dept. of Computer Science & Engineering

B. Tech III Year II Semester

18ENG102   ENGLISH COMMUNICATION - READING AND WRITING
(Common to all branches)

	L	T	P	C
	2	0	0	2

Course Prerequisite: 18ENG101

Course Description: As the students being exposed to the global language 'English; it has become a widespread need. This course builds on what was offered in the first semester and facilitates deeper understanding into the mechanics of the English language, especially in regard to two particular skills, i.e. Reading and Writing. This course is offered in order to help students cultivate and nurture a mind that "think in English." Intricate issues of understanding academic texts, vocabulary needed to comprehend texts, evaluate and analyze writing tasks, etc.

Course Objectives:
This course enables students to –
1. Hone in on their reading skills
2. Cultivate critical reading and writing skills
3. Develop crucial comprehension of texts, graphs and graphics
4. Enhance vocabulary for greater communicative impact
5. Overall development in the English language

UNIT 1:
Reading for main ideas; Applying background knowledge to predict content; Skimming; Scanning; Making inferences; Understanding discourse.   **(6)**

UNIT 2:
Identifying audience; Reading for detail; Using visuals; Academic vocabulary, collocations and synonyms.   **(6)**

UNIT 3:
Scanning to find crucial information; Using critical thinking to identify purpose; Previewing; Topic related vocabulary; Writing an introduction; Essay structure; Descriptive paragraphs; Writing a conclusion.   **(6)**

UNIT 4:
Analyzing essay questions; Writing a problem-solution based on graphs and graphics; Developing own ideas.   **(6)**

UNIT 5:
Writing cause-effect paragraphs; Evaluating diagrams; Brainstorming; Academic verbs and topical language.   **(6)**

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Course Outcomes:
At the end of the course, learners will be able to
1. Read and comprehend academic texts, graphs, diagrams and graphics
2. Develop crucial thinking skills
3. Write purposefully and effectively
4. Enhance vocabulary
5. Overall development in the English language

Textbook:

1. Carolyn Westbrook; *Unlock 3 series (B1): Reading & Writing;* Published by: Cambridge University Press.

References:
1. Adrian Doff, Craig Thaine, Herbert Puchta, et al; *Empower: Upper Intermediate (B2+)*; Published by: Cambridge University Press.
2. Josh Sreedharan; *The Four Skills for Communication*; Cambridge University Press, 2014.
3. V. Sasikumar, P.Kiranmai Dutt, Geetha Rajeevan; *A Course in Listening & Speaking II*; Cambridge University Press, 2014.
4. Liz Driscoll; *Reading Extra*; Cambridge University Press, 2004.
5. Graham Palmer; *Writing Extra*; Cambridge University Press, 2004.
6. *Writing Tutor*; Advanced English Learners' Dictionary, 9th Edition; Oxford University Press, 2012.
7. *https://www.nypl.org/blog/2012/11/28/11-great-free-websites-practice-english*
8. *www.readbrightly.com/6-great-websites-teen-writers/*

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech. III Year II Semester

18CSE113   AI TOOLS, TECHNIQUES AND APPLICATIONS

Course Prerequisite: None

L	T	P	C
3	0	0	3

Course Description:
To understand the importance of AI and its applications, Machine learning and Deep Learning algorithms and smart solutions for various domains.

Course Objectives:
The objectives of this course are to
1. Expose fundamental concepts in AI
2. Demonstrate the capability to create simple AI applications using Natural Language Processing, Speech Recognition, Computer Vision, Pattern recognition.
3. Present various modeling and formulation techniques to solve problems using AI techniques.
4. Introduce state-of-art AI tools and techniques to solve various problems faced by Engineers in design and analysis.

UNIT I: FUNDAMENTALS OF AI
AI-Definition, Applications of AI, Search Strategies – BFS, DFS, Knowledge representation and reasoning – Knowledge based Agent, Wumpus World Environment, Logics. **Machine Learning:** Supervised Learning - Linear Regression, Logistic Regression, Unsupervised Learning – K-means clustering, Anomaly Detection, Reinforcement Learning.   **(9)**

UNIT II: NLP AND BOT TECHNOLOGIES
Natural Language Processing: Natural language Understanding, Sentiment Analysis, Segmentation and recognition, Speech Recognition, Text-to-Speech, NLP in the cloud, NL Interface, **Chatbots:** Chatbot definition, Build a Chatbot, How has chatbot transformed user experience, Designing elements, best practices for chatbot development, **Virtual Assistants:** What is a Virtual Assistant?   **(9)**

UNIT III: IMAGE PROCESSING &APPLICATIONS
What is Image processing?, Image Noise, Removal of Noise from Images, Color Enhancement, Fourier transforms, Feature detection and matching, Segmentation**,** Object detection, Face recognition, Recognition Databases and test sets. Application: Optical Character Recognition.
(9)

UNIT IV: DEEP LEARNING
Introduction - Neural Networks, Deep Learning, Different types of Deep Neural Networks - CNN,RNN, forward propagation, Cost function, backpropagation. APIs using Softwares Tensorflow and Keras.   **(9)**

UNIT V: SMART APPLICATIONS
Smart Agriculture, Smart Transportation &Autonomous Vehicles, Smart Homes, Smart cities
(9)

Course Outcomes:
Upon the completion of the course, students able to
1. Understand the basic concepts and applications of Artificial Intelligence.
2. Design Chatbots based on the user requirements
3. Identify the features of digital images for analysis.
4. Implement the deep learning techniques using software tools.
5. Develop smart applications for various domains

Textbooks:

1. Tom Markiewicz& Josh Zheng,Getting started with Artificial Intelligence, Published by O'Reilly Media,2017
2. Stuart J. Russell and Peter Norvig,Artificial Intelligence A Modern Approach
3. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer 2010
4. Ian Goodfellow, Yoshua Bengio, Aaron Courvill, Deep Learning

References:

1. AurélienGéron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017
2. A classical approach to Artificial Intelligence, Munesh Chandra Trivedi, Khanna Publications
3. Artificial Intelligence and Machine Learning, Chandra S.S. & H.S. Anand, PHI Publications
4. Machine Learning, Rajiv Chopra, Khanna Publishing House

Mode of evaluation: Assignments, Mid Term Tests, End Semester Examination.

B. Tech. III Year II Semester

		L T P C
18CSE114	**COMPILER DESIGN**	**2 1 0 3**

Course Prerequisite: 18CSE109,18MAT112

Course Description:
The course is intended to learn the basic techniques that underlie the practice of Compiler Construction. This course explores the principles, algorithms, and data structures involved in the design and construction of compilers. Topics include lexical analysis, context-free grammars, Syntax Analyzer, LR and LALR parsers, other parsing techniques, symbol tables, error recovery, and an introduction to intermediate code generation and code generation.

Course Objectives:
1. To understand the theory and practice of compiler implementation.
2. To learn context free grammars, compiler parsing techniques.
3. To perform syntax-directed translation of expression evaluation, construction of abstract syntax trees, intermediate code generation.
4. To learn symbol table and understand intermediate machine representations and actual code generation
5. To gain working knowledge on Lex & Yacc (Bison)

UNIT I: INTRODUCTION
Overview of Compilation: Overview of Compilation: Phases of Compilation – Lexical Analysis, Input buffering, Lexical Errors, Language for Specifying Lexical Analyzers- Expressing Tokens by Regular Expressions, Converting Regular Expression to NFA and DFA- Minimization of DFA, interpretation, bootstrapping, data structures in compilation – Symbol table, lexical analyzer generator- Design of Lexical Analyzer for a token separation (LEX for Linux or FLEX for Windows).   **(9)**

UNIT II: TOP-DOWN & BOTTOM-UP PARSING
Top down Parsing: The role of the parser. Context Free Grammar: definition, notation, derivation, parse tree, ambiguity, Top down parsing – Backtracking, Predictive parsing - LL(1) parser, recursive descent parsing, Preprocessing steps required for predictive parsing – Elimination of left recursion, Left factoring of a grammar. **Bottom up Parsing:** Operator precedence parser, Shift Reduce parsing, SLR, LR(k), CLR and LALR parsing, Conflicts in LR grammars, Error recovery in LR parsing, Automatic parser generator-Design of a syntax Analyzer for a calculator (YACC for Linux or BISON for Windows).   **(9)**

UNIT III: SEMANTIC ANALYSIS
Semantic analysis: Syntax directed Definitions – Syntax directed translation (SDT) for Expression evaluation, Construction of Syntax Tree, conversion from infix to postfix expression, Types of attributes - attributes and their computation, S-attributed definition, L-attributed definitions, Bottom-up Evaluation of S-Attribute Definitions, Type Systems - Specification of a simple type checker - Equivalence of Type Expressions - Type Conversions, SDT for Type checking.   **(9)**

UNIT IV: INTERMEDIATE CODE GENERATION
Intermediate languages - Directed Acyclic Graph for expressions, Three address code – Types of three address statements, Syntax directed translation to generate three address code. Implementations of Three address statements - quadruples, triples, indirect triples,
Intermediate code generation: Addressing array elements, boolean expression, control structures, **Runtime Environmen**t – storage organization, storage allocation strategies, symbol tables.   **(9)**

UNIT V: CODE OPTIMIZATION & CODE GENERATION
Code optimization: The principal sources of optimization, Optimization of basic blocks, loop optimization. **Code generation**: issues in the design of a code generator, Target machine, Basic blocks and Flow graphs A simple code generation algorithm, The DAG representation of basic blocks, Peephole optimization.   **(9)**

Course Outcomes:
Upon completion of this course the students should:
1. Know the Compiler Components and the phases of a compiler.
2. Understand the functioning of Lexical Analyzer.
3. Understand the how Syntax Analyzer works.
4. Understand the how Intermediate Code is generated.
5. Understand about Code optimization and Code generation.

Text Books:
1. Compilers: Principles, Techniques and Tools By Alfred V Aho, Monica S Lam, Ravi Sethi, and Jeffrey D. Ullman, Second Edition, Pearson, 2014.
2. Principles of compiler design - A.V. Aho, J.D.Ullman Pearson Education, 2002.

References:
1. Lex & Yacc, John R. Levine, Tony Mason, Doug Brown, O'reilly, Second edition, 1992.
2. Modern Compiler Design, Grune, D., Van Reeuwijk, K., Bal, H.E., Jacobs, C.J.H., Langendoen, K. Springer-Verlag New York, 2012.
3. Modern Compiler Implementation in C, Andrew N.Appel, Cambridge University Press, 2005.
4. Engineering a Compiler, Keith D Cooper and Linda Torczon, Morgan Kaufmann Publishers Elsevier Science, 2004.
5. Crafting a Compiler with C, Charles N. Fischer, Richard. J. LeBlanc, Pearson Education, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

B. Tech. III Year II Semester

18CSE210   AI TOOLS, TECHNIQUES AND APPLICATIONS LABORATORY

	L	T	P	C
	0	0	3	1.5

Course Prerequisite: None

Course Description:

Performing data labeling, building custom models, object recognition, speech recognition, building chatbot, configuring neural network, building virtual assistant, and building convolutional neural network.

Course Objectives: The objectives of this course are to

1. Perform data labelling
2. Develop custom models for object recognition
3. Build chatbot.
4. Configure neural network.

LIST OF EXPERIMENTS

1. Implement simple linear regression to predict profits for a food truck based on the population of the city that the truck would be placed in.
2. Build a classification model that estimates the probability of admission based on the exam scores using logistic regression.
3. Implement the unsupervised learning algorithm using K-means clustering
4. Implement an anomaly detection algorithm using a Gaussian model and apply it to detect failing servers on a network.
5. Liv.ai - App for Speech recognition and Synthesis through APIs
6. Building a Chatbot
7. Build a virtual assistant
8. Supervised Algorithm - Perform Data Labelling for various images using object recognition
9. Implement un-regularized and regularized versions of the neural network cost function and compute gradients via the backpropagation algorithm.
10. Build a Convolutional Neural Network for Cat vs Dog Image Classification

Course Outcomes:

At the end of the course student will be able to

1. Label the data based on object recognition
2. Develop virtual assistant using speech recognition
3. Develop Chatbots based on the user requirements
4. Design and configure Neural Networks for various real world applications
5. Create convolution neural network model for image classification

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Textbooks:

1. Tom Markiewicz& Josh Zheng,Getting started with Artificial Intelligence,Published by O'Reilly Media,2017
2. Programming collective Intelligence: Building Smart Web 2.0 Applications-Toby Segaran

References:

1. AurélienGéron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017
2. Machine Learning with Python, Abhishek Vijayvargia, BPB publications
3. Python Machine Learning, Sebastian Raschka, packt publishers
4. Building Machine Learning systems with Python, WilliRichart Luis Pedro Coelho
5. Python Machine Learning by Example, Liu, Yuxi(Hayden),Packt Publishers
6. Stuart J. Russell and Peter Norvig,Artificial Intelligence A Modern Approach

Mode of evaluation: Continuous Internal Evaluation and End Semester Examination.

Dept. of Computer Science & Engineering

B. Tech. III Year II Semester

18CSE211   COMPILER DESIGN LABORATORY

L T P C
0 0 3 1.5

Course Prerequisite: 18CSE201, 18CSE203

Course Description:
This course helps the students to implement the principles and phases of compiler design in the programming languages in which they are familiar. This practical comprises the simulation of Finite Automata, implementation of the data structure used by the compiler and implementation of different phases of compiler.

Course Objectives:
1. To simulate finite automata, regular expression
2. To implement lexical analyzer, top down and bottom up parsing techniques.
3. To implement intermediate code generator to produce form of three address code.
4. To perform operations on symbol table.
5. To work with Lex & Yacc (Bison) for implementing scanner and parser.

LIST OF EXPERIMENTS
1. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value. Simulate the same in C/C++ language.

2. (a) Write a C program to identify whether a given line is a comment or not
   (b) Write a C program to test whether a given identifier is valid or not.

3. Write a C program to validate operators.

4. (a) Write a program to convert Regular Expression to Non-Deterministic Finite Automata.
   (b) Write program to simulate DFA, NFA for accept any input belongs to a particular language.

5. To implement Lexical Analyzer using LEX or FLEX (Fast Lexical Analyzer). The program should separate the tokens in the given C program and display with appropriate caption.

6. Implement following programs using LEX.
   a.   Write a LEX specification file to take input C program from a .c file and count the number of characters, number of lines & number of words.
   b.   Write a LEX program to count the number of Macros defined and header files included in the C program.

7. Implement following programs using LEX.
   a.   Write a LEX program to print all the constants in the given C source program file.
   b.   Write a LEX program to print all HTML tags in the input file.
   c.   Write a LEX program which adds line numbers to the given C program file and display the same in the standard output.

8. Write a LEX program to count the number of comment lines in a given C program and eliminate them and write into another file.

9. Implement a C program to perform symbol table operations.

10. Implement a C program to eliminate left recursion and left factoring from a given CFG.

11. Write a C program to find FIRST and FOLLOW for predictive parser.

12. Write a C program for constructing of LL (1) parsing.

13. Write a C program to construct recursive descent parsing.

14. Write a C program for stack implementation of Shift Reduce parser.

15. Write a C program to implement operator precedence parsing.

16. Create YACC (or BISON) and LEX specification files to implement a basic calculator which accepts variables and constants of integer and float type.

17. Implement a simple intermediate code generator in C program, which produces three address code statements for a given input expression.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Understand the principles of compiler design
2. Gain knowledge on implementation of the phases of compiler including lexical analyzer, syntax analyzer.
3. Implement intermediate code generator
4. Work with scanner generator and parser generator tools such as Lex & Yacc to design compiler.

Major Equipment: PC, UNIX Server/Client or Windows, LEX & YACC for Linux, FLEX for Windows.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B.Tech. IV Year I Semester

B.Tech. IV Year I Semester

18CSE115   INTERNET OF THINGS

                                                                    L T P C
                                                                    3 0 0 3
Course Prerequisite: 18CSE109

Course Description:
The Internet of Things (IoT) is a network of a wide variety of devices like vehicles, humans, soil etc. These devices gather data using sensors, which can be used for monitoring or control. This course is an introduction to the embedded devices, communication protocols and APIs used in IoT.

Course Objectives:
This course enables students to
1. Introduce the fundamental concepts of IoT and physical computing
2. Expose the student to a variety of embedded boards and IoT Platforms
3. Create a basic understanding of the communication protocols in IoT communications.
4. Familiarize the student with application program interfaces for IoT.
5. Enable students to create simple IoT applications.

UNIT I - OVERVIEW OF IOT
The Internet of Things: An Overview; The Flavor of the Internet of Things; The "Internet" of "Things"; The Technology of the Internet of Things; Enchanted Objects; Who is Making the Internet of Things?; Design Principles for Connected Devices; Calm and Ambient Technology; Privacy; Keeping Secrets; Whose Data Is It Anyway?; Web Thinking for Connected Devices; Small Pieces, Loosely Joined; First-Class Citizens On The Internet; Graceful Degradation; Affordances.   **(9)**

UNIT II - EMBEDDED DEVICES – I (ARDUINO)
Embedded Computing Basics; Microcontrollers; System-on-Chips; Choosing Your Platform; Arduino; Developing on the Arduino; Some Notes on the Hardware; Openness.   **(9)**

UNIT III - EMBEDDED DEVICES – II (RASPBERRY PI)
Raspberry Pi ; Cases and Extension Boards; Developing on the Raspberry Pi; Some Notes on the Hardware; Openness; Other notable platforms; Mobile phones and tablets; Plug Computing: Always-on Internet of Things.   **(9)**

UNIT IV - COMMUNICATION IN THE IOT
Internet Principles; Internet Communications: An Overview   ; IP; TCP; The IP Protocol Suite (TCP/IP); UDP ; IP Addresses; DNS ; Static IP Address Assignment ; Dynamic IP Address Assignment; IPv6 ; MAC Addresses ; TCP and UDP Ports   ; An Example: HTTP Ports ; Other Common Ports; Application Layer Protocols- HTTP; HTTPS: Encrypted HTTP ; Other Application Layer Protocols.   **(9)**

UNIT V - PROTOTYPING ONLINE COMPONENTS
Getting Started with an API; Mashing Up APIs; Scraping; Legalities; Writing a New API; Clockodillo; Security; Implementing the API; Using Curl to Test; Going Further; Real-Time Reactions; Polling; Comet; Other Protocols ; MQ Telemetry Transport; Extensible Messaging and Presence Protocol; Constrained Application Protocol.   **(9)**

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Course Outcomes:

After completing this Unit, students will be able to

1. Interpret the design principles that govern connected devices and select a platform for a particular embedded computing application
2. Develop simple applications using Arduino microcontroller
3. Develop simple applications using Raspberry Pi
4. Utilize the Internet communication protocols for IoT applications
5. Design and develop a solution for a given application using APIs

Text Books:

1. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, Wiley Publications, 2014, ISBN:978-1-118-43062-0.
2. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, 2015. ISBN: 978-8173719547

Reference Books:

1. Pethuru Raj, Anupama C. Raman, The Internet of Things, Enabling technologies and use cases, CRC Press. 2017. ISBN: 978-1498761284.
2. Matt Richardson & Shawn Wallace, Make:Getting Started with Raspberry Pi, O'Reilly, 3rd Edition, 2016, ISBN:978-1-680-45246-4.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

B.Tech. IV Year I Semester

18CSE116   MOBILE APPLICATION DEVELOPMENT

Course Prerequisite: 18CSE104

L	T	P	C
3	0	0	3

Course Description:

This course is concerned with the development of applications on Android platform. Android is used as a basis for the development of mobile applications. This course starts with the basic concepts of Java, history of android and architecture. It introduces the major building blocks that are used to develop an android application with examples. It also covers the development of applications using widgets, events, networking. It provides ideas on sensors, their types and writing programs based on sensor classes for application development.

Course Objectives:
While studying this course student will be able to
1. Understand Android history and its fundamentals and know the building blocks of android
2. Get idea on the creation of android user interface and its testing mechanisms
3. Identify the usage of threads, broadcast receivers, indents, services and their working methodology
4. Know about the storage mechanism in android using SQLite and the usage of content providers
5. Recognize the usage of android widgets and sensors in android based applications

UNIT- I INTRODUCTION AND INSTALLATION OF ANDROID TOOLS
Android Overview – History – Android Versions - Android Flavors. **Android Stack**: Linux, Native Layer and Hardware Abstraction Layer (HAL) – ART - Application Framework: Native C++ Library – Applications: System and User Applications - **Installation and Use of Android Tools:** Installing the Android SDK - Anatomy of an Android Project - Drawable Resources – XML Introduction - Creating user interface using XML – Overview of Android Building Blocks – Logging Messages in Android .   **(9)**

UNIT- II USER INTERACTION
Example. Input Components – Text View – Image View – List View and Alert Dialogues – Menus: Popup, Options and Context Menus – Screen Navigation through App Bar – Recycler View – Material Design – Testing the User Interface: Expresso – Screen Navigation using Intents: Definition – Usage of Intends – Creation of Indents with example program – Lists and Adapters – Types of Adapters – Examples using Adapters.   **(9)**

UNIT- III THREADS, LOADERS AND ASYNCTASK LOADER, BROADCAST RECEIVERS, SERVICES
Threading in Android – AsyncTask – Loaders – AsyncTask Loader – Connecting to Internet: JSON - HTTP API, Apache HTTP Client, HTTP URL Connection - Broadcast Receivers: Custom Broadcasts – Broadcasting Intends and their related API - Boot Receiver - Alarms and system services – Examples on alarms and services – Services: Services Life Cycle – Intent Service – Implementing Intent Service – Notifications: Managing Notifications.   **(9)**

UNIT IV: SAVING, RETRIEVING AND LOADING DATA:
Android File systems and Files - Action Bar: Preferences and Action Bar - Shared Preferences – App Settings - Databases on Android - SQLite - Status Contract Class, Update Refresh Service – Cursors – Backups - Content Providers: Overview – Role of Content Providers - - Content Provider Example Program – Content Resolver.   **(9)**

UNIT-V APPLICATIONS WIDGETS, INTERACTION AND SENSORS
App Widgets: Creation of Application Widgets - Interaction and Animation: Live Wallpaper and Handlers - Sensors: Sensor API in Android - Motion Sensor, Position Sensor, Environmental Sensor, Sensor Values, Sensor Manager Class, Sensor Class, Sensor Event class, Sensor Event Listener interface, Compass Accelerometer and orientation Sensors, Sensor Examples. **(9)**

Course Outcomes:
Upon successful completion of this course, students can able to:

1. Work on android basic components and Install android
2. Create User Interfaces with various Layouts and views using android building blocks
3. Work with Broadcast Receivers and Services
4. Create Database in Android, Store and Retrieve data using SQLite and Content Providers
5. Develop widgets, Wall papers for an android application and write programs based on Sensors

Text Books:

1. Android Programming-The Big Nerd Ranch Guide, Bill Philips, Christ Stewart, Kristin Mariscano, Big Nerd Ranch publishers, 3rd Edition
2. Android Programming for Beginners, John Horton, PACKT publishers
3. Learning Android , By Marko Gargenta& Masumi Nakamura, O'Reilly, II Edition
4. Android Application Development All in One for Dummies, Barry Burd, Wiley, 2nd Edition

Reference Books:

1. Android application Development-Black Book, Pradeep Kothari, dreamtech
2. Android Programming - Unleashed, B.M.Harwani, Pearson Education, 2013
3. Head First Android Development: A Brain-Friendly Guide, Dawn Griffiths and David Griffiths, O'Reilly, 2nd Edition
4. Android System Programming, Roger Ye, PACKT publishers
5. Programming   Android,ByZigurdMednieks,LairdDornin,G.BlakeMeike&   Masumi Nakamura, O'Reilly

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination

Dept. of Computer Science & Engineering

B. Tech. IV Year I Semester

<h3 style="text-align:center">18CSE212   INTERNET OF THINGS LABORATORY</h3>

<div style="text-align:right">

L T P C
0 0 2 1

</div>

Course Prerequisite: 18CSE207

Course Description:

This course provide hands-on practices on IoT using Arduino & Raspberry microcontrollers with various interfaces such as sensors, actuators, mobile app, cloud, social media.

Course Objectives:
1. To understand working principles of IoT devices
2. To get exposure towards the IoT internals
3. To understand the concepts of real world designs, industrial automation and commercial needs for designing IOT enabled solution

<h3 style="text-align:center">LIST OF EXPERIMENTS</h3>

1. Study on IoT Platform
a) Getting information and study of IOT microcontrollers (Arduino, Resperrypi)

2. **Study on IoT Platform**
a) Getting information about Sensors (IR, temperature, pressure, gas sensor)
b) Getting information about actuators. (Piezoelectric actuator, pneumatic actuator)

3. **Programming with Arduino platform**
a) Installation of Arduino in computer and verifying any errors in connection.
b) Control LED using Arduino
c) Traffic Light Control

4. Programming with Arduino platform and Reading from Sensors
a) interfacing sensors to Arduino board and getting information from them (any two sensors).
b) Experiment with both analog and digital sensors.

5. Programming with Resperrypi
a) Displaying Date on Serial Monitor
b) Automated Door Opening System

6. Connecting Android Phone with Arduino
a) Connecting Arduino with Mobile Device Using the Bluetooth Module.
b) Control any two actuators connected to the development board using Bluetooth.

7. Integrating Ethernet Shield.
Read data from sensor and send it to a requesting client using socket communication. Note: The client and server should be connected to same local area network
8. Creating Mobile App
a) Create a mobile app to control an actuator.
b) Control Electronic Devices from anywhere across the world using Internet & Mobile App.

9. **Interfacing Cloud**
a) Push sensor data to cloud - Use Arduino to Upload data from Environmental Sensors to Cloud Server.
b) Control an actuator through cloud

10. Data analysis and Visualization
Access the data pushed from sensor to cloud and apply any data analytics or visualization services.

11. Social media with IoT
Creating Program for Local host Web Server for controlling devices and update status on Twitter through Arduino.

12. Mini Project
Identify a problem in your local area or college which can be solved by integrating the things you learned so far and create a prototype to solve it.

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

1. Choose the sensors and actuators for an IoT application
2. Select protocols for a specific IoT application
3. Utilize the cloud platform and APIs for IoT application
4. Experiment with embedded boards for creating IoT prototypes
5. Design and develop a solution for a given IoT application

Text/ Reference Books:

1. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, Wiley Publications, 2014, ISBN:978-1-118-43062-0.
2. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, 2015. ISBN: 978-8173719547
3. Pethuru Raj, Anupama C. Raman, The Internet of Things, Enabling technologies and use cases, CRC Press. 2017. ISBN: 978-1498761284.
4. Matt Richardson & Shawn Wallace, Make:Getting Started with Raspberry Pi, O'Reilly, 3rd Edition, 2016, ISBN:978-1-680-45246-4.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech. IV Year I Semester

18CSE213   MOBILE APPLICATION DEVELOPMENT LABORATORY

	L	T	P	C
	0	0	2	1

Course Prerequisite: 18CSE204,18CSE207

Course Description:

      This Course introduces the concepts of advanced java that can be used in developing mobile applications. Students will get the capability to develop mobile based applications. Students will learn about record management system and generic framework. They will design and develop Mobile applications with the use of J2ME, like SMS, MMS, Gaming, Multimedia, JavaFX & Android.

Course Objectives:

 The student should be made to:
1. Understand the installation of Android SDK
2. Get idea on the User Interface Design and their testing methodologies
3. Know the components of Android Building Blocks and how to use them for different application developments

LIST OF EXPERIMENTS:

1. Develop an android application to display a simple text in the emulator
2. Develop an android application to display the internal keyboard in the emulator
3. i. Write an android program to display a message in the toast
   ii. Write an android program to input a text through a text and the same must be displayed in the toast when a button is clicked on the screen
4. i. Develop an application to perform 5 arithmetic operations: Addition, Subtraction, Multiplication, Division and Modulo operation with necessary user interface creation
   ii. Develop an android application to process a student mark list by creating proper UI using the necessary controls
5. Write an android application to create a calculator
6. Create an android UI that consists of Different Departments of a company namely Production, Finance, Marketing and HR. If the user clicks on any department it should show details of that department. Use indents.
7. Design an android application to display a list of items on the android screen. If the user clicks any one of the list items a dialogue box should show that the user has clicked that particular item (Use array adopters)
8. Develop an android application to show some categories such as education, entertainment, health, provisions etc., If the user clicks on any one of the items it should show the sub categories of the category and if is again clicked it should the details of those items. (Use indents and lists)
9. i. Design an android application to create a service that shows the service is running in the background in the form of a toast
   ii. Develop an android application to create an alarm using the concept of service

10. Develop an android application to demonstrate the concept of Fragments in Android
11. Develop an android application to demonstrate the database connectivity with the SQLite database to post and retrieve data through the User Interface
    (Example: Student mark list processing, Email Registration and Login, Products and sales)
12. Demonstrate the usage of Sensors in android by developing proper application.

Course Outcomes:

After successful completion of this course, the students can able to

1. Do the installation of Android SDK and write simple programs
2. Write programs for different applications by creating different user interfaces and testing them
3. Work on Sensor programs and network connectivity applications

Mode of Evaluation: Continuous Evaluation of the Lab Experiments, Record, Viva-voce and External Lab Examination.

Open Elective - II

Dept. of Computer Science & Engineering

Open Elective - II

18MAT301   ADVANCED NUMERICAL METHODS

	L	T	P	C
	3	0	0	3

Course Description

This course reviews and continues the study of computational techniques for evaluating interpolations, derivatives and integrals; solving system of algebraic equations, transcendental equations, ordinary differential equations and partial differential equations. The course emphasizes on numerical and mathematical methods of solutions with appropriate error analysis. The students use MATLAB as the computer language to obtain solutions to a few assigned problems.

Course Objectives

1. To introduce computation methods of solving algebraic and transcendental equations.
2. To avail the basics of numerical techniques for solving the system of linear equations.
3. To familiarize the knowledge of interpolation and numerical calculus.
4. To use numerical calculus for solving ordinary differential equations.
5. To introduce the computational techniques for solving partial differential equations.

UNIT-I: SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

Introduction to MATLAB, errors, sources of errors, floating point arithmetic, significant digits, relative error, propagation of errors, how to avoid loss of significant digits, evaluation of polynomial.
Bisection method, False-position method, Secant method, Fixed-point iteration method, Newton's method – single and multiple roots, Order of convergence of the methods.
Exercises of Bisection method and Newton's method through MATLAB   **(9)**

UNIT-II: SOLUTIONS OF SYSTEM OF ALGEBRAIC EQUATIONS

Gaussian Elimination, LU decomposition, Thomas algorithm for the tridiagonal systems, Norms-Euclidean, mini-maxi, Frobenius and 1-,2- and ∞-norms, Condition numbers and errors in computed solutions. Jacobi's method, Gauss-Seidel method, Power method for obtaining eigenvalues and eigenvectors of matrices.
Exercises of Gaussian Elimination and Gauss-Seidel method through MATLAB   **(9)**

UNIT-III: INTERPOLATION & NUMERICAL CALCULUS
Existence and Uniqueness of interpolating polynomial, Lagrange polynomials, Divided differences, Evenly spaced points, Error of interpolation, cubic spline, Inverse interpolation, Derivatives from difference table, Higher order derivatives, Trapezoidal rule, Simpsons rule, a composite formula, Gaussian Quadrature.
Exercises of Divided differences and Simpson's rule through MATLAB   **(9)**

UNIT-IV: NUMERICAL SOLUTIONS TO ORDINARY DIFFERENTIAL EQUATIONS

Taylor series method, Euler and Modified Euler's method, Runge-Kutta methods for initial value problems, Shooting method, Finite difference method for boundary value problems.
Exercises of Runge-kutta method and Shooting method through MATLAB

(9)

UNIT-V: NUMERICAL SOLUTION TO PARTIAL DIFFERENTIAL EQUATIONS

Finite difference methods for one-dimensional Wave and Heat equations; Laplace and Poisson equations (five-point formula).
Exercises of Finite difference method (forward, central and backward differentiation) and Crank-Nicolson method through MATLAB **(9)**

Course Outcomes

At the end of this course, students should be able to
1. Solve the system of algebraic and transcendental equations.
2. Apply the numerical techniques to find the solution to system of equations.
3. Calculate and analyze the rate of variations and numerical sum of such changes using numerical calculus relevant to the field of Engineering.
4. Find the accurate numerical solutions to ordinary differential equations representing some Engineering problems.
5. Compute the solutions for engineering problems represented by partial differential equations.

Text Books:

1. Curtis F. Gerald, Patrich O. Wheatley, Applied Numerical Analysis, Pearson Education, 7th Edition, 2003.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2010.
2. Burden and Faires, Numerical Analysis 7th ed., Thomson Learning, 2001.
3. Advanced Engineering Mathematics by E. Kreyszig, 10th ed., Wiley, 2010.
4. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven C. Chapra, 3rd ed., Mc Graw Hill, 2012.
5. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering, New Age International Ltd., 5th Edition, 2010.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective - II

18MAT302   ENGINEERING OPTIMIZATION

	L	T	P	C
	3	0	0	3

Course prerequisite:18MAT101,18MAT106, 18MAT104, 18MAT108, 18MAT109.

Course description: Unconstrained and constrained optimization, Linear programming problem, transportation and assignment problems, dynamic programming problem, project management and queuing models.

Course objectives:
1. Understand the optimization techniques for solving engineering problems.
2. Formulate and solve linear programming problem.
3. Obtain the optimal solution for transportation and assignment problems.
4. Avail knowledge to solvedynamic programming problem using recursive relations.
5. Analyze the techniques of project management and queuing models.

UNIT 1: CLASSICAL OPTIMIZATION.
Introduction to optimization, unconstrained optimization with single variable and multi variable. Constrained multivariable optimization with equality constraints- Lagrange multipliers method, constrained multivariable optimization with inequality constraints - Kuhn-Tucker conditions.**(9)**

UNIT 2: LINEAR PROGRAMMING PROBLEM.
Linear Programming Problem (LPP), Mathematical formulation, graphical solution, simplex method. Artificial variable technique - Big M-method and two phase simplex method.Duality, dual Simplex method.   **(9)**

UNIT 3: TRANSPORTATION PROBLEM AND ASSIGNMENT PROBLEM.
Transportation problem: definition and algorithm, transshipment problem. Assignment problem, travelling salesman problem.   **(9)**

UNIT 4: DYNAMIC PROGRAMMING.
Introduction, developing optimal decision policy, Dynamic Programming Problem (DPP) under certainty, DPP approach for solving LPP.   **(9)**

UNIT 5: PROJECT MANAGEMENT AND QUEUING MODELS.
Network analysis: Network representation, Critical Path Method (CPM) and Project Evolutionary and Review Technique (PERT). Introduction to queuing system, single server queuing models $(M/M/1) :(\infty/FCFS)$, $(M/M/1): (N/FCFS)$.   **(9)**

Dept. of Computer Science & Engineering

Course outcomes:
At the end of the course the students should able to
1. Understood the importance of unconstrained and constrained optimization to solve engineering problems.
2. Get an idea about the linear programming techniques.
3. Solve transportation andassignment problems in engineering situations.
4. Applythe Bellman principle of optimality to solvedynamic programming problem.
5. Analyze the problems of network analysis for project management and Queuing systems engineering & industry.

Text Books:

1. J K Sharma, Operations Research: Theory and Practice, Macmillan Publishers India Ltd, 5th edition,2013.
2. B.S. Grewal, Higher Engineering Mathematics, 43rd edition (2014), Khanna publishers.

References:

1. Hamdy A Taha, Operations Research: An Introduction, Pearson Education, 9/E, 2011.
2. FS Hillier and GJ Lieberman, Introduction to Operations Research, TMH, 8/E, 2006.
3. JC Pant, Introduction to Optimization: Operations Research, Jain Brothers, New, 6/E, 2004.
4. A Ravindran, DT Philips and JJ Solberg, Operations Research: Principles and Practice, John Wiley& Sons, Singapore, 2nd edition.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

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Open Elective - II

18PHY301   OPTICAL PHYSICS AND ITS APPLICATIONS

L T P C

3 0 0 3

Course Prerequisite: None

Course Description:
The course will cover Geometrical optics, Aberrations, Physical Optics, Diffraction and Optical fibers.

Course Objectives:
1. Knowledge of basic principles and concepts in optics and the techniques used to deal with them.
2. Explain the limitations associated with spherical and chromatic aberration
3. Describe optical systems such as microscopes and telescopes with reference to parameters such as angular magnification and depth of field
4. Provide students with a working knowledge of optical physics, including interference, diffraction and physical optics.
5. Introduce construction and concepts of basic fiber optic communication system and to make the students learn about its important applications for societal needs.

UNIT I: INTRODUCTION
Corpuscular and wave theory, Fermat's principle, Matrices for translation, refraction and reflection, Unit and nodal planes, Eigenvalues and Eigenvectors.

(9)

UNIT II: ABERRATIONS AND OPTICAL INSTRUMENTS
Types of aberrations, Chromatic and monochromatic aberrations. Different types of monochromatic aberrations. Simple and Compound microscopes, Astronomical and Terrestrial telescopes. Ramsden's and Huygens' eye pieces.

(9)

UNIT III: WAVE OPTICS & INTERFERENCE
Huygens's principle, Superposition of waves, Fourier transforms, representation of slits and apertures, Two beam interference by Division of wave front. Applications of Interference, Nonlinear interaction of light with matter (self-study).

(9)

UNIT IV: DIFFRACTION & POLARISATION
Fraunhoffer diffraction, Diffraction from single slit, double slit & multiple slits, Fresnel half-period zones, Zone plate, Applications of diffraction, Polarization, Malus' law, double refraction. Applications of polarization.

(9)

UNIT V: FIBER OPTICS
Construction and working principle of optical fibers, Numerical aperture and acceptance angle, Types of optical fibers. Attenuation and losses in optical fibers, Analog and Digital optical fiber communication system. Applications of optical fibers in communications, sensors and medicine.

(9)

Course Outcomes:

Dept. of Computer Science & Engineering

Upon completion of this course the students shall be able to:
1. Recollect the fundamental characteristics of light and their mathematical principles.
2. Learn the principles of superposition, Interference and Diffraction
3. Understand nonlinear optics and photonics phenomena.
4. Be exposed to the application of optical techniques in cutting edge research areas.
5. Describe the basic laser physics, working of lasers and principle of propagation of light in optical fibers.

Text Book:

1. Optics by Ghatak, 4th Edition, Tata McGraw Hill (2011).

Reference Books:

1. Optics by Lipson, Lipson & Lipson, 4th Edition, Cambridge Univ Press (2010).
2. Optics by Hecht, 4th Edition, Addison-Wesley (2002).

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective - II

18PHY302   LASER PHYSICS AND ADVANCED LASER TECHNOLOGY

L T P C

3 0 0 3

Course Prerequisite: Basic knowledge of atomic structure at intermediate (10+2) level is sufficient

Course Description:
Laser usage is rampant in various technological applications. Several fields gaining attention in the usage of lasers. This course covers the introduction to the theory and mechanism of laser action, various types of lasers and their applications and future use.

Course Objectives:
1. Make the student to understand the detailed principles of various lasers.
2. Profound understanding of different variety of lasers will provide them to think of superior selection and usage of lasers in practical technological applications.
3. Students are aware of latest developments in certain areas of Laser technology which have important applications for societal needs.
4. Explain how material processing is accomplished with lasers. Estimate laser operation parameters for material processing.
5. Exposure about Lasers applications in engineering, communications, spectroscopy and material process etc.

UNIT I: INTRODUCTION TO LASER TECHNOLOGY

Laser characteristics, The Einstein Coefficients, Absorption and Emission Cross Sections, Spontaneous and Stimulated emission of radiation, Population inversion, Methods of Population Inversion, Laser Rate Equations, stable two minor optical resonators, Mode selection, Gain in the regenerative laser cavity.

(9)

UNIT II: GASES AND LIQUIDS LASING MEDIUM
Energy levels & Radiative properties of Atoms and molecules**;** *Atomic lasers*: He-Ne laser, Argon Ion laser**;** *Molecular Lasers*: Carbon dioxide laser, Liquid energy levels and their radiative properties, Organic Dye laser.

(9)

UNIT III: SOLID STATE LASERS
Energy Levels in solids-dielectric medium, Solid-state lasing materials, Narrow line width laser materials, broad band line width laser materials, solid state lasers: Nd:YAG, Nd:YLF; Ti:Sapphire (introduction only)
Energy Levels in solids-semiconductor medium, direct and indirect band gap semiconductors, Semiconductor diode laser, Quantum dot lasers (Introduction only);

(9)

UNIT IV: PULSED OPERATION OF LASERS

Nanosecond: Q-Switching, Techniques of Q-Switching: electro-optic, Acousto-Optic. Femtosecond: Relationship between pulse duration and Spectral Width, Passive mode-locking, Active mode locking, Kerr lens mode locking, Amplification of femtosecond pulses.

(9)

UNIT V: LASER APPLICATIONS

Laser processing of materials: laser cutting, laser drilling, welding; Lasers in metrology- Accurate measurement of length, light wave communications; Laser spectroscopy: Laser fluorescence and Raman scattering

(9)

Course Outcomes

Upon completion of this course the students shall be able to:
1. Understand the principle of phenomenon of laser and identify the operating principle involved in various type of lasers.
2. Estimate stability requirements in producing laser light by different types of sources
3. Differentiate or list the various types of lasers and their means of excitation.
4. Assess (Identify) which laser would best meet the need for a particular industrial or research task.
5. Student can knowledge of latest technological developments in laser technology. Femtosecond laser etc.

Text books:

1. Laser Fundamentals: William T Silfvast. Cambridge Publication.
2. Laser Theory and Applications: A.K. Ghatak and K. Thyagarajan, Springer

Reference books:

1. Solid State Laser Engineering: Walter Koechner. Springer series in optical sciences.
2. Ultrafast Optics, Andrew M. Weiner
3. Laser spectroscopy: Demtroder
4. Laser Applications: Monte Ross
5. Femtosecond Laser Pulses Principles and Experiments: Claude Rulli`ere, Springer
6. Principles of Laser: O. Svelto
7. Laser Physics: Peter W Miloni, Joseph H Eberly.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective – II

18CHE301   INTRODUCTION TO PETROLEUM INDUSTRY

L T P C

3 0 0 3

Course Pre-requisite: Basic Chemistry at Intermediate or equivalent level.

Course Description:
It deals with basic principles of petroleum engineering and the processes involved in petroleum industry.

Course Objective:
1. To get exposure to the basic concepts of petroleum refining.
2. To understand the basic properties of various fuels, additives and their importance.
3. To introduce the basic concepts of refining processes and technologies.
4. To familiarize the basic concepts of catalysis and various catalysts used in the refinery.
5. To understand the safety and environmental issues in petroleum industry

UNIT I: BASIC PROCESSES IN PETROLEUM REFINING AND FUEL TESTING
Source of Crude oils and types, Overview of refinery process, Atmospheric Distillation, Vacuum distillation, Desalter, Desulphurization, Cracking, catalysis, Effluent treatment plant(ETP). Properties and quality control of fuel: Density, Viscosity, Pour Point, Flashpoint, Fire Point, Octane Number, Cetane Number, Ductility, Water Content, Sulphur Analysis, Micro Carbon Residue Test(MCRT), Saturate, Aromatic, Resin and Asphaltene(SARA), High Frequency Reciprocating Rig(HFRR), Calorific Value.

(9)

UNIT II: CHEMICAL ADDITVES IN PETROLEUM INDUSTRY
Types of products in the refinery and their structural properties, Neutralizing amines, Corrosion inhibitors, Multifunctional additives, viscosity modifiers, drag reducing agents, antioxidants, Lubrication modifiers, Antifoam agents, Oil spill absorbers, Dispersants, Chemicals used for ETP plant.

(9)

UNIT III: ROLE OF HYDROPROCESSING AND FLUID CATALYTIC CRACKING IN PETROLEUM INDUSTRY
Hydrocracking reactions, Hydrocracking feedstock's, Modes of Hydrocracking, Effects of process variables, Hydro treating process and catalysts, Resid hydro processing, FCC Cracking, Catalyst coking and regeneration, Design for Fluidized-Bed Catalytic Cracking Units

(9)

UNIT IV: ROLE OF CATALYSTS AND BIOPROCESSES IN PETROLEUM INDUSTRY
Types of catalyst and their importance, Design and selection of catalyst. Catalytic processes. Bioprocesses: Introduction, Refining of petroleum using biodesulphurisation, Bioremediation, commercial processes for bioethanol, isopropanol.

(9)

UNIT V: SAFETY AND MANAGEMENT IN PETROLEUM INDUSTRY
Safety policy, Personal protective equipment, Different type of extinguishers, Types of gloves and their application, Hydrants and their role, Safety indicators, Safety contact, Environmental pollution, precaution and first aid, safety measures, Different elements and their role in Occupational safety and Management.

(9)

Course Outcomes:
At the end of the course, the students will
1. Be able to understand the overview of petroleum industry
2. Be able to understand the concepts of crude oil, types of crude oils, properties of fuels such as octane number, cetane number, viscosity, density etc. Instruments.
3. Be familiarized with importance and their use of chemicals involved in the petroleum industry.
4. Be familiarized with the processes involved in hydroprocessing and fluid catalytic cracking.
5. Be familiarized the types of catalysts and bioprocesses in the petroleum industry.
6. Understanding the PPE, different types of extinguishers, First aid, process safety and management in the petroleum industry.

Text Books:

1. Mohamed A. Fahim, Taher A. Al-Sahhaf and Amal Elkilani, Fundamentals of Petroleum Refining, Elsevier,2009
2. David T Day, Handbook of the Petroleum Industry, Volume 1, ISBN: 137595962X, Chizine Publ., 2017

Reference Books:

1. Sankara Papavinasam, Corrosion Control in the Oil and Gas Industry, Elsevier, 2013
2. Petroleum Engineering Handbook (Vol. 1 - VIII). Editor in Chief: Larry W. Lake, Society of Petroleum Engineers.
3. Srinivasan Chandrasekaran. Health, Safety and Environmental Management for offshore and Petroleum Engineers, John Wiley and Sons, U.K., ISBN: 978-11-192-2184-5, 2016.
4. S. P. Srivastava and Jenő Hancsók, Fuels and fuel additives, Wiley VCH Verlag Gmbh & Co, Weinheim, 2004.
5. Robert O. Anderson, Fundamentals of the Petroleum Industry–University of Oklahoma Pres, 1987.
6. James G. Speight, Handbook of Petroleum Product Analysis, John Wiley & Sons, Inc, 2015
7. Physical Chemistry by G.W. Castellan (Addison Wesley Publishing Company), 2004

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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Open Elective - II

18CHE302   GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT

L T P C
3 0 0 3

Course Prerequisite: Basic Engineering Chemistry or equivalent level

Course Description:
This course aims to introduce the interdisciplinary concept for engineering's to enhance their knowledge that they need to contribute with relevance and confidence in developing green technologies.
This course covers feedstocks, green metrics and the design of safer, more efficient processes, as well as the role catalysts, solvents and green processes for nanoscience.

Course Objectives:
1. Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry
2. Sensitize the students in redesigning of chemicals, industrial processes and products by means of catalysis.
3. Understand the use of alternatives assessments in using environmentally benign solvents.
4. Emphasize current emerging greener technologies and the need of alternative energies.
5. Learn to adopt green chemistry principles in practicing nanoscience.

UNIT 1:   PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY

Introduction, Green chemistry principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement and addition reactions and un-economic reactions: Substitution, Elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation.

(9)

UNIT 2:   CATALYSIS AND GREEN CHEMISTRY
Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites: Catalytic cracking, ZSM-5 catalyst and high silica zeolites, TS1 Oxidation catalyst, Catalytic Converters, Homogeneous catalysis: Hydrogenation of alkenes using Wilkinson's catalyst, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide. Recycling of catalyst.

(9)

UNIT 3: ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS
Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: carbondioxide, water - water as a reaction solvent, water based coatings, Ionic liquids as solvent.

(9)

UNIT 4: EMERGING GREENER TECHNOLOGIES AND ALTERNATIVE ENERGY SOURCES

Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Fuel Cells(Hydrogen—oxygen fuel cell, SOFC and PEMFC), Photochemical Reactions: Advantages and Challenges of Photochemical Processes, Example-Caprolactum, chemistry Using Microwaves: heating, assisted Reactions, Sonochemistry.

(9)

UNIT 5: GREEN PROCESSES FOR NANOSCIENCE

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing nanoscience. Green Synthesis of Nanophase Inorganic Materials and Metal Oxide Nanoparticles: Hydrothermal Synthesis, Reflux Synthesis, Microwave-Assisted Synthesis, Other methods for Green synthesis of metal and metal oxide nanoparticles, Green chemistry applications of Inorganic nanomaterials

(9)

Course Outcomes:

Upon completion of this course the students should

1. Recognize green chemistry concepts and apply these ideas to develop respect for the interconnectedness of our world and an ethic of environmental care and sustainability.
2. Understand and apply catalysis for developing eco friendly processes.
3. Be in a position to use environmental benign solvents where ever possible.
4. Have knowledge of current trends in alternative energy sources.
5. Apply green chemistry principles in practicing green Nanoscience.

Text Books:

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA 2005.

Reference Books:

1. Edited by Alvise Perosa and Maurizio Selva, Hand Book of Green chemistry Volume 8: Nanoscience, wiley-VCH
2. V.K. Ahluwalia, M. Kidwai, New trends in Green chemistry, 2004, Springer.
3. Benny Joseph, Environmental Science and Engineering, TATA Mc Graw Hill, New Delhi 2006.
4. Albert Matlack, Introduction to Green Chemistry, Second Edition CRC press, 2010

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective - II

18HUM301   INTELLECTUAL PROPERTY RIGHTS

L T P C

3 0 0 3

Course Description: Intellectual property (IP) is a legal term that refers to creations of the mind. Examples of intellectual property include music, literature, and other artistic works; discoveries and inventions; and words, phrases, symbols, and designs. Under intellectual property laws, owners of intellectual property are granted certain exclusive rights. Some common types of intellectual property rights (IPR) are copyright, patents, and industrial design rights; and the rights that protect trademarks, trade dress, and in some jurisdictions trade secrets. Intellectual property rights are themselves a form of property, called intangible property.

Course Objectives: The course is intended to:
1. Explain the importance of Intellectual Property Rights, its protection and management;
2. Explain the types/tools of IPR;
3. Make aware the students to understand the commercialization of IPR;
4. Know the filing of patent rights, acts, rules & portfolio analysis, management, patent strategy; and
5. Create awareness about Right to Information Act (RTI), its powers, functions, penalties and appeal.

UNIT I: INTRODUCTION:
Intellectual property and its protection, WTO, TRIPS Agreement& its Protection

(9)

UNIT II: INTRODUCTION TO COPYRIGHTS
Copyright Principles – Copyright Law - Copyright ownership - Right to prepare derivative works – Rights of Distribution - Copyright Formalities and Registrations - Copyright disputes - International Copyright Law – Patent Trademark – Geographical indications

(9)

UNIT III: COMMERCIALIZATION OF IP ASSETS:
Contracting, Licensing, Assignment and technology transfer; Drawing up a business strategy IP rights in export markets; Ownership of rights by employees; Valuation of intellectual property rights.

(9)

UNIT IV: PROCEDURE FOR FILING PATENT IN INDIA AND OTHER COUNTRIES,
PCT filing, Patent Search, Patent Acts & Rules, Patent Infringement, Patent Portfolio analysis and management, Patent Strategy.

(9)

UNIT V: RTI
Introduction – Objectives – Obligation of Public Authorities – The Central & State information commission – Powers & Functions – Penalties & Appeal.

(9)

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Course Outcomes:
 At the end of the course, students will be able to
1. Understand the importance of Intellectual Property Rights, its protection and management.
2. Analyze and apply the types/tools of IPR.
3. Identify the process of commercialization of IPR.
4. Understand the procedure of filing of patent, acts, rules and portfolio analysis, management, patent strategy.
5. Apply the Right to Information Act (RTI) in real life situation.

Text Book:

1. Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets, 4th Edition (2013) By **Deborah E. Bouchoux, Cengage Learning**

References:

1. Latest Research Papers

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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Open Elective - II

18HUM302   HUMAN RESOURCE DEVELOPMENT

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L  T  P  C

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Course Description: The course content includes: Introduction to HRM, strategic human resource challenges, work flows, job analysis, managing diversity, concepts, goals, mechanism and system of HRD, recruitment and selection, downsizing and outplacement, appraising and managing employee performance, training, career development, managing compensation, rewarding performance, designing benefit plans, employee relation and employee discipline, and workplace safety and health.

Course Objectives: The course is intended to:
1. Explain the nature and scope of HRM, its functions, policies and strategies;
2. Describe the human resource planning, work analysis and importance in designing jobs;
3. Know the recruitment, selection and the process of performance appraisal;
4. Make the student to learn about training and development; and
5. Explain the industrial relations, trade unions, Ethics and fair treatment at work.

UNIT I: INTRODUCTION
Understanding the nature and scope of Human Resource Management- Definition, Functions / objectives, organization of department.

(9)

UNIT II: HUMAN RESOURCE PLANNING
Human Resource Planning- Factors affecting HRP, the planning process, managerial succession planning. Job Analysis, Methods of collecting job data, Competency based Job Analysis, Job design approach, contemporary issues in Job Description.

(9)

UNIT III: RECRUITMENT, SELECTION AND PERFORMANCE APPRAISAL
Recruiting and selecting employees-, Selection process, Barriers, selection in India. Performance Management, Process of Performance Appraisal, Methods of Performance Appraisal - Errors in Performance Appraisal.

(9)

UNIT IV: TRAINING AND DEVELOPMENT
Training v/s development – Training Methods - challenges in training - Career development – Reward Management – Performance Appraisal – Compensation Management.

(9)

UNIT V: INDUSTRIAL RELATIONS, TRADE UNIONS
Industrial Relations, Trade unions, resolving dispute- Labor Movement - Trade Union in India, Collective Bargaining: Process and Methods, Grievance: Sources and process of Redressal, Managing Ethical issues in Human Resource Management- Ethics and fair treatment at work.

(9)

Dept. of Computer Science & Engineering

Course Outcomes:
At the end of the course, students will be able to:
1. Understand the concept of HRM, its nature, scope, functions, policies and strategies;
2. Analyse human resource planning and apply in designing jobs;
3. Evaluate the recruitment, selection and the process of performance appraisal;
4. Understand the importance of training and development activities; and
5. Examine the industrial relations, trade unions, employee safety and health measures.

Text Books:

1. Aswathappa K., Human Resource Management- Text and Cases, Tata McGraw Hill, 6th Edition, 2010
2. Gomez-Mejia, L.R., Balkin, D.B., &Cardy, R.L. Managing Human Resource Management 6th edition, Pearson Edu. 2007.

References:

1. Garry Dessler, BijuVarkkey , Human Resource Management ,11th Edition, Pearson Education, 2009.
2. R. Wayne Mondy, Human Resource Management, 10th Edition, 2010

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective II

18HUM304 NATIONAL CADET CORPS

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L  T  P  C
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Pre-requisite: NCC B-Certificate

Course Description:
The main aim of this course is to mould the youth into responsible citizens of the nation. It helps to improve character and leadership qualities towards nation building. This course also motivates the youth to offer Selfless service to the society and nation. The course comprises Common subjects, Service subjects of NCC, societal aspects and basic organization of Indian Armed Forces.

Course Objectives:
This course enables the student to –
1. Get aware of NCC organization and general structure of Defence Forces.
2. Learn leadership and national integration.
3. Motivate towards to maintain Health and hygiene, personality development.
4. Learn elementary characteristics of disaster management, Field craft and Battle craft.
5. Acknowledge the Social activities, Communication and Military History.

UNIT I   **10 hours**

INTRODUCTION TO NCC
Introduction, History of NCC , NCC Motto, NCC Flag, Aims of NCC, Cardinal points of NCC, Organization of defence forces in general, Organizational structure of Indian Army(Armed forces), Organizational structure of NCC, NCC Song, Incentives of NCC, Ranks in Army, Navy and Air Force, current representatives – Certificate Examination in NCC– Honours and Awards.

FOOT DRILL BASICS
 Aims of Drill, Word of Commands, Attention, Stand at Ease, Turning Left, Right and Inclining at the Halt. Sizing, Forming up in three Ranks and Numbering, Open and Close March Order, Dressing the Squad, Saluting at the Halt, Getting on Parade, Falling Out and Dismissing, Marching, Guard of Honour.

UNIT II   **10 hours**
LEADERSHIP
Meaning, Leadership Traits, Types of Leadership, Discipline & Duty of an Indian Citizen, Motivation, Code of Ethics, Perception, Communication, Customs of Services, Importance of Team Work, leaders(swami Vivekananda).

NATIONAL INTEGRATION
Meaning and Importance, Unity in Diversity, Indian History and Culture, Religion and Customs of India, India and its Neighbours, Contribution of Youth in Nation Building, Contribution of leaders in nation unification .

UNIT III   12 hours
HEALTH AND HYGIENE
Structure and Function of Human Body, Hygiene and Sanitation, Preventable Diseases, First Aid, Yoga: Introduction and Exercises, Physical and Mental Health, Fractures: Types and Treatment.
PERSONALITY DEVELOPMENT
Introduction to personality development, Physical and social factors influencing / shaping personality, psychological and philosophical factors influencing / shaping personality, Self-awareness, SWOT analysis, mind set, interpersonal relationship and communication, effective communication, barriers of communication.
ENVIRONMENT AND ECOLOGY
Environment: Meaning, Global Warming, Acid Rain, Depletion of Ozone Layer, Conservation of Environment. Ecology: Introduction, Component of Ecological System, Forest Ecology, Wild Life, Pollution Control.

UNIT IV   10 hours
DEFENCE AND DISASTER MANAGEMENT
Civil Defence: Meaning, Organization and its Duties, Civil Defence Services, Fire Fighting : Meaning, Mode of Fire, Fire Fighting Parties, Fire Fighting Equipment. Introduction, Classification of Disaster: Natural Disaster & Man Made Disaster, Disaster Management During Flood, Cyclone and Earth Quake, Assistance in Removal of Debris, Collection and Distribution of Aid Material, Message Services.
SOCIAL SERVICE ACTIVITIES (Social Service And Community Development)
Basics of Social Service, Weaker Sections in the Society and its Identification, Contribution of Youth towards Social Welfare, NGOs and their Role and Contribution , Social Evils, Drug Abuse, Family Planning, Corruption, Counter Terrorism, Eradication of Illiteracy – Aids Awareness programme – Cancer Awareness Programme.

UNIT V   10 hours
COMMUNICATION
Types of communication, characteristics of wireless technology, Walkie/talkie, Basic RT procedure, Latest trends and development(Multimedia, video conferencing, IT)
MILITARY HISTORY
Biography of Indian Historical Leaders: Chatrapati Shivaji, Maharana Pratap, Akbar Famous Battles / Wars of India: Indo – Pak War 1971(all wars), Kargil War.(Categorise: before/ After independence) Biography of Successful Leaders: General Patton, General Mac. Arthur, Field Marshal Sam Maneksha.

Course Outcomes:
At the end of the course, students will be able to:
1. Analyse the NCC structure and different ranks in Indian Armed Forces along with foot drill.
2. Notify the leadership traits and the need of national integrity towards nation building.
3. Instill respect and responsibility towards personal health and hygiene, develop dynamic personality with adequate qualities.
4. Identify different disasters and judging measurements on the ground.
5. Recognise various communication devices, analyse the Military Organization.

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Text Books:

1. HAND BOOK OF NCC – "SANJAY KUMAR MISHRA, MAJOR RC MISHRA", published by Kanti prakashan-2020.
2. NCC HAND BOOK - "SHASHI RANJAN & ASHISH KUMAR", published by Goodwin Publications-2021.

Reference Books:

1. NCC Hand book – "R.Gupta's", Ramesh Publishing House-2021.
2. NCC (ARMY WING)- "R.Guptas's",RPH Editorial Board-2021
3. Hand Book Of N.C.C. – "Ashok Pandey", Kanti Publications-2017

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Open Elective - II

18CE301   GROUND IMPROVEMENT TECHNIQUES

L T P C

Course Prerequisites: None

3 0 0 3

Course Description

Identification of problematic soils; ground improvement techniques; densification in granular soils; densification in cohesive soils; soil stabilization; confinement; reinforced earth; geosynthetics; improvement of expansive soils.

Course Objectives

1. To introduce engineering properties of soft, weak and compressible deposits, principles of treatment for granular and cohesive soils and various stabilization techniques.
2. To bring out concepts of reinforced earth.
3. Applications of geotextiles in various civil engineering projects.

UNIT I: DEWATERING & GROUTINHG

Introduction- Need for engineered ground improvement, classification of ground modification techniques; suitability, feasibility and desirability of ground improvement technique.
Methods of de-watering- sumps and interceptor ditches- wells- drains- Electro- osmosis. Objectives of grouting- grouts and their properties-grouting methods.

(9)

UNIT II: DENSIFICATION

In - situ densification methods in cohesionless Soils: - Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth. In - situ densification methods in cohesive soils: - preloading or dewatering, Vertical drains - Sand Drains- Sand wick geo-drains - Stone and lime columns - thermal methods.

(9)

UNIT III: STABILIZATION

Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride- sodium silicate and gypsum.

(9)

UNIT IV: REINFORCED EARTH & GEOSYNTHETICS

Principles - Components of reinforced earth - factors governing design of reinforced earth walls design principles of reinforced earth walls. Geotextiles- Types, Functions and applications - geo- grids and geo-membranes - functions and applications.

(9)

UNIT V: EXPANSIVE SOILS

Problems of expansive soils - tests for identification - methods of determination of swell pressure. Improvement of expansive soils - Foundation techniques in expansive soils - under reamedpiles.

(9)

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

1. Identify basic deficiencies of various soil deposits and able to decide various dewatering methods to improve the soil.
2. Implement different techniques of soil densification.
3. Use admixtures in stabilizing the soil.
4. Use geo-synthetics materials in engineering applications.
5. Suggest different types of foundation techniques and methods to control swelling of soil

Text Books:

1. Dr. Purushotham Raj, P., Ground Improvement Techniques, Laxmi Publications, New Delhi.
2. Dr. Sivakumar Babu, GL, An Introduction to Soil Reinforcement & Geosynthetics, Universities Press

Reference Books:

1. Hausmann M.R., Engineering Principles of Ground Modification, McGraw-Hill International Edition, 1990.
2. Moseley M.P., Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA, 1993.
3. Xanthakos P.P., Abramson, L.W and Brucwe, D.A., Ground Control and Improvement, John Wiley and Sons, New York, USA, 1994.
4. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercy, USA.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective - II

18CE302 ENVIRONMENTAL IMPACT ASSESSMENT

	L	T	P	C

Course Prerequisites: None

3 0 0 3

Course Description

The course will focus on Basic concept of Environmental Impact Assessment (EIA), EIA Methodologies, Impactof Developmental Activities and Land use in soil, water, and vegetation, Environmental Audit, Post Audit activities, The Environmental pollution Acts.

Course Objectives

1. To impart knowledge on Environmental management and Environmental Impact Assessment.
2. To give the student the brief knowledge about various legislations and auditprotocols.
3. To give student knowledge about the framing of environmental audit through case studies.

UNIT I: CONCEPTS AND METHODOLOGIES IN EIA
Introduction - Elements of EIA - Factor affecting EIA -Impact evaluation and analysis - Preparation of Environmental Base map - Classification of environmental parameters. Criteria for the selection of EIA Methodology - EIA methods: Ad-hoc methods - matrix methods - Network method - Environmental Media Quality Index Method -overlay methods - cost/benefit Analysis.

(9)

UNIT II: IMPACT OF DEVELOPMENTAL ACTIVITIES
Introduction and Methodology for the assessment of soil and ground water - Delineation of study area - Identification of actives. Procurement of relevant soil quality - Impact prediction - Assessment of Impact significance -Identification and Incorporation of mitigation measures. EIA in surface water - Air and Biological environment.

(9)

UNIT III: IMPACT ON VEGETATION AND WILD LIFE
Assessment of Impact of development Activities on Vegetation and wildlife - environmental Impact of Deforestation - Causes and effects of deforestation.

(9)

UNIT IV: ENVIRONMENTAL AUDIT
Environmental Audit & Environmental legislation objectives of Environmental Audit - Types of environmental Audit - Audit protocol - stages of Environmental Audit - onsite activities - evaluation of audit data and preparation of audit report - Post Audit activities.

(9)

UNIT V: ENVIRONMENTAL POLLUTION ACTS
The water Act-1974 - The Air Act-1981 (Prevention & Control of pollution Act.) - Wild life Act- 1972 - Indian Forest Conservation Act-1980 -National Green Tribunal Act –2010 - Biological Diversity Act-2002.

(9)

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Course Outcomes
The students after completing the course will be able to:
1. Utilize the various methods used in predicting environmental impacts.
2. Utilize site information to interpret impacts on land and groundwater.
3. Outline the environmental impacts of various development activities on existing ecosystem.
4. Utilize the procedures and various protocols involved in preparation of environmental audit report.
5. Utilize the implications of environmental prevention and protection acts in relation to environmental impact assessment.

Text Books:

1. Anjaneyulu, Y., Environmental Impact Assessment Methodologies, B.S. Publication, Sultan Bazar, Kakinada.

Reference Books:

1. Glynn, J. and Gary W. Hein Ke., Environmental Science and Engineering, Prentice Hall Publishers
2. Suresh K. Dhaneja Environmental Science and Engineering, S.K., Katania& Sons Publication, New Delhi.
3. Dr. Bhatia, H.S., Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective - II

18CE303   WATERSHED MANAGEMENT

L T P C

Course Prerequisites: None

3 0 0 3

Course Description

Topic covers basic concepts of watershed, sustainable watershed management approached and practices, integrated watershed management and modelling, social aspect in watershed management, quantification of water quality and quantity at the catchment outlet using modern techniques, drought, flood and storm management at catchment scale.

Course Objectives

1. To discuss various aspects of water resources development and management on watershed basis.
2. To proliferate the sustainable use and development of natural resources.
3. To enrich the students for change in the hydrological fluxes due altered physiographic condition (land use or elevation) on a watershed scale.
4. To improve the quantitative problem solving skills of the students for natural resources management.

UNIT I

CONCEPT OF WATERSHED: Concept of watershed - classification of watershed - introduction to watershed management - objective of watershed development - Hydrological cycle - water balance equation - different stakeholders and their relative importance - watershed management policies and decision making.

(9)

FACTOR AFFECTING WATERSHED DEVELOPMENT: Morphological characteristics: linear - Arial and Relief aspect - land use - vegetation - soil and geological characteristics - Hydrology and geology and socio-economic characteristics.

UNIT II

WATERSHED MODELING: Watershed delineation - modelling of rainfall - runoff process - Concept of integrated watershed management conjunctive use of water resources - Integrated water resources management. PRA - Private sector participation - Institutional issues - Socio-economy issues - Integrated development - Water legislation and implementations - Tools and emerging technologies for watershed management and planning.

(9)

UNIT III

EROSION AND SEDIMENTATION: Types of erosion - factor affecting erosion - effect of erosion on land fertility and capacity - estimation of soil loss due to erosion: universal soil loss equation.

PREVENTION AND CONTROL TO EROSION: contour techniques - ploughing - furrowing

- trenching - bunding - terracing - gully control - rockfill dams - check dams - brushwood dam - Gabion structure.

(9)

UNIT IV
WATER HARVESTING: Rain water harvesting - catchment harvesting - harvesting structures - soil moisture conservation - check dams - artificial recharge from pond - percolation tanks.
FLOOD AND DROUGHT MANAGEMENT: Definition of flood - Flood frequency analysis: Weibul - Gumbel - and log Pearson methods.Definition and classification of drought - drought analysis techniques - drought mitigation planning.
MANAGEMENT OF WATER QUALITY: Water quality and pollution - types and Sources of pollution - water quality modeling - environmental guidelines for water quality.

(9)

UNIT V

COVER MANAGEMENT: Land use land cover change estimation through satellite imageries - land capability classification - management of forest - agricultural - grassland and wild land - Reclamation of saline and alkaline soil. Classification of columns based on slenderness ratio - reinforcement & loading - Design of rectangular and circular columns subjected to axial load - (axial load + uni-axial bending) and (axial load + bi-axial bending). Different Types of Footings - Design of isolated - square - rectangular and circular footings.
INTEGRATED CROPPING SYSTEM FOR WATERSHEDS: Intercropping - mix cropping strip and terrace cropping - sustainable agriculture - cover cropping (biomass conservation) - horticulture - dryland agriculture and afforestation.

(9)

Course Outcomes
The students after completing the course will be able to:

1. Classify watershed and Identify factors to consider for watershed Development.
2. Apply the concepts of watershed development and planning
3. Evaluate the erosion rate and total amount of soil loss from a watershed
4. Select the flood and drought mitigation measures
5. Quantify the change in land use land/cover and its impact on hydrological processes.

Text Books:

1. Kenneth N. Brooks Peter F. Ffolliott Joseph A. Magner. Hydrology and the Management of Watersheds. A John Wiley & Sons, Inc., Publication (4th Edition)
2. VVN, Murthy. Land and Water Management- Kalyani Pblication

Reference Books:

1. JVS Murthy. Watershed Management. New Age International publisher.
2. A.M. Michel and T.P. Ojha. Hand Book on Agricultural Engineering, Volume 2.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective – II

18ME301   MATERIAL SCIENCE FOR ENGINEERS

L T P C

Course Prerequisite: None

3 0 0 3

Course Description:
The purpose of this course is to introduce the student to enrich their knowledge on the materials science field. Begin with the microscopic level the structure at the atomic and their impact on the material properties are discussed. Electronic and related conductivity of materials and respective origins are studied. Substantial part of this course is dedicated in study of magnetism and its origin in the materials along with suitable applications. Last unit is dedicated towards photonic materials.

Course Objectives:
1. To understand the relation between structure and properties of metallic materials.
2. To understand the strengthening mechanism of metals
3. To comprehend the various electrical and electronic properties of materials.
4. To understand origins and various types of magnetism and its applications.
5. To comprehend the transmission of light in various solids and study of photonic behavior.

UNIT I: STRUCTURE OF MATERIALS
Introduction: Historical prospective - importance of materials - Classification of Materials and its Properties. Bonding in solids: bonding forces and energies - primary and secondary bonding. Crystallography and Metallic structures: Unit cell - Crystallographic directions and planes, FCC, BCC, HCP, SC and other structure – miller indices, Linear and planar densities - close-packed crystal structures. Packing of atoms in solids. Packing factor

(9)

UNIT II: CRYSTAL IMPERFECTIONS AND DIFFUSION.
Crystal Imperfections: Types, Vacancies and interstitials, Dislocations and grain boundaries. Diffusion: Fick's Law of diffusion – Diffusion mechanism – Steady state and non-steady state, factors affecting diffusion.

(9)

UNIT III: ELECTRICAL PROPERTIES OF MATERIALS
Introduction and Electrical Conduction: Ohm's Law, Electrical Conductivity, Electronic and Ionic Conduction, Energy Band Structures in Solids, Electron Mobility, Electrical Resistivity of Metals Semiconductivity: Intrinsic and Extrinsic Semiconduction, Temperature Dependence of Carrier Concentration, Factors that Affect Carrier Mobility, The Hall Effect, Semiconductor Devices. Conduction in Ionic Materials, Electrical Properties of Polymers.
Dielectric Materials: Capacitance, Ferroelectric Materials, Piezoelectric Materials.   **(9)**

UNIT IV: MAGNETIC PROPERTIES OF MATERIALS
Introduction and Basic Concepts, Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism, Ferrimagnetism, Influence of Temperature on Magnetic Behavior, Domains and Hysteresis, Magnetic Anisotropy, Soft and Hard Magnetic Materials, Magnetic Storage, Superconductivity.   **(9)**

UNIT V: PHOTONIC MATERIALS

Introduction, Electronic Radiation in Vacuum; Reflection, Refraction and absorption in materials; Absorption and Chemical Bonding: Color, X-Ray absorption, Photon absorption Devices.
Photon Emission: X-Ray Emission, Emission of electromagnetic radiation and devices: LED's, OLEDs and LASERs. Optical Fibers in communication

(9)

Course Outcomes:

At the end of the course students will be able:

1. To develop deep knowledge of crystal structure and effect of structure on the properties of the materials.
2. To demonstrate knowledge of various imperfections in crystal, and diffusion mechanism in materials.
3. To explain the origins of various electronic and electrical properties in the materials.
4. To understand the concept of magnetism, its origin and types, while choosing the right material for the given application.
5. To summarize various optical properties of the material and light's transmission behavior.

Text Books:

1. W. Callister, "Materials Science and Engineering", Wiley, 7th Edition, 2007.
2. Charles M. Gilmore, "Materials Science and Engineering Properties", Cengage Learning, SI Edition, 2016.

References:

1. Donald R. Askeland, Pradeep P. Phule, "The Science and Engineering of Materials", Cengage Learning, 5th Edition, 2006.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective - II

18ME302   ELEMENTS OF MECHANICAL ENGINEERING

Course Prerequisite: None

L T P C

3 0 0 3

Course Description:

Course Objectives:
Students belonging to all branches of Engineering are made to learn following fundamental topics related to mechanical engineering

1. To teach students the basic concepts of Thermodynamics.
2. To teach students the basic Classification and working principles of boilers and turbines.
3. To teach students about IC engines, Refrigeration, and Air-Conditioning systems.
4. To teach students about engineering materials and casting manufacturing processes.
5. To teach students and machines tools and manufacturing systems.

UNIT I:
Basic concepts of Thermodynamics: Introduction, Important terminologies used in thermodynamics, Specific heat capacity, First law of thermodynamics, Second law of thermodynamics, Reversible and irreversible processes, the Carnot cycle and the Clausius inequality.

(9)

UNIT II:
Boilers: Introduction to boilers, Classification of boilers, requirements of a good boiler, Cochran, Babcock, Locomotive, and Lancashire boilers.
Turbines: Hydraulic Turbines-Classification and specification, Principles and operation of Pelton wheel turbine, Francis turbine, and Kaplan turbine (elementary treatment only).
Hydraulic Pumps: Introduction, Classification, and specification of pumps, reciprocating pump, and centrifugal pump.

(9)

UNIT III:
Internal Combustion Engines
Classification, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines, Working principle of IC engines, Valve timing diagrams, Otto cycle, Diesel cycle, and Dual cycle.
Refrigeration and Air conditioning Refrigeration – Introduction, Refrigerator, and Heat pump, Components of refrigeration system, Types of refrigeration system, and Type of refrigerants.

(9)

UNIT IV:
Engineering Materials: Introduction, mechanical properties of engineering materials, mechanical testing of engineering materials, Impact test, and Classification of engineering materials.
Casting: Introduction to casting processes, Classification of casting processes, Sand casting, and special casting methods.
Power Transmission Devices: Introduction, belt drive, rope drive, Chain drive, Gear drive, Classification of gears.

(9)

UNIT V:
Machine Tools: Introduction, Mechanism of metal cutting, Geometry of single point cutting tool, Orthogonal and oblique metal cutting, Lathe, and Milling machines.
Manufacturing Systems Introduction, Computer Integrated Manufacturing, CAD/CAM, Numerical Control (NC), Computer Numerical Control, and Dynamics Numerical Control.   **(9)**

Course Outcomes:

On successful completion of the course, the student will be able to:
1. State first, second and third law of thermodynamics.
2. Sketch components of boilers and turbines.
3. State working principle of IC engines and R& AC systems.
4. Fair understanding of application and usage of various engineering materials, Casting process, and different types of drives with applications.
5. Explain the role of Computers in manufacturing systems.

Text Book:

1. "Basic Mechanical Engineering" by Pravin Kumar, Pearson Edition ISBN: 9789332505759, 9789332505759.

References:

1. George E Dieter, "Mechanical Metallurgy", 3rd Edition, McGraw Hill, 2017.
2. S. Kalpakjian and S. R. Schmid, "Manufacturing Engg, and Technology", 7th Edition, Pearson, 2018.
3. P K Nag, "Engineering Thermodynamics", 6th Edition, McGraw Hill, 2017.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Open Elective - II

18ME303   BASIC THERMODYNAMICS

L   T   P   C

3   0   0   3

Course Prerequisite: Differential Equations

Course Description:
Thermodynamics is one of the fundamental courses in the study of mechanical engineering. The principles of thermodynamics are applicable to a wide range of problems encountered in all branches of engineering. Also thermodynamics is an essential pre-requisite for subsequent courses in mechanical engineering like fluid mechanics, applied thermodynamics, heat transfer, gas dynamics, refrigeration and air conditioning, etc. This course is designed to equip the students with a thorough understanding of basic concepts of thermodynamics and with necessary skills and techniques to solve problems in thermodynamics through a systematic analysis using fundamental principles. The specific topics to be covered in the course include concepts of system and surroundings, energy, energy transfer by work and heat, properties of substances and property changes, first and second laws of thermodynamics.

Course Objectives:
1. To introduce the concepts of system, surroundings, energy interactions, thermodynamics properties of substances and to teach different techniques used for estimating the properties like gas laws and property tables
2. To explain the principles of work and energy.
3. To introduce the fundamentals of thermodynamic laws, concepts and principles.
4. To teach the systematic approach to be employed for effectively solving the problems in thermodynamics.
5. To explain the principles of various cycles and to apply the thermodynamic concepts in various applications like IC engines and Refrigeration and Air conditioning systems.

UNIT 1: THERMODYNAMIC BASICS
Macroscopic versus Microscopic viewpoint, Thermodynamic system and control volume, Thermodynamic properties, processes and cycles, Homogeneous and heterogeneous systems, Thermodynamic equilibrium, Quasi-static process, Concept of continuum, Zeroth law of thermodynamics, temperature scale, Ideal gas, Work Transfer, Heat transfer, First law of thermodynamics, Specific heat, Enthalpy, Internal Energy, Steady flow energy equation and application, PMM1 and Steady flow energy equation. **(9)**

UNIT 2: PROPERTIES OF PURE SUBSTANCES
Pure substance, Vapor-Liquid-Solid-Phase equilibrium in a pure substance, Independent properties of a pure substance, Phase boundaries, tables of thermodynamic properties, Thermodynamic Surfaces, p-v and p-T diagram for a pure substance, p-v-T surface, T-s and h-s or Mollier diagram for a pure substance, dryness fraction, Steam Tables, Charts of Thermodynamic properties, Measurement of steam quality. **(9)**

UNIT 3: SECOND LAW OF THERMODYNAMICS AND ENTROPY

Qualitative difference between heat and work, cyclic heat engine, Kelvin-Planck statement of second law, Clausius' statement of second law, Refrigerator and heat pump, Equivalence of Kelvin-Planck and Clausius statement, Reversibility and Irreversibility, Carnot cycle, Reversed heat engine, Carnot's Theorem, Corollary of Carnot's theorem, absolute thermodynamic temperature scale and Efficiency of heat engine, Entropy, Inequality of Clausius, Temperature-Entropy plot, Entropy generation in an open and closed system and Entropy change in an Irreversible process. **(9)**

UNIT 4: THERMODYNAMIC PROPERTY RELATIONS AND GAS MIXTURES

Equation of state, Ideal gas, Real gas, Compressibility chart, Internal energy, enthalpy, entropy, specific heats and Gibbs free energy of gas mixture, Maxwell's Equations, TdS equation, Difference in heat capacities, Ratio of heat capacities, Joule-Kelvin Effect, Clausius-Clapeyron equation, Properties of atmospheric air, Psychrometric chart and Psychrometric process. **(9)**

UNIT 5: THERMODYNAMIC CYCLES

Rankine cycle, Actual vapour cycle processes, Comparison of Rankine and Carnot cycles, Air standard cycles - Otto, Diesel, dual and Brayton cycles, Reversed heat engine cycle, Vapour compression refrigeration cycles. **(9)**

Course Outcomes:

On successful completion of the course, the student will be able to:
1. Define the fundamentals of the zeroth and first laws of thermodynamics and explain their application to a wide range of systems.
2. Apply the properties of steam to design steam systems.
3. Apply the second law of thermodynamics for the design of heat engine, heat pump and refrigerators. The student will also be able to Evaluate entropy changes in a wide range of processes and determine the reversibility or irreversibility of a process from such calculations.
4. Explain the cycles on which IC engines, Gas turbines and refrigerator works.
5. Explain the importance of Tds relations and be able to use psychometric charts for the design of air conditioning systems.

Text Books:

1. Cengel, Y.A and Boles, M.A, Thermodynamics: An Engineering Approach, 5th ed., McGraw-Hill, 2006.

References:

1. Sonntag, R.E., Borgnakke, C., and Van Wylen, G.J., Fundamentals of Thermodynamics, 6th ed., John Wiley, 2003.
2. Nag, P.K., Engineering Thermodynamics, 3rd ed., Tata McGraw-Hill, 2005.

Mode of Evaluation: Assignment, Mid Examination, End Examination

Open Elective - II

18EEE301   INDUSTRIAL ELECTRICAL SYSTEMS

L T P C

Course Prerequisite: 18EEE101

3 0 0 3

Course Description:
This course deals with basics of electrical wiring systems for residential, commercial and industrial consumers, and its representation with standard symbols and drawings, various components of industrial electrical systems and its sizing and control aspects of industrial electrical system using PLC and SCADA.

Course Objectives:
1. To understand the electrical wiring systems for residential, commercial and industrial consumers.
2. To learn the representation of systems with standard symbols and drawings.
3. To understand the various components of industrial electrical systems.
4. To analyze and select the proper size of several electrical system components.
5. To study the control aspects of industrial electrical system using PLC and SCADA

UNIT I: ELECTRICAL SYSTEM COMPONENTS
LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices.

(9)

UNIT II: RESIDENTIAL AND COMMERCIAL ELECTRICAL SYSTEMS
Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

(8)

UNIT III: ILLUMINATION SYSTEMS
Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

(8)

UNIT IV: INDUSTRIAL SUBSTATION SYSTEMS
HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.   **(8)**

UNIT V: INDUSTRIAL SYSTEM AUTOMATION
DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.
Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

                                                                                  (12)
Course Outcomes:
Upon successful completion of the course, students will be able to
1. Discuss the various component representation involved in the design of electrical wiring for Low Tension.
2. Understand the guidelines for wiring of household and commercial buildings.
3. Understand the various components of illumination in industrial electrical systems.
4. Select the proper size of various electrical system components required for designing different electrical wiring systems.
5. Understand the control aspects of industrial electrical system using PLC and SCADA.

Text Books:

1. S. L. Uppal and G. C. Garg, "Electrical Wiring, Estimating & Costing", Khanna publishers, 2008.
2. K. B. Raina, "Electrical Design, Estimating & Costing", New age International, 2007.

Reference:

1. Web site for IS Standards.
2. S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.
3. H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Dept. of Computer Science & Engineering

Open Elective - II

18EEE302   INTRODUCTION TO MEMS

L T P C

Course Prerequisite: 18EEE101

3 0 0 3

Course Description:
This course describes about manufacturing, modeling and applications of MEMS.

Course Objectives:
1. To know the fundamentals of MEMS materials, their physical properties and Principles of operation of MEMS devices
2. To know various MEMS microfabrication technologies.
3. To provide various MEMS technology for mechanical, optical, and chemical sensors and actuator

UNIT I: INTRODUCTION
Overview – History and industry perspectives – Working principles – Mechanics and dynamics –
– Scaling law

(9)

UNIT II: MICRO SENSORS & ACTUATORS
Micro sensors: Pressure sensors, accelerometers, gyroscopes-Micro actuators: comb drive actuators – Micro-electromechanical systems

(9)

UNIT III: MICRO MANUFACTURING
Materials for MEMS and Microsystems- Micro fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapour Deposition- Physical Vapour Deposition, Micro manufacturing: Bulk micromachining, surface micromachining, LIGA Process- Packaging.

(9)

UNIT IV: MODELING IN MEMS
Micro system design: Finite Element Methods-– Modeling of simulation – piezoelectric, Gyroscope

(9)

UNIT V: MEMS APPLICATIONS
Micro fluids-sensors for turbulence measurement and control, micro-actuators for flow control, RFMEMS- filters, Oscillators and phase shifters, Optical MEMS, micro robotics – Case studies

(9)

Dept. of Computer Science & Engineering

Course Outcomes:
At the end of the course, students will able to
1. Explain the fundamentals of MEMS materials, their physical properties and Principles of operation of MEMS devices
2. Analyze the Micro sensors and actuators and its fabrication
3. Explain the materials for MEMS and Microsystems
4. Design MEMS using microfabrication techniques
5. Explain the advantages of MEMS technology for mechanical, optical, and chemical sensors and actuator

Text Books:

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2006
2. G.K. Ananthsuresh et al ,'Micro and Smart Systems', Wiley, India, 2010

References:

1. NadimMaluf, "An introduction to Micro electro mechanical system design", ArtechHouse, 2000.
2. Mohamed Gad-el-Hak, editor, "The MEMS Handbook", CRC press Baco Raton, 2000
3. James J.Allen, micro electro mechanical system design, CRC Press published in 2005
4. Stephen D. Senturia, Microsystem Design, Kluwer Academic Publishers, 2001

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Dept. of Computer Science & Engineering

Open Elective - II

18ECE301   BIO-MEDICAL ELECTRONICS

L   T   P   C
3   0   0   3

Course Description:
This course provides the fundamental knowledge on applications of electronics in bio-medical signal measurements and processing, bio-medical instrumentation and imaging techniques.

Course Objectives:
1. To acquire the basic knowledge on human physiology and biological transducers.
2. To learn about bio-electrodes and bio-amplifiers used in bio-signal acquisition.
3. To understand the working principle of bio-medical measuring instruments.
4. To study various types of imaging techniques used in medicine.
5. To learn the applications of medical instrumentation in designing artificial medical aids.

UNIT I: HUMAN PHYSIOLOGY AND BIOMEDICAL TRANSDUCERS
Introduction to human physiology - Biomedical transducers for measuring displacement, velocity, force, acceleration, potential, dissolved ions and gases.   **(9)**

UNIT II: BIO-ELECTRODES AND AMPLIFIERS
Introduction to bio-potential, Bio-electrodes, Typical waveforms and characteristics of ECG, EMG and EEG, Bio-potential amplifiers for ECG, EMG and EEG – Lead systems and recording methods.   **(9)**

UNIT III: BIOMEDICAL MEASURING INSTRUMENTS
Measurement of blood pressure and temperature, Blood flow meter, Cardiac output measurement, Respiratory measurement, Blood cell counter, Impedance plethysmography.   **(9)**

UNIT IV: MEDICAL IMAGING
X-ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear imaging, Ultrasonic Imaging.   **(9)**

UNIT V: PROSTHESES AND AIDS
Pacemakers, Defibrillators, Heart-lung machine, Artificial kidney, Aids for the handicapped, Safety aspects.   (**9**)

Dept. of Computer Science & Engineering

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Understand the applications of biological transducers in medical field.
2. Analyze the design of bio-electrodes and bio-amplifiers.
3. Apply suitable measuring instruments to measure various medical parameters.
4. Understand and test various imaging techniques used in bio-medical diagnosis.
5. Analyze the applications of artificial medical aids.

Text / Reference Books:

1. W.F. Ganong, Review of Medical Physiology, 26th Edition, Tata McGraw-Hill, New Delhi, 2019.
2. J.G. Websster, ed., Medical Instrumentation, 3rd Edition, Wiley India Pvt. Ltd. 2009.
3. A.M. Cook and J.G. Webster, eds., Medical Devices and Human Engineering, Taylor & Francis, 2014.
4. R.S.Khandpur, "Handbook of Biomedical Instrumentation", 2nd edition, Tata McGraw-Hill, New Delhi, 2005.
5. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice-Hall, New Delhi, 2011.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Open Elective II

18ECE302   VLSI DESIGN

                                                                      L   T   P   C
                                                                      3   0   0   3

Course Description
This course describes about various VLSI design methodologies, fundamentals of CMOS technology. It incorporates basics of MOSFET, CMOS processing technology, circuit characterization and performance estimation, combinational logic design, sequential logic design, logic families and VLSI Design flow.

Course Objectives
1. To provide to the student with an introduction to the fundamentals of integrated circuits.
2. Impart knowledge about practical considerations pertaining to the design of integrated circuits.

UNIT I: INTRODUCTION TO VLSI DESIGN METHODOLOGIES
Introduction to VLSI Design Methodologies, Scaling, CMOS Logic: Inverter, NAND Gate, NOR Gate, Combinational Logic, Compound Gates, Pass Transistors and Transmission Gates, CMOS Inverter Cross-section, Stick Diagrams. VLSI Design Flow, Complementary CMOS Inverter DC Characteristics, Beta Ratio Effects, Noise Margin.   **(9)**

UNIT II: MOS TRANSISTOR THEORY
MOS Ideal I-V Characteristics, C-V Characteristics, MOS Small-signal Model, MOS Capacitance Models, MOS Gate Capacitance Model, MOSFET as a Switch, non-ideal I-V Effects: Velocity Saturation and Mobility Degradation, Channel Length Modulation, Body Effect, Sub-threshold Conduction, Junction Leakage, Tunneling.   **(9)**

UNIT III: CMOS TECHNOLOGIES
CMOS Technologies: Background, Wafer Formation, Photolithography, Well and Channel Formation, Isolation, Gate Oxide, Gate and Source/Drain Formation, Contacts and Metallization, Passivation, Metrology. Scribe Line and Other Structures, MOSIS Scalable CMOS Design Rules, Micron Design Rules.   **(9)**

UNIT IV: LOW POWER DESIGN
Delay Estimation using RC Delay Model and Linear Delay Model, Logical Effort, Parasitic Delay. Logical Effort and Transistor Sizing: Delay in a Logic Gate, Delay in Multistage Logic Networks, choosing the Best Number of Stages. Power Dissipation: Static Dissipation, Dynamic Dissipation, Low-Power Design. Interconnect: Resistance, Capacitance, Delay, and Crosstalk.   (**9**)

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UNIT V: CIRCUIT FAMILIES
Circuit Families: Static CMOS, Ratioed Circuits, Cascade Voltage Switch Logic, Dynamic Circuits, Sense Amplifier Circuits, Bi-CMOS Circuits, Multiplexers, Sequential Static Circuits, Design of Latches and Flip-Flops.   **(9)**

Course Outcomes
Upon successful completion of the course, students will be able to
1. Explain the VLSI design methodologies and basic CMOS circuits used in modern Integrated circuits applications.
2. Discuss the fundamentals of MOS transistor theory.
3. Discuss about the CMOS processing technology.
4. Discuss about the integrated circuit characterization and performance estimation.
5. Describe the designing process combinational and sequential circuits.

Text / Reference Books:

1. J. P. Uyemura: Introduction to VLSI Circuits and Systems, Wiley.
2. Neil H.E. Weste, David Harris, Ayan Banerjee: CMOS VLSI Design, Third Edition, Pearson Education.
3. Neil H.E. Weste, Kamran Eshraghian: Principle of CMOS VLSI Design, Pearson Education.
4. Philip E. Allen and Douglas R Holberg: CMOS Analog Circuit Design, Oxford.
5. Carver Mead and Lynn Conway: Introduction to VLSI systems, BS Publication.
6. Plummer: Silicon VLSI Technology, Pearson Education.
7. J. P. Uyemura: Chip Design for Submicron VLSI, Cengage Learning.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

OPEN ELECTIVE – IV

Dept. of Computer Science & Engineering

Open Elective - IV

<table>
<tr><td align="center">**18ENG301**   **CREATIVE WRITING**</td><td>**L T P C**
3 0 0 3</td></tr>
</table>

Course Description: The course functions as a broad-based introduction to various forms of creative writing, such as short fiction, poetry and drama. Short story writing is geared towards creative writing so that students learn about character, dialogue, voice, style and description in fiction. The course provides them with the opportunity to delve deeper into the analysis of selected short fiction and to work on stories of their own. Students explore the genre of poetry in-depth through their own writing and that of published poets. The study of playwriting involves many of the same focuses as short story writing, such as dialogue, character and plot. Students also experiment with writing these genres. The class is usually comprised of technique and style discussions, reading assignments and writing exercises.

Course Objectives:
This course enables the students to –
1. familiarize with different forms of writing: poetry, scene writing, vignette and feature writing.
2. To encourage reading and acquainting, appreciating and responding to different genres of writing.

UNIT I: Introduction to creative writing and reading. Poetry, Short Story, Drama, Fiction, Non Fiction, Feature Writing, etc.   **(9)**

UNIT II: Poetry, Scenario writing, feature and vignette writing. Haiku, Object Poem, List Poem, Visual Poem, Nature Poem. Scanning a poem and understanding its meaning.   **(9)**

UNIT III: Writing a scene, finding sources from which to draw ideas to write scenes, creating an effective setting for a scene to take place; creating strong, believable characters in a scene
                                                                                       (9)

UNIT IV: Learning how a scene can drive the plot of a story, how to effectively use point of view to enhance a scene, how to write interesting and useful dialogue, self-editing own writing.
                                                                                       (9)

UNIT V: Writing a vignette, finding sources from which to draw ideas to write a vignette, organizing one's time and ideas to produce a longer piece of writing.   **(9)**

Dept. of Computer Science & Engineering

Course Outcomes:
At the end of the course, students will be able to:
1. Develop skills in reading, writing, and editing various literary genres.
2. Obtain an awareness of the role of analysis to inform appreciation and understanding of poetry.
3. Demonstrate the ability to read and respond thoughtfully.
4. Develop plot of the story and sketch characters with relevant dialogues
5. Obtain effective writing skills such as good essays and projecting scholarly ideas.

Text Book:

1. Tondeur, Louise. 2017. How to Think Like a Writer: A Short Book for Creative Writing Students and Their Tutors. Louise Tondeur

Reference Books:

1. Middleton, Daniel. 2012. The 7 Points of Write: An Essential Guide to Mastering the Art of Storytelling, Developing Strong Characters, and Setting Memorable Scenes. 711 Press

2. Kumar, Amrita. 2017. Kissing the Demon: The Creative Writer's Handbook. Harper Collins
3. Mastering Creative Writing: A Writer's Guide by Dahveed Bar-Daniel (kindle book) published :12 April 2017

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations.

Open Elective- IV

18HUM303   ENTREPRENEURSHIP DEVELOPMENT

L T P C
3 0 0 3

Course Description: The objective of this course is to inculcate in students the skills necessary to craft strategies and initiatives which can enable growth and sustainability in an entrepreneurial venture, to include the effective management of inventory, receivables, production, human resources, financial resources, and risk. Students will develop higher-level critical thinking skills, evidenced by analysis, evaluation, and synthesis.

Course Objectives: The course is intended to:
1. Explain the basic concepts of entrepreneurship and its role in Indian Economy;
2. Describe the SWOT analysis, promotional and financial aspects of entrepreneurship
3. Explain project planning and feasibility studies;
4. Make the students acquire knowledge about women entrepreneurship; and
5. Explain the rural entrepreneurship and role of NGOs and EDPs in India.

UNIT I: INTRODUCTION
Entrepreneurial competencies, attitudes, qualities, functions - Forms of Entrepreneurship - Types of ownership - sole trading, partnership and corporation – Role of Government in Entrepreneurship Development.   **(9)**

UNIT II: PROMOTIONAL & FINANCIAL ASPECTS OF ENTREPRENEURSHIP
Idea generation– opportunities - SWOT Analysis - patents and trademarks, Intellectual Property Rights. Financial Aspects of the Entrepreneurship: Source of Capital, Debt capital, seed capital, venture capital - Informal Agencies in financing entrepreneurs, Government Grants and Subsidies, Types of Investors and Private Offerings.   **(9)**

UNIT III: PROJECT PLANNING AND FEASIBILITY STUDIES
Concept of Project, Project Life Cycle -Project Planning, Feasibility Report – Project proposal & report preparation. Technical Feasibility and Economic Viability – sources of New Ideas.
(9)

UNIT IV: WOMEN ENTREPRENEURSHIP
Scope of entrepreneurship among women – Promotional effects – Institutional framework - Successful cases of women entrepreneurs.   **(9)**

UNIT V: RURAL ENTREPRENEURSHIP AND EDPS
Role of NGO's– Organizing EDPs – Social Entrepreneurship – startups – Entrepreneurship development among target groups of society.   **(9)**

Course Outcomes:

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

1. Understand the concepts of entrepreneurship and its role in Indian Economy;
2. Compare and apply sources of different promotional and financial aspects;
3. Understand and analyze the feasibility study in project planning;
4. Find the women entrepreneurship development in India; and
5. Assess the rural entrepreneurship and strengthen the role of NGOs and EDPs.

References:

1. Entrepreneurial Development, S. Chand and Company Limited, S.S. Khanka, New Delhi, 2009.
2. Fundamentals of Entrepreneurship, H. Nandan, PHI, First/e, New Delhi, 2009.
3. Entrepreneurship, 6/e, Robert D Hisrich, Michael P Peters, Dean A Shepherd, TMH,2009.
4. The Dynamics of Entrepreneurial Development and Management, Vasanth
5. Desai, Himalaya,2009
6. Entrepreneurship Management – text and cases, Bholanath Dutta, Excel Books, 2009
7. Entrepreneurship – New venture Creation, Holt, PHI, 2009

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations.

Dept. of Computer Science & Engineering

Open Elective – IV

18MAT303   GRAPH THEORY

	L	T	P	C
Course Prerequisite: Modern Algebra, Linear algebra	3	0	0	3

Course Description:

Graph theory is the core content of Discrete Mathematics. This course introduces in an elementary way some basic knowledge and the primary methods in Graph Theory also it is important in regarding to find out the mathematical structures from graph theory in concrete examples.

Course Objectives

1. To understand the fundamental definitions and properties of graphs.
2. To know the concepts of trees and spanning trees.
3. To learn about the matching and factors, connectivity.
4. To study the concepts of coloring of graphs, Planer graphs.
5. To introduce about the edges and cycles.

UNIT I: FUNDAMENTAL CONCEPTS
Graphs, path, cycles and trails, vertex degree and counting, directed graphs   **(9)**

UNIT II: TREES AND DISTANCE
Basic properties, spanning trees, optimization and trees.   **(9)**

UNIT III: MATCHING AND CONNECTIVITY
Matching and covers, algorithm and applications, Cuts and Connectivity, k-connetced graphs.
                                                                                                  (9)

UNIT IV: COLOURING OF GRAPHS AND PLANER GRAPHS
Vertex coloring, structure of k-chromatic graphs, Euler's formula, characterization of planar graphs.   **(9)**

UNIT V: EDGES AND CYCLES
Line graphs and edge coloring, Hamiltonian cycles, planarity, coloring and cycles.   **(9)**

Text Book:

1. Douglas B. West, Introduction to Graph Theory, Prentice Hall of India 2014.

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References:

1. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science. Prentice-Hall.
2. Frank Harary, Graph Theory, Narosa.
3. R. Ahuja, T. Magnanti, and J. Orlin, Network Flows: Theory, Algorithms, and Applications, Prentice-Hall.

Course Outcomes:

At the completion of the course the students will be able to:
1. Understand the basic terminology of graphs.
2. Determine the number of trees and spanning trees in a graph.
3. Find the matching and connectivity in graphs.
4. Learn about the concepts of coloring of graphs and Planer graphs.
5. Determine the number of edges and cycles of a graph.

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Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations.

Open Elective - IV

18MAT304   MATHEMATICAL MODELING AND NUMERICAL SIMULATION

L T P C
3 0 0 3

Course Description:
This course introduces mathematical modeling and numerical simulation as tools for analyzing and solving real world problems. Here, data assimilation (DA) technique has been discussed to find the best estimate of the state by combining available information including model forecasts, observations and their respective errors. The accurate initial condition obtained by DA is used as input to numerical weather prediction (NWP) modules to improve the model forecast. Data visualization techniques allow engineering students to use their perception to better understanding of the implications of the data and their importance in many different fields.

Course Objectives:

1. To understand the overview of dynamic model system with dynamical and thermo-dynamical equations
2. To understand the basic concept and classification of partial differential equations and importance of initial and boundary value problem.
3. To introduce the development and use of modeling system in terms of scale and physical process.
4. To provide a conceptual and mathematical overview of the data assimilation.
5. To develop the skills for design and a comparative study between observed and modeled data.

UNIT I: BASIC CONSERVATION LAWS AND APPLICATIONS OF BASIC EQUATIONS

Total differentiation, Vectorial form of the momentum equation in rotating coordinates, Component equations in spherical coordinates, The continuity equation, The thermodynamic energy equation, Basic equations in isobaric coordinates, Balanced flow, Trajectories and streamlines, Thermal wind, Vertical motion   **(9)**

UNIT II: NUMERICAL DISCRETIZATION OF EQUATIONS

Classification of partial differential equations (PDEs), Initial value problems, Finite difference method for space discretization, Boundary value problems: Heat, Wave and Laplace equations
(9)

UNIT III: NUMERICAL MODELS AND PHYSICAL PROCESSES

Numerical models: Global, Regional, Mesoscale models, Parameterization of sub-grid scale physical processes: Planetary boundary layer, Moist microphysics physics, Cumulus convection, Radiation, Air-sea interaction processes, and Land-surface processes, Overview of interactions and parameterizations of these processes   **(9)**

UNIT IV: DATA ASSIMILATION

Data assimilation: Empirical analysis schemes, Objective analysis schemes, Variational data assimilation techniques (unsteady three dimensional); Forecast error covariance; Dynamical and physical balance in the initial conditions; Quality control of observations; Atmospheric predictability; Concepts of chaotic systems and ensemble forecasting.   **(9)**

UNIT V: DATA ANALYSIS AND VISUALIZATION

Introduction of WRF model and its Applications; Analysis of simulated and observed data sets through Grid Analysis and Display System (GrADS), MATLAB, and Excel software.   **(9)**

Course outcomes
At the end of the course students are able to
1. Understand overview of dynamic model system and solve a set of dynamical and thermo-dynamical equations governing the state of the atmosphere.
2. Find accurate results through simulations by using proper and suitable representation of dynamical processes
3. Gain the knowledge of how and where to use the mathematical models in regional, mesoscale and global scales and develop an understanding of the physical processes
4. Compute the best estimate of the state by statistically combining model forecasts, observations, and their respective errors by using data assimilation technique.
5. Prepare the data for visualization and compare the results with observations.

Text books:

1. An Introduction to Dynamic Meteorology, Fourth Edition, by James R. Holtan, Elsevier Academic Press
2. Atmospheric Modeling, Data Assimilation, and Predictability, by Eugenia Kalnay (Cambridge University Press, 2003)
3. A description of the advanced research WRF version 3. Tech. Note, by Skamarock, W.C (2008).

References:

1. Dynamics, Volume 101, Second Edition: Physical and Numerical Aspects. Academic Press
2. Mark Z Jacobson. Fundamentals of Atmospheric Modeling, Cambridge University Press
3. James C. McWilliams. Fundamentals of Geophysical Fluid Dynamics, Cambridge University Press
4. Introduction to Grid Analysis and Display System (GrADS), by Guilherme Martins (2014), DOI:10.13140/RG.2.1.2594.2249.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations.

Open Elective - IV

18PHY303   THIN FILM TECHNOLOGY AND ITS APPLICATIONS

L T P C
3 0 0 3

Course Prerequisite: None

Course Description:
Nucleation, crystallization, surface energy, various thin film coating processes including both physical vapour deposition such as evaporation, sputtering, pulsed laser deposition and chemical vapour deposition, spray coating, and other methods such as spin-coating, plasma polymerization, Langmuir Blodgett, transport phenomena in thin films, various properties of thin films, techniques and method to characterize thin films, current application of thin film, introduction to fabrication of thin film devices

Course Objectives:
1. To provide students with a comprehensive overview on the fundamentals of thin film preparation and characterization.
2. To enable the students to develop a thorough understanding of how core physics can be used to understand thin film deposition processes.
3. To establish the correlation between processing variables and materials characteristics and performance within the framework of key modern technologies.
4. To realize thin film applications to science and technology

UNIT I: PHYSICS OF THIN FILMS
Introduction - Role of thin films in devices - Thin film definition - Crystalline and amorphous films - Crystal defects - Nucleation and growth - film formation.   **(9)**

UNIT II: THIN FILM DEPOSITION TECHNIQUES
Physical methods of films deposition-evaporation, e-beam, sputter deposition, pulsed laser, molecular beam epitaxy. Chemical methods of film deposition -Deposition of Inorganic films from Solutions-Chemical vapour deposition - Electrolysis, Anodization, Spray pyrolysis, Other techniques: Langmuir Blodgett and Spin Coating.   **(9)**

UNIT III: PROPERTIES OF THIN FILMS
Structural-Optical-Electrical-Magnetic-Mechanical and Thermal properties of thin films.   **(9)**

UNIT IV: CHARACTERIZATION OF THIN FILMS
Imaging Techniques (SEM, AFM, TEM) - Structural Techniques (XRD, Raman)-Optical Techniques (UV-Vis-NIR, PL)-Electrical Techniques (Hall Effect, IV, CV)-Magnetic Techniques (EPR, H-V curve)-Mechanical Techniques (Hardness testing)-Thickness measurement (profilometer, ellipsometry).   **(9)**

UNIT V: APPLICATIONS OF THIN FILMS

Transparent conducting coating - Optical coating – Solar cells – Photocatalytic – Sensors - Superconductivity- Superhard coatings – Thin film transistors.   **(9)**

Course Outcomes:

After a successfully completed course the students will be able to:
1. Discuss the differences and similarities between different vacuum based deposition techniques, evaluate and use models for nucleating and growth of thin films.
2. Asses the relation between deposition technique, film structure, and film properties.
3. Know the typical thin film applications.
4. Motivate selection of deposition techniques for various applications.

Text books:

1. Thin Film Deposition: Principles and Practice, *Donald L. Smith*, McGraw Hill, Singapore, 2001.
2. Maissel, L.I and Glang. R, "Handbook of thin film technology", McGraw Hill, 1970.

References:

1. Thin film phenomena / *Kasturi L. Chopra,* New York: McGraw-Hill, c1969.
2. G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties & Applications" Imperial College Press, 2004.
3. An introduction to physics and technology of thin films / *Alfred Wagendristel, Yuming Wang*, Singapore: World Scientific, c1994.
4. Thin film processes, *John L Vossen, Werner Kehn* editors, Academic Press, New York, 1978.
5. Thin film physics / *O.S. Heavens*, London: Methuen, c1970.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Dept. of Computer Science & Engineering

Open Elective – IV

18CHE303   INTRODUCTION TO NANO SCIENCE AND TECHNOLOGY

L T P C
3 0 0 3

Course Description

This is primarily a lecture course which brings together relevant knowledge from the disciplines of physics and chemistry to give students a fundamental understanding of the integrated multidisciplinary nature of Nanotechnology.

Objectives

1. To understand the emergence of nanoscience and technology through history.

2. The various process techniques available for nanostructured materials.

3. The role of nanotechnology in electronics how basic nano-systems work

4. To use physical reasoning to develop simple nanoscale models to interpret the behaviour of such physical systems

UNIT I: MOLECULE TO MATERIALS: BASICS OF NANOTECHNOLOGY

History & emergence (Feynman to present) of Nanoscience and Nanotechnology, Challenges in Nanotechnology. Atomic Structures: Rutherford and Bohr's model of atom. Bohr's model to Quantum: Wave function, Uncertainty principle, Orbital quantum numbers, Shape of the orbitals. Types of simple crystal structures, defects in crystals.   **(9)**

UNIT II: TYPES AND SYNTHESIS OF NANOSTRUCTURES

Definition of a Nano system - Zero Dimensional (OD), One Dimensional (1D) - Two Dimensional (2D) - Three Dimensional (3D) nanostructured materials. Nanoscale building blocks, Top-down and Bottom-up approaches. Synthesis of Nanomaterials – Physical & Chemical methods: Chemical Vapour Deposition (CVD), Atomic Layer Deposition (ALD), Chemical Reduction, Co-precipitation, Emulsion Polymerization (Polymer and Organic NPs), Sol-Gel, Green synthesis of Nanoparticle (NP).   **(9)**

UNIT III: PROPERTIES OF NANOMATERIAL

Thermal, Mechanical, Optical, Electrical and Magnetic properties of nanomaterials (Metal oxides, Ceramics, Nanocomposites, Semiconductors). Carbon age materials: CNTs, and other Carbon-based materials). Effect of size and shape on the properties of nanomaterials.   **(9)**

UNIT IV: CHARACTERIZATION OF NANOMATERIALS

Structure: Powder XRD (SAXS); Composition: XPS; Thermal: TG-DTA; Optical & Electron microscopes: Atomic force microscopes (AFM), Scanning electron microscope (SEM), Transmission electron microscope (TEM); Magnetic characterization (SQUID). **(9)**

UNIT V: APPLICATIONS OF NANOMATERIALS

Molecular electronics and nano-electronics – LED applications, Quantum electronic devices - CNT based transistor and Field Emission Display – Biological (anti-bacterial, anti-fungal, anti-microbial) applications - Biochemical sensor - Membrane based water purification, Target based drug delivery system. **(9)**

Course Outcomes:

Upon completion of this course the students will be able to:
1. Understand the correlation between atomic, molecular structures and nanomaterials
2. Classify the types and synthesis the nanomaterials based on the needs of the society and environment.
3. Infer and interpret the properties of nanomaterials
4. Apply the knowledge of characterization tools towards making the sustainable engineering products.
5. Illustrate the application of various nanomaterials in daily life, industry towards the sustainable development.

Text Books:

1. M. Wilson, K. Kannangara, G. Smith, M. Simmons, and B. Raguse, Nanotechnology: Basic science and Emerging technologies, Overseas Press India Pvt Ltd, New Delhi, First Edition, 2005.
2. C. N. R. Rao, A. Muller, and A. K. Cheetham (Eds), The chemistry of nanomaterials: Synthesis, properties and applications, Wiley VCH Verlag Gmbh & Co, Weinheim, 2004.
3. Kenneth J. Klabunde (Eds), Nanoscale Materials Science, John Wiley & Sons, InC, 2001.
4. C. S. S. R. Kumar, J. Hormes, and C. Leuschner, Nanofabrication towards biomedical applications, Wiley - VCH Verlag GmbH & Co, Weinheim, 2004.
5. T. Pradeep, Nano: The Essentials, Understanding Nanoscience and Nanotechnology, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

References:

1. W. Rainer, *Nano Electronics and information Technology*, Wiley, 2003.
2. K. E. Drexler, *Nano systems*, Wiley, 1992.
3. G. Cao, *Nanostructures and Nanomaterials: Synthesis, properties and applications*, Imperical College Press, 2004.
4. P. Yang, Chemistry of Nanostructured Materials, World Scientific Publishers, 2005.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective - IV

18CHE304 COMPUTATIONAL METHODS IN MATERIALS SCIENCE AND ENGINEERING

	L	T	P	C
	3	0	0	3

Course Prerequisite:

Exposure to Introductory engineering mathematics, introductory materials science and introductory programming courses is preferred.

Course Description:

This course deals with various computational approach and mathematical methods to understanding and apply different concepts in materials science and engineering.

Course Objectives:

1. To get exposed to the basic concepts in Materials Science and Engineering.
2. To understand the basic concepts of Programming and Graphical plotting.
3. To introduce the basic concepts of Data types and handling of various data.
4. To familiarize the basic concepts of modelling and simulation.
5. To acquire and apply the current knowledge and trends in the field of Computational Materials Science.

UNIT I: INTRODUCTION TO COMPUTATIONAL MATERIALS SCIENCE AND ENGINEERING

Concepts in materials science and engineering; use of computers and freely available open source software to: data handling; understand concepts and solve problems of engineering interest

(9)

UNIT II: PROGRAMMING AND PLOTTING

Introductions to the advanced concept C programming language; open source software for numerical computations and visualization (gnuplot, GNU Octave, Scilab); introduction to the LaTeX software for report preparation along with other miscellaneous software and programs.

(9)

UNIT III: DATA TYPES AND HANDLING TECHNIQUES

Classification, and understanding of data properties, data handling - plotting, fitting, functional forms, interpolation, and integration.

(9)

UNIT IV: COMPUTATIONAL MODELING AND SIMULATIONS

Understanding the materials properties; atomistic and electronic modelling of materials; concepts in molecular dynamics and its application using Quantum ESPRESSO. **(9)**

UNIT V: CURRENT TRENDS IN COMPUTATIONAL MATERIALS SCIENCE

Applied materials for various engineering field; research literature exploration; real-time application of computational methods in materials science and engineering, mini-project. **(9)**

Course Outcomes:
At the end of the course, the students will be able to
1. Understand the importance and applications of computational methods in Materials Science and Engineering.
2. Be familiarized with the tools of the trade, namely programming and graphical plotting.
3. Be able to understand and access the various types of data sets and appropriately handle it to productively work with it.
4. Get the knowledge about handling various open source computational tools and their effective usage to do computational modeling and simulations.
5. Be familiarized with up to date trends in computational materials science by taking up real time research problems and provide solutions.

Text Books:
1. Computational Materials Science: An Introduction, Second Edition 2nd Edition, by June Gunn Lee, 2014
2. Materials science and engineering: an introduction, William D Callister, Sixth edition, John Wiley & Sons, 2013.
3. The C programming language, Brian W Kernighan and Dennis M Ritchie, Second edition, PHI Learning Private Limited, 2010.
4. Materials science and engineering: a first course, V Raghavan, Fifth edition, PHI Private Limited, 2008.
5. Physical metallurgy principles, Robert E. Reed-Hill, Second edition, Affiliated East-West Press Pvt. Limited, 2008.
6. An introduction to materials science and engineering, Kenneth M Ralls, Thomas H Courtney, and John Wulff, Wiley India Pvt. Ltd., 2011.

References:
1. Materials Science and Engineering,V Raghavan,Prentice-Hall India, 2004
2. Advanced Engineering Mathematics, E Kreyzig, Wiley-India,1999.
3. A Review of Computational Methods in Materials Science, International Journal of Molecular Sciences 10(12):5135-216

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective- IV

18CE304   GREEN BUILDING AND ENERGY CONSERVATION

L T P C
3 0 0 3

Course Prerequisites: None

Course Description: The course covers various aspects of bioclimatic architecture like climate sensitive design, passive solar architecture, Water management, green building materials and construction techniques.

Course Objectives:
1. The course introduces concepts of sustainability and bioclimatic design in planning, construction and life of buildings.
2. This course intends to equip students with technical knowledge of energy-efficient green buildings
3. This course guide students, through projects, to apply concepts and ideas for the design of a green building by introducing them to green initiatives and ratings.
4. This course also initiates students in basics of functional design and drawing of the various buildings using the above concepts.

UNIT -I: GREEN BUILDING CONCEPTS
Introduction to bioclimatic architecture - Sustainability in building science and Functional planning - Orientation - Elements of building design and drawing – Building regulations and bylaws - Traditional and Vernacular Architecture - Climate zones - Design Charts - sun path diagram - Solar angles - Indices of thermal comfort - Vernacular buildings in different climate zones.   **(9)**

UNIT-II: CLIMATE RESPONSIVE SCIENTIFIC PROCESS OF DESIGN
Introduction - various steps in Site planning - Plan form Building envelope Landform -Topography – vegetation - water bodies; Orientation - S/V ratio - P/A ratio - Walls, Fenestration - Roof and floors - Active and passive solar strategies - Passive solar architecture.
                                                                                              (9)

UNIT-III: THERMAL FLOW IN BUILDINGS
Calculation of thermal conductance - Heat flow through different building elements - Ventilation and day lighting - Design and placement of openings - Water management in buildings - Techniques to recycle, reuse and harvest water.   **(9)**

UNIT IV: GREEN BUILDING MATERIALS AND CONSTRUCTION
Material properties - Energy efficiency using various materials - emerging new materials Construction techniques - Techniques for roof, wall and foundations.   **(9)**

UNIT V: ECONOMY OF GREEN BUILDING
Cost of building - operation and maintenance - Green building rating system - Evaluation criteria of LEED - TERI GRIHA case studies - Case studies in different climate zones.   **(9)**

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Course Outcomes:
1. An understanding on green building materials and construction techniques.
2. Knowledge on renewable energy and energy conservation through material usage.
3. A thorough understanding on designing green buildings

Text books:

1. Krishnan, A., Baker, N., Yannas, S., &Szokolay, S. (Eds.). (2001). Climate responsive architecture, a design handbook for energy efficient buildings. New Delhi: Tata McGraw–Hill Publishing Company.
2. TERI & ICAEN (InstitutCatalad'Energia). (2004). Sustainable building design manual (Vol. II). New Delhi: The Energy and Resources Institute(TERI) Press.

References:

1. Bureau of Indian Standards. (1995). SP:41, Handbook on functional requirements of buildings (other than industrial buildings) (First reprint ed.). New Delhi: Bureau of Indian Standards.
2. Indian Green Building Council, LEED-India. (2011). LEED 2011 for India- Green building rating system, abridged reference guide for new construction and major renovations (LEED India NC). Hyderabad: Indian Green Building Council.
3. Koenigsberger, O., ingersoll, T. G., Mayhew, A., &Skozolay, S. V. (2011). Manual of Tropical Housing and Building. Hyderabad: Universities Press.
4. Prabhu, Balagopal T S, K Vincent Paul, and C Vijayan. Building Design and Drawing. Calicut: Spades Publishers, 2008.
5. Szokolay, S. V. (2008). Introduction to Architectural Science – The Basis of sustainable Design (Second ed.). Architectural Press/Elsevier.
6. The Energy and Resources Institute (TERI). (2011). Green Rating for Integrated Habitat Assessment (GRIHA) manual. New Delhi: TERI press.
7. Journals: Energy and Buildings, Building and Environment, Other relevant publications.
8. National Building Code, Bureau of Indian Standards: New Delhi. 2005; Building Bye laws and building rules of selected Indian urban and rural areas
9. Swamy, N. K., & Rao, A. K. (2013). Building planning and Drawing, New Delhi, Charothar Publishing House

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Dept. of Computer Science & Engineering

Open Elective- IV

18CE305   ENVIRONMENTAL ENGINEERING

	L	T	P	C
	3	0	0	3

Course Prerequisites: None

Course Description

The course covers demand, quality, treatment and distribution of water along with characterization, collection, low cost treatment of waste water and household drainage. Similarly, air pollution, noise pollution and solid waste management are also included.

Course Objectives
1. To explain water quality standards, treatment, distribution of drinking water
2. To analyze the characteristics of wastewater and discuss about various units of sewage treatment system.
3. To explain various impacts of air and various methods to control air pollution
4. To describe about solid waste generation, characterization, impacts and various management techniques
5. To discuss about generation and management of electronic waste.

UNIT I: WATER TREATMENT

Water- Sources of Water, quality issues, health impacts of contaminated drinking water, water quality requirement for different beneficial uses, water quality standards, water quality indices, water safety plans, Layout of water Supply systems, components of water supply system; Distribution system, working principle of various units of surface water treatment plant layout

(9)

UNIT II: SEWAGE TREATMENT

Quantity of Sewage, Sewage flow variations. Sewage pumping; Sewerage, Sewer appurtenances, Storm Water; sewage disposal standards, pollution due to improper disposal of sewage, wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage, zero liquid discharge **(9)**

UNIT III: URBAN AIR POLLUTION AND CONTROL TECHNIQUES

Air - Composition and properties of air, source and impacts of air pollution-on human, vegetation and strucutres, types of air pollutants   various air pollution control laws, National Ambient Air Quality Standards, Air Quality Index, Air pollution meteorology and dispersion, Principles and working of various air pollution control equipment- gravity settling chamber, cyclone separators, fabric filters and electrostatic precipitators. **(9)**

UNIT IV: MUNICIPAL SOLID WASTE MANAGEMENT

Municipal Solid Waste-Characteristics and Quantities, MSW Rules, Municipal Solid Waste Collection, Transportation, Segregation and Processing, compositing, recycling, disposal-landfilling and incineration.   **(9)**

UNIT V: ELECTRONIC WASTE MANAGEMENT

E-Waste Generation, E-Waste Rules, Techniques for Recycling and Recovery – glass, plastics, ferrous and non-ferrious materials   **(9)**

Course Outcomes
The students after completing the course will be able to:
1. Explain about impacts of drinking water contamination and various units of surface water treatment plant
2. Discuss about sewage generation and various methods of sewage treatment
3. Describe the impacts of air pollution and review various air control methods
4. Discuss about the impacts of solid waste and various solid waste management techniques
5. Explain the impacts and beneficial reuse of electronic waste

Text Books:

1. Birdie, G.S, Birdie, J.S., Water supply and sanitary Engineering, Including Environmental Engineering, Water and Air Pollution Laws and Ecology, Dhanpat Rai Publications, 1996.
2. Garg, S.K., Sewage Disposal and Air Pollution Engineering, Khanna Publishers, 2008.
3. Rao M and Rao H.V.N. Air Pollution, McGraw Hill Education, 2017.
4. Jagbir Singh and Ramanathan A. L., Solid Waste Management: Present and Future Challenges, I K International Publishing House Pvt. Ltd., 2009

Reference Books:

1. Punmia, B.C, Ashok K Jain, Arun K Jain., Waste Water Engineering, Laxmi Publications, 1998.
2. Peavy, H., Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985
3. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
4. Metcalf & Eddy, Wastewater Engineering Treatment and Dispose, McGraw Hill Publication

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective- IV

18ME304   INTERNET OF MANUFACTURING THINGS

L T P C
3 0 0 3

Course Prerequisite: None

Course Description:
The manufacturing industries are the significant sustainable sources for the modern society. Traditional manufacturing systems and relative management approaches need constant review and upgrade to meet the demands of modern complex products. Internet of Things (IoT), has potential to collect, process, analyze and communicate real time data, while enhancing overall productivity within given time frame with higher flexibility and transparency. This course tries to provide the essential knowledge to bridge the IoT and Manufacturing systems.

Course Objectives:

1. To provide the basic knowledge and importance of IoT and its logic and applications in Manufacturing Industry.
2. To provide the basic knowledge of real time information sensing and cloud computing in manufacturing system.
3. To understand the concepts of IoT enabled smart trolleys and assembly systems.
4. To provide basic understanding of real-time production performance analysis methods. and scheduling system.
5. To provide basic understanding of real-time, information driven production scheduling system.

UNIT I:
Introduction- Concept of IoT, Existing manufacturing paradigms and their limitations, Applications of IoT in Manufacturing System (MS), The Concept of IoT-MS and its limitations.

Overview of IoT-Enabled Manufacturing System- Overall architecture of IoT-MS, Integration framework of real-time manufacturing information, The work logic of IoT-MS, Core technologies in IoT-MS.   **(9)**

UNIT II:

Real-Time(RT) Multisource Manufacturing Information Sensing System - Introduction, Overall Architecture of RT and multisource RMMISS, Deployment of multi-sensors, Multiple sensors manager, Multiple source manufacturing Information Capturing and Sharing, Case studies.

Cloud Computing-Based Manufacturing – Introduction, Overall architecture, Cloud Machine Model, MS-UDDI, Task driven manufacturing service method.   **(9)**

UNIT III:
IoT-Enabled Smart Assembly Station- Introduction, RFID based applications and assistant services in assembly line, Overall architecture, Real-time: Status Monitoring, Production Guiding, Data Sharing, Production Requeuing. IoT Enabled Smart Trolley– Material handling and real time strategy, RT-data capturing in manufacturing field, overall architecture, Real-time: Information capturing, Encapsulation, Exchange, Workflow based guidance. Two stage combination optimization method. **(9)**

UNIT IV:
Real-Time (RT) Production Performances Analysis Method- Real-time: Production monitoring technique, KPI analysis, Anomaly analysis. Overall architecture, Even hierarchy of critical event, HTCPN analysis. Real time production anomaly diagnosis. **(9)**

UNIT V:
Real-Time Information Driven Production Scheduling System – Introduction, RT production scheduling, Agent technology, Manufacturing information monitor technology, Overall architecture, Equipment agent, Capability evaluation agent model, RT- scheduling agent model, Production execution monitor agent model. **(9)**

Course Outcomes:
The focus of this course is to study the inculcation of IoT in manufacturing systems and how the system turns smart. By the end of the course student should:
1. Be able to understand the fundamentals of IoT and its application in manufacturing systems.
2. Have a clear overall picture of multisource manufacturing information sensing system and cloud manufacturing.
3. Outline various methods of IoT enabled smart assembly systems and summarize the usage of smart trolleys
4. Make use of various RT- production performance analysis methods for test its applicability to real life problems.
5. Make use of various RT- information driven production scheduling system for test its applicability to real life problems.

Text Book:

1. Fei Tao, Y. Zhang, "Optimization of Manufacturing Systems Using the Internet of Things", 1st Edition, 2017, Academic Press, Elsevier.

Reference Book:

1. A. Gilchrist, "Industry 4.0: The Industry Internet of Things", 1st Edition, 2016, Apress.
2. M. Dastbaz, P. Cochrane, "Industry 4.0 and Engineering for a Sustainable Future", 1st Edition, 2019, Springer.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective- IV

18ME305   ENTREPRENEURSHIP

	L	T	P	C
	3	0	0	3

Course Prerequisite: None

Course Description:
This course is designed to ignite the entrepreneurship idea into the young minds of engineers. Gives the complete details to setup an enterprise which includes the generating the business ideas, writing a business plan executing the plan successfully.

Course Objectives:
1. Understand the requirements of entrepreneurship as a profession.
2. Understand and develop the business plan.
3. Identify the various financial terms and conditions of new business venture.
4. Selection of plant location and choosing layout.
5. Analyse the market research for new ventures and small businesses.

UNIT I: INTRODUCTION
Introduction to Entrepreneurship Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision processes. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur. Case studies about successful Entrepreneur.   **(9)**

UNIT II : CREATING AND STARTING THE VENTURE
Sources of new Ideas, Methods of generating ideas. The Business Plan Nature and scope of Business plan, Writing Business Plan, Evaluating Business plans, Using and implementing business plans. Marketing plan, financial plan and the organizational plan, Launching formalities. Develop the business plan and evaluate with team.   **(9)**

UNIT III: FINANCING AND MANAGING THE NEW VENTURE
Sources of capital, venture capital, angel investment, Record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. E-commerce and Entrepreneurship, Internet advertising. New venture Expansion Strategies and Issues, Features and evaluation of joint ventures, acquisitions, merges, franchising. Case studies about entrepreneur who success or failure in their business based on the financial control.   **(9)**

UNIT IV: PLANT LAYOUT
Choosing location and layout, Issues related to Selection of layout. Production and Marketing Management, Selection of production Techniques, plant utilization and maintenance. Case study about selection of site and plant layout for new business venture.   **(9)**

Dept. of Computer Science & Engineering

UNIT V: MARKET ANALYSIS
Designing the workplace, Inventory control, material handling and quality control. Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing. Case studies on market analysis on entrepreneur perspective.

(9)

Course Outcomes:
At the end of the course, students should be able to
   1. Describes the sources of new business ideas, methods to develop new ideas and use the problem solving techniques
   2. Able to Write a business plan which includes Financial plan, Organizational Plan and Marketing Plan
   3. Able to identify the financial sources for new business ventures
   4. Able to select a plant layout and draw a plant layout
   5. Design a work place and Analyze the market research for new business.

Text Books:

   1. Entrepreneurship, Robert Hisrich, & Michael Peters, 5/e TMH.
   2. Entrepreneurship, Dollinger, Pearson, 4/e, 2004.

References:

   1. Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publ. House, 2004.
   2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999.
   3. Entrepreneurial Management, Robert J.Calvin, TMH, 2004.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective- IV

18ME306   TOTAL QUALITY MANAGEMENT

Course Prerequisite: None

L T P C
3 0 0 3

Course Description
Total quality management (TQM) is a philosophy, methodology and system of tools aimed to create and maintain mechanism of organization's continuous improvement. It involves all departments and employees for the improvement of processes and products. It helps to reduce costs, exceed needs and expectations of customers and other stakeholders of an organization. TQM encompasses the concepts of business and social excellence that is sustainable approach to organization's competition, efficiency improvement, leadership and partnership.

Course Objectives:
The students will be able to:
1. Study comprehensive knowledge about the principles, practices, tools and techniques of total quality management.
2. Gain knowledge on leadership, customer satisfaction, addressing customer complaints, team work, employee involvement, related to customer and supplier partnership.
3. Gather information on various tools and techniques, concept on Six Sigma, bench marking and Failure Mode Effective Analysis (FMEA).
4. Know the importance of Quality circle, Quality Function Deployment, Taguchi design and case studies related to TQM.
5. To be aware of international/national Quality awards.

UNIT I: INTRODUCTION
Introduction - Need for quality - Evolution of quality - Definition of quality – Quality control, Quality management and Quality Assurance - Definition of TQM – Basic concepts of TQM - TQM Framework - Contributions by Deming, Juran and Crosby – Dimensions of quality – Benefits of quality and Barriers.   **(9)**

UNIT II: TQM PRINCIPLES
TQM principles - Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – Supplier partnership – Partnering, Supplier selection, Supplier Rating.   **(9)**

UNIT III: TOOLS AND TECHNQUES I
The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA.   **(9)**

UNIT IV: TQM TECHNIQUES

Quality circles – Quality Function Deployment (QFD) – Design of Experiments-Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

(9)

UNIT V: IMPELMENTATION OF TQM

Steps for Implementation of TQM, KAIZEN, 5S, JIT, POKAYOKE, I - Introduction to Robust Design, ISO Standards, Need for ISO 9000 and 14000 series, Quality Systems and Case studies.

(9)

Course Outcomes:

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

1. Understand the various principles and practices of TQM to achieve quality.
2. Identify the various statistical approaches for Total Quality Control.
3. Demonstrate the TQM tools for continuous process improvement.
4. Adopt the importance of ISO and Quality systems.
5. Make use of the concepts of TQM to solve case studies

Text Book:

1. Dale H. BesterField, et al., Total Quality Management, Pearson Education Asia, Third Edition, Indian Reprint (2003).

References:

1. James R. Evans and William M. Lindsay, The Management and Control of Quality, (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, Third Edition (2003).
3. Suganthi,L and Anand Samuel, Total Quality Management, Prentice Hall (India) Pvt. Ltd. (2006) Model.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective- IV

18EEE303   ROBOTICS

L T P C
3 0 0 3

Course Prerequisite: Control Systems

Course Description:
Robotics is an interdisciplinary area ranging from mechanical & electrical component design to advanced sensor technology, incorporating computer systems and Artificial Intelligence (AI). With advances in AI-techniques & computational power in recent years, it has become one of the most interesting area for multidisciplinary research, with lots of commercial applications already in market.

Course Objectives:
1. To know the fundamentals of Robotics & its Applications.
2. To make students capable of handling robot manipulator tasks in real, as well as in simulation environment.
3. To know about kinetic and Jacobian modeling
4. To know about sensors and actuators.

UNIT I: INTRODUCTION & TRANSFORMATION AND MAPPING
Evolution of Robots and Robotics, Laws of Robotics, Advancement in Robots, Robot Anatomy, Human Arm Characteristics, Design and Control Issues, Manipulation and Control, Sensors and Vision, Robotic Programming and Future Prospects. Coordinate Frames, Object Description in Space, Transformation of Vectors, Inverting a homogenous transform, Fundamental Rotation Matrices.   **(9)**

UNIT II: KINEMATIC MODELS
Direct Kinematic Model- Mechanical Structure and Notations, Description of links and joints, Kinematic modelling of the Manipulator, Denavit - Hartenberg notation, Kinematic relationship between Adjacent Links, Manipulator Transformation Matrix. Inverse Kinematic Model- Manipulator workspace, Solvability of Inverse Kinematic model, Solution Techniques, Closed form solution.   **(9)**

UNIT III: JACOBIAN AND DYNAMIC MODELLING
Differential motion and statics- Linear and Angular Velocity of a Rigid Body, Relationship between Transformation, Mapping Velocity Vector, Velocity propogation along links, Manipulator Jacobian, Jacobian Inverse, Jacobian Singularities, Static Analysis. Dynamic modelling- Lagrangian mechanics, Lagrange-Euler formulation, Newton-Euler formulation, Comparison of Langrange-Euler and Newton-Euler formulation, Inverse Dynamics**.   (9)**

UNIT IV: ROBOT MANIPULATOR CONTROL AND PATH PLANNING (9)
Robot manipulator control- Introduction, Control of Puma Robot Arm, Computed Torque Technique, near minimum time control, Variable structure control, Non linear decoupled feedback control, Resolved motion control, Adaptive ControlPath/Trajectory Planning- Introduction, Joint

space techniques, Cartesian space techniques, State space search, Problem reduction and use of predicate logic, Means-Ends analysis, Problem solving and robot learning, Robot Task Planning and Basic problems. **(9)**

UNIT V: SENSORS AND ACTUATORS
Range sensing, Proximity sensing, Touch sensors, Force and Torque sensing, Artificial Intelligence techniques using Neural Networks and Fuzzy control. **(9)**

Course Outcomes:
At the end of the course, students will able to
1. Understand the fundamentals of Robotics.
2. Analyze the mechanical structure and notations kinematic model.
3. Analyze the jacobian and dynamic modeling.
4. Explain the robot manipulator control and path planning.
5. Describe the various sensors and actuators.

Text Book:

1. Mittal, R.K. and Nagrath, I.J., Robotic and Control, Tata McGraw Hill, New Delhi, 2003.

References:

1. Fu, K.S., Gonzalez, R.C., and Lee, C.S.G., Robotics Control, Sensing, Vision and Intelligence, McGraw Hill, 1988.
2. Craig, J.J., Introduction to Robotics: Mechanism & Control. Addison Wesley, 1986.
3. Paul, R.P., Robot Manipulator: Mathematics Programming & Control. MIT Press, 1981.
4. Pugh,A., RobotSensors, Vision Vol.-I.Springer Verlag, 1986.
5. Groover, M.P., Industrial Robotics Technology, programming & Application, McGraw Hill, 1986.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective – IV

18EEE304   ELECTRICAL SAFETY

L T P C
3 0 0 3

Course Prerequisite: BEE

Course Description:
To provide a comprehensive exposure to electrical hazards, various grounding techniques, safety procedures and various electrical maintenance techniques.

Course Objectives:
1. To impart knowledge on electrical hazards and safety equipment.
2. To analyze and apply various grounding and bonding techniques.
3. To select appropriate safety method for low, medium and high voltage equipment.
4. To understand how to participate in a safety team.
5. To carry out proper maintenance of electrical equipment by understanding various standards.

UNIT I: ELECTRICAL HAZARDS
Primary and secondary hazards- arc, blast, shocks-causes and effects-safety equipment- flash and thermal protection, head and eye protection-rubber insulating equipment, hot sticks, insulated tools, barriers and signs, safety tags, locking devices- voltage measuring instruments- proximity and contact testers-safety electrical one line diagram- electrician's safety kit.   **(9)**

UNIT II: GROUNDING AND BONDING
General requirements for grounding and bonding- definitions- grounding of electrical equipment-bonding of electrically conducting materials and other equipment- connection of grounding and bonding equipment- system grounding- purpose of system grounding- grounding electrode system- grounding conductor connection to electrodes-use of grounded circuit conductor for grounding equipment- grounding of low voltage and high voltage systems.   **(9)**

UNIT III: SAFETY METHODS
The six step safety methods- pre job briefings- hot -work decision tree-safe switching of power system- lockout-tag out- flash hazard calculation and approach distances- calculating the required level of arc protection-safety equipment , procedure for low, medium and high voltage systems-the one minute safety audit.   **(9)**

UNIT IV: SAFETY TEAM
Electrical safety programme structure, development- company safety team- safety policy-programme implementation- employee electrical safety teams- safety meetings- safety audit-accident prevention- first aid- rescue techniques-accident investigation.   **(9)**

UNIT V: MAINTENANCE OF ELECTRICAL EQUIPMENT

Safety related case for electrical maintenance- reliability centered maintenance (RCM) - eight step maintenance programme- frequency of maintenance- maintenance requirement for specific equipment and location- regulatory bodies- national electrical safety code- standard for electrical safety in work place- occupational safety and health administration standards.

(9)

Course Outcomes:

At the end of the course, students will able to

1. Describe electrical hazards and safety equipment.
2. Analyze and apply various grounding and bonding techniques.
3. Select appropriate safety method for low, medium and high voltage equipment.
4. Participate in a safety team.
5. Carry out proper maintenance of electrical equipment by understanding various standards**.**

Text Book:

1. Dennis Neitzel, Al Winfield,'Electrical Safety Handbook', McGraw-Hill Education , 4th Edition,2012.

References:

1. John Cadick, 'Electrical Safety Handbook', McGraw-Hill School Education Group, 1994.
2. Maxwell Adams.J, "Electrical safety- a guide to the causes and prevention of electric hazards",The Institution of Electric Engineers, 1994.
3. Ray A. Jones, Jane G. Jones, 'Electrical safety in the workplace', Jones & Bartlett Learning, 2000.

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Open Elective – IV

18ECE303   NANO ELECTRONICS

L T P C
3 0 0 3

Course Prerequisite: CMOS VLSI Design, Electronic Devices

Course Description:
This course provides an overview of Semiconductor Physics and carrier transport phenomenon. It illustrates Quantum Mechanics, & Nano-materials, Nanoscale MOSFET Transistors and their characteristics.

Course Objectives:
1. Apply the knowledge of Quantum physics to illustrate energy band structure.
2. Understand the basic physics of Kronig Penny Model.
3. Understand the fundamentals of operation of the main semiconductor electronic devices.
4. Understand and utilize the mathematical models and characteristics of MOS transistors for circuits and systems.
5. Understand and appreciate the nano-materials process.

UNIT I: INTRODUCTION TO NANOTECHNOLOGY
Introduction to nanotechnology, meso-structures, Basics of Quantum Mechanics: Schrodinger equation, Density of States.   **(9)**

UNIT II:
Particle in a box Concepts, Degeneracy. Band Theory of Solids. Kronig-Penny Model. Brillouin Zones.   **(9)**

UNIT III:
Shrink-down approaches: Introduction, CMOS Scaling, The nanoscale MOSFET, Finfets, Vertical MOSFETs, limits to scaling, system integration limits (interconnect issues etc.). **(9)**

UNIT IV:
Resonant Tunneling Diode, Coulomb dots, Quantum blockade, Single electron transistors, Carbon nanotube electronics.   **(9)**

UNIT V:
Band structure and transport, devices, applications, 2D semiconductors and electronic devices, Graphene, atomistic simulation.   **(9)**

Dept. of Computer Science & Engineering

Course Outcomes:
At the end of the course, students will demonstrate the ability to:
1. Understand various aspects of nano-technology and the processes involved in makingnano components and material.
2. Leverage advantages of the nano-materials and appropriate use in solving practical problems.
3. Understand various aspects of nano-technology and theprocessesinvolved in making nano components and material.
4. Leverage advantages of the nano-materials and appropriate use in solving practical problems.

Text / Reference Books:

1. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson,2009.
2. W. Ranier, Nanoelectronics and Information Technology (Advanced Electronic Materialand Novel Devices), Wiley-VCH,2003.
3. K.E. Drexler, Nanosystems, Wiley,1992.
4. J.H. Davies, The Physics of Low-Dimensional Semiconductors, Cambridge University Press,1998.
5. C.P. Poole, F. J. Owens, Introduction to Nanotechnology, Wiley,2003

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Dept. of Computer Science & Engineering

Open Elective- IV

18ECE304   WIRELESS SENSOR NETWORKS

L T P C
3 0 0 3

Course Prerequisite: None

Course Description:
This course introduces the concept of Wireless Sensor Network (WSN) to the students. It articulates the classification of WSN and related issues & challenges. It also describes different types of routing, MAC, dissemination protocols and explains design principles of wireless sensor networks.

Course Objectives:
1. Understand the concept of WSN, issues and challenges, classification of WSN.
2. Analyze and learn the classification of routing and MAC protocols.
3. Understand Dissemination protocol for large sensor network.
4. Design principles of WSNs.
5. Learn the hardware components & design constraints and Operating systems used in WSNs.

UNIT I
Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks. Mobile Ad-hocNetworks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks.   **(9)**

UNIT II
Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee.   **(9)**

UNIT III
Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.   **(9)**

UNIT IV
Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication.   **(9)**

UNIT V
Single-node architecture, Hardware components& design constraints. Operating systems and execution environments, introduction to TinyOS and nesC.   **(9)**

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Course Outcomes:
At the end of the course the students will be able to
1. Design wireless sensor networks for a given application
2. Understand emerging research areas in the field of sensor networks
3. Understand MAC protocols used for different communication standards used in WSN
4. Explore new protocols for WSN

Text/Reference Books:

1. WaltenegusDargie , Christian Poellabauer, " Fundamentals Of Wireless Sensor Networks Theory And Practice" , By John Wiley & Sons Publications ,2011
2. SabrieSoloman, " Sensors Handbook" by McGraw Hill publication. 2009
3. Feng Zhao, Leonidas Guibas, " Wireless Sensor Networks", Elsevier Publications,2004
4. Kazem Sohrby, Daniel Minoli, " Wireless Sensor Networks": Technology, Protocols and Applications, Wiley-Inter science.
5. Philip Levis, And David Gay "TinyOS Programming" by Cambridge University Press 2009

Mode of Evaluation: Assignments, Mid Term Test, End Semester Examinations

Discipline Elective – I

Dept. of Computer Science & Engineering

Discipline Elective – I

18CSE401   DATA MINING AND DATA WAREHOUSING

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

Course Prerequisite: 18CSE105
Course Description:
In this course we explore how this interdisciplinary field brings together techniques from databases, statistics, machine learning, and information retrieval. We will discuss the main data mining methods currently used, including data warehousing and data cleaning, clustering, classification, association rules mining, and web mining.

Course Objectives:
1. To understand the fundamentals of Data mining and Pre-processing techniques
2. To understand the concept of Data warehouses.
3. To understand the algorithms of supervised techniques.
4. To understand the algorithms of unsupervised techniques.
5. To know the applications of data mining in the real world.

UNIT I: INTRODUCTION TO DATA MINING
Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation.   **(9)**

UNIT II: MINING FREQUENT PATTERNS
Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis.   **(9)**

UNIT III : CLSSIFICATION AND PREDICTION
Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures.   **(9)**

UNIT IV: CLUSTER ANALYSIS
Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis.   **(9)**

UNIT V: APPLICATIONS IN DATA MINING
Outlier Analysis, Social networks Analysis, Web mining, Text mining.   **(9)**

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Course Outcomes:
1. Student is able to preprocess any real world dataset by using preprocessing techniques
2. Able to distinguish the OLTP and OLAP.
3. Able to implement data mining techniques such as Associations, classification.
4. Able to implement clustering techniques and its applications.
5. Students can identify the applications where data mining techniques can be applied.

Text Books:
1. Tan, Pang-Ning& others. "Introduction to Data Mining" Pearson Education, 2006.
2. Han J &Kamber M, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers,Second Edition, 2006

Reference Books:
1.Dunhum M.H. & Sridhar S. "Data Mining-Introductory and Advanced Topics", Pearson Education, 2006.
2. Grigoris Antoniou and Frank van Harmelen "A Semantic Web Primer", The MIT Press Cambridge, Massachusetts London, England 2003.
3. S. Sumathi& S.N. Sivanandam "Introduction to Data mining and its applications", Springer-verlag.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective - I

18CSE402   MOBILE COMPUTING

L T P C
3 0 0 3

Course Prerequisite: 18CSE109
Course Description:
This course will give you an understanding of mobile and wireless network systems such as 2G/3G/4G mobile telephony/data networks, and other wireless networks and infrastructure devices. Wireless hosts e.g. mobile phones, laptops, as well as wireless links are becoming increasingly popular, hence there is the need to investigate the principles and protocols that make wireless communications possible. Bluetooth and 802.11 standards are among the topics to be discussed, as well as applications for the mobile phone.

Course Objectives:
1. Identify the necessity of wireless communication.
2. Understand the layered protocol architecture of wireless network.
3. Recognize the different types of WLANs and Define GSM and its evolution from telecommunication to wireless communication.
4. Understand Wireless Medium Access Control Protocols and Differentiate the network and transport protocols used in wired and wireless networks.
5. Define Database Issues and Data Dissemination and Synchronization and Understand the different Routing Protocols used in MANETs

UNIT I : INTRODUCTION TO MOBILE COMMUNICATION AND COMPUTING
Introduction to Mobile Communications and Computing: Mobile Computing (MC) : Introduction to MC, Novel applications, Limitations, and Architecture. GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.   **(9)**

UNIT II : MEDIUM ACCESS CONTROL
(Wireless) Medium Access Control (MAC): Motivation for a Specialized MAC (Hidden and Exposed Terminals, Near and Far Terminals), SDMA, FDMA, TDMA, CDMA, MAC Protocols for GSM.   **(9)**

UNIT III : MOBILE NETWORK LAYER
Mobile IP Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).   **(9)**

UNIT IV : MOBILE TRANSPORT LAYER
Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fastretransmit/fast recovery, Transmission/ time-out freezing, Selective retransmission, Transactionoriented TCP.   **(9)**

UNIT V : PROTOCOLS AND TOOLS
Bluetooth (user scenarios-architecture-Radiolayer-Baseband layerLink manager protocol-L2CAPSecurity- SDA-Profiles). Wireless application protocol(architecture-wieless datagram protocol-wireless transport layer security-Wireless session protocol-wireless application environment-wireless markup language). **(9)**

Course Outcomes:
Upon completion of this course, students should be able to:
1. Learn the different wireless communication technologies, understand the protocols used in the layered architecture.
2. Define WLAN and different WLAN transmission technologies.
3. Explain different types of WLANs, learn about GSM.
4. Explain different Wireless Medium Access Control Protocols, explain Mobile Network and Transport Layer Protocols .
5. Explain different routing algorithms used in Mobile Ad hoc Networks(MANET).

Text Books:
1."Mobile Communications", Jochen Schiller, Addison-Wesley, Second Edition, 2004.
2.**"**Mobile Computing", Raj Kamal, Oxford University Press ,2007.

Reference Books:
1. "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", Reza Behravanfar, Cambridge University Press, Oct2004.
2. "Handbook of Wireless Networks and Mobile Computing", Stojmenovic and Cacute,Wiley, 2002.
3. "Mobile and Wireless Design Essentials", MartynMallick, Wiley DreamTech, 2003.
4. "Principles of Mobile Computing", Hansmann, Merk, Nicklous, Stober, 2nd edition, Springer 2003.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

Discipline Elective - I

18CSE403   ARTIFICIAL INTELLIGENCE

	L	T	P	C
Course Prerequisite: Nil	3	0	0	3

Course Description:
Includes an introduction to artificial intelligence as well as current trends and characterization of knowledge-based systems. They will cover simple representation schemes, problem-solving paradigms, constraint propagation, and search strategies. Areas of application such as knowledge representation, natural language processing and expert systems will be explored.

Course Objectives:
1. To learn the difference between optimal reasoning vs human like reasoning
2. To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities
3. To learn different knowledge representation techniques
4. To understand the applications of Al: namely Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing.
5. To learn how to Evaluate applications and background algorithms used for their implementation.

UNIT I: PROBLEMS AND SEARCH
Foundations of Artificial Intelligence (AI). History of AI; Problem Solving- Formulating problems, problem types, states and operators, state space, search strategies. Scope of AI - Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems, AI techniques- search knowledge, abstraction.Informed Search Strategies- Best first search, A* algorithm, heuristic functions, Iterative deepening A*(IDA), small memory A*(SMA); Game playing - Perfect decision game, imperfect decision game, evaluation function, alpha-beta pruning.   **(9)**

UNIT II: KNOWLEDGE REPRSENTATION ISSUES AND PREDICATE LOGIC
Planning- Basic representation of plans, partial order planning, planning in the blocks world, hierarchical planning, conditional planning, representation of resource constraints, measures, temporal constraints. Introduction, Approaches to Knowledge Representation. Inference, Propositional Logic, predicate logic (first order logic), logical reasoning, forward chaining, backward chaining; Proof Systems, Natural Deduction, Tableau Method, Resolution Method. First Order Logic (FOL), Syntax and Semantics, Unification, Forward Chaining. The Rete Algorithm, Rete example, Programming Rule Based Systems.   **(9)**

UNIT III: KNOWLEDGE INTERFERENCE
Representation in FOL, Categories and Properties, Reification, Event Calculus. Conceptual Dependency (CD) Theory, Understanding Natural Language. Deductive Retrieval, Backward Chaining, Logic Programming with Prolog.Resolution Refutation in FOL, FOL with Equality, Complexity of Theorem Proving.   **(9)**

UNIT IV: STATISTICAL REASONING

Uncertainty - Basic probability, Bayes rule, Belief networks, Default reasoning, Fuzzy sets and fuzzy logic; Decision making- Utility theory, utility functions, Decision theoretic expert system.

(9)

UNIT V :STRONG SLOT AND FILLER STRUCTURES

Inductive learning - decision trees, rule based learning, current-best-hypothesis search, least-commitment search, neural networks, reinforcement learning, genetic algorithms; Other learning methods - neural networks, reinforcement learning, genetic algorithms. **(9)**

Course Outcomes:

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

1. Possess the ability to formulate an efficient problem space for a problem expressed in English.
2. Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
3. Possess the skill for representing knowledge using the appropriate technique.
4. Possess the ability to apply Al techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing.
5. Evaluate applications and background algorithms used for their implementation.

Text Books:

1. Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGraw Hill, 2008.
2. Stuart Russell and Peter Norvig. Artificial Intelligence – A Modern Approach, Pearson Education Press, 2001.

Reference Books:

1. George F. Luger, "AI-Structures and Strategies for Complex Problem Solving", 4/e, 2002, Pearson Education.
2. Robert J. Schalkolf, Artificial Intelligence: An Engineering approach, McGraw Hill, 1990.
3. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson.
4. Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication.
5. Dan W. Patterson, Introduction to Artificial Intelligence and Expert System, PHI.
6. Elaine Rich, Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 1999.
7. George F. Luger, Artificial Intelligence, Pearson Education, 2001.
8. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman, 2002.

Mode of Evaluation: Assignments, Mid Term Tests, External End Examination

Dept. of Computer Science & Engineering

Discipline Elective - I

<p align="center">18CSE404   WEB TECHNOLOGIES</p>

Course Prerequisite: 18CSE104

L	T	P	C
3	0	0	3

Course Description:
This course will expose students to the techniques used in programming web pages for interactive content. The course begins by reviewing basic web technologies (HTML, CSS style sheets) and exploring the use of event-driven programming in JavaScript to add interactive elements such as buttons and text fields to web pages. Next, students will use AJAX tools to build web pages that connect to servers like Google to dynamically access data (maps, search results, videos, images, etc). Finally, the course will show students how to write their own xml code to provide access to a custom database.

Course Objectives:
1. To introduce Markup Languages for client side scripting
2. To introduce JavaScript and DOM and Java Servlets with Java
3. To introduce XML and processing of XML Data with Java
4. To introduce Server side programming with Java Servlets and JSP
5. To introduce various java web services and SOAP

UNIT I: WEB ESSENTIALS
Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols -The World Wide Web-HTTP request message-response message-Web Clients Web Servers-Case Study. Markup Languages: XHTML. An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics-Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-XML Creating HTML Documents-Case Study.   **(9)**

UNIT II: STYLE SHEETS
Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML Style Rule Cascading and Inheritance-Text Properties-Box Model-Normal Flow Box Layout- Beyond the Normal Flow-Other Properties-Case Study. Client-Side Programming: The JavaScript Language-History and Versions Introduction to JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects - JavaScript Debuggers.   **(9)**

UNIT III: HOST OBJECTS
Host Objects: Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window-Case Study. Server-Side Programming: Java Servlets- Architecture -Overview-A Servelet-Generating Dynamic Content-Life Cycle- Parameter Data-Sessions-Cookies- URL Rewriting-Other Capabilities-Data Storage Servlets and Concurrency-Case Study- Related Technologies.   **(9)**

UNIT IV: REPRESENTING WEB DATA

Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers-Case Study-Related Technologies. Separating Programming and Presentation: JSP Technology-Introduction-JSP and Servlets-Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-View-Controller Paradigm-Case Study-Related Technologies.

(9)

UNIT V: WEB SERVICES

Web Services: JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services: WSDL- Representing Data Types: XML Schema-communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files-Databases and Java Servlets. **(9)**

Course Outcomes:
1. Gain knowledge of client side scripting, validation of forms and AJAX programming
2. Have understanding of server side scripting with JSP language
3. Have understanding of what is XML and how to parse and use XML Data with Java
4. Have understanding of Server side programming with Java Servlets and JSP
5. Have understanding of various java web services and SOAP

Text Books:
1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007 .

Reference Books:
1. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", ThirdEdition, Pearson Education, 2006.
2. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I andII, Pearson Education, 2001.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

Discipline Elective - I

		L	T	P	C
18CSE405	**DIGITAL IMAGE PROCESSING**	3	0	0	3

Course Prerequisite: Nil

Course Description:
It begins with an introduction to the fundamentals of digital images and discusses the various discrete transforms, which are extensively used in image processing. It then goes on to discuss the different image processing techniques such as image enhancement, automatic image classification and recognition.

Course Objectives:
1. To Learn fundamentals of Digital image.
2. To be exposed to simple image processing techniques.
3. To Learn to represent image in the form of features.
4. To be familiar with the image compression and segmentation.
5. To learn the breadth and practical scope of digital image processing.

UNIT I: FUNDAMENTALS OF IMAGE PROCESSING
Introduction, origin, step in digital image processing, Digital image representation, Image Sensing and Acquisition, Image sampling and quantization, Basic relation between pixels.   **(9)**

UNIT II: IMAGE ENHANCEMENT
Spatial domain: Gray level transformations, Histogram processing, Basics of spatial filtering, smoothing, sharpening, Combining spatial enhancement methods.
Frequency domain: Basics of filtering, Fourier transform, smoothing, sharpening, frequency domain filtering-Ideal, butterworth and Gaussian filters, Homomorphic filtering.   **(9)**

UNIT III: IMAGE RESTORATION AND SEGMENTATION
Noise models: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Mean and median Filters, order statistics, adaptive filters, band reject filters, band pass filters, notch filters, noise filters, Constrained Least Squares Restoration, wiener filtering.
Segmentation: fundamentals, point, line and edge detection, Detection of discontinuities, boundary detection, region-based segmentation, morphological processing, erosion and dilation. The hit or Miss Transformation.   **(9)**

UNIT IV: COMPRESSION AND MORPHOLOGICAL IMAGE PROCESSING
Need for image compression, classification of redundancy, Image compression models(schemes), Error Free Compression, Huffman and Arithmetic coding, pixel coding, entropy coding, run-length coding, bit plane coding, predictive coding Delta and DPCM techniques. Lossy Compression, Lossy and Lossless Predictive Coding, Zonal versus threshold coding.

(9)

UNIT V: COLOR IMAGE PROCESSING
Color image fundamental, color image models, pseudo color image processing, color models conversion, Image segmentation based on color.   **(9)**

Course Outcomes:
At the end of the course, students will be able to:
1. Have an appreciation of the fundamentals of Digital image processing including the topics of filtering, transforms and morphology and image analysis and compression.
2. Be able to implement basic image processing algorithms in MATLAB
3. Have the skill base necessary to further explore advance d topics of Digital Image Processing.
4. Be in a position to make a positive professional contribution in the field of Digital Image Processing.
5. At the end of the course the student should have a clear impression of the breadth and practical scope of digital image processing and have arrived at a level of understanding that is the foundation for most of the work currently underway in this field.

Text Books:
1. Digital Image Processing – Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008
2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010.

Reference Books
1. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools – ScotteUmbaugh, 2nd Ed, CRC Press, 2011
2. Digital Image Processing using MATLAB — Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Edition, TMH, 2010.
3. Fundamentals of Digital Image Processing — A.K.Jain, PHI, 1989
4. Digital Image Processing and Computer Vision — Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
5. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2008, 2nd Edition
6. Introduction to Image Processing & Analysis — John C. Russ, J. Christian Russ, CRC Press, 2010.
7. Digital Image Processing with MATLAB &Labview — Vipula Singh, Elsevie r.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

Discipline Elective – I

    18CSE406   **MULTIMEDIA TECHNOLOGIES**

                    L T P C
Course Prerequisite: Nil   **3 0 0 3**

Course Description:
This course aims to introduce the students to Multimedia technologies and their usage in real world applications. This course covers introduction to multimedia, different image, video and audio formats, image coding and compression techniques, I/O technologies, Multimedia network and Multimedia Security and Forensics.

Course Objectives:
1. To provide the foundation knowledge of multimedia computing.
2. To provide the knowledge about media characteristics, compression standards, multimedia representation, data formats, multimedia technology development.
3. To understand Multimedia security and forensics.
4. To understand multimedia components efficiently
5. To develop integrated, collaborative multimedia systems

UNIT I: INTRODUCTION TO MULTIMEDIA TECHNOLOGIES
Introduction to Multimedia: Multimedia Elements – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.   **(9)**

UNIT II: COMPRESSION AND FILE FORMATS
Compression and Decompression: Need for Data Compression – Types of Compression – Binary Image Compression Schemes – Image Compression – Video Compression – Audio Compression. Data and File Format Standards: Rich Text Format – TIFF File Format – Resource Interface File Format – MIDI File Format - JPEG DIB File Format – AVI Indeo File Format – MPEG Standards –TWAIN.   **(9)**

UNIT III: MULTIMEDIA I/O TECHNOLOGIES
Input and Output Technologies: Multimedia I/O Technologies: Image Scanners – Digital Voice and Audio – Digital Camera – Video Images and Animation – Full Motion Video -Video Motion Analysis.   **(9)**

UNIT IV: MULTIMEDIA NETWORKS
Protocol - QOS Issues - RTP, RTCP, RTSP, SIP - Media on demand –ITV - STB Broadcast Schemes for VoD Buffer Management- Multimedia over wireless networks.   **(9)**

UNIT V: MULTIMEDIA SECURITY AND FORENSICS

Multimedia encryption - Digital Watermarking Security Attacks- Digital Forensics taxonomy, goals/requirements - Forensic Data Acquisition -Forensics Analysis and Validation.   **(9)**

Course Outcomes:

Upon completion of this course, students should be able to

1. Understand the characteristics of different media and the representations of different multimedia data formats.
2. Understand the characteristics of Image, Audio and Video systems and takes into considerations in multimedia techniques design and implementation.
3. Describe different coding and compression principles and compare different compression techniques.
4. Design multimedia components efficiently
5. Develop integrated, collaborative multimedia systems

Text Books:

1. K. Andleigh, KiranThakrar , Multimedia Systems Design, PHI, 2007
2. ZeNian Li, S. Drew, "Fundamentals of Multimedia", PHI, 2006

Reference Books:

1. Li, Ze-Nian and Mark S. Drew, "Fundamentals of Multimedia", Prentice Hall of India, 2004.
2. Steinmetz Ralf and K. Nahrstedt "Multimedia: Computing, Communications & Applications", Pearson Education, 1995.
3. Ralf Steinmetz and Klara, "Multimedia Computing, Communications and Applications", Pearson Education, 2009
4. Min Wu, Bede Liu, "Multimedia Data Hiding", Springer-Verlag, 2002
5. I. Cox, M. Miller, and J. Bloom, "Digital Watermarking", Morgan Kaufman Publishers, 2001
6. Chun-Shien Lu, "Multimedia Security : Steganography and Digital Watermarking techniques for Protection of Intellectual Property", Springer Inc 2007
7. WenjunZeng, Heather Yu and Ching, Yung Lin, "Multimedia Security technologies for Digital rights Management", Elsevier Inc 2006

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – III

Discipline Elective - III

18CSE407   SOFT COMPUTING

Course Prerequisite: None

L T P C
3 0 0 3

Course Description:
Soft computing is an emerging approach to computing which parallel the remarkable ability of the human mind to reason and learn in an environment of uncertainty and imprecision. Soft computing is based on some biological inspired methodologies such as genetics, evolution, ant's behaviors, particles swarming, human nervous systems, etc. Now, soft computing is the only solution when we don't have any mathematical modeling of problem solving (i.e., algorithm), need a solution to a complex problem in real time, easy to adapt with changed scenario and can be implemented with parallel computing. It has enormous applications in many application areas such as medical diagnosis, computer vision, hand written character recondition, pattern recognition, machine intelligence, weather forecasting, network optimization, VLSI design, etc.

Course Objectives:
To give students knowledge of soft computing theories fundamentals,
1. To learn the fundamentals of non-traditional technologies and approaches to solving hard real-world problems.
2. To learn and apply artificial neural networks, fuzzy sets and fuzzy logic, and genetic algorithms in problem solving and use of heuristics based on human experience.
3. To introduce the ideas of fuzzy sets, fuzzy logic
4. To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
5. To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.

UNIT I: NEURAL NETWORKS - I
Introduction and Architecture: Neuron, Nerve Structure and Synapse, Artificial Neuron and its Model, Activation Functions, Neural Network Architecture: Single Layer and Multilayer Feed Forward Networks, Recurrent Networks. Various Learning Techniques; Perception and Convergence Rule, Auto-Associative and Hetro-Associative Memory.   **(9)**

UNIT II: NEURAL NETWORKS - II
Back Propagation Networks: Architecture: Perceptron Model, Solution, Single Layer Artificial Neural Network, Multilayer Perception Model; Back Propagation Learning Methods, Effect of Learning Rule Co-Efficient;Back Propagation Algorithm, Factors Affecting Back Propagation Training, Applications.   **(9)**

UNIT III: FUZZY LOGIC - I
Introduction: Basic Concepts of Fuzzy Logic, Fuzzy Sets and Crisp Sets, Fuzzy Set Theory and Operations, Properties of Fuzzy Sets, Fuzzy and Crisp Relations, Fuzzy to Crisp Conversion.
                    (9)

UNIT IV: FUZZY LOGIC – II
Fuzzy Membership, Rules: Membership Functions, Interference in Fuzzy Logic, Fuzzy If-Then Rules, Fuzzy Implications and Fuzzy Algorithms, Fuzzifications and Defuzzificataions, Fuzzy Controller, Industrial Applications. **(9)**

UNIT V: GENETIC ALGORITHM
Basic Concepts, Working Principle, Procedures of GA, Flow Chart of GA, GeneticRepresentations, (Encoding) Initialization and Selection, Genetic Operators, Mutation,Generational Cycle, Applications. **(9)**

Course Outcomes:
Upon completion of the course, the students will be able to:
1. Awake the importance of tolerance of imprecision and uncertainty for design of robust and low-cost intelligent machines.
2. Acquire knowledge of soft computing theories fundamentals.
3. Design program systems using approaches of these theories for solving various real-world problems.
4. Try and integrate the knowledge of neural networks, fuzzy logic, genetic algorithms, probabilistic reasoning, rough sets, chaos, hybrid approaches (combinations of neural networks, fuzzy logic and genetic algorithms).
5. To design concepts with genetic algorithms and other random search procedures.

Text Books:
1. S. Rajasekaran and G.A. VijayalakshmiPai, ―Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications, Prentice Hall of India, 2003.
2. J.S.R. Jang, C.T. Sun and E. Mizutani, ―Neuro-Fuzzy and Soft Computing, Pearson Education, 2004.

Reference Books:
1. SimanHaykin, ―Neural Networks, Prentice Hall of India, 1999
2. Timothy J. Ross, ―Fuzzy Logic with Engineering Applications, Third Edition, Wiley India, 2010.
3. S.Y.Kung, ―Digital Neural Network, Prentice Hall International, 1993.
4. liev.R.A and Aliev,R.R, ― Soft Computing and its Application, World Scientific Publishing Company, 2001.
5. Wulfram Gerstner and WennerKristler, ―Spiking Neural Networks, Cambridge University Press.
6. Bart Kosko, ―Neural Networks and Fuzzy Systems: Dynamical Systems Application to Machine Intelligence‖, Prentice Hall, 1992.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – III

<div align="center">

18CSE408   REAL TIME SYSTEMS
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<div align="right">

L   T   P   C
3   0   0   3
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Course Prerequisite: 18CSE109

Course Description:
To introduce the fundamental problems, concepts, and approaches in the design and analysis of real-time systems. To study issues related to the design and analysis of systems in communication, database with real-time constraints.

Course Objectives:
1. To provide good understanding of fundamental concepts in real time systems.
2. To understand on basic multi-task scheduling algorithms for periodic, aperiodic, and sporadic tasks.
3. To learn the programming language tools for real time systems.
4. Acquire knowledge on real time communications and databases.
5. To learn the requirement of communication systems for real time systems

UNIT I: INTRODUCTION
Introduction-Issues in Real Time Computing, Structure of a Real Time System. Task Classes, Performance Measures for Real Time Systems, Estimating Program Run times.   **(9)**

UNIT II: TASKASSIGNMENTAND SCHEDULING
Task Assignment and Scheduling-Classical Uniprocessor scheduling algorithms, UniProcessor scheduling of IRIS Tasks, Task Assignment, Mode Changes, and Fault Tolerant Scheduling. **(9)**

UNIT III: PROGRAMMINGLANGUAGESAND TOOLS
Programming Language and Tools –Desired Language characteristics, Data Typing, Control structures, Facilitating Hierarchical Decomposition, Packages, Run-time (Exception) Error handling, Overloading and Generics, Multitasking, Low Level programming, Task scheduling, Timing Specifications, Programming Environments, Run-time Support.   **(9)**

UNIT IV: REALTIMEDATABASES
RealtimeDatabases- Basic Definition, RealtimeVs General Purpose Databases, Main Memory Databases, Transaction priorities, Transaction Aborts, Concurrency Control Issues, Disk Scheduling Algorithms, Two-phase Approach to improve Predictability, Maintaining Serialization Consistency, Databases for Hard Real Time systems.   **(9)**

UNIT V: REAL TIME COMMUNICATION

Real-Time Communication - Communications Media, Network Topologies Protocols, Fault Tolerant Routing. Fault Tolerance Techniques- Fault Types, Fault Detection. Fault Error containment Redundancy, Data Diversity, Reversal Checks, Integrated Failure handling.   **(9)**

Course Outcomes:

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

1. Understand the basics and importance of real-time systems
2. Analyze the real time system based on requirements specifications
3. Understand basic multi-task scheduling algorithms for periodic, aperiodic, and sporadic tasks as well as understand the impact of the latter two on scheduling
4. Understand requirement of database systems for real time systems
5. Learn the requirement of communication systems for real time systems

Text Books:

1. C.M. Krishna, Kang G. Shin, "Real-Time Systems", McGraw-Hill International Editions, 2010.
2. Stuart Bennett, "Real Time Computer Control-An Introduction", Second edition PernticeHall PTR, 1994

Reference Books:.

1. Peter D. Lawrence, "RealtimeMicro Computer System Design– An Introduction", McGraw Hill, 1988.
2. S.T.Allworthand R.N. Zobel, "Introduction to realtime software design", Macmillan, IIEdition, 1987.
3. R.J.ABuhur, D.L.Bailey, "An Introduction to Real-Time Systems", Prentice-Hall International, 1999.
4. Philip. A. Laplante, "Real Time System Design and Analysis" PHI, III Edition, April 2004

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

Discipline Elective - III

18CSE409   DISTRIBUTED AND CLOUD COMPUTING

L T P C
3 0 0 3

Course Prerequisite: 18CSE109

Course Description:
The course provides a comprehensive understanding of the distributed and cloud computing.

Course Objectives:
1. To understand distributed computing
2. To understand cloud computing.
3. To understand cloud platform
4. To understand service oriented architecture
5. To work with public clouds such as AWS

UNIT I: DISTRIBUTED SYSTEM MODELS AND ENABLING TECHNOLOGIES
Scalable Computing over the Internet, Technologies for Network-Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds, Performance, Security, and Energy Efficiency.   **(9)**

UNIT II: VIRTUAL MACHINES AND VIRTUALIZATION OF CLUSTERS AND DATA CENTERS
Implementation Levels of Virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory, and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.   **(9)**

UNIT III: CLOUD PLATFORM ARCHITECTURE OVER VIRTUALIZED DATA CENTERS
Cloud Computing and Service Models, Data-Center Design and Interconnection Networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms: GAE, AWS, and Azure, Inter-cloud Resource Management, Cloud Security and Trust Management.   **(9)**

UNIT IV: SERVICE-ORIENTED ARCHITECTURES FOR DISTRIBUTED COMPUTING
Services and Service-Oriented Architecture, Message-Oriented Middleware, Portals and Science Gateways, Discovery, Registries, Metadata, and Databases, Workflow in Service-Oriented Architecture.   **(9)**

UNIT V: CLOUD PROGRAMMING AND SOFTWARE ENVIRONMENTS
Parallel and Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments**.**
                                    (9)

Dept. of Computer Science & Engineering

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Understand the concepts of distributed systems
2. Work with Virtual Machines
3. Understand cloud platform
4. Understand service oriented architecture
5. Work with public clouds such as AWS.

Text Books:
3. Kai Hwang, Geoffrey C. Fox, and Jack J. Dongarra: Distributed and Cloud Computing.
4. RajkumarBuyya, James Broberg, and AndrzejGoscinski (eds), Cloud Computing: Principles and Paradigms, 644 pages, ISBN-13: 978-0470887998, Wiley Press, New York, USA, February 2011

Reference Book:
1. MustafizurRahman, Rajiv Ranjan, and RajkumarBuyya, Decentralization in Distributed Systems: Challenges, Technologies, and Opportunities, Advancements in Distributed Computing and Internet Technologies: Trends and Issues, 386-399pp, A. K. Pathan, M. Pathan, and H. Y. Lee (eds), ISBN13: 9781613501108, IGI Global, Hershey, PA, USA, August 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – III

18CSE410   ADHOC WIRELESS NETWORKS

L T P C
3 0 0 3

Course Prerequisite: 18CSE109

Course Description:
The course provides a comprehensive understanding of the Adhoc Wireless Networks and it is an advanced research-oriented course designed for graduate students with computer networks background. It will cover various topics relevant to a cutting-edge technology, namely, Ad hoc Wireless Networks, which include MAC protocols, designing routing protocols and working of Table-Driven Routing protocols, On-Demand Routing protocols, designing Transport layer Protocols for Ad-hoc networks and designing Security Protocols for Adhoc networks. Through this course, students can learn the state of art of wireless ad hoc networks research, and enhance their potential to do research in this exciting area.

Course Objectives:
This course will enable students to
1. List and Explain the various issues and applications of Ad hoc wireless networks.
2. Classify and Explain the working of MAC protocols for Ad-hoc wireless networks
3. Discuss the issues in designing routing protocols and working of Table-Driven Routing protocols.
4. Compare and contrast the working of various On-Demand Routing protocols.
5. Analyze the challenges in designing Transport layer Protocols for Ad-hoc networks , Compare and contrast the working of Transport protocols.
6. Identify the issues in designing Security Protocols for Adhoc networks focusing on the working performance of security protocols.

UNIT I: AD-HOC WIRELESS NETWORKS
Introduction, Issues in Ad-hoc Wireless Networks, Ad-hoc Wireless Internet; MAC Protocols for Ad-hoc Wireless Networks: Introduction, Issues in Designing a MAC Protocol, Design Goals of MAC Protocols, Classification of MAC protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based Protocols with Scheduling Mechanisms.   **(9)**

UNIT II: ROUTING PROTOCOLS FOR AD-HOC WIRELESS NETWORKS
Introduction, Issues in Designing a Routing Protocol for Ad-hoc Wireless Networks; Classification of Routing Protocols; Table Driven Routing Protocols; On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols and Power-Aware Routing Protocols
                                                                                                                (9)

UNIT III: MULTICAST ROUTING IN AD-HOC WIRELESS NETWORKS
Introduction, Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of

Multicast Routing Protocols, Tree-Based Multicast Routing Protocols and Mesh-Based Multicast Routing Protocols. **(9)**

UNIT IV: TRANSPORT LAYER PROTOCOLS FOR AD-HOC NETWORKS
Introduction, Issues in Designing a Transport Layer Protocol; Design Goals of a Transport Layer Protocol; Classification of Transport Layer Solutions; TCP over Transport Layer Solutions; Other Transport Layer Protocols for Ad-hoc Networks. **(9)**

UNIT V: SECURITY IN AD-HOC WIRELESS NETWORKS
Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management and Secure Routing Ad-hoc Wireless Networks. **(9)**

Course Outcomes:
Upon successful completion of the course, students will be able to:
1. Design their own wireless network
2. Evaluate the existing network and improve its quality of service
3. Design multicasting Routing Protocol.
4. Choose appropriate protocol for various applications
5. Examine security measures present at different level

Text Books:
1. C. Siva Ram Murthy & B. S. Manoj: Ad-hoc Wireless Networks, 2nd Edition, Pearson Education, 2011.
2. Ozan K. Tonguz and Gianguigi Ferrari: Ad-hoc Wireless Networks, John Wiley, 2007.

Reference Books:
1. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du: Ad-hoc Wireless Networking, Kluwer Academic Publishers, 2004.
2. C.K. Toh: Ad-hoc Mobile Wireless Networks- Protocols and Systems, Pearson Education, 2002

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – III

18CSE411 SERVICE ORIENTED ARCHITECTURE

Course Prerequisite: Nil

L T P C
3 0 0 3

Course Description:
This course covers Introduction to SOA (Service Oriented Architecture) and Evaluation of SOA systems. The student considers SOA which defines and provisions IT infrastructure and allows for a loosely-coupled data exchange over disparate applications participating in business processes. It also covers the XML basic and its applications. Student also can know about SOA base web services, business process design and Enterprise platform-based services.

Course Objectives:
1. Understand introduction and Evolution of SOA.
2. To learn about Service orientation Principals.
3. To know about XML basic and able build XML based application.
4. To learn about SOA and related webservices.
5. To know about business process design and Enterprise platform.

UNIT I: INTRODUCTION TO SOA, EVOLUTION OF SOA
Fundamental SOA; Common Characteristics of contemporary SOA; Common tangible benefits of SOA; An SOA timeline (from XML to Web services to SOA); The continuing evolution of SOA (Standards organizations and Contributing vendors); The roots of SOA (comparing SOA to Past architectures). **(9)**

UNIT II: SERVICE ORIENTATION PRINCIPAL
Services-orientation and the enterprise; Anatomy of a service-oriented architecture; Common Principles of Service-orientation; Service orientation and Object-orientation; Service layer abstraction; Business service layer; Orchestration service layer; **(9)**

UNIT III: XML BASIC, BUILDING XML BASED APPLICATION
XML document structure – Well-formed and valid documents – Namespaces – DTD – XML Schema – X-Files. Parsing XML – using DOM, SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML. **(9)**

UNIT IV: SOA AND WEB SERVICES
The Web services framework; Services (as Web Services); Service Registry; Service descriptions (with WSDL); Messaging (with SOAP), Transactions, Coordination, Business Activity, Orchestration, Choreography; Addressing, Reliable Messaging, Policies, Metadata, Security, Notification and Events; Semantic Web Services; RESTful Services. **(9)**

UNIT V: BUSINESS PROCESS DESIGN AND ENTERPRISE PLATFORM
Business Process Management basics; WS-BPEL language basics; WS-Coordination overview; Service oriented business process design; WS-addressing language basics; WS-Reliable Messaging language basics; Service Component Architecture basics, SOA platform basics; Enterprise Service Bus basics (including basic and complex patterns)   **(9)**

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Understand software-oriented architectures
2. Design medium scale software project development using SOA principles
3. Develop SOA messages from business use cases
4. Students should have a detailed knowledge of the basic issues in translators.
5. Design and implementation of modern SOA and SOA-specific methodologies, technologies and standards.
6. Create composite services by applying composition style.

Text Books:
1. **Service-Oriented Architecture Concepts and Technology and Design**-Thomas Erl, Pearson Education, 2005.
2. **Understanding SOA with Web Services** – Eric Newcomer, Greg Lomow, Pearson Education, 2005.

Reference Books:
1. T Architecture and Middleware, Strategies for Building Large Integrated Systems, Chris Britton, ISBN 0-201-70907-4.
2. **Developing Enterprise Web Services** – An Architect's Guide – SandeepChatterjee, James Webber Pearson Education, ISBN 81-297-0491-9.
3. Michael Rosen, Boris Lublinsky, Applied SOA Service Oriented Architecture and Design Strategies, Wiely India Edition, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

Discipline Elective - III

18CSE412   **E-LEARNING TECHNOLOGIES**

Course Prerequisite: Nil

L T P C
3 0 0 3

Course Description:

The course provides a comprehensive understanding of the fundamental theory of E-learning and the Strategies of E-Learning .The relation between Models of E-Learning and Multi/Hyper Media for E-learning has been explained across various stages of learning techniques.

Course Objectives:
1. To enable the students to understand the concept of e-learning and integrating the technology.
2. To inculcate knowledge in planning the role of information technology in virtual classroom and university.
3. To make the students to understand the technology mediated communication and its applications.
4. To include knowledge in planning models of E-learning in in virtual classroom and university.
5. To make the students to understand the future of E-learning technology and its development.

UNIT I: CONCEPT OF E-LEARNING
Meaning, Evolution of E-Learning – Components of E-Learning – Virtual classroom: Teleconferencing, Audio and Video conferencing.   **(9)**

UNIT II: STRATEGIES OF E-LEARNING
Process of E-Learning: Knowledge Acquisition and Creation, Sharing of Knowledge, Utilization of Knowledge – E-Learning Instructional Grounds: Behaviourism, Cognitivism and Constructivism.   **(9)**

UNIT III: MODELS OF E-LEARNING
Role of Web-Based Instruction in Learning – Models of WBI: Instructional Design Model (ISD) & Hyper Media Design Model (HMD) – Computer Languages for Designing WBI – Future of E-Learning.   **(9)**

UNIT IV: MULTI/HYPER MEDIA FOR E-LEARNING
Concept, Meaning, Characteristics and Applications – Teaching Techniques through Multi/Hyper Media – Multimedia & Learning – Multimedia for Co-operative and Collaborative Learning Strategies – General Guidelines for Multi/Hyper Media Applications – Advantages & Disadvantages of Multi/Hyper Media.   **(9)**

UNIT V: FUTURE OF E-LEARNING TECHNOLOGY
21stCentury Education – Challenges of Distance Education – Electronic Media in Distance Education – Open Educational Resources / Open Learning – Internet in Distance Education – Virtual University System.E-Patashala, Indian Institutes Developing E-Content.   **(9)**
Course Outcomes:
Upon successful completion of the course, students will be able to

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1. Understand the concept of e-learning and integrating the technology.
2. Make the students to understand the technology mediated communication and its applications.
3. Understand the technology mediated communication and its applications.
4. Include knowledge in planning models of E-learning in in virtual classroom and university.
5. Make the students to understand the future of E-learning technology and its development.

Text Books:

1. Badrul Khan and Mohamed Ally(Edited), 2015, International Hand book of E-Learning:Volume-1 Theoretical Perspectives and Research, Routledge,.
2. Robyler , 2007, Integrating Educational Technology into Teaching, 4th Edition, Pearson Education India .
3. Richard Andrews and Caroline Heythornthwaite (Edited), 2007, The SAGE Hand Book of E-Learning Research, SAGE,Delhi.

Reference Books:

1. Bryn Holmes and John Gardiner, 2006,E-Learning Concepts and Practice, ,Pine Forge Press.
2. Y.R. Ramaiah , 2002,Distance Education and Open Learning, , Mittal Publications.
3. PradeepMandav, 2001, Visual Media Communication, Authorspress.
4. Michael D.Wiliams, Prentice Hall, 2000,Integrating Technology into Teaching and Learning: Concepts and Applications,.
5. Laura Parker Roerden, O'Reilly, 1997,Net Lessons: Web-based Projects for Your Classroom, Volume 1.
6. Paul F. Merrill, Allyn and Bacon, 1996,Computers in Education, 3rd Edition.
7. Joan Riedl, Allyn and Bacon, 1995,The Integrated Technology Classroom.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Discipline Elective – IV

Discipline Elective - IV

18CSE413   DATA SCIENCE

	L	T	P	C
	3	0	0	3

Course Prerequisite: Nil

Course Description:

Modern scientific, engineering, and business applications are increasingly dependent on data, existing traditional data analysis technologies were not designed for the complexity of the modern world. Data Science has emerged as a new, exciting, and fast-paced discipline that explores novel statistical, algorithmic, and implementation challenges that emerge in processing, storing, and extracting knowledge from Big Data.

Course Objectives:
1. To apply fundamental algorithmic ideas to process data.
2. Learn to apply hypotheses and data into actionable predictions.
3. To provide an understanding of R language.
4. To split the input data set into independent chunks that is processed in a completely parallel manner.
5. To analyse and communicate the findings effectively using visualization techniques.

UNIT I INTRODUCTION TO DATA SCIENCE

Introduction to Data Science - Introduction to Data science technologies Overview of the Data Science process – roles, stages in data science project – working with data from files – working with relational databases – exploring data – managing data – cleaning and sampling for modeling and validation.   **(9)**

UNIT II MODELING METHODS

Choosing and evaluating models – mapping problems to machine learning, evaluating clustering models, validating models – cluster analysis – K-means algorithm, Naïve Bayes–Memorization Methods – Linear and logistic regression – unsupervised methods.   **(9)**

UNIT III INTRODUCTION TO R

Reading and getting data into R – ordered and unordered factors – arrays and matrices – lists and data frames – reading data from files – probability distributions – statistical models in R – manipulating objects – data distribution.   **(9)**

UNIT IV MAP REDUCE

Introduction – distributed file system – algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce – Hadoop - Understanding the Map Reduce architecture - Writing Hadoop Map Reduce Programs - Loading data into HDFS - Executing the Map phase – Shuffling and sorting - Reducing phase execution.   **(9)**

UNIT V DATA VISUALIZATION

Introduction to Data Visulatization - Visualization tools - types of plots and graphs - visualization using python - Matplotlib - Seaborn. Visualization using R - ggplot() - Interactive visualization - Bokeh and Plotly().   **(9)**

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Understand the Data Science concepts and its process
2. Appreciate supervised and unsupervised learning and their applications
3. Manipulate data by applying fundamental algorithmic ideas using R.
4. Process large volumes of data in parallel by dividing the work into a set of independent tasks.
5. Gain a foundational understanding of business analytics with visualization techniques.

Text Books:
1. Nina Zumel, John Mount,:"Practical Data Science with R", Manning Publications, 2014.
2. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman: "Mining of Massive Datasets", Cambridge University Press, 2014.

References:
1. W. N. Venables, D. M. Smith and the R Core Team: "An Introduction to R", 2013.
2. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta: "Practical Data Science Cookbook", Packt Publishing Ltd., 2014.
3. Tom White, Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale, 4th Edition, O'Reilly Media, Inc., 2015.
4. Mario Dobler and Tim Großmann, "The Data Visualization Workshop", Packt Publishing Ltd.,2020.
5. Christopher Bishop: "Pattern Recognition and Machine Learning" Springer, 2006.
6. Kevin P. Murphy: "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
7. Hastie, Tibshirani, Friedman: "The Elements of Statistical Learning" (2nd ed)., Springer, 2008.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

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Discipline Elective - IV

18CSE414   DIGITAL FORENSICS

L	**T**	**P**	**C**
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Course Prerequisite: None
Course Description:
The course focuses on the technical issues and open problems in the area of cyber forensics. The fundamental concepts of security that include network layer, transport layer and application layer security techniques are studied. Topics include fundamentals of digital forensics, digital forensics models, multimedia forensics, live and memory forensics; network forensics; mobile devices forensics; current tools and their limitations are briefed

Course Objectives:
The student should be made to:
1. Learn the security issues in network layer and transport layer.
2. Be exposed to security techniques of the application layer.
3. Learn computer forensics fundamentals.
4. Be familiar with forensics tools.
5. Learn to analyze and validate forensics data.

UNIT I NETWORK LAYER & TRANSPORT LAYER SECURITY
Introduction to Security – Network layer Security: IPSec Protocol – IP Authentication Header – IP ESP – Key Management Protocol for IPSec. Transport layer Security: SSL protocol, Cryptographic Computations – TLS Protocol.   **(9)**

UNIT II APPLICATION LAYER SECURITY
PGP – S/MIME. Firewalls: Roles of Firewalls – Firewall related terminology – Types of Firewalls – Firewall designs. SET for E-Commerce Transactions.   **(9)**

UNIT III INTRODUCTION TO COMPUTER FORENSICS
Understanding Computer Forensics: Preparing a Computer Investigations – Taking a Systematic Approach – Procedures for Corporate High-Tech Investigation – Conducting an Investigation, Data Recovery Workstations and Software – Completing the Case. Data Acquisition: Understanding Storage Formats for Digital Evidence – Determining the Best Acquisition Method – Using Acquisition Tools – Validating Data Acquisitions.   **(9)**

UNIT IV EVIDENCE COLLECTION AND FORENSICS TOOLS
Processing Crime and Incident Scenes: Identifying Digital Evidence – Collecting Evidence – Preparing for a Search – Securing a Computer Incident – Seizing Digital Evidence, Storing Digital Evidence – Obtaining a Digital Hash – Reviewing a Case. Computer Forensics Tools: Evaluating Computer Forensics Tool Needs – Software Tools – Hardware Tools – Validating and Testing.

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UNIT V ANALYSIS AND VALIDATION
Determining What Data to Collect and Analyze – Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics. **(9)**

Course Outcomes:
Upon completion of the course, the student should be able to:
1. Understand the security issues in network layer and transport layer.
2. Apply security principles in the application layer.
3. Explain computer forensics.
4. Use forensics tools.
5. Analyze and validate forensics data.

Text Books:
1. Man Young Rhee, "Internet Security: Cryptographic Principles, Algorithms and Protocols", Wiley Publications, 2003.
2. Bill Nelson, Amelia Phillips, Frank Enfinger, "Computer Forensics and Investigations", Cengage Learning, India Edition, 2008.

References:
1. William Stallings, "Cryptography and Network Security: Principles and Practice", 3rd Edition, PHI, 2006
2. John R.Vacca, "Computer Forensics", Cengage Learning, 2005.
3. Richard E.Smith, "Internet Cryptography", 3rd Edition, Pearson Education, 2008.
4. Marjie T.Britz, "Computer Forensics and Cyber Crime": An Introduction", 3rd Edition, Prentice Hall, 2013.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Discipline Elective - IV

18CSE415   CRYPTOGRAPHY AND NETWORK SECURITY

Course Prerequisite: 18CSE109

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Course Description:

We cover in this course principles and practice of cryptography and network security: classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers), linear and differential cryptanalysis, perfect secrecy, public-key cryptography (RSA, discrete logarithms), algorithms for factoring and discrete logarithms, cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes, email and web security, viruses, firewalls, digital right management, and other topics.

Course Objectives:
1. Understand the fundamental principles of access control models and techniques, authentication and secure system design.
2. Have a strong understanding and describe of different cryptographic protocols and techniques be able to use them.
3. Become knowledgeable in various methods and protocols to maintain E-mail security, and web security.
4. Analyze & develop methods for authentication, access control, intrusion detection and prevention.
5. Identify and mitigate software security vulnerabilities in existing systems.

UNIT I: SYMMETRIC CIPHERS Introduction: Security Attacks, Services & Mechanisms, A Model for Network security. Symmetric Key Cryptography: Classical encryption techniques, Block cipher operations, DES, AES.   **(9)**

UNIT II: ASYMMETRIC CIPHERS Introduction: Modular arithmetic (addition, multiplication, inverse, exponentiation and Euler's Theorem) Public key Cryptography principles, RSA: generating keys, encryption and decryption. Other Public-key cryptosystems: Diffie-Hellman, El-Gamal cryptosystems.   **(9)**

UNIT III: CRYPTOGRAPHY AND DATA INTEGRITY ALGORITHMS: Authentication requirements, Message Authentication Code, Cryptographic Hash functions: Applications of Cryptographic Hash functions, Secure Hash Algorithm., HMAC, Digital Signatures, Digital Signature Standard.   **(9)**

UNIT IV: MUTUAL TRUST Key management and Distribution: Symmetric key distribution using Symmetric and Asymmetric encryption, Distribution of public keys, User authentication Protocols- Kerberos X.509 certificates.   **(9)**

UNIT V: NETWORK AND INTERNET SECURITY Transport level security: Web security issues, Secure Socket Layer (SSL), Transport Layer Security(TLS),E-mail Security: PGP,S/MIME System Security: Intruders and Viruses, Firewalls, Intrusion Detection.   **(9)**

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Course Outcomes:
Upon completion of this course, students should be able to:
1. Understand the basic definitions and concepts of the information security
2. Analyze & differentiate between several types of security schemes
3. Design & develop information security schemes
4. Identify the threats.
5. Implement security schemes to protect information system resources

Text Books:

1. Stallings, W.,.Cryptography and Network Security: Principles and Practice, 5th ed., Prentice Hall PTR.,2011.
2. Cryptography and Network Security; 2nd ed. , Behrouz A. Forouzan , Debdeep Mukhopadhyay, McGraw Hill,2011.

References:
1. AtulKahate, Cryptography and Network Security, 2nd ed., Tata Mcgraw Hill education Private Limited, 2011.
2. Computer Security, Dieter Gollman,3rded, Wiley Publications,2011.
 3. Introduction to Computer Security, Matt Bishop,1sted,Addison-Wesley Proffesional,2004.
4. Hand Book of Applied Cryptography, by Alfred Menezes, Paul van Oorschot, Scott Vanstone , CRC-Press 1996.

Discipline Elective - IV

18CSE416   MACHINE LEARNING

Course Prerequisite: Nil

L T P C
3 0 0 3

Course Description:

It begins with an introduction to the fundamentals of Machine Learning and discusses the various clustering techniques, which are extensively used in machine learning. It then goes on to discuss the different machine learning techniques such as Bayesian decision, multivariate and decision trees.

Course Objectives:
6. To demonstrate understanding of different types of learning algorithms
7. To discuss decision making under uncertainty and estimate probabilities
8. To analyse learning from multiple inputs and feature selection methods
9. To Evaluate learning from mixture of distributions and hierarchical data structure
10. To Understand artificial neural network structure and training algorithms

UNIT-I INTRODUCTION TO MACHINE LEARNING

Introduction to Machine Learning – Applications – Supervised Learning – Classification – Regression – Unsupervised Learning – Reinforcement Learning — Vapnik-Chervonenkis (VC) Dimension – Probably Approximately Correct (PAC) Learning – Noise – Learning multiple classes – Model selection and Generalization. **(9)**

UNIT-II BAYESIAN DECISION THEORY AND PARAMETRIC METHODS

Bayesian Decision Theory – Classification – Losses and Risks – Discriminant Functions – Parametric methods – Maximum Likelihood estimation – Evaluating an Estimator: Bias and Variance – Tuning Model complexity: Bias/Variance Dilemma – Model selection procedures. **(9)**

UNIT-III DIMENSIONALITY REDUCTION AND CLUSTERING

Dimensionality reduction – Subset selection – Principal component analysis – Factor analysis – Isoma. Clustering – Mixture densities – k-Means clustering – Expectation-Maximization algorithm – Hierarchical clustering – Non-parametric methods – Histogram estimator – Kernel estimator – k-Nearest neighbor estimator. **(9)**

UNIT-IV DECISION TREES AND MULTILAYER PERCEPTRONS

Decision trees – Univariate trees – Pruning – Rule extraction from trees – Learning rules from data – Multivariate trees. The Perceptron, training a Perceptron, Learning Boolean Functions, Multilayer Perceptrons, MLP as a Universal Approximation, Backpropagation Algorithm, Training Procedures, Tuning the Network Size. **(9)**

UNIT-V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS, CASE STUDY
Design and Analysis of Machine Learning Experiments: Cross Validation and Resampling Methods-Measuring classifier Performance-Interval Estimation-Hypothesis Testing-Assessing classification algorithm performance-Comparing two Classification Algorithms-Case Study.
(9)

Course Outcomes:
At the end of the course, students will be able to:
6. Have an appreciation of the fundamentals of Machine Learning techniques including the topics of Bayesian decision theory, multivariate methods and clustering.
7. Be able to implement basic machine learning algorithms in PYTHON
8. Have the skill base necessary to further explore advanced topics of Machine Learning.
9. Be in a position to make a positive professional contribution in the field of Machine Learning.
10. At the end of the course the student should have a clear impression of the breadth and practical scope of machine Learning and have arrived at a level of understanding that is the foundation for most of the work currently underway in this field.

Text Books:
1. Ethem Alpaydin, Introduction to Machine Learning, Third Edition, MIT Press, 2014.
2. Tom M. Mitchell, Machine Learning, McGraw Hill Education (India) Edition, 2013.
Reference Books
1. David E Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Pearson Education, 2013.
2. Jaime Guillermo C and Tom Michael Mitchell, Machine Learning, Morgan Kaufmann, 1994.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Discipline Elective - IV

18CSE417   CRYPTO CURRENCIES

	L	T	P	C
	3	0	0	3

Course Prerequisite: Nil

Course Description:

The potential applications for Bitcoin-like cryptocurrencies are enormous. The course will cover the technical aspects of cryptocurrencies, blockchain technologies, and distributed consensus. Students will learn how these systems work and how to engineer secure software that interacts with the Bitcoin network and other cryptocurrencies.

Course Objectives:

1. Understand the major concepts about crypto currency and blockchain techniques; Be familiar with major blockchain applications as well as real world issues.
2. Understand the underlying consensus mechanisms in Bitcoin system and other alternative crypto currency systems; analyze the security of Nakamoto consensus.
3. Explain the underlying technology of transactions, blocks, proof-of-work, and consensus building.
4. Design and implement new ways of using blockchain for applications other than crypto currency

UNIT I INTRODUCTION TO CRYPTOGRAPHY & CRYPTOCURRENCIES

Introduction Overview of Cryptocurrency and Block chain techniques, Cryptographic Hash Functions , Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency. Centralization vs. Decentralization, Distributed Consensus, Consensus without Identity: the Block Chain, Incentives and Proof of Work, Putting It All.   **(9)**

UNIT II MECHANICS OF BITCOIN

Bitcoin Transactions, Bitcoin Scripts, Applications of Bitcoin Scripts, Bitcoin Blocks, The Bitcoin Network, Limitations & Improvements, How to Store and Use Bitcoins, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.   **(9)**

UNIT III BITCOIN MINING

The Task of Bitcoin Miners, Mining Hardware, Energy Consumption & Ecology, Mining Pools, Mining Incentives and Strategies, Anonymity Basics, How to de-anonymize Bitcoin, Mixing, Decentralized Mixing, Zerocoin and Zerocash, Consensus in Bitcoin, Bitcoin Core Software, Stakeholders, Roots of Bitcoin, Anti Money-Laundering, Regulation.   **(9)**

UNIT IV ALTERNATIVE MINING PUZZLES, ALTCOINS & ECO SYSTEM

Essential Puzzle Requirements, ASIC Resistant Puzzles, Proof-of-useful-work, Nonoutsourceable Puzzles, Proof-of-Stake "Virtual Mining", A Few Altcoins in Detail, Relationship Between Bitcoin and Altcoins, Merge Mining, Ethereum and Smart Contracts.   **(9)**

UNIT V BITCOIN AS A PLATFORM

Bitcoin as an Append-Only Log, Bitcoin As Smart Property, Secure Multi-Party Lotteries in Bitcoin, Bitcoin As Randomness Source, Prediction Markets & Real-World Data Feeds, The Block Chain as a Vehicle for Decentralization. Routes to Block Chain Integration.   **(9)**

Course Outcomes:

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

1. The technology components of Bitcoin and how it really works behind-the scenes.
2. Explain in detail how keys and addresses work on Bitcoin.
3. Evaluate the multifaceted differences between specialized digital currency platforms and general purpose blockchains by comparing Bitcoin and Ethereum protocols

Text Books:

1. Bitcoin and Cryptocurrency Technologies. Arvind Narayanan, Joseph Bonneau, Edward Felten, An-drew Miller, Steven Goldfeder and Jeremy Clark.
2. http://bitcoinbook.cs.princeton.edu/
3. Mastering Bitcoin: Unlocking Digital Cryptocurrencies 1st Edition, Andreas M.Antonopoulos.

References:

1. Bitcoin: A Peer-to-Peer Electronic Cash System. Satoshi Nakamoto. Available free online at https://bitcoin.org/bitcoin.pdf.
2. How the Bitcoin protocol actually works. Michael Nielsen. Available free online at http://www.michaelnielsen.org/ddi/how-the-bitcoin-protocol-actually-works.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Discipline Elective - V

Discipline Elective - V

18CSE418   BIG DATA ANALYTICS

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Course Prerequisite: Nil
Course Description:
This course introduces fundamental concepts and tools required to understand Data analytics. The also discusses big data applications in Data Science and covers the applications and technologies needed to process the large-scale data.

Course Objectives:
1. To learn data mining and big data basics
2. To learn the big data in technology perspective
3. To learn Hadoop framework for data analytics
4. Applying MapReduce paradigm to solve problems
5. To interpret the potential applications in big data scenario.

UNIT I INTRODUCTION TO DATA MINING AND BIG DATA
Introduction to Data mining, KDD process, Data Mining Techniques: Mining Frequent patterns, Association rule, Cluster analysis, Classification and Regression. Introduction to Big Data - What is Big Data? Explosion in Quantity of Data, Big Data Characteristics, Types of Data, Common Big data Customer Scenarios, BIG DATA vs. HADOOP, A Holistic View of a Big Data System, Limitations of Existing Data Analytics Architecture.   **(9)**

UNIT II DATA ANALYTICS LIFE CYCLE
Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists- Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.   **(9)**

UNIT III INTRODUCTION TO HADOOP
Why DFS? What is Hadoop? Hadoop Distribution, Hadoop Key Characteristics, RDBMS vs. Hadoop, Hadoop 2.x Cluster Architecture, Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node, Hadoop 2.0 New Features – Name Node High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN Hadoop Distributed File System.   **(9)**

UNIT IV PROGRAMMING FOR DATA ANALYTICS
MapReduce program in Java – Map Reduce API – Programming Examples- Combiner Functions Streams and Files - Streams – Text Input and Output – Reading and Writing Binary Data. **(9)**

UNIT V DATA SCIENCE AND APPLICATIONS
Data Loading Techniques & Data Analysis, Text Analytics for Large unstructured information, Analytic Stack, Big Data Applications - Fraud detection in Stock markets, Sentiment Analysis.
                                                                                                                      (9)

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Course Outcomes:
At the end of the course, students will be able to:
1. Apply data mining algorithms for classification and clustering.
2. Understand Big data framework.
3. To understand the map reduce way of solving analytic problems.
4. Illustrate the problem and its solution.
5. Analyze big data applications.

Text Books:
1. Jiawei Han MichelineKamber Jian Pei, Data Mining: Concepts and Techniques, Third Edition, Elsevier, Morgan Kaufmann, 2011.
2. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.
3. Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014.
4. Eric Siegel, Thomas H. Davenport, "Predictive Analytics: The Power to Predict Who WillClick, Buy, Lie, or Die", Wiley, 2013.

References:
1. Chuck Lam ,Hadoop in Action, Manning, Second Edition ,2016.
2. Mark Gardener, Beginning R: The Statistical Programming Language, Wiley, 2013.
3. Jiawei Han and MichelineKamber, Data Mining, Second Edition, Elsevier, 2007. ISBN: 81-312-0535-5.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Discipline Elective - V

18CSE419   SOFTWARE QUALITY ASSURANCE

L	T	P	C
3	0	0	3

Course Prerequisite: 18CSE110, 18CSE113, 18CSE402
Course Objectives:
1. To understand software quality management process and quality management models
2. To learn software quality metrics, assurance and various software standards

UNIT 1 SOFTWARE QUALITY FACTORS
Defining Software Quality -Software Quality factors - Components of software quality assurance - pre project software quality components- Contract Review - Development and Quality Plans.
(9)

UNIT II QUALITY ACTIVITY AND SOFTWARE MAINTENANCE
Integrating Quality Activities in the Project Life Cycle – Reviews - Software Testing – Strategies - Software Testing –Implementation - Assuring the Quality of Software Maintenance - Assuring The Quality of External Participants' Parts - Case Tools and their Effect on Software Quality.
(9)

UNIT III SOFTWARE QUALITY INFRASTRUCTURE COMPONENTS
Software Quality Infrastructure Components- Procedures and Work Instructions - Supporting Quality Devices - Staff Training, Instructing and Certification - Preventive and Corrective Actions - Configuration Management - Documentation and Quality Records Controls.   **(9)**

UNIT IV COMPONENTS SOFTWARE QUALITY & SOFTWARE QUALITY METRICS
Management Components Software Quality - Project Progress Control- Components, Internal & External Participants, Progress control regimes, Computerized tools, Software Quality Metrics – Objective, Classification, Process & Product Metrics, Implementation & Limitation of Software Metrics - Software Quality Costs – Objective, Classification Model of cost, Extended Model and Applications.   **(9)**

UNIT V SOFTWARE QUALITY ASSURANCE STANDARDS
Standards, Certification And Assessment - Need for standards, SQA Standards – ISO9001 Certification - Software Process Assessment, Organizing for Quality Assurance -Management and its Role in Quality Assurance - The Software Quality Assurance Unit - SQA Trustees and Committees, Six Sigma concepts.   **(9)**

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Comprehend industrial standards in maintaining SQA
2. Apply basic software quality assurance practices to ensure software quality and standards
3. Design and model software projects that conform to international quality standards and practices
4. Utilize the concepts in software development life cycle.
5. Demonstrate their capability to adopt quality standards.

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Text Books:
1. Daniel Galin, "Software Quality Assurance: From Theory to Implementation", Pearson Addison-Wesley, 2ndedition, 2012.
2. Jeff Tian, "Software Quality Engineering: Testing, Quality Assurance, and Quantifiable", Wiley, 2005.

References:
1. Gordon G Schulmeyer, "Handbook of Software Quality Assurance", Third Edition,Artech House Publishers 2007.
2. Nina S Godbole, "Software Quality Assurance: Principles and Practice", AlphaScience International, Ltd, 2004.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Discipline Elective - V

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18CSE420   SOFTWARE TESTING

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Course Prerequisite: 18CSE112

Course Description:

      This course aims to introduce the students to different methodologies in testing a program and its usage in building the testing tools. This course covers the basic testing methodologies includes path testing, dataflow testing, domain testing, transaction flow testing, logic based testing and regression testing. Introduction to software testing tools and case studies on latest testing tools are also studied.

Course Objectives:

1. To study the basic principles and models of software testing.
2. To enable the students to understand various testing methodologies.
3. To study the procedure for designing test cases and test plan.
4. To enable the students to use different software testing tools.

UNIT I: BASICS OF SOFTWARE TESTING

Introduction to Testing: Purpose of Testing, Testing Process, Some Terminologies, Dichotomies, Model for Testing, Levels of Testing, Limitations of Testing, The V Shaped Software Life Cycle Model, Consequences of Bugs, Taxonomy of Bugs. Debugging.   **(9)**

UNIT II: PATH TESTING AND DATAFLOW TESTING

Path Testing: Control flow graphs, Path Testing Criteria, Loops, Path Predicates, Predicate expression, Path Sensitizing, Path Instrumentation, Application of Path Testing.

Dataflow testing: Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing.   **(9)**

UNIT III: TRANSACTION FLOW TESTING AND DOMAIN TESTING

Transaction Flow Testing: Transaction Flows, Transaction Flow Testing Techniques, Transaction Based Systems

Domain Testing: Domains and Paths, Nice & Ugly Domains, Domain testing, Domains and Interface Testing, Domains and Testability.   **(9)**

UNIT IV: LOGIC BASED TESTING AND REGRESSION TESTING

Logic Based Testing: Overview, Decision Tables, Path Products & Path Expression, KV Charts, Specifications.

Regression Testing: Regression Testing Process, Regression Test Cases Selection, Reducing the Number of Test Cases, Risk Analysis, Code Coverage Prioritization Technique.   **(9)**

UNIT V: GRAPH MATRICES AND TESTING TOOLS

Graph Matrices and Application: Motivational Overview, Matrix of a Graph, Relations, Power of a Matrix, Node Reduction Algorithm.

Software Testing Tools: Software Test Plan, Generation of Test Cases, Static and Dynamic Software Testing Tools, Case Studies on testing tool like WinRunner, Selenium and TestLink.

(9)

Course Outcomes:
Upon completion of this course the students should be able to:
1. Understand the basic concepts and principles of software testing
2. Apply path testing and data flow testing in a program
3. Make use of transaction flow and domain testing techniques.
4. Test a software using logic based testing and regression testing.
5. Design test cases and use various software testing tools.

Text Books:
1. Boris Beizer - Software Testing Techniques, Dreamtech Press, Second edition.
2. Yogesh Singh - Software Testing, Cambridge University Press, 2012

References:
1. Brian Marick - The craft of software testing, Pearson Education, 2007
2. Paul C. Jorgensen - Software Testing: A Craftsman's Approach, Fourth edition, CRC Press, 2013
3. N.Chauhan - Software Testing: Principles and Practices, Second edition, Oxford University Press.
4. P.Ammann and J.Offutt - Introduction to Software Testing, Second edition, Cambridge University Press.
5. William E. Perry - Effective methods for Software Testing, Third edition, Wiley Publication.
6. P. Nageswara Rao - Software Testing Concepts and Tools, Dreamtech Press, 2006

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Discipline Elective - V

18CSE421   WIRELESS NETWORK SYSTEM

Course Prerequisite: Nil

L T P C
3 0 0 3

Course Descriptions:

Introduction to wireless communications and networking. Topics include transmission fundamentals, satellite and cellular networks, cordless systems, mobile IP and management, multiple access techniques and wireless protocols, wireless LAN, IEEE 802.11, and adhoc and sensor networks in 3G and 4G technologies.

Course Objectives:
1. To study about Wireless networks, protocol stack and standards.
2. To understand the characteristics of mobile network layers.
3. To understand the characteristics of mobile transport layers.
4. To study about fundamentals of 3G Services, its protocols and applications.
5. To study about evolution of 4G Networks, its architecture and applications.

UNIT I WIRELESS LAN   (9)

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX.

UNIT II MOBILE NETWORK LAYER   (9)

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing, Destination sequence distance vector, Dynamic source routing.

UNIT III MOBILE TRANSPORT LAYER   (9)

TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks.

UNIT IV WIRELESS WIDE AREA NETWORK   (9)

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3GSGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.

UNIT V 4G NETWORKS   (9)

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

Dept. of Computer Science & Engineering

Course Outcomes:
1. Understand the fundamentals of various wireless systems and standards wireless LANs.
2. Understand the techniques of mobile network layers.
3. Understand the various techniques of mobile transport layers.
4. Conversant with the latest 3G/4G and WiMAX networks and its architecture.
5. Design and implement wireless network environment for any application using latest wireless protocols and standards.

Text Books:
1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education 2012.
2. Vijay Garg , "Wireless Communications and networking", First Edition, Elsevier 2007.

References:
1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", Second Edition, Academic Press, 2008.
2. Anurag Kumar, D.Manjunath, Joy kuri, "Wireless Networking", First Edition, Elsevier 2011.
3. Simon Haykin , Michael Moher, David Koilpillai, "Modern Wireless Communications", First Edition, Pearson Education 2013.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination

Discipline Elective - V

18CSE422   PROGRAMMING PARADIGMS

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

Course Prerequisite: 18CSE102

Course Description:

This course aims to introduce the students to the different programming language design principles. This course covers introduction to reasons to study programming languages and their syntax and semantics, variables and data types in the languages, expressions and control structures, subprograms, concurrency, exception handling mechanisms, logical programming and functional programming, scripting languages with python as case study.

Course Objectives:
1. To explore modern programming languages and the techniques used for programming.
2. To get an idea on evaluation of programming languages.
3. To analyze a given program from good programming practice perspective.

UNIT I INTRODUCTION

The art of Language design – Programming language spectrum -Compilation and Interpretation – Storage management-Syntax and Semantics of Language C-lite – Name,Scope,Binding – Datatypes – Type Systems – Type Checking-Binding time – Scope rules – Static – Dynamic – Abstract Data types. **(9)**

UNIT II SEMANTICS

Expression – Assignment - Control Flow – File Input/Output – Exception Handling – Equality testing – Partial Functions – Semantics with Dynamic Typing –Dynamic memory allocation. **(9)**

UNIT III FUNCTIONS

Call and Return – Parameter Passing – Function Declaration – Semantics O Call and Return – Streams and monads – Strings, Sets, Pointers and Recursive Types, Lists, – Dynamic Arrays – Garbage Collection. **(9)**

UNIT IV   PROGRAMMING TECHNIQUES

Imperative programming – C – ADA – Perl – Object Oriented Programming – Small Talk- Java– Python – Functional Programming – Scheme – Haskell. **(9)**

UNIT V   MODERN PROGRAMMING TECHNIQUES

Logic Programming–Prolog – Logic Programming in Prolog, Limitations of Logic Programming-Event-Driven programming – Concurrent Programming – Concepts – Synchronization Strategies – Language Level Mechanism - Interprocess COMMUNICATION – Scripting LANGUAGES. **(9)**

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Course Outcomes:
Upon successful completion of the course, students will be able to
1. Write programs related to syntax and semantics.
2. Compare programs between C, Ada, Perl and Small Talk.
3. Write programs using scripting languages.
4. Demonstrate event-driven and concurrent programming using prolog.
5. Apply prolog for developing distributed systems.

Text Books:
1. Allen B. Tucker and Robert E. Noonan, ―Programming Languages – Principles and Paradigms‖, Second Edition, Tata McGraw Hill, 2009.

References:
1. Robert W. Sebesta, ―Concepts of Programming Languages‖, Sixth Edition, Addison Wesley, 2003.
2. Michael L Scott, ―Programming Language Pragmatics‖, Third Edition, Morgan Kauffman, 2009.
3. Donald E. Knuth -The Art of Computer Programming‖, Third Edition, Addison-Wesley, 1997

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Discipline Elective - V

18CSE423   HUMAN COMPUTER INTERACTION

	L	T	P	C

Course Prerequisite: Nil   **3 0 0 3**

Course Description:
The course provides a comprehensive understanding of the fundamental theory of User Interface Design and the Multimedia applications. Human-computer interaction is an interdisciplinary field that integrates theories and methodologies from computer science, cognitive psychology, design, and many other areas. The course is intended to introduce the student to the basic concepts of human-computer interaction. It will cover the basic theory and methods that exist in the field.

Course Objectives:
1. Gain an overview of Human-Computer Interaction (HCI), with an understanding of user interface design.
2. Become familiar with the vocabulary associated with sensory and cognitive systems as relevant to task performance by humans.
3. Be able to apply models from cognitive psychology to predicting user performance in various human-computer interaction tasks and recognize the limits of human performance as they apply to computer operation.
4. Be familiar with a variety of both conventional and non-traditional user interface paradigms.
5. Gain an overview of Icons and Multimedia, with an understanding of user interface design.

UNIT I INTRODUCTION
Importance of user Interface: Definition, Importance of Good Design, Benefits of GoodDesign, A Brief History of Screen Design. The Graphical User Interface : Popularity of Graphics, the Concept of Direct Manipulation, GraphicalSystem, Characteristics, Web User –Interface Popularity, Characteristics- Principles of User Interface.   **(9)**

UNIT II DESIGN PROCESS
Understanding how people interact with computers, importance of human characteristicshuman consideration, Human interaction speeds, and understanding business functions.**Screen Designing**: Design goals–Screen meaning and purpose, organizing screen elements, ordering ofscreen data and content – screen navigation and flow – Visually pleasing composition – amount of information– Focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.   **(9)**

UNIT III SYSTEM MENUS
Structures of Menus, Functions of Menus, Content of Menus, Kinds of Graphical menus Windows: Window characteristics, Components of a window, Window presentation styles, Types of windows,Window management.   **(9)**

UNIT IV CONTROLS
Characteristics of device based controls, selecting the proper device based controls, Operablecontrols, Text Entry/Read-only controls, Selection controls, Combination Entry/selection controls, selecting the proper controls. **(9)**

UNIT V GRAPHICS
Icons, Multimedia, Colour-what is it, Colour uses, Colour and Human vision, Choosingcolours Testing: The purpose and importance of usability testing, Scope of testing, Prototypes, Kinds of Tests,Developing and conducting the test. **(9)**

Course Outcomes:
At the end of the course students will be assessed to determine whether they are able to
1. Find innovative ways of interacting with computers
2. Help the disabled by designing non-traditional ways of interacting
3. Use cognitive psychology in the design of devices for interaction
4. Find the innovative ways of device based controls
5. Use modern technology of Graphics and multimedia tools.

Text Books:
1. The essential guide to user interface design, Wilbert O Galitz, 2nd edition, 2013, Wiley.

Reference Books:
1. Designing the user interface, 3rd Edition Ben Shneidermann, Pearson Education Asia.
2. Human –Computer Interaction, D.R.Olsen, Cengage Learning.
3. Human – Computer Interaction, I.Scott Mackenzie, Elsevier Publishers.
4. Interaction Design, Prece, Rogers, Sharps, Wiley Dreamtech.
5. User Interface Design, SorenLauesen, Pearson Education.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Discipline Elective - VI

Dept. of Computer Science & Engineering

Discipline Elective – VI

18CSE424   SOFTWARE DEFINED NETWORKING

	L	T	P	C

Course Prerequisite: 18CSE104, 18CSE109   **3   0   0   3**

Course Description:

The objective of this course to learn about Software Defined Networking, an emerging Internet architectural framework, including the main concepts, architectures, algorithms, protocols and applications and related topics including Data centre Networks.

Course Objectives:
1. Understand about Software Defined Networking.
2. To learn about an emerging internet architectural framework.
3. Implement Programming SDNs and NFV.
4. To analyse Data centre networks.

UNIT I HISTORY AND EVOLUTION OF SOFTWARE DEFINED NETWORKING (SDN)

Separation of Control Plane and Data Plane, IETF Forces, Active Networking.Control and Data Plane Separation: Concepts, Advantages andDisadvantages, the OpenFlow protocol.   **(9)**

UNIT II NETWORK VIRTUALIZATION

Concepts, Applications, Existing Network Virtualization Framework (VMWare and others), Mininet based examples.   **(9)**

UNIT III CONTROL AND DATA PLANE SEPARATION

Concepts, Advantages andDisadvantages, the OpenFlow protocol. Control Plane: Overview, Existing SDN Controllers includingFloodlight and Open Daylight projects. Customization of Control Plane: Switching and Firewall Implementation using SDN Concepts. Data Plane: Software-based and Hardware-based; Programmable Network Hardware.   **(9)**

UNIT IV PROGRAMMING SDNS AND NFV

Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs. Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications.   **(9)**

UNIT V DATA CENTRE NETWORKS

Packet, Optical and Wireless Architectures, Network Topologies. Use Cases of SDNs: Data Centres, Internet Exchange Points, Backbone Networks, Home Networks, Traffic Engineering.

        (9)

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Have a detailed knowledge on the topic software defined networking and Data centre networks.
2. Gain knowledge on Northbound Application Programming Interface and Network Functions Virtualization.

Text Books:
1. SDN: Software Defined Networks, An Authoritative Review of NetworkProgrammability Technologies, By Thomas D. Nadeau, Ken Gray Publisher:O'Reilly Media, August 2013, ISBN: 978-1-4493-4230-2, ISBN 10:1-4493-4230-2.
2. Software Defined Networks: A Comprehensive Approach, by PaulGoransson and Chuck Black, Morgan Kaufmann, June 2014, Print BookISBN: 9780124166752, eBook ISBN : 9780124166844

References:
1. SDN and OpenFlow for Beginners by VivekTiwari, Sold by: AmazonDigital Services, Inc., ASIN:2013.

2. Network Innovation through OpenFlow and SDN: Principles and Design,Edited by Fei Hu, CRC Press, ISBN-10: 1466572094, 2014.

3. Open Networking Foundation (ONF) Documents,https://www.opennetworking.org, 2015.

4. OpenFlow standards, http://www.openflow.org, 2015.

5. Online Reading Lists, including:http://www.nec-labs.com/~lume/sdn-reading-list.html, 2015

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

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Discipline Elective – VI

<h3 style="text-align:center">18CSE425   SOFTWARE PROJECT MANAGEMENT</h3>

	L	T	P	C
	3	0	0	3

Course Prerequisite: Nil

Course Description:

Software Project Management is generally seen as a key component of successful software projects. Together with software techniques it can produce software of high quality. This course deals with the decisions and actions related to planning, organizing, leading, and controlling programs and projects. Students are expected to gain a comprehensive understanding of Strategy, organization and leadership in managing projects and understanding of Processes, methods and systems used to plan, schedule and monitor projects.

Course Objectives:

1. To understand the basic concepts and issues of software project management.

2. To understand successful software projects that support organization's strategic goals.

3. Develop the skills for tracking and controlling software deliverables.

4. Match organizational needs to the most effective software development model.

5. Create project plans that address real-world management challenges.

UNIT I SPM CONCEPTS

Definition – components of SPM – challenges and opportunities – tools and techniques – managing human resource and technical resource – costing and pricing of projects – training and development – project management techniques.

Agile Methodology: Theories for Agile Management-Agile Software Development-Traditional Model Vs Agile Model-Classification of Agile Methods-Lean Production-SCRUM.   **(9)**

UNIT II SOFTWARE MEASUREMENTS

Monitoring & measurement of SW development – cost, size and time metrics – methods and tools for metrics – issues of metrics in multiple projects.   **(9)**

UNIT III SOFTWARE QUALITY

Quality in SW development – quality assurance – quality standards and certifications – the process and issues in obtaining certifications – the benefits and implications for the organization and its customers – change management.   **(9)**

UNIT IV RISK ISSUES

The risk issues in SW development and implementation – identification of risks – resolving and avoiding risks – tools and methods for identifying risk management.   **(9)**

UNIT V SPM TOOLS

Software project management using Primavera & Redmine and case study on SPM tools.   **(9)**

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Course Outcomes:
Upon successful completion of the course, students will be able to
1. Maintain software projects and monitor software project process
2. Design and develop project modules and assign resources
3. Understand software quality and project management techniques
4. Comprehend, assess, and calculates the cost of risk involved in a project management
5. Use Primavera & Redmine software management tools.

Text Books:
1, Richard H. Thayer, "Software Engineering Project Management", John Wiley & Sons, 2nd Edition-2001
2, David J. Anderson and Eli Schragenheim, ─Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.
 3. Royce, Walker, "Software Project Management", Pearson Education, 2002
 4. Kelker, S. A., "Software Project Management", Prentice Hall, 2003

References:
1. Software Project Management, Bob huges, Mike cotterell, Tata McGraw Hill, New Delhi,2002
2. Software Project Management: A Concise Study, S. A. Kelkar, PHI.
3. Software Project Management, Joel Henry, Pearson Education.
4. Software Project Management in practice, Pankaj Jalote, Pearson Education.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Discipline Elective – VI

18CSE426   C# AND .NET PROGRAMMING

Course Prerequisite: Nil

L T P C
3 0 0 3

Course Description:
This course uses Microsoft Visual Studio .NET to become familiar with advanced C#.NET programming concepts including database and web programming.

Course Objectives:
1. To cover all segments of programming in C# starting from the language basis, followed by the object oriented programming concepts
2. To update and enhance skills in writing Windows applications, ADO.NET and ASP .NET
3. To understand the working of base class libraries, their operations and manipulation of data using XML
4. To introduce data connectivity, WPF, WCF and WPF with C# and .NET 4.5
5. To implement mobile applications using .Net Compact Framework

UNIT I   C# LANGUAGE BASICS
.Net Architecture - Core C# - Variables - Data Types - Flow control - Objects and Types- Classes and Structs - Inheritance- Generics – Arrays and Tuples - Operators and Casts – Indexers.
(9)

UNIT II   C# ADVANCED FEATURES
Delegates - Lambdas - Lambda Expressions - Events - Event Publisher - Event Listener - Strings and Regular Expressions - Generics - Collections - Memory Management and Pointers - Errors and Exceptions – Reflection. (9)

UNIT III   BASE CLASS LIBRARIES AND DATA MANIPULATION
Diagnostics -Tasks, Threads and Synchronization - .Net Security - Localization - Manipulating XML- SAX and DOM - Manipulating files and the Registry- Transactions - ADO.NET- Peer-to-Peer Networking - PNRP - Building P2P Applications - Windows Presentation Foundation (WPF).
(9)

UNIT IV   WINDOW BASED APPLICATIONS, WCF AND WWF
Window based applications - Core ASP.NET- ASP.NET Web forms -Windows Communication Foundation (WCF)- Introduction to Web Services - .Net Remoting - Windows Service - Windows Workflow Foundation (WWF) - Activities – Workflows. (9)

UNIT V   .NET FRAMEWORK AND COMPACT FRAMEWORK
Assemblies - Shared assemblies - Custom Hosting with CLR Objects - Appdomains - Core XAML - Bubbling and Tunneling Events- Reading and Writing XAML - .Net Compact Framework - Compact Edition Data Stores – Errors, Testing and Debugging – Optimizing performance –

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Packaging and Deployment – Networking and Mobile Devices.
(9)

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Write various applications using C# Language in the .NET Framework.
2. Develop distributed application using .NET Framework.
3. Enhance skills in writing Windows applications, ADO.NET and ASP .NET.
4. Understand advanced topics namely data connectivity, WPF, WCF and WPF with C# and .NET 4.5.
5. Create Mobile Application using .NET compact Framework.

Text Books:
1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner . ―Professional C# 2012 and .NET 4.5‖, Wiley, 2012.

References:
1. Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Apress publication, 2012.
2. Ian Gariffiths, Mathew Adams, Jesse Liberty, ―Programming C# 4.0‖, O'Reilly, Fourth Edition, 2010.
3. Andy Wigley, Daniel Moth, Peter Foot, ―Mobile Development Handbook‖, Microsoft Press, 2011.
4. Harsh Bhasin, ―Programming in C#‖, Oxford University Press, 2014.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Discipline Elective – VI

18CSE427   HIGH SPEED NETWORKS

	L	T	P	C

Course Prerequisite: Nil

L T P C
3 0 0 3

Course Description:
To highlight the features of different technologies involved in High Speed Networking and their performance.

Course Objectives:
1. Students will be provided with an up-to-date survey of developments in High Speed Networks.
2. Enable the students to know techniques involved to support real-time traffic and congestion control.
3. Students will be provided with different levels of quality of service (Q.S) to different applications.

UNIT I HIGH SPEED NETWORKS
Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL, High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel – Wireless LANs: applications, requirements – Architecture of 802.11.   **(9)**

UNIT II CONGESTION AND TRAFFIC MANAGEMENT
Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion – Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.   **(9)**

UNIT III TCP AND ATM CONGESTION CONTROL
TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm – Window management – Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats, ABR Capacity allocations – GFR traffic management.   **(9)**

UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services.   **(9)**

UNIT V PROTOCOLS FOR QoS SUPPORT
RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms – Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP.   **(9)**

Course Outcomes:

Upon successful completion of the course, Students will have a detailed knowledge of
1. The basic issues of High Speed network Technologies, and Issues in next generation Network basics.
2. The need and advancement in Routing, Multicasting, Packet Scheduling, Quality of Service etc.
3. Admission control in high speed network: Effective bandwidth, Differentiated services, Policy-based networking, Traffic measurement and characterization.
4. The deployability of Integrated Service Architecture for different networks scenarios.
5. The set of various protocols available and the need for advanced protocols to develop and deploy it in high demand network environment.

Text Book:

1. William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2002.

References:

1. Warland, PravinVaraiya, "High performance communication networks", Second Edition, Jean Harcourt Asia Pvt. Ltd., 2001.
2. IrvanPepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003.
3. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band Telecommunication Networks", CRC Press, New York, 2004.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

Discipline Elective – VI

18CSE428　　　CYBER SECURITY

	L	T	P	C
	3	0	0	3

Course Prerequisite:18CSE108, 18CSE109

Course Description:

The objective of the Cyber Security course is to systematically introduce the theories, principles, and techniques of internet security. The course covers concepts such as fundamentals of computer security, software security, and network security. After completing the course, students should explain the essential components of information security and the risks faced by computer systems, identify and analyze security problems in systems, explain how security mechanisms work in computer systems. Finally, apply conceptual and practical knowledge of cyber security and tools and technologies to avoid, identify, counter, and recover from cyber threats.

Course Objectives:
- To introduce keywords and jargon involved in cyber security
- To learn need of cyber forensics within the context of the cyber security and its policies
- The student should learn and Identify security tools and hardening techniques
- To learn types of incidents, including categories, responses, and timelines for response in organization point of view
- Awareness and understanding of cyber-attacks and data privacy and various case studies

UNIT–I:

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.　　　　　　　　**(9)**

UNIT–II:

Cyber Laws & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.
Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics.　　**(9)**

UNIT–III:

Cybercrime: *Mobile and Wireless Devices:* Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops.　　　　　　　　　　　　　**(9)**

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UNIT–IV:
Cyber Security: *Organizational Implications:* Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. **(9)**

UNIT–V:
Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc
Cybercrime: Examples and Mini-Cases
Examples: Indian Banks Lose Millions of Rupees, Parliament e-mail spoofing instances.
Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain. **(9)**

Course Outcomes: At the end of course, student will be able to,
    1. Analyze cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.
    2. Interpret and forensically investigate security incidents
    3. Apply policies and procedures to manage Privacy issues
    4. Design and develop secure software modules
    5. Students get to know the privacy concepts, and learn about different case studies of various cyber-attacks and their defensive strategies.

Text Books:
1. Sunit, B., and G. Nina. "Cyber Security: Understanding Cybercrimes, computer forensics and Legal Perspectives." Wiley India (2011).
2. Gupta, Brij B., ed. Computer and cyber security: principles, algorithm, applications, and perspectives. CRC Press, 2018.

References:
1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

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Discipline Elective – VI

18CSE429   COMPUTER GRAPHICS

	L	T	P	C
	3	0	0	3

Course Prerequisite : Nil

Course Description:
This Course is a study of the hardware and software principles of interactive raster graphics. Topics includes an introduction to the basic concepts, 2-D and 3-D modelling and transformations, viewing transformations, projections, rendering techniques, solid modelling, graphical software packages achromatic light and colored light and Graphics System. Students will use a standard computer API to reinforce concepts and study fundamental computer graphics algorithms.

Course Objectives:
1. To understand the graphics techniques, packages and algorithms.
2. To study the clipping and drawing algorithms.
3. To enable the Students to understand the transformations and projections.
4. To learn Graphics packages and to use that to develop an application.
5. To understand curves, surfaces and solid modelling mechanisms.
6. To study the color models.

UNIT I INTRODUCTION
Image Processing as Picture Analysis, the Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Classification of Applications, Development of Hardware and Software for Computer Graphics, Conceptual Framework for Interactive Graphics, Drawing with SRGP, Basic Interaction Handling, Raster Graphics Features, Limitations of SRGP.   **(9)**

UNIT II BASIC RASTER GRAPHICS ALGORITHMS FOR DRAWING 2D PRIMITIVES
Overview, Scan Converting Lines, Scan Converting Circles, Scan Converting Ellipses, Filling Rectangles, Filling Polygons, Filling Ellipse Arcs, Pattern Filling, Thick Primitives, Line Style and Pen Style, **Clipping:** Clipping in a Raster World, Clipping Lines, Clipping Circles and Ellipses, Clipping Polygons, Generating Characters, SRGP Copy Pixel, Antialiasing.   **(9)**

UNIT III 2D GEOMETRICAL TRANSFORMATIONS
2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composition of 2D Transformations.**3D Geometrical Transformations**: Matrix Representation of 3D Transformations, Composition of 3D Transformations, Transformation as a change in Coordinate System.   **(9)**

UNIT IV REPRESENTING CURVES AND SURFACES
Polygon Meshes, Parametric Cubic Curves, Parametric Bicubic Surfaces, Quadratic Surfaces.
Solid Modeling: Representing Solids, Regularized Boolean Set Operations, Primitive Instancing,
Sweep Representations, Boundary Representations, Spatial-Partitioning Representations,
Constructive Solid Geometry, Comparison of Representations, User Interfaces for Solid Modeling.
(9)

UNIT V ACHROMATIC LIGHT AND COLORED LIGHT
Achromatic Light, Chromatic Color, Color Models for Raster Graphics, Reproducing Color, Using
Color in Computer Graphics.**Case Studies**: Case studies using GKS, CORE. **(9)**

Course Outcomes:
 After Completion of this course students will be able to
   1. Create interactive graphics applications using one or more graphics application
      programming interfaces.
   2. Learn about graphics packages and displaying techniques.
   3. Learn about geometrical transformations.
   4. Demonstrate 2D & 3D image processing techniques.
   5. Draw curves, surfaces and solid modeling mechanisms.
   6. Learn about color models.

Text Books:
1. Computer Graphics Principles and Practice, Second Edition in C, James D.Foley, Andries Van
   Dam, Steven K.Feiner, JhonF.Hughes
2. Computer Graphics C version, Donald Hearn and M. Pauline Baker, Pearson education.

References:
1. Computer Graphics Second Edition, Zhigandxiang, Roy Plastock, Schaum's , Tata McGraw
   Hill.
2. Computer Graphics: A Practical Approach, Er. Rajiv Chopra, S.Chand.
3. Procedural elements for Computer Graphics, David F Rogers, TataMcGraw hill, Second
   Edition.
4. Principles of Interactive Computer Graphics, Neuman and Sproul, TMH.
5. Principles of Computer Graphics, Shalini, Govil-Pai, Springer.
6. Computer Graphics, Steven Harrington, TMH
7. Computer Graphics, F.S.Hill, S.M.Kelley, PHI.
8. Computer Graphics, P.Shirley, Steve Marschner& Others, Cengage Learning.
9. Computer Graphics and Animation, M.C.Trivedi, Jaico Publishing House.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

MANDATORY NON-CREDIT COURSES

Mandatory Course

18CHE901   ENVIRONMENTAL SCIENCES

L T P C
2 0 0 0

Course Prerequisites: Basic knowledge about sciences up to intermediate or equivalent level.

Course Description: The course deals with basic concepts of environment, its impact on human, universe, consumption of energy sources, effects, controlling methods for pollution and the environmental ethics to be followed by human beings.

Course Objectives:

1. To make the students aware about the environment and its inter-disciplinary nature and to emphasize the importance of the renewable energy sources.
2. To familiarize the concept of Ecosystem and their importance.
3. To bring the awareness among students about the importance of biodiversity and the need for its conservation.
4. To make the students understand the adverse effects of environmental pollution, its causes and measures to control it.
5. To introduce the environmental ethics and emphasize the urgency of rain water harvesting along with water shed management.

UNIT I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and Importance – Need for Public Awareness. Renewable energy Resources: Solar energy - solar cells, wind energy, tidal energy. Non-renewable energy resources: LPG, water gas, producer gas. Overgrazing, effects of modern agriculture – fertilizer and pesticides.   **(6)**

UNIT II: ECOSYSTEMS

Concept of an ecosystem. Structure – functions – Producers, Consumers and Decomposers – Ecological succession – Food chains, Food webs and Ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystems: Forest, Desert and Lake.   **(6)**

UNIT III: BIODIVERSITY AND ITS CONSERVATION

Introduction, Definition: Value of biodiversity: consumptive use, productive use, social, ethical and aesthetic values. Biogeographical zones of India. Threats to biodiversity: habitat loss, poaching of wildlife, Endangered and Endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.   **(6)**

UNIT IV: ENVIRONMENTAL POLLUTION

Definition, Cause, effects and control measures of pollution – Air, Water, Soil and Noise. Solid Waste Management: Effects and control measures of urban and industrial wastes.   **(6)**

UNIT V   SOCIAL ISSUES AND THE ENVIRONMENT

Urban problems related to Water conservation, rain water harvesting and watershed management; Climate changes: global warming, acid rain, ozone layer depletion, nuclear accidents. Case Studies: Population growth, variation among nations and population explosion.   **(6)**

Course Outcomes:

At the end of the course, the students will be able to acquire
1. Ability to understand the natural environment, its relationship with human activities and need of the day to realize the importance of the renewable energy sources.
2. The knowledge of various ecosystems and their importance along with the concepts of food chains, food webs and ecological pyramids.
3. Familiarity with biodiversity, its importance and the measures for the conservation of biodiversity.
4. The knowledge about the causes, effects and controlling methods for environmental pollution, along with disaster management and solid waste management.
5. Awareness about the sustainable development, environmental ethics, social issues arising due to the environmental disorders.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press, 2005.

2. Environmental Studies by R. J. Ranjith Daniels and Jagdish Krishnaswamy, (Wiley Re-print version 2014).
3. Chemistry for Environmental Engineering/C.N. Sawyer, P.L. McCarty, G.F. Parkin (TataMcGraw Hill, Fifth Edition, 2003).
4. Environmental Chemistry by B.K. Sharma, (Goel Publishing House, 2014).
5. Environmental Studies by Benny Joseph (TataMcGraw Hill, Second Edition, 2009).

Reference Books:

1. Environmental Science & Engineering by Dr. A. Ravikrishnan, Hitech Publishing Company Pvt. Ltd. 2013.
2. Perspectives in Environmental Studies, Second edition, Anubha Koushik and C.P. Koushik, New Age International (P) Limited, Publishers, 2004.

Mode of Evaluation: Assignments and Mid Term Tests.

Dept. of Computer Science & Engineering

Mandatory Course

18HUM902 INDIAN CONSTITUTION

L T P C
2 0 0 0

Course Prerequisites:

Course Objectives:
The course is intended to:
1. To know about Indian constitution;
2. To know about central and state government functionalities in India; and
3. To know about Indian society.

UNIT I: INTRODUCTION

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.   **(6)**

UNIT II: STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT
Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.
(6)

UNIT III: STRUCTURE AND FUNCTION OF STATE GOVERNMENT
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature –Judicial System in States – High Courts and other Subordinate Courts.   **(6)**

UNIT IV CONSTITUTION FUNCTIONS
Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments –Constitutional Functionaries - Assessment of working of the Parliamentary System in India.   **(6)**

UNIT V INDIAN SOCIETY
Society: Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections**.   (6)**

Course Outcomes:
Upon completion of the course, students will be able to:
1. Understand the functions of the Indian government; and
2. Understand and abide the rules of the Indian constitution.

Dept. of Computer Science & Engineering

Text Books:
1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.
3. Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
4. K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi.

References:
1. Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

Mode of Evaluation: Assignments and Mid Term Tests.

Mandatory Course

18HUM903 ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

L T P C
2 0 0 0

Course Prerequisite:
Basic understanding on Indian culture, traditions, and beliefs. Logistic approach towards learning.

Course Description:
This course deals with introducing and elaborating the importance and capabilities of the ancient, Indian Traditional Knowledge System in achieving heights of success and well-being towards humanity.

Course Objectives:
1. To get exposed to the basics of ITKS;
2. To understand the types and techniques used in Traditional Indian Medicine;
3. To introduce and elaborate the kind of art, architecture along with Vaastu Shashtra knowledge systems. To elucidate the product and construction technologies;
4. To familiarize the basic knowledge in ancient and traditional Astronomy and astrology along with aviation technologies in traditional knowledge systems; and
5. To acquire the knowledge on ancient contemporary world and IT revolution.

UNIT I: Indian Traditional Knowledge Systems (TKS) – Indian monuments; British Impact; Basics sciences - Philosophy and physical science; Indian physics; story of Kanada; Indian Chemistry; Indian Mathematics.

(6)

UNIT II: (Traditional Medicine)
Ayurveda – origin, texts, the three greater classics, three lesser classics, concepts; manifestation of creation; mental constitution; three Doshas; individual constitution, clinical process and proceedings; sushruta Samhita and its contents; shastrakarma; Yoga; and siddha.

(6)

UNIT III: Production and construction Technology; Art, Architecture and VastuShashtra; crafts and trade – Impact of Technology on society

(6)

UNIT IV: Astronomy and Astrology; Aviation technology in Ancient India - Vedic Astronomy; Eclipses, calculations using earths circumferences; Heliocentric theory of Gravitaton; vedic Astrology; Vaimanika Sastra and its ancient notes.

(6)

UNIT V: Information Technology in India – trends – Contemporary issues of IT Industry – Impact of IT on Indian society

(6)

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

1. Understand the basics of Indian Traditional Knowledge System and the origin of basic science and Mathematics,
2. Get familiarized with various traditional medical methods and their implications in the human betterment,
3. Understand various production and construction technologies along with art and architectural implications in TKS,
4. Get the knowledge Vedic astronomy and astrology and get to know the ancient aviation technologies, and
5. Understand the outreach of the TKS to the contemporary world and gain the Indian action in protecting the TKS along with IT revolution.

Text Books:
1. Traditional Knowledge System in India, Amit Jha, Atlantic publishers, 2009. ISBN: 978-81-269-1223-0.
2. Traditional Knowledge System & Technology In India, Basanta Kumar Mohantra, Pratibha Prakashan (2012), ISBN-10: 8177023101

References:
1. Online Materials

Mode of Evaluation: Assignments and Mid Term Tests.

Dept. of Computer Science & Engineering

Mandatory Course

18CE904   DISASTER MANAGEMENT

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                                                    L   T   P   C
                                                    2   0   0   0
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Course Prerequisite: None

Course Description:
The goal of this course is to expose the under graduate students regarding different types of disasters and preparedness needed to mitigate their effects. The course matrix will cover various natural, biological, chemical and emerging hazards and risks that may cause property, loss of lives, and livestock's. Thus, the future engineers will understand the social responsibility for the preparedness and mitigation of the damages caused by the disasters.

Course Objectives:
1. To make aware the students about disasters and their impact on living beings.
2. To ensure the students for the understanding on vulnerability, disasters, disaster prevention and risk reduction.
3. To gain a preliminary understanding of approaches for the Disaster Risk Reduction (DRR)
4. To enhance awareness of institutional processes available in the country for the disaster risk mitigation.
5. To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I: INTRODUCTION

Introduction, Etymology of disaster, Concepts and definitions: disaster, hazard, vulnerability, risks, Resilience, prevention and mitigation.   **(6)**

UNIT II: TYPES OF DISASTERS

Types of Disaster; natural disasters (earthquakes, volcanoes, forest fires and explosions, heat and cold waves, floods, draught, cyclones, tsunami, landslides, soil erosion); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.), hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.   **(6)**

UNIT III: DISASTER IMPACTS

Disaster Impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.   **(6)**

UNIT IV: DISASTER RISK MITIGATION MEASURES

Disaster Risk Reduction (DRR) - Disaster management- four phase approach; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications), DRR programmers in India and the activities of National Disaster Management Authority. Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, **(6)**

UNIT V: IMPACT OF DEVELOPMENTAL ACTIVITIES

Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.   **(6)**

Course Outcomes:

The student will develop competencies in:
1. Understanding on the nature of disasters
2. Application of Disaster Concepts to Management
3. Analyzing Relationship between Development and Disasters.
4. Ability to understand Categories of Disasters
5. Realization of the responsibilities to society

Text Book:
1. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

Reference Books:
1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
6. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

Mode of Evaluation: Assignments and Mid Term Tests.

HONORS

Dept. of Computer Science & Engineering

Honors

B.Tech. III Year-I Semester

18HDCSE101   DATA VISUALIZATION

Course Prerequisite: None

L T P C
3 0 0 3

Course Description:
This course is all about data visualization, the art and science of turning data into readable graphics. Students will explore how to design and create data visualizations based on data available and tasks to be achieved. Students will also learn to evaluate the effectiveness of visualization designs, and think critically about each design decision, such as choice of color and choice of visual encoding.

Course Objectives:
1. Provide the foundations necessary for understanding and extending the current state of the art in data visualization.
2. Understand why visualization is an important part of data analysis
3. Understand the components involved in visualization design including graphical perception and techniques for visual encoding and interaction.
4. Exposure to interaction techniques corresponding analysis tasks.
5. The ability to read and discuss research papers from the visualization literature.

UNIT I: OVERVIEW OF DATA VISUALIZATION
Why Visualize Data? – Data abstraction: Dataset Types, Attribute Types, Semantics - Task Abstraction: Actions, Targets - Analyzing and Deriving - Marks and Channels - Defining Marks and Channels - Using Marks and Channels - Channel Effectiveness.   **(9)**

UNIT II: TABLES, SPATIAL DATA, NETWORKS AND TREES
Arrange Tables: Arrange by Keys and Values, Scatterplots, Bar Charts, Stacked Bar Charts, Stream graphs, Dot and Line Charts, Cluster Heat maps, Scatterplot Matrix, Pie Charts – Arrange Spatial data: Geometry, Scalar Fields, Vector Fields, Arrange Networks and Trees: Connection, Matrix Views, Costs and Benefits.   **(9)**

UNIT III: COLOR AND SIZE IN VISUALIZATION
Color Theory–Colormaps - Other Channels - Manipulate View: Change View over Time, Select Elements Changing Viewpoint, Reducing Attributes.   **(9)**

UNIT IV: INTERACTION TECHNIQUES
Facet into Multiple views: Coordinate Views, Partition into Views, Superimpose Layers, Static Layers, Dynamic Layers.   **(9)**

UNIT V: DATA REDUCTION AND CASE STUDY
Reduce Items and Attributes: Filter, Aggregate – Analyse case studies: VisDB, Hierarchical
Clustering Explorer, PivotGraph, InterRing.   **(9)**

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

1. Craft visual presentations of data for effective communication.
2. Conduct exploratory data analysis using visualization.
3. Design and evaluate color palettes for visualization based on principles of perception.
4. Use knowledge of perception and cognition to evaluate visualization design alternatives.
5. Apply data transformations such as aggregation and filtering for visualization.

TEXT BOOKS:

1. Tamara Munzner, Visualization Analysis and Design (A K Peters Visualization Series), 1st
   Edition, A K Peters/CRC Press, 2014. [ISBN-10: 9781466508910]

REFERENCE BOOKS:

2. Edward R. Tufte, The Visual Display of Quantitative Information, 2nd Edition, Graphics
   Press, 2001. [ISBN-10: 9780961392147]
3. Yau Nathan, Visualize This: The FlowingData Guide to Design, Visualization, and
   Statistics. Wiley, 2011. [ISBN-13 : 978-0470944882]
4. Yau Nathan, Data Points: Visualization that means something, John Wiley & Sons, 2013.
   [ISBN-13 : 978-1118462195]

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

Honors

B.Tech. III Year-I Semester

18HDCSE102   FUNDAMENTALS OF INFORMATION SYSTEMS SECURITY

	L	T	P	C
Course Prerequisite: NIL	3	0	0	3

Course Description:
This course is designed to provide the foundation for understanding the key issues associated with protecting information assets, determining the levels of protection and response to security incidents, and designing a consistent, reasonable information security system with appropriate intrusion detection

Course Objectives:

1. Understand the concepts of information systems security as applied to an IT infrastructure.
2. Understand to describe how threats, and vulnerabilities impact an IT infrastructure.
3. Understand the role of access controls in implementing a security policy.
4. Understand the role of operations & administration in implementation of security policy.

UNIT I: INTRODUCTION, NEED FOR SECURITY
Introduction to Information Security - The History of Information Security- Critical Characteristics of Information - NSTISSC Security Model - Components of an Information System - Securing Components - Balancing Information Security and Access - The Systems Development Life Cycle - The Security Systems Development Life Cycle. The Need for Security: Introduction - Business Needs First -Threats -Attacks.   **(9)**

UNIT II:RISK MANAGEMENT AND INFORMATION SECURITY
Introduction - An Overview of Risk Management - Risk Identification -Risk Assessment - Risk Control Strategies - Selecting a Risk Control Strategy - Risk Management Discussion Points - Recommended Practices in Controlling Risk.   **(9)**

UNIT III: POLICIES, STANDARDS, PRACTICES AND BUSINESS CONTINUITY
Introduction - Information Security Policy, Standards and Practices -The Information Security Blueprint: ISO 17799/BS 7799, ISO 27001and its controls, NIST Security Models, Design of Security Architecture - Security Education, Training and Awareness Program - Continuity Strategies.   **(9)**

UNIT IV: SECURITY TECHNOLOGY

Introduction - Intrusion Detection and Prevention Systems: IDPS Terminology, Use of IDPS, Strengths and Limitations of IDPS - Honey Pots, Honey Nets, and Padded Cell Systems - Scanning and Analysis Tools, Access Control Devices .   **(9)**

UNIT V:BIOMETRIC CONTROLS

Biometrics - Nature of Biometrics Identification/Authentication Techniques - Biometric Techniques - Matching and Enrollment Process in Biometrics - Benefits Over Traditional Authentication Methods. Attacks on Wireless Networks: Other Security Risks in Wireless Networks, Management and Mitigations for Wireless Networks Attacks.   **(9)**

Course outcomes

1. Identify and analyze the security threats and attacks and apply device suitable security policies and standards.
2. Assess the risks and apply suitable risk control strategies.
3. Employ appropriate intrusion detection and prevention systems to ensure information security.
4. Discuss various national and international laws of information security and its framework

TEXT BOOKS
   1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Course Technology, New Delhi, Fourth Edition, 2012 Reprint.
   2. Nina Godbole, "Information Systems Security-Security Management, Metrics, Frameworks and Best Practices", Wiley India Pvt. Ltd., New Delhi, First Edition, 2009.(Biometric Controls, Security of Wireless Networks, Laws and Legal Framework)

REFERENCE BOOKS
   1. homas R.Peltier, "Information Security Fundamentals", Auerbach Publications, Second Edition, 2013.
   2. Micki Krause and Harold F.Tipton, "Information Security Management Handbook", Auerbach Publications, Sixth Edition,2008.
   3. Mark Merkow and Jim Breithaupt," Information Security - Principles & Practices", Second Edition, Pearson Education, 2014.
   Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Honors

B.Tech. III Year-I Semester

18HDCSE103   VIRTUALIZATION AND CLOUD COMPUTING

Course Prerequisite: NIL

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

Course Description:

To enable students exploring some important cloud computing driven commercial systems and applications. To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations

Course Objective:
1. The fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges;
2. The basic ideas and principles in data center design; cloud management techniques and cloud software deployment considerations;
3. Different CPU, memory and I/O virtualization techniques that serve in offering software, computation and storage services on the cloud; Software Defined Networks (SDN) and Software Defined Storage (SDS);
4. Cloud storage technologies and relevant distributed file systems, NoSQL databases and object storage;
5. The variety of programming models and develop working experience in several of them.

UNIT I: INTRODUCTION

Cloud computing at a glance: Vision of cloud computing - Defining a cloud- Cloud computing reference model- characteristics and benefits -Challenges - Historical Developments: Distributed systems-Virtualization- web 2.0- Service Oriented ComputingUtility -Oriented Computing- Building cloud computing environments.   **(9)**

UNIT II: VIRTUALIZATION

Introduction-Characteristics of Virtualized Environments-Taxonomy of Virtualization Techniques-Virtualization and Cloud Computing-Pros and Cons of Virtualization - Technology Examples: Xen Para virtualization - VM ware Full virtualization - Microsoft hyper -V   **(9)**

UNIT III: CLOUD COMPUTING ARCHITECTURE

Cloud reference model: Architecture, Infrastructure / Hardware as a service, Platform as a service- Software as a service, Types of cloud: Public clouds, Private clouds, Hybrid Cloud, Community Clouds-Economics of the Cloud-Open Challenges.   **(9)**

UNIT IV: CLOUD PLATFORMS IN INDUSTRY

Amazon web services: Compute services- Storage services- Communication services-additional services-Google App Engine: Architecture and core concepts- Application life cycle- cost modelMicrosoft Azure: Azure core concepts- SQL Azure- Windows Azure platform appliance.

(9)

UNIT V: SECURITY IN THE CLOUD

Security Overview - Cloud Security Challenges and Risks - Software-as-a-Service Security - Security Governance - Risk Management. Security Monitoring - Security Architecture Design - Data Security - Application Security - Virtual Machine Security - Identity Management and Access Control - Autonomic Security.

(9)

Course outcomes

1. Recognize the need for cloud computing and state the services and building blocks of cloud computing environments.
2. Define and classify the virtualization and its techniques.
3. Illustrate the cloud architecture and discover the requirement in industries.
4. Analyze the major security challenges and privacy problems in the cloud and virtual environment.

TEXT BOOKS

1. Rajkumar Buyya, Christian Vecchiola, and Thamarai Selvi, "Mastering Cloud Computing", Tata McGraw Hill, 2013.
2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010. (Security In The Cloud only)

REFERENCE BOOKS

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, Reprint 2010.
3. Tom White, "Hadoop: The Definitive Guide", Yahoo Press, Third Edition, 2012. 4. Jim Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann,

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

Honors

B.Tech. III Year II Semester

18HDCSE104   DATA ANALYTICS

Course Prerequisite: NIL

L	T	P	C
3	0	0	3

Course Description:
The Data Analytics course has an analytical and logical approach. It focuses on the storage and retrieval of large chunks of data and the different ways by which data can be transferred in a secured way. It helps the student you learn to organize data, uncoverpatterns and insights, draw meaningful conclusions, and clearly communicate critical findings

Course Objectives:
1. To help students learn, understand, and practice data analytics
2. machine learning approaches
3. scaling up machine learning techniques focusing on industry applications.
4. conceptualization and summarization of text and web mining.

UNIT I: BUSINESS INTELLIGENCE CONCEPTS AND APPLICATIONS
Business Intelligence, Pattern Recognition, Data Processing Chain, Database, Data Warehouse, Data Mining, Data Visualization,BI for better decisions, Decision types,BI Tools,BI Skills, BI Applications, Customer Relationship Management, Healthcare and Wellness,Education, Retail, Banking, Financial Services, Insurance   **(9)**

UNIT II: DECISION TREES AND REGRESSION
Decision Tree problem, Decision Tree Construction, Lessons from constructing trees, Decision Tree Algorithms.Correlations and Relationships, Visual look at relationships, Regression Exercise, Non-linear regression exercise, Logistic Regression, Advantages and Disadvantages of Regression Models   **(9)**

UNIT III: ARTIFICIAL **NEURAL NETWORKSAND CLUSTER ANALYSIS**
Business Applications of ANN, Design Principles of an Artificial Neural Network, Representation of a Neural Network, Architecting a Neural Network, Developing an ANN, Advantages and Disadvantages of using ANNs.
Applications of Cluster Analysis, Definition of a Cluster, Representing clusters,Clustering techniques, Clustering Exercise, K-Means Algorithm for clustering,Selecting the number of clusters, Advantages and Disadvantages of K-Means algorithm   **(9)**

UNIT IV: MINING
Association Rule Mining,Business Applications of Association Rules, Representing Association Rules, Algorithms for Association Rule,Apriori Algorithm, Text Mining, Text Mining Applications, Text Mining Process, Term Document Matrix, Mining the TDM, Comparing Text Mining and Data Mining, Text Mining Best Practices, Web Mining, Web content mining, Web structure mining, Web usage mining, Web Mining Algorithms.   **(9)**

UNIT V: BIG DATA

Defining Big Data, Big Data Landscape, Business Implications of Big Data, Technology Implications of Big Data, Big Data Technologies, Management of Big Data, Personalized Promotions at Sears A Case Studies. **(9)**

Course Outcomes:

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

1. Identify the characteristics of datasets and compare the trivial data and big data for various applications.
2. Select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.
3. Understand and apply scaling up machine learning techniques and associated computing techniques and technologies.
4. Recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.
5. Integrate machine learning libraries and mathematical and statistical tools with modern technologies

TEXT BOOK:

1. Data Analytics Made Accessible by A. Maheshwari, McgrawHill Education, 2015.

REFERENCE BOOK:

1. Lean Analytics: Use Data to Build a Better Startup Faster, by Alistair Croll, and Benjamin Yoskovitz, , Oreilly publishers,2017

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Honors

B.Tech. III Year-II Semester

18HDCSE105   BLOCK-CHAIN TECHNOLOGY AND APPLICATIONS

Course Prerequisite: NIL

L T P C
3 0 0 3

Course Description:
Blockchain is an emerging technology platform for developing decentralized applications and data storage, over and beyond its role as the technology underlying the cryptocurrencies. The basic tenet of this platform is that it allows one to create a distributed and replicated ledger of events, transactions, and data generated through various IT processes with strong cryptographic guarantees of tamper resistance, immutability, and verifiability.

Course Objectives
1. To understand the basic concept of Block chain.
2. To learn about blockchain terminology.
3. To Explore the concepts of Consensus and Smart contracts.
4. To learn about cryptocurrency
5. To integrate ideas of blockchain technologies with security in an application.

UNIT I: INTRODUCTION
Distributed Database and Fault Tolerance, Distributed File System, Distributed Hash Table, Cryptography: Hash function, Digital Signature - Memory Hard Algorithm, Zero Knowledge Proof, Puzzle friendly Hash, Collison resistant hash, public key crypto, verifiable random functions. **(9)**

UNIT II: BLOCKCHAIN
Introduction, Advantage over conventional distributed database, Blockchain Network, Mining, Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain application, Soft & Hard Fork, Private and Public blockchain. **(9)**

UNIT III: DISTRIBUTED CONSENSUS AND SMART CONTRACTS
Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate. The Turing Completeness of Smart Contract Languages and verification challenges, using smart contracts to enforce legal contracts **(9)**

UNIT IV: CRYPTOCURRENCY
History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin, Hyper ledger fabric, the plug and play platform and mechanisms in permissioned blockchain **(9)**

UNIT V: PRIVACY, SECURITY ISSUES IN BLOCKCHAIN & APPLICATION

Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains – such as Sybil attacks, selfish mining, 51% attacks - advent of algorand, and Sharding based consensus algorithms to prevent these Applications: Internet of Things, Medical Record Management System, Domain Name Service, record maintenance, Supply chain management and future of Blockchain.   **(9)**

Course Outcomes
Upon completion of this course, the student should be able to
1. Understand the basic concepts of Blockchain.
2. Explain different terminology in the Blockchain.
3. **A**ble to develop a smart contract for any application.
4. Build configuring and develop hyper ledger application using like Hyper ledger fabric.
5. Able to gain knowledge developing a secure application using blockchain.

TEXT BOOKS:

1. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019.
2. Imran Bashir," Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Second Edition, Kindle Publishing .2018.
3. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A comprehensive Introduction ", Princeton University Press, 2016

REFERENCE BOOKS:

1. David H. Hoover, Kevin Solorio, and Randall Kanna,"Hands-On Smart Contract Development with Solidity and Ethereum: From Fundamentals to Deployment" published by O'Reilly Media,inc , 1 edition - 2019
2. Parikshit Jain," A Practical Guide to Blockchain and its applications " ,Bloomsbury India ,1 edition - 2019
3. Mohanty Debajani," BlockChain From Concept to Execution " BPB Publications 1 - edition – 2019.
4. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
5. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Honors

B.Tech. III Year II Semester

    18HDCSE106   **CLOUD DESIGN - PERFORMANCE, SCALABILITY AND SECURITY**

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

Course Prerequisite: 14CSU411

Course Description:
This course recall the concepts of distributed computing, parallel computing, grid computing and introduce the new concept cloud computing and its benefits. It also discuss the performance management,application development,web services offered from cloud, security issues in cloud and standards in cloud computing. The concepts of cloud security are explained with the help of X.509 certificates, OpenSSL.

Course Objectives:
1. To learn the basic elements of cloud computing system design.
2. To know the performance of cloud management.
3. To know the major cloud service providers and the web services offered by them.
4. To learn the common standards in cloud application development.
5. To compare the modern cloud security concepts as they are applied to cloud computing.

UNIT I: INTRODUCTORY CONCEPTS AND OVERVIEW
Cloud Design overview, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.

    (9)

UNIT II: PERFORMANCE MANAGEMENT
Management techniques, methodology and key performance metrics used to identifying CPU, memory, network, virtual machine and application performance bottlenecks in a virtualized environment. Configuration and change management goals and guidelines, tools and technologies in virtualized environments.   **(9)**

UNIT III: MANAGEMENT OF CLOUD SERVICES
Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics : Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat).   **(9)**

UNIT IV – APPLICATION DEVELOPMENT

Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App. Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages. **(9)**

UNIT V: SECURITY CONCEPTS

Confidentiality, privacy, integrity, authentication, non-repudiation, availability, access control, defence in depth, least privilege, how these concepts apply in the cloud, what these concepts mean and their importance in PaaS, IaaS and SaaS. e.g. User authentication in the cloud; Cryptographic Systems- Symmetric cryptography, stream ciphers, block ciphers, modes of operation, public-key cryptography, hashing, digital signatures, public-key infrastructures, key management, X.509 certificates, OpenSSL. **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to
1. Articulate the concepts, technologies and challenges of cloud computing designs.
2. Analyse the various cloud performance management delivered from the cloud.
3. Apply the cloud service features in cloud ntworks.
4. Design cloud services and applications.
5. Apply security features in cloud networks.

TEXT BOOKS:

1. Cloud Computing implementation, management and security by John W. Rittinghouse, James F.Ransome, CRC Press, Taylor & Francis group, 2010.
2. Cloud Computing: A practical approach by Anthony T.velte, Toby J.velte Robert Elsenpeter, Tata Mc Graw Hill edition, 2010.

REFERENCE BOOKS:

1. Cloud Application Architectures by George Reese, Oreilly publishers.
2. Cloud Computing and SOA convergence in your enterprise, by David S. Linthicum, Addison-Wesley.
3. Gautam Shroff, "Enterprise Cloud Computing Technology Architecture Applications*"*, Cambridge University Press;Edition1, 2010.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Honors

B.Tech. IV Year I Semester

<div align="center">

18HDCSE107   NATURAL LANGUAGE PROCESSING

</div>

Course Prerequisite: NIL

L	T	P	C
3	0	0	3

Course Description:
This course deals with the basic concepts of Natural Language processing (NLP). Different types of analysis performed on expression like world level analysis and syntactic analysis are discussed. Structure and meaning of expression and/or instruction also studied through this course.

Course Objectives:
1. To learn the fundamentals of natural languageprocessing
2. To understand the use of CFG and PCFG inNLP
3. To understand the role of semantics of sentences andpragmatics
4. To apply the NLP techniques to differentapplications

UNIT I: INTRODUCTION

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance   **(9)**

UNIT II: WORD LEVEL ANALYSIS

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.   **(9)**

UNIT III: SYNTACTIC ANALYSIS

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of featurestructures   **(9)**

UNIT IV: SEMANTICS AND PRAGMATICS

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.   **(9)**

UNIT V: DISCOURSE ANALYSIS AND LEXICAL RESOURCES

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using

Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC). **(9)**

Course Outcomes:
Upon completion of the course, the students will be ableto:
1. Analyze a given text with basic Languagefeatures
2. Implement a rule based system to tackle morphology/syntax of alanguage
3. Perform semantic analysis on sentences
4. Compare and contrast the use of different statistical approaches for different types of NLPapplications.
5. Design an innovative application using NLPcomponents

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

REFERENCES:
1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher,2015.
2. Richard MReese,―Natural Language Processing with Java‖,O_Reilly Media,2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press,2010.
4. TanveerSiddiqui,U.S.Tiwary,-Natural LanguageProcessing andInformation Retrieval‖,Oxford University Press, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Honors

B.Tech. IV Year I Semester

18HDCSE108   CYBER FORENSICS

Course Prerequisite: 18CSE428, 18CSE414, 18HDCSE102

L	T	P	C
3	0	0	3

Course Description:

   Cyber Forensics is the scientific processes of identification, seizure, acquisition, authentication, analysis, documentation and preservation of digital evidence

Course Objectives:
   1. To learn computer forensics.
   2. To become familiar with forensics tools.
   3. To learn to analyze and validate forensics data.

UNIT I INTRODUCTION TO COMPUTER FORENSICS
Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques – Incident and incident response methodology – Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. – Forensics Technology and Systems – Understanding Computer Investigation – Data Acquisition.   **(9)**

UNIT II EVIDENCE COLLECTION AND FORENSICS TOOLS
Processing Crime and Incident Scenes – Working with Windows and DOS Systems. Current Computer Forensics Tools: Software/ Hardware Tools.   **(9)**

UNIT III ANALYSIS AND VALIDATION
Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics.   **(9)**
UNIT IV ETHICAL HACKING
Introduction to Ethical Hacking – Footprinting and Reconnaissance – Scanning Networks – Enumeration – System Hacking – Malware Threats – Sniffing.   **(9)**

UNIT V ETHICAL HACKING IN WEB
Social Engineering, Denial of Service, Session Hijacking, Hacking Web servers, Hacking Web Applications, SQL Injection, Hacking Wireless Networks,Hacking Mobile Platforms.   **(9)**

Course Outcomes:
Upon successful completion of the course, students will be able to
   1. Understand the basics of computer forensics
   2. Apply a number of different computer forensic tools to a given scenario
   3. Analyze and validate forensics data
   4. Identify the vulnerabilities in a given network infrastructure
   5. Implement real-world hacking techniques to test system security

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TEXT BOOKS:
1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, ―Computer Forensics and Investigations, Cengage Learning, India Edition, 2016.
2. CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition, 2015.

REFERENCE BOOKS:
1. John R.Vacca, ―Computer Forensics, Cengage Learning, 2005
2. MarjieT.Britz, ―Computer Forensics and Cyber Crime: An Introduction, 3rd Edition, Prentice Hall, 2013.
3. AnkitFadia ― Ethical Hacking Second Edition, Macmillan India Ltd, 2006
4. Kenneth C.Brancik ―Insider Computer Fraud Auerbach Publications Taylor & Francis Group–2008

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Honors

B.Tech. IV Year-I Sem

18HDCSE109   COMPUTER VISION AND DEEP LEARNING L T P C
                                                    3 0 0 3

Course Prerequisite: Probability & Statistics, Machine learning, Python.

Course Description: - This course deals with the fundamental concepts of computer vision and deep learning. The computer vision part deals with image shape representation and segmentation. Deep learning part covers the basics of neural network concepts, regularization, optimization and Applications of deep learning.

Course Objectives:
1. To introduce the foundations of image processing and computer vision.
2. To understand the concepts of Image shape representation and segmentation.
3. To acquire the knowledge on Deep Learning Concepts.
4. To learn various types of Artificial Neural Networks models.
5. To gain knowledge to apply optimization strategies.

UNIT-I: INTRODUCTION TO COMPUTER VISION
Image Processing, Computer Vision and Computer Graphics, What is Computer Vision - Low-level, Mid-level, High-level, Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality.   **(10)**

UNIT-II: SHAPE REPRESENTATION AND SEGMENTATION
Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors , Medial representations, Multiresolution analysis, Structure from Motion.   **(8)**

UNIT -III: INTRODUCTION TO DEEP LEARNING
Historical Trends in Deep learning, Deep Feed – forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation, Differentiation Algorithms, Activation Functions.   **(8)**

UNIT -IV: REGULARIZATION FOR DEEP LEARNING
Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Tangent Classifier.   **(8)**

UNIT-V: OPTIMIZATION TO TRAIN DEEP MODELS
Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies, Meta-Algorithms, Applications of Deep learning.   **(8)**

Course Outcomes:
Upon successful completion of the course, students will be able to
  1. Understand the fundamental concepts of image processing and computer vision.
  2. Understand the concept of Image shape representation and segmentation.
  3. Select the Learning Networks in modelling real world systems
  4. Apply optimization strategies for large scale applications.
  5. Develop applications using computer vision and deep learning techniques

TEXT BOOKS:
  1. D. Forsyth and J. Ponce, "Computer Vision - A modern approach", by, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
  2. E. Trucco and A. Verri, "Introductory Techniques for 3D Computer Vision", Publisher: Prentice Hall.
  3. Ian Good fellow and Yoshua Bengio and Aaron Courville, "Deep Learning", An MIT Press Book".
  4. Simon Haying, "Neural Networks and Learning Machines" 3rd Edition, Pearson Prentice Hall.

REFERENCE BOOKS:
  1. Richard Szeliski, "Computer Vision: Algorithms and Applications" (CVAA). Springer, 2010.
  2. Simon Haying, "Neural Networks and Learning Machines" 3rd Edition, Pearson Prentice Hall.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

MINOR COURSE

Artificial Intelligence (AI)

Minor

B.Tech. III Year-I Semester

18MDCSE101 AI: KNOWLEDGE REPRESENTATION AND REASONING

	L	T	P	C
Course Prerequisite: NIL	3	0	0	3

Course Description:

An intelligent agent needs to be able to solve problems in its world. The ability to create representations of the domain of interest and reason with these representations is a key to intelligence. In this course we explore a variety of representation formalisms and the associated algorithms for reasoning. We start with a simple language of propositions, and move on to first order logic, and then to representations for reasoning about action, change, situations, and about other agents in incomplete information situations.

Course Objectives:

1. To learn the distinction between optimal reasoning Vs. human like reasoning
2. To understand the main approaches to artificial intelligence such as Propositional Logic. and First Order Logic.
3. To learn different knowledge representation techniques.
4. To learn Programmic logic and knowledge Structures.
5. To understand the applications of AI and description logic.

UNIT I: PROPOSITIONAL LOGIC
Introduction, Language, Semantics and Reasoning, Syntax and Truth Values, Valid Arguments and Proof Systems, Rules of Inference and Natural Deduction, Axiomatic Systems and Hilbert Style Proofs, The Tableau Method, The Resolution Refutation Method   **(10)**

UNIT II: FIRST ORDER LOGIC (FOL)
Syntax, Semantics, Entailment and Models, Proof Systems, Forward Chaining, Unification, Forward Chaining Rule Based Systems, The Rete Algorithm, Programming in a Rule Based Language, The OPS5 Expert System Shell.   **(8)**

UNIT III: REPRESENTATION IN FOL
Skolemization, Knowledge Representation, Properties and Categories, Reification and Abstract Entities, Resource Description Framework (RDF), The Event Calculus: Reasoning About Change. Mapping Natural Language to FOL: Understanding = Fulfilling Expectations, Conceptual Dependency (CD) Theory, Understanding Language, Conceptual Analysis: Mapping English to CD Theory**.**   **(10)**

UNIT IV: PROGRAMMING IN LOGIC & KNOWLEDGE STRUCTURES

Deductive Retrieval in Backward Chaining, Logic Programming, Prolog, Depth First Search and Efficiency Issues, Controlling Search, The Cut Operator in Prolog. Theorem Proving in FOL- Incompleteness of Forward and Backward Chaining, The Resolution Refutation Method for FOL, Clause Form and The Resolution Rule, FOL with Equality, Complexity.   **(10)**

UNIT V: ONTOLOGY & DESCRIPTION LOGICS

Ontology & Description Logics: A Description Logic, Normalization, Structure Matching, Classification, A-box Reasoning, Extensions, ALC, Further Extensions Inheritance: Taxonomies and Inheritance, Beliefs, Credulous and Skeptical Reasoning. Default Reasoning: Introduction to Default Reasoning, Applications.   **(8)**

Course Outcomes:

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

6. Formulate an efficient problem space for a problem expressed in natural language.
7. Select a search algorithm for a problem and estimate its time and space complexities.
8. Possess the skill for representing knowledge using the appropriate technique for a
9. Apply logic in Knowledge structures
10. Apply AI techniques to solve any real world problems.

Text Books
1. Ronald J. Brachman, Hector J. Levesque: Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.
2. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India), 2013.

Reference Books
1. Schank, Roger C., Robert P. Abelson: Scripts, Plans, Goals, and Understanding: An Inquiry into Human Knowledge Structures. Hillsdale, NJ: Lawrence Erlbaum, 1977.
2. R. C. Schank and C. K. Riesbeck: Inside Computer Understanding: Five Programs Plus Miniatures, Lawrence Erlbaum, 1981.
3. Murray Shanahan: A Circumscriptive Calculus of Events. Artif. Intell. 77(2), pp. 249-284, 1995.
4. John F. Sowa: Conceptual Structures: Information Processing in Mind and Machine, Addison Wesley Publishing Company, Reading Massachusetts, 1984.
5. John F. Sowa: Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year-I Semester

		L	**T**	**P**	**C**

18MDCSE102   **COMPUTER VISION**

L   T   P   C
3   0   0   3

Course Prerequisite: NIL.

Course Description: - This course deals with the fundamental concepts of image processing It also deals with various image formation models, image shape representation and segmentation, edge detection and various applications of computer vision such as Survivallance   and Vehicle vision system.

Course Objectives:
6. To introduce the foundations of image processing and computer vision.
7. To acquire the knowledge on Image Formation Models.
8. To understand the concepts of Image shape representation and segmentation
9. To learn various types edge detection techniques.
10. To gain knowledge on various applications of computer vision.

UNITI: INTRODUCTION TO COMPUTER VISION
Image Processing, Computer Vision and Computer Graphics, What is Computer Vision - Low-level, Mid-level, High-level, Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality.   **(10)**

UNIT II:IMAGE FORMATION MODELS
Monocular imaging system, Radiance, Irradiance, BRDF, color etc, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading , Photometric Stereo, Depth from Defocus, Construction of 3D model from images.   **(10)**

UNIT III: SHAPE REPRESENTATION AND SEGMENTATION
Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multiresolution analysis, Structure from Motion.   **(8)**

UNIT IV:EDGE DETECTION
Interest Points & Corner Detection, Feature Tracking and Optical Flow, Fitting and AlignmentCamera Models and Projective Geometry, Transformation Matrix, Projection Matrix and Camera Calibration.   **(8)**

UNITV: APPLICATIONS

Surveillance-foreground-background separation, particle filter, Chamfer matching, tracking, and occlusion, combining views from multiple cameras , Human gait analysis Application: In-vehicle vision system: locating roadway, road markings, identifying road signs, locating pedestrians**. (8)**

Course Outcomes:

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

1. Understand the fundamental concepts of image processing and computer vision.
2. Extract features form Images and do analysis of Images by using image formation models.
3. Apply the concept of Image shape representation and segmentation.
4. Understand edge detection motion geometry Develop applications using computer vision
5. To develop applications using computer vision techniques.

TEXT BOOKS:

5. D. Forsyth and J. Ponce, "Computer Vision - A modern approach", by, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
6. E. Trucco and A. Verri, "Introductory Techniques for 3D Computer Vision", Publisher: Prentice Hall.
7. R. C. Gonzalez, R. E. Woods. "Digital Image Processing" Addison Wesley Longman, Inc., 1992.
8. D. H. Ballard, C. M. Brown. "Computer Vision". Prentice-Hall, Englewood Cliffs, 1982.

REFERENCE BOOKS:

3. Richard Szeliski, "Computer Vision: Algorithms and Applications" (CVAA). Springer, 2010.
4. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press, 2012.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year-II Semester

18MDCSE103   MACHINE LEARNING

Course Prerequisite: NIL

Course Description:

L	T	P	C
3	0	0	3

This course provides a broad introduction to machine learning and statistical pattern recognition. It contains supervised learning (generative/discriminative learning, parametric/non-parametric learning, neural networks, support vector machines), unsupervised learning (clustering, dimensionality reduction, kernel methods)

Course Objectives: -

1. To introduce machine learning problems, various approaches.
2. To give a though understanding of Bayes decision Theory.
3. To impart the need and methods of dimension reduction and clustering
4. To give a good understanding of discriminant based methods, viz., Perceptrons, SVMs.

UNIT I: INTRODUCTION TO MACHINE LEARNING, SUPERVISED LEARNING
What Is Machine Learning, Examples of Machine Learning Applications, learning a class from Examples, Vapnik-Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm.   **(9)**

UNIT II: THEORY, PARAMETRIC METHODS
Introduction to Bayesian Decision Theory, Classification, Losses and Risks, Discriminant Functions, Utility Theory, Association Rules, Introduction to parametric methods, Maximum Likelihood Estimation, evaluating an Estimator: Bias and Variance, The Bayes' Estimator, Parametric Classification, Regression, Tuning Model Complexity: Bias/Variance Dilemma, Model Selection Procedures.   **(9)**

UNIT III: DIMENSIONALITY REDUCTION, CLUSTERING
Introduction, Subset Selection, Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis, Isoma, Locally Linear Embedding, **Introduction** to Clustering, Mixture Densities, k-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Hierarchical Clustering, Choosing the Number of Clusters.   **(9)**

UNIT IV: LINEAR DISCRIMINATION MULTILAYER PERCEPTRONS

Introduction, Generalizing the Linear Model, Geometry of the Linear Discriminant, Pairwise Separation, Parametric Discrimination Revisited, Gradient Descent, Logistic Discrimination, Discrimination by Regression, The Perceptron, training a Perceptron, Learning Boolean Functions, Multilayer Perceptrons, MLP as a Universal Approximation, Backpropagation Algorithm, Training Procedures, Tuning the Network Size.   **(9)**

UNIT V: KERNEL MACHINES, MULTIPLE LEARNERS

Introduction, Optimal Separating Hyperplane, The Nonseparable Case: Soft Margin Hyperplan, v-SVM, Kernel Trick, Vectorial Kernels, Defining Kernels, Multiple Kernel Learning, Multiclass Kernel Machines, Kernel Machine for Regressions, One-ClassKernelMachines, Kernel Dimensionality Reduction, Rationale, Generating Diverse Learners, Model Combination Schemes, Voting, Error-correcting output codes, Bagging, Boosting.   **(9)**

Course Outcomes: -

1. Students should have a good understanding of machine learning approaches.
2. Ability to apply Bayes Decision Theory for decision making and error analysis.
3. Ability to do dimensionality reduction.
4. Ability to cluster the given data.
5. Students should have a good understanding of Perceptron, multilayer perceptron's, SVMs.

TEXT BOOK:

1. "Introduction to Machine learning" by Ethem Alpaydin Second Edition, MIT Press.

REFERENCES:

1. R. O. Duda, P. E. Hart and D. G. Stork, "Pattern Classification", John Wiley, 2001.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Minor

B.Tech. III Year II Semester

18MDCSE104   ADVANCED PYTHON

Course Prerequisite: 18CSE101

Course Description:

L	T	P	C
3	0	0	3

Python is a programming language known for its code readability and use of whitespace for user-friendly design, making it easier to use the purpose of coding. Its approach aims to help programmers write clear, logical code for large-scale projects.Python is appreciated for its versatility, flexibility, and object-oriented features. Its ability to do both complex tasks and provide an easy-to-use experience makes it important to learn for Developers, Data Scientists, and other web-based professionals.

Course Objectives:

1. Create and maintain modules and packages
2. Implement OOPS concepts using python
3. Interact with network services
4. Query databases
5. Visualize data

UNIT-I: LIBRARY, FILES AND OOPS
Modules and Packages: Built-in Modules, Importing Modules, Working with Random Modules,
File Operations: Text and Bytes files,0Opening a file, Reading and Writing Files, Other File tools, MS Excel files, Introduction to MS Excel files
Classes And Objects: Classes as User Defined Data Type,Objects as Instances of Classes, Creating Class and Objects, Creating Objects By Passing Values, Variables & Methods in a Class, Inheritance, Polymorphism   **(9)**

UNIT II: EXCEPTION HANDLING, NETWORK PROGRAMMING AND DATABASE PROGRAMMING
Exception Handling: Default Exception and Errors, Catching Exceptions,User defined exception
Networking: Socket Module, Server-client-socket, Connecting client server, Client-server chatting program
Database: Introduction to MySQL, Connections, Executing queries, Transactions   **(9)**

UNIT III: ADVANCED PACKAGES I AND STATISIICS

Numpy: Creating NumPy arrays, Indexing and slicing in NumPy, Downloading and parsing data, Creating multidimensional arrays, NumPy Data types, Array tributes, Indexing and Slicing, Creating array views copies, Manipulating array shapes I/O.

Statistics: Mean, Median, Mode, Z-scores, Bias -variance dichotomy, Sampling and t-tests, Sample vs Population statistics, Random Variables, Probability distribution function, Expected value, Binomial Distributions, Normal Distributions, Central limit Theorem, Hypothesis testing,

Z-Stats vs T-stats, Type 1 type 2 error, Chi Square test, ANOVA test and F-stats   **(9)**

UNIT IV: ADVANCED PACKAGES II

Scipy: Introduction to SciPy, Create function, modules of SciPy

Pandas: Using multilevel series, Series and Data Frames, Grouping, aggregating, Merge DataFrames, Generate summary tables, Group data into logical pieces, Manipulate dates, Creating metrics for analysis, Data wrangling, Merging and joining, Analytics Vidhya dataset- Loan Prediction Problem, Data Mugging using Pandas, Building a Predictive Model.   **(9)**

UNIT V: VISUALIZATION

Matplotlib: Scatter plot, Bar charts, histogram, Stack charts, Legend title Style, Figures and subplots, Plotting function in pandas, Labelling and arranging figures, Save plots

Seaborn: Style functions, Color palettes, Distribution plots, Categorical plots, Regression plots, Axis grid objects.   **(9)**

Course Outcomes:

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

1. Discuss the use of classes and objects
2. Describe Modules and Packages
3. Apply the Networking and Database concepts using Python
4. Analyze different machine learning related packages
5. Apply different statistics using Python

TEXT BOOKS:

3. Python for Programmers,, Paul Deitel & Harvey Deitel, 2019, Pearson Education
4. Programming Python,Mark Lutz 4th edition, 2015, Orielly Publications,

REFERENCE BOOK:

1. Expert Python Programming, Tarek Ziadé, 2014, Packt Publications

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Minor

B.Tech. III Year II Semester

18MDCSE201ADVANCED PYTHON LABORATORY

Course Prerequisite: 18MDCSE104

L T P C
0 0 4 2

Course Description:

To give practical exposure on advanced concepts like object oriented programming, network programming, database programming, descriptive & inferential statistics programming and data visualization using the advanced packages of python like numpy, pandas, sklearn, matpotlib and seaborn.

Course Objectives:
1. To provide deeper understanding into inter process communication, and database access.
2. To expose the students to the advanced modules of python
3. To familiarize students with different type statistics and their implementation in python.
4. To familiarize with different data visualizations using python

LIST OF EXPERIMENTS

1. Write program to create the following classes with appropriate methods
    a. Robot
    b. ATM Machine

2. Write a program to read a CSV file and display all the rows
3. Write a python program that imports requests and fetch content from the web page
4. Write a program to access to from employee table and display all the employee details of a given department
5. Write a program to perform broad casting on numpy arrays
6. Write a program to Calculate Mean, Median, Mode, Variance, Standard Deviation, Range & comment about the values / draw inferences, for the given dataset in csv file
7. Write a program to Calculate Skewness, Kurtosis & draw inferences on the following data Cars speed and distance
8. Write a program to read excel file and display the some selected rows using pandas
9. Read csv file and display scatter plot, box plots using matplotlip and seaborn
10. Read csv file and display violin plot, joint plot and boxen plot

Course Outcomes:
Upon completion of this course, students should be able to:

1. Understand the OOPS and Networking concepts
2. Differentiate the descriptive and inferential statistics.
3. Draw insights into the data
4. Apply the concepts of numpy and pandas
5. Effective utilization of data

TEXT BOOK:
1. Introduction to Machine Learning with Python, Andreas C. Mueller, Sarah Guido, Orielly Publications, 2016

REFERENCE BOOKS:
1. Fluent Python, Luciano Ramalho , Orielly Publications 2015.
2. Grokking Algorithms: An illustrated guide for programmers and other curious people, Aditya Bhargava, Manning Publications,2016

Mode of evaluation: Continuous Evaluation of the lab Experiments, Record, Viva-voce and External Lab Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. IV Year-I Semester

		L	T	P	C
18MDCSE105	**DEEP LEARNING**	**3**	**0**	**0**	**3**

Course Prerequisite: 18MDCSE103.

Course Description: - This course deals with the fundamental concepts of deep learning. It also covers the concepts of neural networks, deep unsupervised learning, regularization, optimization and Applications of deep learning to computer vision and Natural Language Processing.

Course Objectives:

1. To acquire the knowledge on Deep Learning Concepts
2. To learn various types of unsupervised deep learning models.
3. To gain knowledge on regularization techniques for deep learning.
4. To learn optimization strategies for large scale applications
5. To Acquire knowledge on applications of computer vision and Natural language processing.

UNIT I: INTRODUCTION TO DEEP LEARNING
Historical Trends in Deep learning, Deep Feed – forwardnetworks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation, Differentiation Algorithms, RelU Heuristics for avoiding bad local minima. Heuristics for faster training. Nestors accelerated gradient descent. Regularization. Dropout.   **(10)**

UNIT II: DEEP UNSUPERVISED LEARNING
Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Magnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization,Counter Propagation Networks, Convolutional Neural networks(CNN), Recurrent Neural networks(RNN).   **(10)**

UNIT III:REGULARIZATION FOR DEEP LEARNING
Regularization andUnder-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervisedlearning, Multi-task learning, Early Stopping, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Tangent Classifier.   **(8)**

UNIT IV: OPTIMIZATION TO TRAIN DEEP MODELS
Challenges in Neural Network Optimization, Basic Algorithms, Parameter InitializationStrategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods,Optimization Strategies, Meta-Algorithms.   **(8)**

UNIT-V: APPLICATIONS

Large-Scale Deep Learning, Image segmentation, object detection, automatic image captioning, Image generation with Generative adversarial networks, video to text with LSTM models. Attention models for computer vision tasks. Dialogue topic tracking, Neural Summarization, Opinion Mining using Recurrent Neural Networks.   **(9)**

Course Outcomes:

Upon successful completion of the course, students will be able to
1. Understand the concepts of Neural Networks and Deep learning.
2. Choose the appropriate learning Networks in modelling.
3. Use an efficient regularization algorithm for Deep Learning Models
4. Apply optimization strategies for large scale applications.
5. Develop an deep learning applications to Computer vision and NLP.

TEXT BOOKS:

1. Ian Good fellow and Yoshua Bengio and Aaron Courville, "Deep Learning", An MIT Press Book,2015.
2. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1 (2009).

REFERENCE BOOKS:

1. Simon Haying, "Neural Networks and Learning Machines" 3rd Edition, Pearson Prentice Hall.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Cyber Security

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year I Semester

18MDCSE106   CRYPTOGRAPHY

Course Prerequisite: NIL

L	T	P	C
3	0	0	3

Course Description:

Providing secure communication and ensuring confidentiality and integrity of information are a major concern in the field of information technology. This course deals with the techniques and mathematics used to provide information security.

Course Objectives:
6. Understand the classical encryption techniques.
7. Acquire fundamental knowledge on the concepts of finite and number theory.
8. Understand various block cipher models
9. Describe the principles of public key cryptosystems and hash functions.

UNIT I: CLASSICAL CRYPTOGRAPHY
Introduction to Security attacks Symmetric cipher model, Security mechanisms Substitution techniques: Caesar cipher, Monoalphabetic cipher Polyalphabetic ciphers, Onetime pad Transposition techniques, Steganography.   **(9)**

UNIT II: FINITE FIELDS AND NUMBER THEORY
Groups, Rings, Fields Euclid's Algorithm Modular arithmetic Finite Fields, Polynomial Arithmetic Prime Numbers, Testing for Primality Fermat's and Euler's Theorem The Chinese remainder theorem Discrete Logarithms   **(9)**

UNIT III: BLOCK CIPHERS
Block cipher principles Data Encryption Standard Block cipher Modes of operation Advanced Encryption Standard Blowfish, RC5 algorithm.   **(9)**

UNIT IV: PUBLIC-KEY CRYPTOGRAPHY
Principles of Public-key Cryptosystems The RSA algorithm Key management Diffie,Hellman key exchange Elliptic curve: Arithmetic, Elliptic Curve Cryptography.   **(9)**

UNIT V: HASH FUNCTIONS AND CRYPTOGRAPHIC APPLICATIONS
MAC Hash Algorithms (MD5, SHA) Digital Signature Standard Applications pertaining to Encryption using different ciphers and modes, One-way hash algorithms.   **(9)**

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Course Outcomes:

Upon completion of this course, students should be able to:
1. Understand OSI security architecture and classical encryption techniques.
2. Acquire fundamental knowledge on the concepts of finite fields and number theory.
3. Understand various block cipher and stream cipher models.
4. Describe the principles of public key cryptosystems, hash functions and digital signature.
5. Gain a first-hand experience on encryption algorithms, encryption modes.

TEXT BOOKS:
1. William Stallings, "Cryptography and Network Security", 6th Edition, 2014, Pearson Eduction,
2. Cryptography and Network Security; 2nd ed. , Behrouz A. Forouzan , Debdeep Mukhopadhyay, McGraw Hill,2011.

REFERENCES:
1. AtulKahate, Cryptography and Network Security, 2nd ed., Tata Mcgraw Hill education Private Limited, 2011.
2. Computer Security, Dieter Gollman,3rded, Wiley Publications,2011.
3. Introduction to Computer Security, Matt Bishop,1sted,Addison-Wesley Proffesional,2004.

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year I Semester

18MDCSE107   NETWORK SECURITY

Course Prerequisite: NIL

L T P C
3 0 0 3

Course Description:
        To give a knowledge, idea and applications of network security

Course Objectives:
1. To learn today's increasing network security threats and explain the need to implement a comprehensive security policy to mitigate the threats.
2. To provide extended security using authentication
3. To introduce the security services offered by the IPsec protocols, and how these services can be employed in the IP environment.
4. To introduce security services for email and email protocols.
5. To improve protection of information technology (IT) resources.

UNIT I: INTRODUCTION
Network concepts – Threats in networks – Network security controls – Importance of security – Threat models – Security concepts – Common mitigation methods.   (9)

UNIT II: AUTHENTICATION
Overview of authentication – Authentication of people – Security Handshake pitfalls – Strong password protocols – Kerberos – Public key infrastructure.   (9)

UNIT III: IP & WEB SECURITY
IP security: Overview - Architecture – Authentication Header - Encapsulating Security Payload - Key management – Web security: Web security considerations – Secure Socket Layer and Transport Layer Security – Secure electronic transaction – Web issues.   (9)

UNIT IV: ELECTRONIC MAIL SECURITY
Store and forward – Security services for e-mail – Establishing keys – Privacy – Authentication of the Source – Message Integrity – Non repudiation – Proof of submission and delivery - Pretty Good Privacy – Secure/Multipurpose Internet Mail Extension.   (9)

UNIT V: SYSTEM SECURITY
Intruders – Intrusion detection – Password management – Malicious software: Viruses and related threats – Virus countermeasures – Firewalls: Firewall design principles – Firewall configurations – Trusted systems.   (9)

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Course Outcomes:

Upon completion of this course, students should be able to:
1. Understand the threats in networks and security concepts.
2. Apply authentication applications in different networks.
3. Apply Web security standards in developing websites.
4. Understand security services for email.
5. Awareness of firewall and it applications.

TEXT BOOKS:
1. Charles P. Fleeger, "Security in Computing", Prentice Hall, New Delhi, 2009.
2. Behrouz A.Forouzan, ―Cryptography & Network Security‖, Tata McGraw Hill, India, New Delhi, 2009.
3. William Stallings, ―Cryptography and Network Security, Prentice Hall, New Delhi, 2006.

REFERENCES:
1. Chalie Kaufman, Radia Perlman, Mike Speciner, ―Network Security: Private Communication in a Public Network‖, Pearson Education, New Delhi, 2004.
2. Neal Krawetz, ―Introduction to Network Security‖, Thomson Learning, Boston, 2007.
3. Bruce Schneier, ―Applied Cryptography‖, John Wiley & Sons, New York, 2004

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year II Semester

18MDCSE108   CYBER LAWS AND SECURITY POLICIES

Course Prerequisite: 18MDCSE106, 18MDCSE107

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L  T  P  C
3  0  0  3
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Course Description:
        To understand the basics of cyber law, its related issues and ethical laws of computer for different countries.

Course Objectives:
1. Familiarize the issues those are specific to amendment rights.
2. Become aware on copyright issues in software's.
3. Understand the Cyber-crimes and Cyber Frauds.

UNIT I: INTRODUCTION TO CYBER CRIME
Introduction, Forgery, Hacking, Software Piracy, Computer Network intrusion - Category of Cybercrime - Cybercrime Mobile & Wireless devices - Tools and Methods used in Cybercrime - Phishing & Identity Theft.   **(9)**

UNIT II: CYBER LAW
Power of Arrest without Warrant under the IT act, 2000: A Critique - Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals – Jurisdiction in the cyber world – Battling Cyber Squatters and Copyright Protection – E-Commerce taxation – Digital signatures, certifying authorities and E-Governance – Indian Evidence Act – Protection of Cyber Consumers in India.
                                                                                                                (9)

UNIT III: CYBER AND INFORMATION SECURITY POLICY
Cyber governance issues – Cyber user issues – Cyber conflict issues – Cyber management issues – Cyber infrastructures issues - Introduction - Corporate policies - Tier 1, Tier 2 and Tier3 policies - process management - planning and preparation - developing policies – asset classification policy - developing standards.   **(9)**

UNIT IV: SECURING CYBERSPACE
The private sector role in securing cyberspace - National governments and their role in securing cyberspace - International law's role in securing cyberspace - Privacy, surveillance and the law Cyber War and Strategy - Authentication and Identity - Current legislative and policy initiatives.
                                                                                                                (9)

UNIT V ORGANIZATIONAL AND HUMAN SECURITY
Organizational and Human Security: Adoption of Information Security Management Standards, Human Factors in Security - Role of information security profession.   **(9)**

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Course Outcomes:
Upon completion of this course, students should be able to:
1. Explain the basic information on cybercrime.
2. Describe cyber laws for various crime activities.
3. Identify the security policies for cyber issues.
4. Analyze the role of organization for securing cyberspace.
5. Explain the need for security in organizations.

TEXT BOOKS:
1. Reich, Pauline C, "Law, Policy, and Technology: Cyberterrorism, Information Warfare, andInternet Immobilization", IGI Global, 2012.
2. Jennifer L. Bayuk, Jason Healey, Paul Rohmeyer, Marcus H. Sachs, Jeffrey Schmidt, "Cyber Security Policy Guidebook", John Wiley & Sons, 2012.

REFERENCE BOOKS:
1. VivekSood, "Cyber Law Simplified", Tata Mcgraw Hill, 2001.
2. Kenneth J. Knapp, "Cyber Security and Global Information Assurance: Threat Analysis andResponse Solutions", IGI Global, 2009.
3. Jonathan Rosenoer, "Cyber law: the Law of the Internet", Springer - verlag, 1997.

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year II Semester

18MDCSE109   **CYBER CRIME INVESTIGATION AND DIGITAL FORENSICS**

Course Prerequisite: 18MDCSE106, 18MDCSE107,18MDCSE108

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

Course Description:
       To give knowledge of constitutional and case law to search and capture digital evidence, determine the most effective and appropriate forensic response strategies to digital evidence, and provide effective proof in a case involving digital evidence.

Course Objectives:
1. To learn the overview of cybercrime.
2. To learn the issues of cybercrime.
3. To learn the various methods to investigate cybercrime.
4. To learn about digital forensics.
5. To understand the laws and acts behind.

UNIT I: INTRODUCTION
Introduction and Overview of Cyber Crime - Nature and Scope of Cyber Crime - Types of Cyber Crime: Social Engineering - Categories of Cyber Crime - Property Cyber Crime.   **(9)**

UNIT II: CYBER CRIME ISSUES
Unauthorized Access to Computers - Computer Intrusions - White collar Crimes - Viruses and Malicious Code - Internet Hacking and Cracking - Virus Attacks – Software Piracy - Intellectual Property - Mail Bombs - Exploitation - Stalking and Obscenity in Internet - Digital laws and legislation - Law Enforcement Roles and Responses.   **(9)**

UNIT III: INVESTIGATION
Introduction to Cyber Crime Investigation - Investigation Tools – Discovery - Digital Evidence Collection - Evidence Preservation - E-Mail Investigation – Tracking - IP Tracking - E-Mail Recovery - Hands on Case Studies - Encryption and Decryption Methods - Search and Seizure of Computers - Recovering Deleted Evidences - Password Cracking.   **(9)**

UNIT IV: DIGITAL FORENSICS
Introduction to Digital Forensics - Forensic Software and Hardware - Analysis and Advanced Tools - Forensic Technology and Practices - Forensic Ballistics and Photography - Face, Iris and Fingerprint Recognition - Audio Video Analysis - Windows System Forensics - Linux System Forensics - Network Forensics.   **(9)**

UNIT V: LAWS AND ACTS
Laws and Ethics - Digital Evidence Controls - Evidence Handling Procedures - Basics of Indian Evidence ACT IPC and CrPC - Electronic Communication Privacy ACT - Legal Policies.   **(9)**

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Course Outcomes:

Upon completion of this course, students should be able to:
1. To have various ideas about cybercrime.
2. To have knowledge of the various issues of cybercrime.
3. To investigate and find the cybercrime.
4. To identify the cybercrime.
5. To have clear idea of the various laws and acts.

TEXT BOOKS:
1. Nelson Phillips and Enfinger Steuart, ―Computer Forensics and Investigations‖, Cengage Learning, New Delhi, 2009.
2. Kevin Mandia, Chris Prosise, Matt Pepe, ―Incident Response and Computer Forensics ―, Tata McGraw -Hill, New Delhi, 2006.

REFERENCES:
1. Robert M Slade, Software Forensics, Tata McGraw Hill, New Delhi, 2005.
2. Bernadette H Schell, Clemens Martin, ―Cybercrime, ABC – CLIO Inc, California, 2004.
3. Understanding Forensics in IT ―, NIIT Ltd, 2005.

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year II Semester

18MDCSE202   CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY

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Course Prerequisite: 18MDCSE106, 18MDCSE107

Course Description:
    To give practical exposure on basic security attacks, encryption algorithms, authentication techniques. Apart from security algorithms, firewall configuration is also introduced.

Course Objectives:
1. To provide deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures.
2. To explain various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes.
3. To familiarize symmetric and asymmetric cryptography

LIST OF EXPERIMENTS
1. Implementation of Caesar Cipher technique
2. Implement the Play fair Cipher
3. Implement the Pure Transposition Cipher
4. Implement DES Encryption and Decryption
5. Implement the AES Encryption and decryption
6. Implement RSA Encryption Algorithm
7. Implementation of Hash Functions
8. Implement Firewalls.

Course Outcomes:

Upon completion of this course, students should be able to:
1. Identify basic security attacks and services
2. Know Encryption and Decryption.
3. Use symmetric and asymmetric key algorithms for cryptography
4. Make use of Authentication functions.
5. Understand about the firewalls.

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TEXT BOOKS:
1. William Stallings, "Cryptography and Network Security", 6th Edition, 2014, Pearson Eduction,
2. Cryptography and Network Security; 2nd ed. , Behrouz A. Forouzan , Debdeep Mukhopadhyay, McGraw Hill,2011.

REFERENCE BOOKS:
1. AtulKahate, Cryptography and Network Security, 2nd ed., Tata Mcgraw Hill education Private Limited, 2011.
2. Computer Security, Dieter Gollman,3rded, Wiley Publications,2011.
3. Introduction to Computer Security, Matt Bishop,1sted,Addison-Wesley Proffesional,2004.

Mode of evaluation: Continuous Evaluation of the lab Experiments, Record, Viva-voce and External Lab Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. IV Year I Semester

18MDCSE110   PENETRATION TESTING AND VULNERABILITY ASSESSMENT

Course Prerequisite: 18MDCSE108,18MDCSE109

L	T	P	C
3	0	0	3

Course Description:
      The purpose is to understand the methodologies and techniques used for penetrating a machine using tools.

Course Objectives:
1. To identify security vulnerabilities and weaknesses in the target applications.
2. To identify how security controls can be improved to prevent hackers gaining access to operating systems and networked environments.
3. To test and exploit systems using various tools.
4. To understand the impact of hacking in real time machines.

UNIT I: INTRODUCTION
Penetration Testing phases/Testing Process, types and Techniques., Blue/Red Teaming, Strategies of Testing, Non Disclosure Agreement Checklist, Phases of hacking, Open-source/proprietary pentest Methodologies. **(9)**

UNIT II:INFORMATION GATHERING AND SCANNING
Information-gathering methodologies-Foot printing, Competitive Intelligence-DNS Enumerations-Social Engineering attacks, Post Scanning-Network Scanning-Vulnerability Scanning-NMAP scanning tool-OS Fingerprinting-Enumeration. **(9)**

UNIT III: SYSTEM HACKING
Password cracking techniques –Key loggers – Escalating privileges- Hiding Files, Double Encoding. Steganography technologies and its Countermeasures-Active and passive sniffing – ARP Poisoning, MAC Flooding-SQL Injection-Error-based, Union-based, Time-based, Blind SQL, Out-of-band. Injection Prevention Techniques. **(9)**

UNIT IV: ADVANCED SYSTEM HACKING
Broken Authentication, Sensitive Data Exposure, XML External Entities, Broken Access Code, XSS – Stored, Reflected, DOM Based. **(9)**

UNIT V WIRELESS PENTEST
Wi-Fi Authentication Modes, Bypassing WLAN Authentication, Types of Wireless Encryption, Flaws, AP Attack on the WLAN Infrastructure, DoS-Layer1, Layer2, Layer3, DDoS Attack, Client Misassociation, Wireless Hacking Methodology, Wireless Traffic Analysis **(9)**

Dept. of Computer Science & Engineering

Course Outcomes:
Upon completion of this course, students should be able to:
1. Understand various penetration techniques..
2. Outline the information gathering and scanning
3. Gain knowledge various system hacking.
4. Discuss various advanced system hacking.
5. Explain various risks involved in regulating Assessments and Vulnerability management

TEXT BOOK:
1. Kali Linux Wireless Penetration Testing Beginner's Guide by Vivek Ramachandran, Cameron Buchanan, 2015 Packt Publishing.

REFERENCE BOOKS:
1. SQL Injection Attacks and Defense 1st Edition, by Justin Clarke-Salt, Syngress Publication.
2. Mastering Modern Web Penetration Testing By Prakhar Prasad, October 2016 Packt Publishing
3. Kali Linux 2: Windows Penetration Testing, By Wolf Halton, Bo Weaver, June 2016 Packt Publishiong
4. Kali Linux Revealed: Mastering the Penetration Testing Distribution – June 5, 2017, by Raphael Hertzog(Author), Jim O'Gorman (Author), Offset Press Publisher.

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

BlockChain

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year I Semester

18MDCSE111   DISTRIBUTED SYSTEMS

Course Prerequisite: NIL

L   T   P   C
3   0   0   3

Course Description

This course provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission. The structure of distributed systems using multiple levels of software is emphasized. Specific topics include: distributed algorithms, distributed file systems, distributed databases, security and protection, distributed services such as the world-wide web, and examples of research and commercial distributed systems

Course Objectives

1. To understand the foundations and characteristics of distributed systems.
2. To understand the concepts of Inter process communication and distributed objects in distributed systems
3. To learn issues related to clock Synchronization and the need for global state in distributed systems
4. To understand the significance of concurrency control and dead lock detection in Distributed Systems
5. To make students aware about failure and security issues in distributed environment

UNIT I: INTRODUCTION
Characterization of Distributed Systems & Models, Introduction-Examples of distributed Systems, Resource sharing and the Web- Challenges-Architectural models- Fundamental models.   **(9)**

UNIT II:IPC AND DISTRIBUTED OBJECTS
Inter process Communication: Introduction- The API for the Internet protocols- External data representation and marshalling- Client -Server communication- Group communication- Distributed File Systems- Distributed Objects and Remote Invocation: Communication between distributed objects- Remote procedure call- RMI.   **(9)**

UNIT III - SYNCHRONIZATION AND MUTUAL EXCLUSION
Time and Global States: Physical clock, logical clocks-Scalar and vector clocks-Snapshot algorithms for FIFO channels-Mutual Exclusion: Election Algorithms-Bully & Ring Algorithms-Lamport's algorithm,-Ricart-Agrawala algorithm -Maekawa's algorithm-Suzuki–Kasami's broadcast algorithm - Consensus & Agreement.   **(9)**

UNIT IV-TRANSACTIONS AND CONCURRENCY CONTROL
Transactions and Concurrency Control: Locks, Two-Phase Locking-based-Timestamp Ordering algorithm Dead lock: Detection algorithms- Path pushing algorithms-Edge chasing algorithms-

Distributed Shared Memory: Design and Implementation issues-Distributed Minimum Spanning Tree- Distributed Databases: MongoDB-Apache Cassandra-Apache HBase.   **(9)**

UNIT V- FAULT TOLERANCE AND SECURITY
Failures & Recovery Approaches in Distributed Systems: Domino effect-Rollback recovery schemes- Koo Toueg Coordinated Check pointing Algorithm -Distributed systems Security: Infrastructure level vulnerabilities and Solution-Sandboxing -Virtualization ..   **(9)**

Course Outcomes
Upon completion of this course, the student should be able to

1. Elucidate the foundations and issues of distributed systems
2. Analyze the concepts of Inter process communication and distributed objects
3. Exemplify the various synchronization issues and global state for distributed systems
4. Apply the agreement protocols and dead lock detection mechanisms in distributed systems.
5. Summarize the fault tolerance and major security issues associated with distributed systems along with the range of techniques available for increasing system security

TEXT BOOKS:
1.George Coulouris, Jean Dollimore and Tim Kindberg," Distributed Systems Concepts and Design", Pearson Education, Fifth Edition,2014.
2.Ajay D. Kshemkalyani and Mukesh Singhal," Distributed Computing: Principles, Algorithms, and Systems",Cambridge University Press,2008 .
3.Abhijit Belapurkar, Anirban Chakrabarti, Harigopal Ponnapalli," Distributed Systems Security: Issues, Processes and Solutions", Wiley publications,2009

REFERENCE BOOKS:

1.Andrew S. Tanenbaum "Distributed Systems: Principles and Paradigms",Pearson Education , 2nd Edition 2007.
2.Liu M.L," Distributed Computing, Principles and Applications", Pearson Education, First Edition ,2004.
3.Pradeep K Sinha"Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year I Semester

18MDCSE112 BLOCKCHAIN TECHNOLOGY

	L	**T**	**P**	**C**
Course Prerequisite: NIL	**3**	**0**	**0**	**3**

Course Description: Blockchain is an emerging technology platform for developing decentralized applications and data storage, over and beyond its role as the technology underlying the cryptocurrencies. The basic tenet of this platform is that it allows one to create a distributed and replicated ledger of events, transactions, and data generated through various IT processes with strong cryptographic guarantees of tamper resistance, immutability, and verifiability. Public blockchain platforms allow us to guarantee these properties with overwhelming probabilities even when untrusted users are participants of distributed applications with ability to transact on the platform. Even though, blockchain technology has become popularly known because of its use in the implementation of Cryptocurrencies such as Bitcoin, Ethereum, etc.,

Course Objectives
6. To understand the concept of Block chain.
7. To learn about Bitcoin, Cryptocurrency.
8. To Explore the concepts of Ethereum.
9. To learn about Hyper Ledger Fabric model and its architecture.
10. To integrate ideas from blockchain technologies into projects.

UNIT I: INTRODUCTION

Block Chain - History of Blockchain - Types of Block Chain - Consensus - CAP Theorem and Block Chain - Decentralization using Blockchain - Block Chain and Full Ecosystem Decentralization - Platform for Decentralization **(9)**

UNIT II: BLOCKCHAIN BASICS

Bitcoin blockchain, the challenges, and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use. **(9)**

UNIT III: INTRODUCTION TO CRYPTOCURRENCY
Bitcoin - Digital keys and addresses - Transitions - Mining - Bitcoin Network and Payments - Wallets-Bitcoin Payment Alternative coins- Theatrical Foundations- Bitcoin limitation - Namecoin-Lite coin-Prime coin- Zcash- Smart contracts-Ricardian contracts **(9)**

UNIT IV: ETHEREUM
Introduction -Ethereum network -Components of the Ethereum ecosystem -Programming Languages- Ethereum Development Environment - Development Tools and Frameworks
Illustrative: Setup the Ethereum development environment   **(9)**

UNIT V: WEB3 AND HYPERLEDGER
Introduction to Web3 - Contract Deployment - Development Frameworks - Hyper Ledger as a protocol - Reference Architecture – Hyper Fabic – Sawtooth Lake - Corda. **Illustrative :** Creating and deploying a business network on Hyper ledger composer playground , Implementation of business network on Hyper ledger composer playground, Implementation of Business network in Blockchain using Hyper Ledger Fabric.   **(9)**

Course Outcomes
Upon completion of this course, the student should be able to
1. Understand the basic concepts of Block chain.
2. Explain the functional / Operational aspects of Cryptocurrency Ecosystem
3. Developing application using Ethereum.
4. Build model for Block Chain Technology.
5. Integrate idea of creating Hyperledger using web 3 .

TEXT BOOKS:
1. AImran Bashir," Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Second Edition, Kindle Publishing 2018.
2. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A comprehensive Introduction ", Princeton University Press, 2016

REFERENCE BOOKS:

1. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019.
2. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Minor

B.Tech. III Year II Semester

18MDCSE113 ETHEREUM AND SMART CONTRACTS

Course Prerequisite: Nil

        L T P C
        3 0 0 3

Course Description:
Ethereum represents the gateway to a worldwide, decentralized computing paradigm. This platform enables you to run decentralized applications (DApps) and smart contracts that have no central points of failure or control, integrate with a payment network, and operate on an open blockchain. With this practical guide, Andreas M. Antonopoulos and Gavin Wood provide everything you need to know about building smart contracts and DApps on Ethereum and other virtual-machine blockchains. Discover why IBM, Microsoft, NASDAQ, and hundreds of other organizations are experimenting with Ethereum. This essential guide shows you how to develop the skills necessary to be an innovator in this growing and exciting new industry. Run an Ethereum client, create and transmit basic transactions, and program smart contracts Learn the essentials of public key cryptography, hashes, and digital signatures Understand how "wallets" hold digital keys that control funds and smart contracts Interact with Ethereum clients programmatically using JavaScript libraries and Remote Procedure Call interfaces Learn security best practices, design patterns, and anti-patterns with real-world examples Create tokens that represent assets, shares, votes, or access control rights Build decentralized applications using multiple peer-to-peer (P2P) components

Course Objectives
  1.To understand the concept of Ethereum Block chain.
  2.To learn about Cryptography Techniques.
  3.To Explore the concepts of Wallets and Transaction.
  4.To learn about Smart contracts and solidity Programming.
  5.To explore the security approach in the smart contacts.

UNIT I: INTRODUCTION TO ETHEREUM
Ethereum - Components-Ethereum Basics - Getting started with Meta Mask-Externally Owned Accounts and Contacts - Interacting with the contracts - Ethereum Networks - Running an Ethereum client -Ethereum based block chain - Remote Ethereum Clients.   **(9)**

UNIT II: CRYPTOGRAPHY
Basics of Cryptography-Public key cryptography - Private key from random number - Elliptic curve cryptography - operation - generating public key - cryptographic Hash function - Ethereum Address.   **(9)**

UNIT III: WALLETS & TRANSCATION
Wallet Technology Overview - Non Deterministic Wallets - Deterministic Wallets - Hierarchical Deterministic Wallets - Seeds and Mnemonic codes - Wallets Best Practices -Mnemonic Code Words- Creating HD wallets – HD wallets and Paths - Transaction - Structure - Transaction Nonce-Transaction Gas- Transaction Recipient- Transaction Value and Data - special transaction - Digital

Signature - Transaction propagation - Recording on the Block chain - Multiple Signature Transaction **(9)**

UNIT IV: SMART CONTRACTS AND SOLIDITY
smart contracts - Life cycle of smart contracts - Ethereum High level language - Build smart contact with solidity -Ethereum contract ABI- Programming with solidity -Gas consideration-vulnerabilities and Vyper - Decorator - function and variable ordering - protecting against overflow Errors. **(9)**

UNIT V: SMART CONTRACTS   SECURITY & TOKENS
Security Risks and Anti patterns- Reentrancy - Arithmetic over/underflows - unexpected Ether - Entropy Illusion -Denial of Services (DOS)-Block timestamp manipulation -Tokens and Fungibilty - counterparty Risk - Tokens on Ethereum - token standards - Extension to token interface standard. **(9)**

Course Outcomes
Upon completion of this course, the student should be able to

CO1: Understand the basic concepts of Ethereum Block chain.
CO2: Explain different cryptographic algorithms for Block chain
CO3: Developing application using solidity programming.
CO4: Build model for Block Chain Transaction.
CO5: Able to gain knowledge about the Token in Blockchain.

TEXT BOOK:
1. Andreas M.Antonopoulos, Dr.GavinWood," Mastering Ethereum: Building Smart Contracts and DApps", First Edition, Shroff/O'Reilly Publishing .2018.

REFERENCE BOOKS:

1. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019.
2. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year II Semester

18MDCSE114   HYPERLEDGER FABRIC

Course Prerequisite:

L T P C
3 0 0 3

Course Description:
       This course main focus on building the Hyper Ledger Fabric projects - its components, design, references architecture and overall enterprises readiness and the goal is to build an understanding of the diversity of various hyper ledger projects.

Course Objectives
1. To understand the concept of Hyper Ledger.
2. To learn about Designing a data and Transaction Model.
3. To Exposing Network Assets and Transaction.
4. To learn about Blockchain Networks.
5. To explore Hyper Ledger Fabric Security.

UNIT I: INTRODUCTION TO HYPER LEDGER
Hyper Ledger - Frameworks - tools - Building Blocks of Block chain - Hyper Ledger Fabric Component Design-Principals -CAP Theorem - References architecture - Run time architecture - Sample Transaction Explored -Business Scenario and use case - Setting up the development Environment.   **(9)**

UNIT II: DATA AND TRANSACTION MODEL
Chain code Development –installation – invoking - Creating a chain code-Interface –setup – invoking - Access control-ABAC -Chain Code Functions - Testing Chain code- SHIM Mocking - Chain code design - Logging Output-Integration with existing system and Process   **(9)**

UNIT III: BUSINESS NETWORK
Defining business Networks-Introducing participants- types -agents -Introducing assets - asset flow - tangible and intangible assets -structure assets introducing transaction -Fundamental concept -Implicit and explicit transaction -signature -digital transaction processing -transaction history and assert states -regulators and business networks – business network examples   **(9)**

UNIT IV: AGILITY IN A BLOCKCHAIN NETWORK
Defining the promotion process -configuring a continuous integration Pipeline-Configure your GIT repository -Testing the end - to -end process - updating the network - modifying or upgrading a hyper ledger fabric application - system monitoring and performance   **(9)**

UNIT V: HYPERLEDGER FABRIC SECUIRTY
Hyper ledger Fabric design goals imparting security - Hyper Ledger Fabric architecture -Network bootstrap and governance towards security - strong identities - chain code security -common threats and how hyper ledger fabric mitigates them.   **(9)**

Dept. of Computer Science & Engineering

Course Outcomes
Upon completion of this course, the student should be able to

1. Understand the basic concepts of Hyper Ledger
2. Explain different data transaction model
3. Developing assets using hyper Ledger.
4. Build configuring a continuous integration Pipeline.
5. Able to gain knowledge about thehyper ledger fabric security.

TEXT BOOK:

1. Salman A. Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, Weimin Sun, Xun (Brian) Wu,Blockchain ," Development with Hyperledger Build Decentralized Applications with Hyperledger Fabric and Composer" ,Packt Publishing ,2019

REFERENCE BOOKS:

1. Shah Nakul ,"Blockchain for Business with Hyperledger Fabric "BPB Publications ,2019 Paperback,
2. Narendranath Reddy Thota"Mastering Hyperledger Fabric - Master The Art of Hyperledger Fabric on docker, docker swarm and Kubernetes"Publisher: Narendranath Reddy Thota , 2020.
3. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Venkatraman Ramakrishna, Anthony O'Dowd ,"Hands-On Blockchain with Hyperledger" ,Packt Publishing ,June 2018

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year II Semester

18MDCSE203 SMART CONTRACTS AND HYPERLEDGERLABORATORY

Course Prerequisite: 18MDCSE113, 18MDCSE114

L T P C
0 0 4 2

Course Description:

This laboratory guide you how to develop the skills necessary to be an programmer in this growing and exciting new industry to Run an Ethereum client, create and transmit basic transactions, and program smart contracts Learn the essentials of public key cryptography, hashes, and digital signatures.

Course Objectives:

1. To learn about Smart contracts and Solidity.
2. Understand the basic concepts of Ethereum Block chain.
3. Explain different cryptographic algorithms for Block chain
4. Build model for Block Chain Transaction.
5. To learn about Designing a data and Transaction Model using Hyper Ledger.

LIST OF EXPERIMENTS

1. Creating the Contract on the Blockchain
2. Make Interacting with the Contract
3. Write Cryptographic Hash Functions for: Keccak-256
4. Built Decentralized Applications (DApps) for Backend (Smart Contract)
5. Built Decentralized Applications (DApps) for Frontend (Web User Interface)
6. Built Decentralized Applications (DApps) for Data Storage
7. Implement the Decentralized Message Communications Protocols for application
8. Building an Ethereum Blockchain Application
9. Exploring an Enterprise Blockchain Application Using Hyperledger Fabric
10. Implementing Business Networks Using Hyperledger Composer

Course Outcomes:

Upon completion of this course, students should be able to:
1. To build the smart contract for any application.
2. Apply the hash function for Encryption and Decryption.
3. Can build Decentralized application for Blockchain.
4. Built Ethereum Blockchain Application.
5. Effectively can used Hyperledger Composer for build block chain application.

TEXT BOOKS:

1. Andreas M.Antonopoulos, Dr.GavinWood," Mastering Ethereum: Building Smart Contracts and DApps", First Edition, Shroff/O'Reilly Publishing .2018.
2. Salman A. Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, Weimin Sun, Xun (Brian) Wu,Blockchain ," Development with Hyperledger Build Decentralized Applications with Hyperledger Fabric and Composer" ,Packt Publishing ,2019

REFERENCE BOOKS:

1. S. Shukla, M. Dhawan, S. Sharma, S. Venkatesan, 'Blockchain Technology: Cryptocurrency and Applications', Oxford University Press, 2019.

3. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
4. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
5. Shah Nakul ,"Blockchain for Business with Hyperledger Fabric "BPB Publications ,2019 .
6. Paperback, Narendranath Reddy Thota"Mastering Hyperledger Fabric - Master The Art of Hyperledger Fabric on docker, docker swarm and Kubernetes"Publisher: Narendranath Reddy Thota , 2020.
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Venkatraman Ramakrishna, Anthony O'Dowd ,"Hands-On Blockchain with Hyperledger" ,Packt Publishing ,June 2018

Mode of evaluation: Continuous Evaluation of the lab Experiments, Record, Viva-voce and External Lab Examination.

Dept. of Computer Science & Engineering

 Minor

B.Tech. IV Year I Semester

18MDCSE115   SOLIDITY PROGRAMMING

Course Prerequisite: 18MDCSE113, 18MDCSE114

L	T	P	C
3	0	0	3

Course Description: solidarity programming is a contract-oriented language whose syntax is highly influenced by JavaScript, and is designed to compile code for the Ethereum Virtual Machine. Solidity Programming Essentials will be your guide to understanding Solidity programming to build smart contracts for Ethereum and blockchain from ground-up.

Course Objectives

1. To understand the concept of solidarity programming language.
2. To learn about how write smart contracts.
3. To Exposing about various functions and call methods
4. To learn various exception and error handling techniques.
5. To gain knowledge about Truffle IDE and Remix Debugger.

UNIT I: INTRODUCTION TO SOLIDATY ETHEREUM VIRTUAL MACHINE
Solidity and Solidity files - pragma - Import statements - contracts- structure of a contract- variables - structures - modifiers - events -enumeration -functions - data types in solidity - pass by value - pass by references - storage and memory data location -Literals - Arrays -Enumeration -Address -Mapping - Global variables and Functions - expressions and control structures   **(9)**

UNIT II: WRITING SMART CONTARCTS
Smart contracts - Writing a simple contract - creating contract - Constructor - Contract Composition - inheritance - Encapsulation -Polymorphism - Method overriding - Abstract contract – Interfaces   **(9)**

UNIT III: FUNTIONS, MODIFIERS AND FALLBACKS
Function Input and Output - Modifier - Views - Constant - Pure Function - Address function - Send method - transfer method - call method - call code method - delegate call method - The fallback function   **(9)**

UNIT IV: EXCEPTION AND ERROR HANDLING
Error handling - Require statements - assert statement - revert statement - Events and Logging - handling in writing smart contracts -Capturing Smart Contract Events in our User Interface - Smart Contract Security Best Practices-Smart Contract Best Practices for UX and Interoperability
          (9)

UNIT V: TRUFFLE BASIC IDE & REMIX EDITOR

Application development life cycle management - Truffle - Development with Truffle - testing with Truffle - Debugging contracts - debugging - The Remix editor - debugging using events - debugging using a block explore **(9)**

Course Outcomes

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

CO1: Understand the basic concepts of solidity programming.
CO2: Explain different data types, functions and error handling methods.
CO3: Able to develop a smart contract for any application.
CO4: Build configuring and developing application using like Truffle.
CO5: Able to gain knowledge about Remix debugging tool used for writing smart contact.

TEXT BOOK:

1. Ritesh Modi ,"Solidity Programming Essentials" Packt Publishing,2018.

REFERENCES:
1. David H. Hoover, Kevin Solorio, and Randall Kanna,"Hands-On Smart Contract Development with Solidity and Ethereum: From Fundamentals to Deployment" published by O'Reilly Media,inc , 1 Edition - 2019

2. Parikshit Jain," A Practical Guide to Blockchain and its applications ", Bloomsbury India ,1 Edition - 2019
3. Mohanty Debajani," BlockChain from Concept to Execution " BPB Publications 1 - Edition - 2019

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Full Stack Development

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year I Semester

18MDCSE116   FUNDAMENTALS OF WEB DESIGNS

Course Prerequisite: NIL

Course Description:

L	T	P	C
3	0	0	3

This course will expose students to the techniques used in programming web pages for interactive content. The course begins by reviewing basic web technologies (HTML, CSS style sheets) and exploring the use of event-driven programming.

Course Objectives:
1. To build web applications using HTML, CSS with client side validations.
2. To learn the image and image types with html.
3. To develop the web application with various CSS layout.
4. To develop a web application with various form layout.
5. To learn the basic things of website and domain names.

UNIT I: INTRODUCTION: HTML AND HTML5
Getting started with tags, How to save web pages, Viewing your web pages. Basic HTML Tags, Basic HTML template, Heading Tags, Paragraph and Break tags, Bold and Italics, HTML lists. Getting started with CSS, Introduction to CSS, CSS rules, Where to put your styles, Using CSS selectors, Inline and Embedded styles, CSS and Fonts, Font colours, Font sizes, Styling Fonts **(9)**

UNIT II:DEALING WITH IMAGES:
Types of Images, Inserting Images part 1,Inserting Images part 2,Image Attributes, Images and CSS, Text wrapping with CSS, CSS and image borders, Background Images, Adding captions to images, Linking to other pages, Hyperlinks, Linking to other pages, Other types of hyperlinks, CSS and hyperlinks, External style-sheets, HTML lists and navigation bars.   **(9)**

UNIT III:CSS LAYOUTS
The Box Model, CSS Comments, CSS Positioning, CSS floats, A one column CSS layout, Styling the one column layout, Styling HTML 5 tags, A two column CSS layout. HTML 4 and HTML 5 tables,Row and Col span, Table alignment, colours, images.   **(9)**

UNIT IV:HTML FORM TAGS
Text boxes, Submit, Reset, Formatting Text boxes with CSS, labels, Text areas, option buttons and Check boxes, Passwords, hidden fields, HTML 5 Forms, Place holders, Required, Email, URL,

Search, Spinners and sliders, Dates, Color pickers, Data List, HTML Form Layout, HTML 5 Video and Audio, HTML 5 Canvas tags details, Mask. **(9)**

UNIT V: WEB ESSENTIALS

Clients, Servers and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers. Gettingyour site on the internet: Websites and Domain Names, What to look for when buying Web space, Search engine optimization, Pay per click advertising, Sitemaps. **(9)**

Course Outcomes:
1. Design web pages with CSS attributes.
2. Design and import various typ of images with html tags.
3. Design and develop web applications with the support of client side validations.
4. Develop the web applications with various form layout.
5. Design and develop the basic things of website and domain names.

TEXT BOOKS:
1. Web Technologies, Uttam K Roy, Oxford University Press
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", ThirdEdition, Pearson Education, 2006.
3. HTML & CSS:The Complete Reference ,Thomas.A Powel "Fifth Edition"Kindle Edition,2017

REFERENCE BOOKS:
1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, PearsonEducation, 2007 .
2. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I andII, Pearson Education, 2001.
3. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year I Semester

<div align="center">

18MDCSE118   ADVANCED WEB DESIGN

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	L	**T**	**P**	**C**

Course Prerequisite: NIL   **L   T   P   C**
                                                                3   0   0   3

Course Description

This course will expose students to the techniques used in programming web pages for interactive content. The course begins by reviewing basic web technologies (HTML, XML) and exploring the use of event-driven programming .The students will use AJAX tools to build web pages that connect to servers like Google to dynamically access data (maps, search results, videos, images, etc). Finally, the course will show students how to create their own J2ME application.

Course Objectives:
1. To build web applications using HTML, XML with client side validations.
2. To build XML documents with DTD, XSLT style sheets.
3. To build the e-business system oriented B2B methods.
4. To develop a web application with ajax techniques.
5. To build J2ME enabled web applications.

UNIT I: HTML AND XML

HTMLIntroduction, HTML Elements, Attributes, HTML Headings, Paragraphs, HTML Formatting, Fonts, Styles, HTML Links, Images, Tables, HTML Lists, Forms, Frames, HTML Colors, Color names, Color values, HTML Quick List.The Need for XML, Structured Data and Formatting, Advantages of XML, SGML, XML, and HTML, World Wide Web Consortium (W3C) Specifications and Grammars, XML Applications and Tools, Creating and Viewing XML Documents, Transforming XML Documents, XML Document Syntax, Validating XML Documents with DTDs, XML Name spaces   **(9)**

UNIT II: XML PROGRAMMING

Introduction, Transforming XML Documents with XSLT and XPath, Formatting XML Documents with XSL-FO, Purpose of XSL Formatting Objects (XSL-FO) , XSL-FO Documents and XSL-FO Processors, XSL-FO Namespace, Page Format Specifiers, Page Content Specifiers.XML Documents with Schemas: Introduction to Simple Object Access Protocol (SOAP), SOAP's Use of XML and Schemas, Elements of a SOAP Message, Sending and Receiving SOAP Messages (SOAP Clients and Receivers), Handling SOAP Faults, Current SOAP Implementations; Introduction to Web Services: Architecture and Advantages of Web Services, Purpose of Web Services Description Language (WSDL) , WSDL Elements.   **(9)**

UNIT III: XML APPLICATIONS

B2B Scenarios, e-business system involved: delivery, sales, cross company communication: replacement for EDI, the document as the application, XML and relational databases, XML and dynamic Web publishing, benefits of XML schemas to applications, XML processors enforcing structure, application access to document structure, fixed values, channels.Creating and Examining WSDL Files, Overview of Universal Description, Discovery, and Integration (UDDI), UDDI Registries (Public and Private). **(9)**

UNIT IV: AJAX - Asynchronous JavaScript and XML

Web Applications - Pre and Post Ajax, Ajax in the Real World, Alternatives to Ajax, XML In A Nutshell, Syntax, Rules, JavaScript In A Nutshell, Primitive Data Types and Reference Types, Variables Loops, Function Definition and Function Call, Objects, Expressions, Operators and Escape Sequences, Document Object Model (DOM), Window Object, HTML & XML DOM, Node, Element, Accessing Element Nodes, Inner HTML, Properties of Element and Text Nodes, Node Attributes Node Name & Node Value, Event Handling, Key Word – this, Whitespace Interpretation – Browser Differences, Removing Nodes, Creating New Nodes, Node Methods **(9)**

UNIT V: J2ME

Java Environments Comparison: J2ME (Java 2 Micro Edition), J2SE (Java 2 Standard Edition) & J2EE (Java 2 Enterprise Edition); J2ME specifics: ME components: KVM, J2ME, CLDC, MIDP - Comparison of different ME platforms, Profiles - Overview of profile system, Architecture - How the J2ME works, Differences between J2ME environments - Comparisons between J2ME and Personal Java; MIDP: Mobile information device profile, Creating MIDP applications, Midlet suites and deployment; MIDP GUI: Graphical User Interfaces with MIDP, Displays, Commands, Pointers, Screens, Animations and drawing. **(9)**

Course Outcomes:
1. Design and build web applications using HTML, XML with client side validations.
2. Develop the XML documents with DTD, XSLT style sheets.
3. Build the e-business system oriented B2B methods.
4. Develop a web application with ajax techniques.
5. Build J2ME enabled web applications.

TEXT BOOKS:
1. Web Technologies, Uttam K Roy, Oxford University Press
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", ThirdEdition, Pearson Education, 2006.
3. HTML & CSS:The Complete Reference ,Thomas.A Powel "Fifth Edition"Kindle Edition,2017

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REFERENCE BOOKS:

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, PearsonEducation, 2007 .
2. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I andII, Pearson Education, 2001.

Learning jQuery, Jonathan Chaffer, Karl Swedberg, Third Edition, Packt Publishing Ltd

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year II Semester

18MDCSE117   MULTIMEDIA AND WEB TECHNOLOGY

Course Prerequisite: NIL

	L	T	P	C
	3	0	0	3

Course Description:
This course will expose students to learn the techniques used in multimedia basic concepts. The course begins by reviewing basic web technologies (HTML, CSS style sheets) and exploring the use of event-driven programming in servlet to add interactive elements such as buttons and text fields to web pages. Next, students will use AJAX tools to build web pages that connect to servers like Google to dynamically access data (maps, search results, videos, images, etc). Finally, the course will show students how to write their own web services code to provide access to a custom database.

Course Objectives:
1. To introduce the basic concepts Multimedia essentials.
2. To introduce the different types of style sheets with html.
3. To introduce DOM object model concepts.
4. To introduce Server side programming with Java Servlets and JSP.
5. To introduce various java web services and SOAP

UNIT I: MULTIMEDIA ESSENTIALS
Multimedia Essentials: Concepts of multimedia, different image formats, applications, image scanning, basic concepts of image creation, Graphics tools, Image handling, operations on layers, channels and masks, painting and editing, voice recording applications, sound and file format, JPEG and MPEG formats.   **(9)**

UNIT II: STYLE SHEETS
Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML Style Rule Cascading and Inheritance-Text Properties-Box Model-Normal Flow Box Layout- Beyond the Normal Flow-Other Properties-Case Study. Client-Side Programming: The JavaScript Language-History and Versions Introduction to JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects – JavaScript Debuggers.   **(9)**

UNIT III: HOST OBJECTS
Host Objects: Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window-Case Study. Server-

Side Programming: Java Servlets- Architecture -Overview-A Servelet-Generating Dynamic Content-Life Cycle- Parameter Data-Sessions-Cookies- URL Rewriting-Other Capabilities-Data Storage Servlets and Concurrency-Case Study- Related Technologies.   **(9)**

UNIT IV: REPRESENTING WEB DATA

Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration- Name spaces JavaScript and XML: Ajax-DOM based XML processing Event-oriented Parsing: SAX- Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers-Case Study-Related Technologies. Separating Programming and Presentation: JSP Technology-Introduction-JSP and Servlets-Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-View-Controller Paradigm-Case Study-Related Technologies.   **(9)**

UNIT V: WEB SERVICES

Web Services: JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services: WSDL- Representing Data Types: XML Schema- communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files-Databases and Java Servlets.   **(9)**

Course Outcomes:

1. Gain knowledge of multimidia concepts and client side scripting, validation of forms and AJAX programming
2. Gain knowledge about DOM object model concepts.
3. Have understanding of server side scripting with JSP language
4. Have understanding of what is XML and how to parse and use XML Data with Java
5. To introduce Server side programming with Java Servlets and JSP

TEXT BOOKS:

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2. John F.koegel Buford "Multimedia Systems",Pearson Education,2013.

REFERENCE BOOKS:

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, PearsonEducation, 2007 .
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", ThirdEdition, Pearson Education, 2006.
3. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I andII, Pearson Education, 2001.

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year II Semester

        18MDCSE119   **WEB PROGRAMMING**

Course Prerequisite: NIL

                                                 L T P C
                                                 3 0 0 3

Course Description

This course will expose students to the techniques used in programming web pages for interactive content. The course begins by reviewing basic web technologies (HTML, CSS style sheets) and exploring the use of event-driven programming in JavaScript to add interactive elements such as buttons and text fields to web pages. Next, students will use AJAX tools to build web pages that connect to servers like Google to dynamically access data (maps, search results, videos, images, etc). Finally, the course will show students how to write their own server-side code to provide access to a custom database.

This course provides the knowledge necessary to design and develop dynamic, database-driven web pages using PHP. PHP is a language written for the web, quick to learn, easy to deploy and provides substantial functionality required for e-commerce. This course introduces the PHP framework and syntax, and covers in depth the most important techniques used to build dynamic web sites. Students learn how to connect to any ODBC-compliant database, and perform hands on practice with a MySQL database to create database-driven HTML forms and reports. E-commerce skills including user authentication, data validation, dynamic data updates, and shopping cart implementation are covered in detail. Students also learn how to configure PHP and Web Servers like Apache, IIS, WAMP and XAMPP.

Course Objectives:

1. To build web applications using HTML, CSS and PHP with client side validations.
2. To build XML documents with DTD, Schemas and style sheets.
3. To maintain session management tracking using cookies & HTTP Sessions.
4. To develop a web application with database interaction.
5. To build AJAX enabled web applications.

UNIT I:HTML5 and CSS3

History of HTML/XHTML/HTML5, HTML5 New Features, HTML5 vs HTML4 vs XHTML, Structural, Content, Application-focused tags, Deprecated elements. History of CSS, The Power of CSS, Selectors and Pseudo Classes, Fonts and Text Effects, Colors, Gradients, Background Images, Masks, Borders and Box Effects, Transitions, Transforms, and Animations.   **(9)**

UNIT II: JAVASCRIPT AND jQuery

Introduction to javaScript, Comments, Variables, Exploring JavaScript Data Types, Popup Boxes, Objects, Functions, Conditions, Loops, JavaScript Break and Continue, Error handling, Form Validation, RegExp Object, String Object, Date Object, Array Object, Math Object, Cookies. Introduction to jQuery, Installation, Selectors, Events, Effects, Callbacks, jQuery and HTML, jQuery and AJAX. **(9)**

UNIT III: XML & OVERVIEW OF PHP DATA TYPES AND CONCEPTS XML

Introduction to XML, Creating XML Documents, Creating XML DTDs, XMLSchemas, XSL. Overview of PHP Data types and Concepts: Variables and data types, Operators, Expressions and Statements, Strings, Arrays and Functions. PHP-Overview of Classes, Objects, and Interfaces. Overview of Classes, Objects, and Interfaces: Creating instances using Constructors, controlling access to class members, extending classes, Abstract classes and methods, using interfaces, using class destructors, File Handling and Using Exceptions. **(9)**

UNIT IV:PHP ADVANCED CONCEPTS & CREATING AND USING FORMS PHP

Advanced Concepts: Using Cookies, Using HTTP Headers, Using Sessions, authenticating users, Using Environment and Configuration variables, Working with Date and Time. Creating and Using Forms: Understanding Common Form Issues, GET vs. POST, Validating form input, working with multiple forms, and Preventing Multiple Submissions of a form. **(9)**

UNIT V:PHP AND DATABASE ACCESS & PHP AND OTHER WEB TECHNOLOGIES

PHP and Database Access: Basic Database Concepts, connecting to a MYSQL database, Retrieving and Displaying results, Modifying, Updating and Deleting data, MVC Architecture. PHP and Other Web Technologies: PHP and XML, PHP and AJAX **(9)**

Course Outcomes:

1. Design pages with CSS attributes.
2. Design and develop web applications with the support of client side validations.
3. Use well-formed XML documents and develop PHP scripts with may support of object oriented features.
4. Manage the session in web browser through Cookies & Sessions and able to communicate with other web pages through form GET and POST methods.
5. Design and develop web applications with the database interactions (thorough SQL queries) and apply XML and Ajax for faster performance.

Dept. of Computer Science & Engineering

TEXT BOOKS:

1. JavaScript for Absolutie Beginners, Terre McNavage, Apress Publications
2. Beginning PHP and MySQL, 3rdEdition , Jason Gilmore, Apress Publications (Dream tech.)
   3. Web Design The complete Reference, Thomas Powell, Tata McGraw Hill
3. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware(Addison Wesley) Pearson Education
2. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications
3. PHP 5.1, I. Bayross and S.Shah, The X Team, SPD
4. PHP and MySQL by Example, E.Quigley, Prentice Hall(Pearson)
5. PHP Programming solutions, V.Vaswani, TMH
6. Web Technologies, Uttam K Roy, Oxford University Press
7. Learning jQuery, Jonathan Chaffer, Karl Swedberg, Third Edition, Packt Publishing Ltd

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year II Semester

18MDCSE204   WEB PROGRAMMING LABORATORY

Course Prerequisite: NIL

L	T	P	C
0	0	4	2

Course Description:

This course is to apply the concepts of web programming in a practical approach; the emphasis of this course is on techniques of web programs development within the structure and object-oriented paradigm. Implementation of programs includes HTML static pages, CSS, JavaScript, XML, and PHP with database interactions.

Course Objectives:

1. To create a fully functional website with database interactions.
2. To develop an online Book store using we can sell books.

List of Experiments:

1. Creation college website
2. Working on CSS
3. Client side validations using javascript
4. Working on jQuery effects
5. Display Library information using XML
6. Working on PHP and Forms
7. User Authentication
   a) User authentication through cookies
   b) User authentication through sessions
8. Working with MySQL database
9. Create a table which should contain at least the following fields: name, password, email-id, phonenumber.
10. Write a PHP program to connect to that database and extract data from the tables and display them.
11. Insert the details of the users who register with the web site, whenever a new user clicks the submitbutton in the registration page.
12. Insert the details of the 3 or 4 users who register with the web site (week8) by using registrationform. Authenticate the user when he submits the login form using the user name and password fromthe database.
13. Create tables in the database which contain the details of items (books in our case like Book name,

14. Price, Quantity, Amount) of each category. Create catalogue page in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using PHP
15. Implementation of stateful HTTP (HTTP is a stateless protocol). Session is required to maintain thestate.

Course Outcomes:

After Completion of this course students will be able to

1. Design web pages using HTML and CSS.
2. Perform client side validations using javascript.
3. Build web applications using PHP.
4. Implement HTTP protocol for web client/web server communication.
5. Create a fully functional website with database interactions.

TEXT BOOK:

1. Beginning PHP and MySQL, 3rd Edition , Jason Gilmore, Apress Publications (Dream tech.).

REFERENCE BOOKS:

1. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann andJon Stephens.
2. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Leeand B.Ware(Addison Wesley) Pearson Education.
3. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage LearningPublications.
4. PHP 5.1, I. Bayross and S.Shah, The X Team, SPD.
5. PHP and MySQL by Example, E.Quigley, Prentice Hall(Pearson).
6. PHP Programming solutions, V.Vaswani, TMH.

Mode of evaluation: Continuous Evaluation of the lab Experiments, Record, Viva-voce and External Lab Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year II Semester

18MDCSE120   FULL STACK DEVELOPMENT

Course Prerequisite: 18CSE101

L	T	P	C
3	0	0	3

Course Description:
This course provides you hands-on experience and exposure to developing HTML5 based single page application for browsers. This course builds strong foundation on HTML5 which will help developer to use HTML5 concepts for building responsive web application. This course provides the knowledge necessary to design and develop dynamic, database-driven web pages using PHP, JS with MongoDB and Sqlite,io.

This course will expose students to the techniques used in programming web pages for interactive content. The course begins by reviewing basic web technologies (HTML, CSS style sheets) and exploring the use of event-driven programming in JavaScript to add interactive elements such as buttons and text fields to web pages. Next, students will use Node.JS to build web pages that connect to servers like Google to dynamically access data (maps, search results, videos, images, etc).Students learn how to connect to any ODBC-compliant database, and perform hands on practice with a MySQL database to create database-driven HTML forms and reports. E-commerce skills including user authentication, data validation, dynamic data updates, and shopping cart implementation are covered in detail.

Course Objectives:

1. To build web applications using HTML5, CSS3 and PHP with client side validations.
2. To build Front-end, and Chat Application,Task Managers with unit testing.
3. To learn and develop the new applications with angular4.
4. To develop a web application with React components.
5. To develop a web application with database interaction.

UNIT I: DESIGNS TO WIREFRAMES WITH HTML5 AND CSS3
HTML5 Video Player, Building Responsive Websites with HTML5 and CSS3,HTML5 and CSS3 Site Design, HTML5 Mobile Game Development Make HTML5 Games with No Coding Required, Understanding HTML5 Input Types, Website Wireframing with HTML5 and CSS3,Fundamentals Of JavaScript, JavaScript for Beginning Web Developers, jQuery, Fundamentals of Ajax Development, Advanced JavaScript. **(9)**

UNIT II: INTRODUCTION AND FOUNDATION NODE.JS
Working with shrink-wrap to lock the node modules versions, Working with asynchronous programming, Building a HTTP Server with Node.JS using HTTP APIs, File System, Buffers,

Streams, and Events, Multi-Processing in NodeJS,ExpressJS,Express JS with MongoDB and Sqlite,io, The Front-end, and Chat Application,Task Managers with unit testing.   **(9)**

UNIT III: INTRODUCTION OF ANGULAR, PREPARING FOR TYPESCRIPT

Angular-4 new features, Building with A4 Components, Bootstrap Scaffolding, Angular 4 Binding and Events, Dependency Injection and services, Directives, Pipes, Forms, HTTP, Promises, and Observables, Testing ,Introduction to NoSQL databases, MongoDB A Database for the Modern Web, CRUD Operations in MongoDB, Indexing and Aggregation, Replication and Sharding, Developing Java and Node JS Application with MongoDB, Administration of MongoDB Cluster Operations.   **(9)**

UNIT IV: STARTING WITH REACT
React Components,React State and Props,React Event Handling, Routing in React React flux, Styling React, SQL Querying, Your First Queries, Filtering Your Results, Consolidating Your Data, Grouping Your Data, Joining Tables, Subqueries, Manipulating, Transaction control, Database Objects And Adding Business Logic.   **(9)**

UNIT V:PHP AND DATABASE ACCESS & PHP AND OTHER WEB TECHNOLOGIES
PHP and Database Access,Introduction to Web sockets,Web socket URIs,Web socket APIs, Opening Handshake,Data Framing,Sending and Receiving Data, Closing the Connections, Error Handling,Web socket Security, Deployment Considerations.   **(9)**

Course Outcomes:

1. Design web pages with HTML5, CSS3.
2. Design and develop web applications with the support of client side validations.
3. Manage and learn the develop the new applications with angular4.
4. Design and develop the web application with React components.
6. Design and develop web applications with the database interactions

TEXT BOOKS:

1. JavaScript for Absolutie Beginners, Terre McNavage, Apress Publications
2. Beginning PHP and MySQL, 3rdEdition , Jason Gilmore, Apress Publications (Dream tech.)
3. Web Design The complete Reference, Thomas Powell, Tata McGraw Hill
4. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann andJon Stephens
5. Hands on Full stack Web Development with ASP.NET Core,Tamir Dresher,Amir Zuker,Shay
6. Friedman,Kindle Edition,2018.

REFERENCE BOOKS:

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware(Addison Wesley) Pearson Education
2. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications
3. PHP 5.1, I. Bayross and S.Shah, The X Team, SPD
4. PHP and MySQL by Example, E.Quigley, Prentice Hall(Pearson)
5. PHP Programming solutions, V.Vaswani, TMH
7. Web Technologies, Uttam K Roy, Oxford University Press
8. Learning jQuery, Jonathan Chaffer, Karl Swedberg, Third Edition, Packt Publishing Ltd

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Software Developer

Minor

B.Tech. III Year I Semester

18MDCSE121   DATA STRUCTURES AND ALGORITHMS

	L	**T**	**P**	**C**
Course Prerequisite: Nil | **3** | **0** | **0** | **3** |

Course Description:

This course is aimed to provide basic understanding of different data structures and algorithms. This course covers introduction to algorithms, basic data structures like arrays, linked lists, stacks, queues, various types of trees, graphs and their implementation.

Course Objectives:
1. To develop skills to design and analyze linear and nonlinear data structures.
2. Develop algorithms for manipulating linked lists, stacks, queues, trees and graphs.
3**.** Develop recursive algorithms as they apply to trees and graphs.

UNIT I: **EFFICIENCY AND COMPLEXITY, LINEAR AND LINKED REPRESENTATION**

Introduction: Algorithm specification, growth of functions, Asymptotic notations.Algorithms as opposed to programs, Data structures, abstract data types, design patterns , Overview,
Complexity: Time versus space complexity, Worst versus average complexity, Concrete measures for performance, Big-O notation for complexity
Arrays, Loops and Iteration, **List:** Singly Linked List and Its Operations, Doubly Linked List and its operations, Circular Lists.   **(9)**

UNIT II: STACKS AND QUEUES
Stack: Array representations, operations on stack. Applications of Stack.
Queue: array and linked list representations, operations on queue, applications of queue, Circular queue, insertion and deletion, Dequeue.   **(9)**

UNIT III: TREES
Tree: Introduction, Terminology, Binary Tree, representation, Binary Tree Traversals.
Binary Search Tree: Properties, Insertion, Deletion, and Searching operations.
Balanced Search Trees: AVL Trees, Red Black Trees, and Splay Trees.   (**9**)

UNIT III: SORTING, PRIORITY QUEUES, HEAP TREES
Sorting: Selection Sort, Merge Sort, Quick Sort, Radix Sort,
Priority queue: Definition and Applications, implementation using Heaps, Max Heap, Min Heap, Insertion into a Max Heap, Deletion from a Max Heap, Heap Sort.   **(9)**
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UNIT V: HASHING and GRAPHS

Hashing: Dictionaries, HashTable Representation, Static and Dynamic Hashing, Collision Resolution methods-Open Addressing, Separate Chaining, Double hashing.
Graphs: Terminology, Representation, operations, Graph Traversal techniques.   **(9)**

Course Outcomes:
At the end of the course, students will be able to:
1. Design algorithms to implement various data structures.
2. Choose the appropriate queue to solve real world problems
3. Categorizes various sorting and hashing techniques.
4. Implement the various operations of Tree data structure.
5. Develop applications using Tree and Graph data structures.

TEXT BOOK:
1. Fundamentals of Data Structures using C++, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta, Silicon Press, Second Edition. 2007.

REFERENCE BOOKS:
1. Data Structures and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffery D.Ulman.Pearson; 1st edition.
2. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
3. Data Structures, Algorithms and Applications in C++ by Sartaj Sahni, McGraw Hill, NY, Second Edition.

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year I Semester

18MDCSE122   DATABASE MANAGEMENT SYSTEMS

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

Course Prerequisite: Nil

Course Description:

This course is designed to provide basic understanding on database systems and its design. The course material further used for developing any web based applications in which database is back end. Course covers from all basic and advanced queries of SQL, PL/SQL programs, Relational algebra and calculus, normal forms, low level details such as representing data elements of database and indexed structures, transaction management and data recovery.

Course Objectives:
1. To understand the components of DBMS and to study the database design.
2. To study the retrieval of data using relational algebra and calculus and the concept of normal forms in the design of database.
3. To comprehend the structure of SQL Queries to query, update, and manage a database.
4. To understand all constraints to develop a business application using cursors, triggers and stored   procedures.
5. To provide knowledge on distributed databases, concurrency techniques.

UNIT I: DATABASE SYSTEM ARCHITECTURE AND RELATIONAL MODEL
Overview of Database Systems: Managing data, File Systems versus a DBMS.
Introduction to Database Design: Database design and ER Diagrams, Entities, Attributes and Entity sets, Relationships and relationship types, Additional features of ER model, conceptual design with the ER Model.
Introduction to Relational Model: Introduction, Integrity Constraints, Logical database design, Introduction to views
Relational Algebra: Preliminaries, Relational algebra- Selection and Projection, Set Operations, Renaming, Joins, Division   **(9)**

UNIT II: RELATIONAL CALCULUS AND SQL
Relational Calculus – Expressive power of Algebra and Calculus.
The Database Language SQL – Simple Queries in SQL – Queries Involving More than One Relation, Sub Queries, aggregate operators, null values, complex integrity constraints, triggers and active databases Embedded SQL, Dynamic SQL, Cursors, Introduction to JDBC, Stored Procedures.   **(9)**

UNIT III: DATABASE DESIGN
Functional Dependencies– Rules about Functional Dependencies, Keys, Design of Relational Database Schemas, Multivalued Dependencies.   **(9)**

UNIT IV: STORAGE STRATEGIES AND TRANSACTION PROCESSING
Storage strategies: Indices, B-trees, hashing. **Transaction Processing:** Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp-based schedulers, Multi-version and optimistic Concurrency Control schemes. **(9)**

UNIT V: DATABASE SECURITY
Database recovery Authentication, Authorization and access control, DAC, MAC and RBAC models, SQL injection. **(9)**

Course Outcomes:
At the end of the course, students will able to
6. Design database structure and represent ER model.
7. Construct relational algebra expressions for the query.
8. Design database and access data from the database using SQL queries.
9. Implement transaction processing techniques in a database.
10. Apply security features in database, data server and data warehouse design.

TEXT BOOKS:
1. Database Management Systems, Raghu RamaKrishnan, Johannes Gehrke, 3rd Edition, 2003, McGraw Hill.
2. Database Systems, The Complete Book, Hector Garcia-Molina, Jeffrey D. Ullman and Jennifer Widom, 3rd impression, 2009, Pearson.

REFERENCE BOOKS:
1. "Data base System Concepts", Silberschatz, Korth, McGraw Hill, V edition
2. The UNIX Programming Environment, B.W. Kernighan & R. Pike, Prentice Hall of India.
3. "Fundamentals of Database Systems", Elmasri Navathe, 6th edition, 2013, Pearson.
4. "Introduction to Database Systems", C. J. Date, Pearson Education.

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year II Semester

18MDCSE123   SOFTWARE ENGINEERING

Course Prerequisite: None.

L T P C
3 0 0 3

Course Description:
This course presents software engineering techniques and explains the software development life-cycle, including software specification, Requirement analysis, design implementation, testing and maintenance. This course covers on past and current trends in software development practices. This course is designed to cover fundamentals of Software Engineering concepts, requirement analysis, process models, Design issues, modeling, testing strategies, Risk strategy, quality management. The course will present a variety of tools, in the context of team production of publicly releasable software. The main goal of this course for each student to build their ability to do useful applications that could be released for real-world use.

Course Objectives:
1. To make students to learn Different life cycle models.
2. To make students to learn different phases in software engineering.
3. To make students to learn about testing strategies.
4. To provide better understanding of software quality and assurance techniques.

UNIT I: BASIC CONCEPTS OF SOFTWARE ENGINEERING AND PROCESS MODEL
Introduction to Software Engineering: Ethics of Software engineering, Type of software, Software characteristics, Software Lifecycle model, Capability Maturity Model Integration (CMMI), **Process models:** The waterfall model, Incremental process models, spiral model, **Agile Development**-Agile Process-Other Agile process Frameworks: Adaptive process models, Scrum, Dynamic Systems Development Method and Crystal   (**9**)

UNIT II: SOFTWARE REQUIREMENT ENGINEERING AND SYSTEM MODELS
Software Requirements: Functional and Non-functional requirements, User requirements, System requirements, Interface specification, and the software requirements specification (SRS).
Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management. **System models:** Context Models, Behavioral models, Data models, Object models.   (**9**)

UNIT III: SOFTWARE DESIGN AND ENGINEERING
Design Engineering: Design process and Design quality, Design concepts, the design model, pattern based software design, Object oriented Analysis and Design (using UML): Class diagrams, Use diagrams, Interaction diagrams, activity diagrams.

Modeling component-level design: Designing class-based components, conducting component-level design, Object constraint language, designing conventional components.
Performing User interface design: Golden rules, User interface analysis and design, interface analysis.   **(9)**

UNIT IV: SOFTWARE TESTING AND METRIC PROCESS

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing.
Product metrics: Software Quality, Frame work for Product metrics, Metrics for Analysis Model, Metrics for Design Model, Metrics for source code, Metrics for testing, Metrics for maintenance.
Metricsfor Process and Products: Software Measurement, Metrics for software quality.

(9)

UNITV: SOFTWARE QUALITY ASSUARANCE

Software Quality: Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews. **Software Quality Assurance**: Statistical Software Quality Assurance, Software reliability, The ISO 9000 quality standards**,** Principles of Software ProcessChange.   **(9)**

Course Outcomes:
Upon completion of this course the students will be able to:
1. Describe principles, concepts and practice of software engineering.
2. Explain the methods and processes of constructing the different types of software systems.
3. Describe Software design and Engineering process
4. Explain testing strategies of software projects and quality of software systems
5. Understand Project planning and quality management process.

TEXT BOOKS:
1. Software Engineering: A practitioner's Approach, Roger S Pressman, 9th Edition. McGrawHill International Edition, 2020
2. Engineering Software Products: An Introduction to Modern Software Engineering: Ian Sommerville, First Edition, Pearson Education, 2019.
3. Agile Product Management with Scrum, Pichler Roman, Pearson Education,2010.

REFERENCE BOOKS:
1. Fundamentals of Software Engineering: Rajib Mall, PHI, 2005.
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India,2010.
3. Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008.
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition,2006.
6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition, 2006.

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year II Semester

18MDCSE104　　　ADVANCED PYTHON

Course Prerequisite: 18CSE101

Course Description:

L	T	P	C
3	0	0	3

Python is a programming language known for its code readability and use of whitespace for user-friendly design, making it easier to use the purpose of coding. Its approach aims to help programmers write clear, logical code for large-scale projects.Python is appreciated for its versatility, flexibility, and object-oriented features. Its ability to do both complex tasks and provide an easy-to-use experience makes it important to learn for Developers, Data Scientists, and other web-based professionals.

Course Objectives:

1. Create and maintain modules and packages
2. Implement OOPS concepts using python
3. Interact with network services
4. Query databases
5. Visualize data

UNIT-I: LIBRARY, FILES AND OOPS
Modules and Packages: Built-in Modules, Importing Modules, Working with Random Modules,
File Operations: Text and Bytes files,0Opening a file, Reading and Writing Files, Other File tools, MS Excel files, Introduction to MS Excel files
Classes And Objects: Classes as User Defined Data Type, Objects as Instances of Classes, Creating Class and Objects, Creating Objects By Passing Values, Variables & Methods in a Class, Inheritance, Polymorphism   **(9)**

UNIT II: EXCEPTION HANDLING, NETWORK PROGRAMMING AND DATABASE PROGRAMMING
Exception Handling: Default Exception and Errors, Catching Exceptions, User defined exception
Networking: Socket Module, Server-client-socket, Connecting client server, Client-server chatting program
Database: Introduction to MySQL, Connections, Executing queries, Transactions   **(9)**

UNIT III: ADVANCED PACKAGES I AND STATISIICS

Numpy: Creating NumPy arrays, Indexing and slicing in NumPy, Downloading and parsing data, Creating multidimensional arrays, NumPy Data types, Array tributes, Indexing and Slicing, Creating array views copies, Manipulating array shapes I/O.

Statistics: Mean, Median, Mode, Z-scores, Bias -variance dichotomy, Sampling and t-tests, Sample vs Population statistics, Random Variables, Probability distribution function, Expected value, Binomial Distributions, Normal Distributions, Central limit Theorem, Hypothesis testing, Z-Stats vs T-stats, Type 1 type 2 error, Chi Square test, ANOVA test and F-stats   **(9)**

UNIT IV: ADVANCED PACKAGES II

Scipy: Introduction to SciPy, Create function, modules of SciPy

Pandas: Using multilevel series, Series and Data Frames, Grouping, aggregating, Merge DataFrames, Generate summary tables, Group data into logical pieces, Manipulate dates, Creating metrics for analysis, Data wrangling, Merging and joining, Analytics Vidhya dataset- Loan Prediction Problem, Data Mugging using Pandas, Building a Predictive Model.   **(9)**

UNIT V: VISUALIZATION

Matplotlib: Scatter plot, Bar charts, histogram, Stack charts, Legend title Style, Figures and subplots, Plotting function in pandas, Labelling and arranging figures, Save plots

Seaborn: Style functions, Color palettes, Distribution plots, Categorical plots, Regression plots, Axis grid objects.   **(9)**

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

1. Discuss the use of classes and objects
2. Describe Modules and Packages
3. Apply the Networking and Database concepts using Python
4. Analyze different machine learning related packages
5. Apply different statistics using Python

TEXT BOOKS:

1. Python for Programmers,, Paul Deitel & Harvey Deitel, 2019, Pearson Education
2. Programming Python,Mark Lutz 4th edition, 2015, Orielly Publications,

REFERENCE BOOK:

1. Expert Python Programming, Tarek Ziadé, 2014, Packt Publications

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.

Dept. of Computer Science & Engineering

Minor

B.Tech. III Year II Semester

18MDCSE201   ADVANCED PYTHON LABORATORY

Course Prerequisite: 18MDCSE104

L	T	P	C
0	0	4	2

Course Description:
        To give practical exposure on advanced concepts like object oriented programming, network programming, database programming, descriptive & inferential statistics programming and data visualization using the advanced packages of python like numpy, pandas, sklearn, matpotlib and seaborn.

Course Objectives:
1. To provide deeper understanding into inter process communication, and database access.
2. To expose the students to the advanced modules of python
3. To familiarize students with different type statistics and their implementation in python
4. To familiarize with different data visualizations using python

LIST OF EXPERIMENTS

1. Write program to create the following classes with appropriate methods
2. Robot
3. ATM Machine

4. Write a program to read a CSV file and display all the rows
5. Write a python program that imports requests and fetch content from the web page
6. Write a program to access to from employee table and display all the employee details of a given department
7. Write a program to perform broad casting on numpy arrays
8. Write a program to Calculate Mean, Median, Mode, Variance, Standard Deviation, Range & comment about the values / draw inferences, for the given dataset in csv file
9. Write a program to Calculate Skewness, Kurtosis & draw inferences on the following data Cars speed and distance
10. Write a program to read excel file and display the some selected rows using pandas
11. Read csv file and display scatter plot, box plots using matplotlip and seaborn
12. Read csv file and display violin plot, joint plot and boxen plot

Course Outcomes:
Upon completion of this course, students should be able to:

1. Understand the OOPS and Networking concepts
2. Differentiate the descriptive and inferential statistics.
3. Draw insights into the data
4. Apply the concepts of numpy and pandas
5. Effective utilization of data

TEXT BOOK:
1. Introduction to Machine Learning with Python, Andreas C. Mueller, Sarah Guido, Orielly Publications, 2016

REFERENCE BOOKS:

1. Fluent Python, Luciano Ramalho , Orielly Publications 2015.
2. Grokking Algorithms: An illustrated guide for programmers and other curious people, Aditya Bhargava, Manning Publications,2016

Mode of evaluation: Continuous Evaluation of the lab Experiments, Record, Viva-voce and External Lab Examination.

Dept. of Computer Science & Engineering

Minor

B. Tech IV-I -Sem.

18MDCSE103   MACHINE LEARNING

Course Prerequisite: NIL

Course Description:

L	T	P	C
3	0	0	3

This course provides a broad introduction to machine learning and statistical pattern recognition. It contains supervised learning (generative/discriminative learning, parametric/non-parametric learning, neural networks, support vector machines), unsupervised learning (clustering, dimensionality reduction, kernel methods)

Course Objectives: -

1. To introduce machine learning problems, various approaches.
2. To give a though understanding of Bayes decision Theory.
3. To impart the need and methods of dimension reduction and clustering
4. To give a good understanding of discriminant based methods, viz., Perceptrons, SVMs.

UNIT I: INTRODUCTION TO MACHINE LEARNING, SUPERVISED LEARNING What Is Machine Learning, Examples of Machine Learning Applications, learning a class from Examples, Vapnik-Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm. **(9)**

UNIT II: THEORY, PARAMETRIC METHODS

Introduction to Bayesian Decision Theory, Classification, Losses and Risks, Discriminant Functions, Utility Theory, Association Rules, Introduction to parametric methods, Maximum Likelihood Estimation, evaluating an Estimator: Bias and Variance, The Bayes' Estimator, Parametric Classification, Regression, Tuning Model Complexity: Bias/Variance Dilemma, Model Selection Procedures. **(9)**

UNIT III: DIMENSIONALITY REDUCTION, CLUSTERING

Introduction, Subset Selection, Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis, Isoma, Locally Linear Embedding, **Introduction** to Clustering, Mixture Densities, k-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Hierarchical Clustering, Choosing the Number of Clusters. **(9)**

UNIT IV: LINEAR DISCRIMINATION MULTILAYER PERCEPTRONS

Introduction, Generalizing the Linear Model, Geometry of the Linear Discriminant, Pairwise Separation, Parametric Discrimination Revisited, Gradient Descent, Logistic Discrimination, Discrimination by Regression, The Perceptron, training a Perceptron, Learning Boolean Functions, Multilayer Perceptrons, MLP as a Universal Approximation, Backpropagation Algorithm, Training Procedures, Tuning the Network Size.   **(9)**

UNIT V: KERNEL MACHINES, MULTIPLE LEARNERS

Introduction, Optimal Separating Hyperplane, The Nonseparable Case: Soft Margin Hyperplan, v-SVM, Kernel Trick, Vectorial Kernels, Defining Kernels, Multiple Kernel Learning, Multiclass Kernel Machines, Kernel Machine for Regressions, One-ClassKernelMachines, Kernel Dimensionality Reduction, Rationale, Generating Diverse Learners, Model Combination Schemes, Voting, Error-correcting output codes, Bagging, Boosting.   **(9)**

Course Outcomes: -

1. Students should have a good understanding of machine learning approaches.
2. Ability to apply Bayes Decision Theory for decision making and error analysis.
3. Ability to do dimensionality reduction.
4. Ability to cluster the given data.
5. Students should have a good understanding of Perceptron, multilayer perceptron's, SVMs.

TEXT BOOK:

1. "Introduction to Machine learning" by Ethem Alpaydin Second Edition, MIT Press.

REFERENCES:

1. R. O. Duda, P. E. Hart and D. G. Stork, "Pattern Classification", John Wiley, 2001.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

Mode of Evaluation: Assignments, Internal Mid Examinations, End Semester Examination.