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 2020-21

and

B. Tech. Lateral Entry Scheme from the academic year 2021-22

B.TECH. COMPUTER SCIENCE & ENGINEERING

Vision and Mission of the Institution

Vision	To become a globally recognized research and academic institution and thereby contribute to technological and socio-economic development of the nation
Mission	To foster a culture of excellence in research, innovation, entrepreneurship, rational thinking and civility by providing necessary resources for generation, dissemination and utilization of knowledge and in the process create an ambience for practice-based learning to the youth for success in their careers.

Vision and Mission of the Department

Vision	To excel in technical education and research in area of Computer Science & Engineering and to provide expert, proficient and knowledgeable individuals with high enthusiasm to meet the societal challenges
Mission	➢ To provide an open environment to the students and faculty that promotes professional and personal growth. ➢ To impart strong theoretical and practical background across the computer science discipline with an emphasis on software development and research. ➢ To inculcate the skills necessary to continue their education after graduation, as well as for the societal needs.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Gain Successful Professional career in IT industry as an efficient software engineer.

PEO2: Succeed in Master/Research programmes to gain knowledge on emerging technologies in Computer Science & Engineering.

PEO3: Grow as a responsible computing professional in their own area of interest with intellectual skills and ethics through lifelong learning approach to meet societal needs.

PROGRAM OUTCOMES (POs)

At the end of the programme, graduate will be able to

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.

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

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

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

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: Apply mathematical foundations, algorithmic principles and computing techniques in the modelling and design of computer-based systems.

PSO 2: Design and develop software in the areas of relevance under realistic constraints.

PSO 3: Analyze real world problems and develop computing solutions by applying concepts of Computer Science.

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE
MADANAPALLE

B. Tech Four Year Curriculum Structure

Branch: COMPUTER SCIENCE & ENGINEERING

Total Credits	160 Credits for 2020(Regular) & 121 Credits for 2021(Lateral Entry) Admitted Batch
	163 Credits for 2021(Regular) & 124 Credits 2022(Lateral Entry) Admitted Batch onwards

I. Induction Program and Holistic Development Activities

Sl.No.	Title	Duration
1	Induction Programme (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

R20 - Curriculum Structure

I Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	BSC	20MAT101	Engineering Calculus	3	1	0	4	4
2	BSC	20PHY102	Applied Physics	3	1	0	4	4
3	ESC	20EEE101	Basic Electrical Engineering	3	1	0	4	4
4	ESC	20CSE101	Programming for Problem Solving (Python)	2	0	3	5	3.5
5	HSMC	20ENG201	English for Professional Purposes Laboratory	0	0	2	2	1
6	BSC	20PHY201	Physics Laboratory	0	0	3	3	1.5
7	ESC	20EEE201	Electrical Engineering Laboratory	0	0	3	3	1.5
Total				**11**	**3**	**11**	**25**	**19.5**

I Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	HSMC	20ENG101	Professional English	3	0	0	3	3
2	BSC	20MAT110	Linear Algebra	3	0	0	3	3
3	BSC	20CHE101	Engineering Chemistry	3	0	0	3	3
4	ESC	20CSE102	C Programming and Data Structures	3	0	0	3	3
5	ESC	20ME101	Engineering Graphics	2	0	2	4	3
6	BSC	20CHE201	Chemistry Laboratory	0	0	3	3	1.5
7	ESC	20CSE201	C Programming and Data Structures Laboratory	0	0	3	3	1.5
8	ESC	20CSE202	Engineering and IT Workshop	0	0	3	3	1.5
Total				**14**	**0**	**11**	**25**	**19.5**

(L = Lecture, T = Tutorial, P = Practical)

Dept. of Computer Science & Engineering

II Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	BSC	20MAT111	Probability and Statistics for Computer Science	3	0	0	3	3
2	PCC	20CSE103	Computer System Architecture	3	0	0	3	3
3	PCC	20CSE104	Data Structures	3	0	0	3	3
4	PCC	20CSE105	Object Oriented Programming using C++	2	1	0	3	3
5	PCC	20CSE106	Database Management Systems	2	1	0	3	3
6	PCC	20CSE203	Data Structures Laboratory	0	0	3	3	1.5
7	PCC	20CSE204	Object Oriented Programming using C++ Laboratory	0	0	3	3	1.5
8	PCC	20CSE205	Database Management Systems Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course – I (Refer ANNEXURE-IV)	1	0	2	3	2
10	MC	20CHE901	Environmental Science	2	0	0	2	0
Total				**16**	**2**	**11**	**29**	**21.5**

II Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	HSMC	20HUM101	Economics and Financial Accounting for Engineers	3	0	0	3	3
2	BSC	20MAT112	Discrete Mathematical Structures	3	0	0	3	3
3	ESC	20CSE107	Operating Systems Fundamentals	3	0	0	3	3
4	PCC	20CSE108	JAVA Programming	3	0	0	3	3
5	PCC	20CSE109	Design and Analysis of Algorithms	2	1	0	3	3
6	PCC	20CSE206	Operating Systems Fundamentals Laboratory	0	0	3	3	1.5
7	PCC	20CSE207	JAVA Programming Laboratory	0	0	3	3	1.5
8	PCC	20CSE208	Design and Analysis of Algorithms Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course – II (Refer ANNEXURE-IV)	1	0	2	3	2
10	MC	20HUM901	Indian Constitution	2	0	0	2	0
Total				**17**	**1**	**11**	**29**	**21.5**

(L = Lecture, T = Tutorial, P = Practical)

III Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PCC	20CSE110	Formal Languages and Automata Theory	2	1	0	3	3
2	PCC	20CSE111	Computer Networks	3	0	0	3	3
3	PCC	20CSE112	Machine Learning	3	0	0	3	3
4	OE		Open Elective-I	3	0	0	3	3
5	PE		Professional Elective-I	3	0	0	3	3
6	PCC	20CSE209	Computer Networks Laboratory	0	0	3	3	1.5
7	PCC	20CSE210	Machine Learning Laboratory	0	0	3	3	1.5
8	SC		Skill Oriented Course – III (Refer ANNEXURE-IV)	1	0	2	3	2
9	MC	20CE901	Disaster Management	2	0	0	2	0
10	PROJ	20CSE701	Summer Internship - 1*	0	0	3	3	1.5
Total				**17**	**1**	**11**	**29**	**21.5**

* 2 Months internship during 2nd year summer vacation and to be evaluated in III Year I Semester

III Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PCC	20CSE113	Compiler Design	3	0	0	3	3
2	PCC	20CSE114	Internet of Things	3	0	0	3	3
3	PCC	20CSE115	Software Engineering	3	0	0	3	3
4	OE		Open Elective-II	3	0	0	3	3
5	PE		Professional Elective-II	3	0	0	3	3
6	PCC	20CSE211	Compiler Design Laboratory	0	0	3	3	1.5
7	PCC	20CSE212	Internet of Things Laboratory	0	0	3	3	1.5
8	PCC	20CSE213	Software Engineering Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course – IV (Refer ANNEXURE-IV)	1	0	2	3	2
10	MC	20HUM902**/ 20HUM102#	Universal Human Values	2/3	0	0	2/3	0/3
Total				**18/19**	**0**	**11**	**29/30**	**21.5/24.5**

** 20HUM902 Universal Human Values is offered as non-credit mandatory course for 2020 (Regular) & 2021 (Lateral Entry) Admitted Batch

20HUM102 Universal Human Values is offered as three credit course for 2021 (Regular) & 2022(Lateral Entry) Admitted Batch onwards

(L = Lecture, T = Tutorial, P = Practical)

IV Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PE		Professional Elective-III	3	0	0	3	3
2	PE		Professional Elective-IV	3	0	0	3	3
3	PE		Professional Elective-V	3	0	0	3	3
4	OE		Open Elective-III	3	0	0	3	3
5	OE		Open Elective-IV	3	0	0	3	3
6	OE-HSMC		Open Elective-V (Taken from Humanities & Social Science)	3	0	0	3	3
7	SC		Skill Oriented Course – V (Refer ANNEXURE-IV)	1	0	2	3	2
8	PROJ	20CSE702	Summer Internship - 2*	0	0	6	6	3
Total				**19**	**0**	**8**	**27**	**23**

* 2 Months internship during 3rd year summer vacation and to be evaluated in IV Year I Semester

IV Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PROJ	20CSE703	Project Work and Internship	0	0	24	24	12
Total				**0**	**0**	**24**	**24**	**12**

(L = Lecture, T = Tutorial, P = Practical)

ANNEXURE - I

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

ANNEXURE - II

OPEN ELECTIVE – I

(To be offered under MOOC's Category from SWAYAM – NPTEL)

Sl. No.	Course Code	Course Title	Course Offered by Department of
1	20HUM3M01	Project Management for Managers	Management Studies
2	20HUM3M02	Ethics in Engineering Practice	Management Studies
3	20HUM3M03	E – Business	Management Studies
4	20CE3M01	Integrated Waste Management for Smart City	Civil
5	20CE3M02	Soil and Water Conservation Engineering	Civil
6	20CE3M03	Plastic Waste Management	Civil
7	20CE3M04	Safety in Construction	Civil
8	20ME3M01	Operations Management	Mechanical
9	20ME3M02	Operations Research	Mechanical
10	20ME3M03	Design Thinking and Innovation	Mechanical
11	20EEE3M01	Non-Conventional Energy Sources	EEE
12	20EEE3M02	Design of Photovoltaic Systems	EEE
13	20ECE3M01	Microprocessors and Interfacing	ECE
14	20ECE3M02	Microprocessors and Microcontrollers	ECE
15	20ECE3M04	System Design Through Verilog	ECE
16	20IE3M01	Intellectual Property Rights and Competition Law	Multidisciplinary
17	20IE3M02	Introduction to Research	Multidisciplinary
18	20IE3M03	Roadmap for Patent Creation	Multidisciplinary
19	20IE3M04	Energy Conversion Technologies (Biomass And Coal)	Multidisciplinary
20	20IE3M05	Research Methodology	Multidisciplinary
Any new Interdisciplinary Course offered by SWAYAM NPTEL can be appended in future.			

OPEN ELECTIVE – II (To be offered under Conventional Mode)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20MAT301	Advanced Numerical Methods	Mathematics
2	20MAT302	Engineering Optimization	Mathematics
3	20PHY301	Optical Physics and its Applications	Physics
4	20PHY302	LASER Physics and Advanced LASER Technology	Physics
5	20CHE301	Introduction to Petroleum Industry	Chemistry
6	20CHE302	Green Chemistry and Catalysis for Sustainable Environment	Chemistry
7	20CE301	Ground Improvement Techniques	Civil
8	20CE302	Environmental Impact Assessment	Civil
9	20CE303	Watershed Management	Civil
10	20ME301	Material Science for Engineers	Mechanical
11	20ME302	Elements of Mechanical Engineering	Mechanical
12	20EEE301	Industrial Electrical Systems	EEE
13	20EEE302	Introduction to MEMS	EEE
14	20ECE301	Bio-Medical Electronics	ECE
15	20ECE302	VLSI Design	ECE
Any new Interdisciplinary Course can be appended in future.			

OPEN ELECTIVE – III (To be offered under MOOC's Category from SWAYAM – NPTEL)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20HUM3M04	Management Information System	Management Studies
2	20HUM3M05	Business Analytics & Text Mining Modeling Using Python	Management Studies
3	20CE3M05	Remote Sensing and GIS	Civil
4	20CE3M06	Wastewater Treatment and Recycling	Civil
5	20CE3M07	Building Materials And Composites	Civil
6	20ME3M04	Power Plant Engineering	Mechanical
7	20ME3M05	Mechatronics and Manufacturing Automation	Mechanical
8	20EEE3M03	Introduction to Smart Grid	EEE
9	20EEE3M04	Transducers For Instrumentation	EEE
10	20IE3M06	Learning Analytics Tools	Multidisciplinary
Any new Interdisciplinary Course offered by SWAYAM NPTEL can be appended in future.			

OPEN ELECTIVE – IV (To be offered under Conventional Mode)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20PHY303	Thin Film Technology and its Applications	Physics
2	20CHE303	Introduction to Nano Science and Technology	Chemistry
3	20CHE304	Computational Methods in Materials Science and Engineering	Chemistry
4	20CE304	Green Buildings and Energy Conservation	Civil
5	20CE305	Environmental Engineering	Civil
6	20ME303	Total Quality Management	Mechanical
7	20ME304	Entrepreneurship	Mechanical
8	20EEE303	Robotics	EEE
9	20EEE304	Electrical Safety	EEE
10	20ECE303	Embedded Systems	ECE
11	20ECE304	DSP Architecture	ECE
12	20ECE305	Community Radio Technology	ECE
Any new Interdisciplinary Course can be appended in future.			

OPEN ELECTIVE – V (HUMANITIES) (To be offered under Conventional Mode)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20HUM301	Principles of Management	Humanities
2	20HUM302	Human Resource Development	Humanities
3	20HUM303	Soft Skills	Humanities
4	20HUM304	National Cadet Corps	Humanities
Any new Interdisciplinary Course can be appended in future.			

ANNEXURE – III

LIST OF PROFESSIONAL ELECTIVES

Professional Elective – I		
Sl. No.	**Course Code**	**Course Title**
1.	20CSE401	Cryptography and Network Security
2.	20CSE402	Real Time Operating Systems
3.	20CSE403	Artificial Intelligence
4.	20CSE404	Web Technologies
5.	20CSE405	Digital Image Processing
Any advanced courses can be appended in future.		

Professional Elective – II (To be offered under MOOC's Category from SWAYAM – NPTEL)		
Sl. No.	**Course Code**	**Course Title**
1.	20CSE4M01	Software Testing
2.	20CSE4M02	Introduction to Soft computing
3.	20CSE4M03	Online Privacy
4.	20CSE4M04	Privacy and Security in Online Social Media
5.	20CSE4M05	Ethical Hacking
6.	20CSE4M06	Mobile Computing
7.	20CSE4M07	Computer Vision
8.	20CSE4M08	Cloud Computing and Distributed Systems
Any other new Disciplinary Course which doesn't exist in the Curriculum can be appended in future.		

Professional Elective – III		
Sl. No.	**Course Code**	**Course Title**
1.	20CSE406	Data Warehousing and Data Mining
2.	20CSE407	Data Visualization Techniques
3.	20CSE408	Malware Analysis
4.	20CSE409	Network Design and Technologies
5.	20CSE410	Design Patterns
6.	20CSE411	DevOps
Any advanced courses can be appended in future.		

Professional Elective – IV		
Sl. No.	**Course Code**	**Course Title**
1.	20CSE412	Real Time Systems
2.	20CSE413	Deep Learning
3.	20CSE414	Exploratory Data Analysis
4.	20CSE415	Software Project Management
5.	20CSE416	Information Retrieval
6.	20CSE417	Big Data Analytics
Any advanced courses can be appended in future.		

Professional Elective – V		
Sl. No.	**Course Code**	**Course Title**
1.	20CSE418	Cyber Security
2.	20CSE419	Software Quality Assurance
3.	20CSE420	Human Computer Interaction
4.	20CSE421	Database Security
5.	20CSE422	Software Defined Networks
6.	20CSE423	Reinforcement Learning
Any advanced courses can be appended in future.		

ANNEXURE – IV

SKILL ORIENTED COURSES

Skill Oriented Course - I		
Sl.No	**Course Code**	**Course Title**
1	20CSE601	Web Scripting
2	20CSE602	Android Application Development
Any advanced courses can be appended in future		

Skill Oriented Course - II		
Sl.No	**Course Code**	**Course Title**
1	20ENG601	Corporate Communication
Any advanced courses can be appended in future		

Skill Oriented Course - III		
Sl.No	**Course Code**	**Course Title**
1	20CSE603	Multimedia Computing
2	20CSE604	Python for Data Science
Any advanced courses can be appended in future		

Skill Oriented Course - IV		
Sl.No	**Course Code**	**Course Title**
1	20CSE605	Full Stack Development
2	20CSE606	AI Tools, Techniques and Applications
Any advanced courses can be appended in future		

Skill Oriented Course - V		
Sl.No	**Course Code**	**Course Title**
1	20CSE607	Blockchain Architecture
2	20CSE608	NoSQL
Any advanced courses can be appended in future		

ANNEXURE - V

MINOR IN COMPUTER SCIENCE & ENGINEERING

(Applicable to CE, EEE, ME and ECE)

Stream Name: Computer Science

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
III Year I Semester								
1		20MDCSE101	Data Structures (Except EEE Branch)	3	0	0	3	3
	Professional Core Course	20MDCSE102	Database Management Systems	3	0	0	3	3
2		20MDCSE103	Software Engineering	3	0	0	3	3
III Year II Semester								
3		20MDCSE104	Web Technologies	3	0	0	3	3
4	**Professional Core Course**	20MDCSE105	Data Visualization Techniques	3	0	0	3	3
5		20MDCSE201	Web Technologies Laboratory	0	0	4	4	2
IV Year I Semester								
6	**Professional Core Course**	20MDCSE106	Data Warehousing and Data Mining	3	0	0	3	3
7		20MDCSE107	Cyber Security	3	0	0	3	3
			Total	**18**	**0**	**4**	**22**	**20**

ANNEXURE - VI

HONORS IN COMPUTER SCIENCE & ENGINEERING

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
III Year I Semester								
1	**Professional Elective Course (Choose any two from three courses)**	20HDCSE101	GO Programming	3	0	0	3	3
2		20HDCSE102	Advanced Information Systems Security	3	0	0	3	3
3		20HDCSE103	Data Communications	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)**	20HDCSE104	Mining Massive Datasets	3	0	0	3	3
5		20HDCSE105	GP - GPU Computing	3	0	0	3	3
6		20HDCSE106	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 two from three courses)**	20HDCSE107	Natural Language Processing	3	0	0	3	3
8		20HDCSE108	Crypto Currencies	3	0	0	3	3
9		20HDCSE109	Digital Forensics	3	0	0	3	3
10	**SOC**	20HDCSE601	Advanced Machine Learning	1	0	2	3	2
	Sub Total			**7**	**0**	**2**	**9**	**8**
	Total			**19**	**0**	**2**	**21**	**20**

I Year I Semester

B. Tech I Year I Semester

20MAT101 ENGINEERING CALCULUS

L	T	P	C
3	1	0	4

Pre-requisite: Mathematics at Intermediate or Equivalent Level

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. To introduce the basic concepts of definite integrals, improper integrals, Beta and Gamma functions.
2. To acquire knowledge on mean value theorems in calculus.
3. To illustrate various techniques of testing the convergence of infinite series and introduces the functions of sine and cosine series.
4. To familiarize the knowledge of limit, continuity and the derivatives, extreme values in Multivariable.
5. To emphasize the role of Double and Triple integrals in dealing with area and volume of the regions.

UNIT I INTEGRAL CALCULUS 12 hours

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.

UNIT II DIFFERENTIAL CALCULUS 12 hours

Rolle’s Theorem, Mean value theorems, Taylor’s and Maclaurin theorems with remainders (without proofs); indeterminate forms, Maxima and minima.

UNIT III SEQUENCE AND SERIES 12 hours

Sequence and Series, their Convergence and 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.

UNIT IV MULTIVARIABLE DIFFERENTIAL CALCULUS 12 hours

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers.

UNIT V MULTIVARIABLE INTEGRAL CALCULUS 12 hours

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 (double integration), triple integrals, gradient, curl and divergence, Green’s, Stokes and Gauss divergence theorems (without proofs).

Course Outcomes:

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

1. Evaluate the definite integrals, Beta and Gamma functions and calculate length of curve and underlying area.
2. Relate the results of mean value theorems in calculus to Engineering problems.
3. Use the Power series and Fourier series for ascertaining the stability and convergence of various techniques.
4. Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.
5. Compute the area and volume by interlinking them to appropriate double and triple integrals.

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

20PHY102 APPLIED PHYSICS

L	T	P	C
3	1	0	4

Pre-requisite: Plus two level physics course

Course Description:

Applied Physics for Electrical, Electronics and Computer Engineers is a basic physics course which provides fundamental knowledge to understand the concepts of Waves, Optics, Quantum Mechanics, Semiconductors, Lasers and Fiber Optics.

Course Objectives:

1. Expose students in understanding the basic laws of nature through wave equation using the principles of oscillations and waves.
2. Analyze and understand the concepts of waves and optics to prepare the students for advanced level courses.
3. Expose students to theoretical and mathematical aspects of Interference, Diffraction techniques, Polarization and Lasers for testing of materials.
4. Develop knowledge and understanding the fundamental concepts of Quantum mechanics, Semiconductors and Fiber Optics.
5. Adaptability to new developments in science and technology.

UNIT I WAVES AND OSCILLATIONS 11 hours

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, one dimensional wave equation, solution for wave equation, velocity of a transverse wave along a stretched string, modes of vibration of stretched string, reflection and transmission waves at boundary, standing waves, standing wave ratio.

UNIT II OPTICS 13 hours

Superposition of waves, interference of light by division of wavefront - Young's double slit experiment, interference of light by division of amplitude- interference in thin film by reflection, Newton's rings experiment.

Diffraction, Farunhofer diffraction due to single slit, double slit and Diffraction grating (Nslit).

Polarization, Types of polarization, Polarization by reflection, refraction and double refraction,

Nicol's prism. Half wave and Quarter wave plates.

UNIT III QUANTUM MECHANICS 12 hours

De Broglie's hypothesis, Uncertainty principle (Qualitative only), Postulates of quantum mechanics, Time-dependent and time-independent Schrodinger equations for wave function, Free-particle wave function and wave-packets (group velocity & phase velocity), Solution of wave equation: Solution of stationary-state, Schrodinger equation for one dimensional problems – particle in a box, Scattering from a potential barrier and principle of tunnelling- operation of scanning tunnelling microscope.

UNIT IV FREE ELECTRON THEORY & SEMICONDUCTORS 12 hours

Free electron theory of metals (drift velocity and electrical conductivity), Fermi energy level, density of states, Kronig-Penney model (Qualitative only) and origin of energy bands, band structure of 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), Drift and Diffusion Current, Hall effect.

UNIT V LASERS & FIBER OPTICS 12 hours

Introduction to lasers, characteristics of laser, spontaneous and stimulated emission, Einstein's coefficients; population inversion, excitation mechanisms, solid-state lasers – ruby laser, gas Lasers - He-Ne Laser, applications of lasers.

Fiber Optics: Principle, Construction and working of optical fiber, Acceptance angle, Numerical aperture, Types of fiber, Fiber optic communication system.

Course Outcomes:

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

1. Describe a mathematical wave equation using the principles of waves and oscillations
2. Apply the knowledge for materials testing using Interference, Diffraction & Polarization techniques.
3. Understand the idea of wave function and to solve Schrodinger equation for simple potentials.
4. Explain the role of semiconductors in different realms of physics and their applications in both science and technology.
5. Acquire the basic knowledge of lasers and fiber optics.

Text Books:

1. Engineering Physics –Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering Physics –K. Thyagarajan, McGraw Hill Publishers.

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. B.G. Streetman, "Solid State Electronic Devices", Prentice Hall of India, 1995.
4. Concepts of Modern Physics by Arthur Beiser, 7th Edition, 2017.

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

B. Tech I Year I Semester

20EEE101 BASIC ELECTRICAL ENGINEERING

L	T	P	C
3	1	0	4

Pre-requisite Intermediate Physics

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 materials, 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 material 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 12 hours

Electrical circuit elements, 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.

UNIT II AC CIRCUIT ANALYSIS 12 hours

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.

UNIT III MAGNETIC MATERIALS AND TRANSFORMERS 12 hours

Magnetic materials, B-H characteristics, ideal and practical transformer, principle of operation, emf equation, equivalent circuit, losses in transformers, regulation and efficiency.

UNIT IV DC AND AC MACHINES 12 hours

Construction, working, emf equation of DC generator, methods of excitation, speed control of dc motor. Introduction to different types of AC motors, Three Phase Induction Motors - Generation of rotating magnetic fields, construction, working and starting methods: D.O.L, Autotransformer starter. Introduction to Alternators.

UNIT V RECTIFIERS AND ELECTRICAL INSTALLATIONS 12 hours

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 – Current carrying capability, Insulation Strength; Earthing.

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 understand magnetic materials and to 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.

Reference Books:

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

Dept. of Computer Science & Engineering

B. Tech I Year I Semester

20CSE101 PROGRAMMING FOR PROBLEM SOLVING (PYTHON)

L	T	P	C
2	0	3	3.5

Pre-requisite: None

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:

This course enables students to

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.
6. Getting exposed to the basics of Object Oriented Programming using Python

UNIT I: INTRODUCTION 12 hours

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?

UNIT II: OPERATORS AND EXPRESSIONS 12 hours

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.

UNIT-III: DATA STRUCTURES 12 hours

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.

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

UNIT-V:

Python packages: Predefined Packages and User-defined Packages, Package Creation.

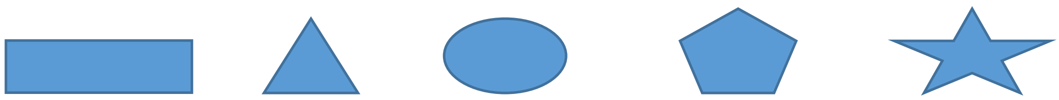
Object Oriented Programming using Python: Introduction to OOP, Creating Classes and Objects in Python, Creating Methods in Python

Brief Tour of the Standard Library: Turtle

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) Create a class by name Student with instance variables such as roll_no, name, year_of_study, branch, section, and marks in any five subjects. The class should also contain one method for calculating the percentage of marks and the other method for printing a report as follows:

Roll No.	Name	Year	Section	Branch	M1	M2	M3	M4	M5	Percentage
101	abc	I	A	CSE	58	68	95	47	56	64.8

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



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/thinkpython/)

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: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year I Semester

20ENG201 ENGLISH FOR PROFESSIONAL PURPOSES LABORATORY

(Common to all branches)

L	T	P	C
0	0	2	1

Pre-requisite None

Course Description:

English language communication is a social phenomenon and students need to be able to function in the society at large as the communicators before entering the professional world. The present course equips the students with the basic functions of English language communication, which are required not only in their day-to-day lives but also profoundly significant for their future professional, academic training and their careers in the industry. The course mainly focuses on the achievement of communicative proficiency of the students coupled with the necessary linguistic inputs.

Course Objectives:

This course enables the student to –

1. Get aquatinted with the basic communicative functions.
2. Engage effectively in learning various functions of English language communication.
3. Enhance their narration abilities in past experiences and future plans and goals/events.
4. Develop their abilities in expressing opinion.
5. Provide speaking practice in speech.

Course contents:

Greeting and Introductions (L & S)

- Greeting on different occasions and responding to greetings **(L & S)**
- Wishing on various occasions, taking leave and saying goodbye **(L & S)**
- Introducing oneself and others **(L & S)**
- Asking for introduction and responding to introduction **(L & S)**
- Developing a short personal profile **(R &W)**

Describing: (L, S, R & W)

- Using adjectives **(Vocab)**
- Degrees of comparison **(Grammar)**
- Common words, phrases, and expressions used for description **(Vocab)**
- Describing people, places and objects **(L, S, R & W)**
- Reading and writing descriptive paragraphs **(R &W)**

Narrating (L, S, R & W)

- Talking about past experiences and events **(L & S)**
- Talking about memorable incidents or events **(L & S)**
- Techniques of narration and narrative tenses **(Grammar)**
- Composing and narrating a story **(R &W)**

Planning and Predicting (L, S, R & W)

- Talking about future events **(L & S)**
- Making promises and giving assurances **(L & S)**
- Predicting future events **(L & S)**
- Writing and organising a short plan of an event **(R &W)**

Instructions and directions (L, S, R & W)
- Forming imperative sentences (Grammar)
- Reading and writing short instruction manuals **(R &W)**
- Writing a recipe/ procedure **(R &W)**
- Giving directions

Enquiring: (L, S, R & W)
- Open and closed ended questions **(Grammar)**
- Asking for information and giving information **(L & S)**
- Telephonic enquiry **(L & S)**
- Official enquiries through emails and letters **(R &W)**

Requesting: (L, S, R & W)
- Polite expressions
- Modal verbs and key phrases for requesting **(Grammar and vocab)**
- Official requests through emails and letters **(R &W)**

Comparing and contrasting: (L, S, R & W)
- Words and phrases used for comparison and contrast **(Vocab)**
- Comparing qualities/properties/quantities of people, places and objects **(L & S)**
- Composing comparison and contrast paragraphs **(R &W)**

Expressing opinion: (L, S, R & W)
- Language expressions used for expressing opinions **(Vocab)**
- Developing opinion based paragraphs **(R &W)**
- Discourse markers and linkers used in opinion based paragraphs **(R &W)**

Public Speaking: (L, S, R & W)
- Techniques and strategies required for public speaking **(L & S)**
- Developing and organising a short speech **(R &W)**
- Presentation skills required for public speaking **(L & S)**

Course Outcomes:

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

1. Develop their confidence while giving introduction, describing a place, & giving directions. (3,4,5)
2. Use various functions of English like asking for & giving information**,** inviting people for events/occasions, & requesting people. (3,4,5)
3. Narrate the past experiences and events in speaking and wring (3,4,5)
4. Express their views and opinions logically and appropriately in spoken and written format. (3,4,5,6)
5. Deliver logically organized speeches and present them without hesitations. (3,4,5, 6)

Text Books:

1. Leo Jones; Functions of English, Published by: Cambridge University Press.
2. Leo Jones; Let’s Talk Level 1, 2, 3, Published by: Cambridge University Press.
3. 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: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year I Semester

20PHY201 PHYSICS LABORATORY

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 optics to 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:

{Out of 17 experiments any 12 experiments (minimum 10) must be performed in a semester}

1. Spring constant - Coupled Pendulums.
2. Study of resonance effect in series and parallel LCR circuit.
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. Thickness of a given wire - Wedge Method.
8. Dispersive power of prism – Spectrometer.
9. Frequency of the tuning fork - Melde's apparatus.
10. Determination of particle size using Laser.
11. Width of single slit - Diffraction due to Single Slit.
12. Torsional Pendulum.
13. Determination of the numerical aperture of a given optical fiber and hence to find its acceptance angle.
14. Measurement of *e/m* of electron (Thomson's method)
15. Energy gap of a material of p-n junction.
16. Determination of Planck's constant.
17. Ferroelectric hysteresis (B-H Curve).

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.

Reference Books:

1. Physics Laboratory Manual
2. Optics, A. Ghatak, 4th Edition, Tata McGraw-Hill, New Delhi 2011.
3. Fundamentals of Optics, F. A. Jenkins and H. E. White, 4th edition, McGraw-Hill Inc., 1981.
4. Engineering Mechanics, 2nd ed. — MK Harbola
5. Introduction to Electrodynamics- David J Griffiths

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year I Semester

20EEE201 ELECTRICAL ENGINEERING LABORATORY

L	T	P	C
0	0	3	1.5

Prerequisite: None

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 multimeter, 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, wattmeter, multi-meter, oscilloscope. Study of passive components - 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 cut-out 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. Wavelength of the spectral lines - Diffraction Grating.
6. 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 (1) a lamp/fan point, (2) Staircase or Corridor Winding.
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 voltage, current and power in a single-phase circuit using voltmeter, ammeter and wattmeter. Also, calculate the power factor of the circuit.
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).

11. Regulated power supply for generating a constant DC Voltage.
12. Fabrication of a given electronic circuit on a PCB and test the same.

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

I Year II Semester

B. Tech I Year II Semester

20ENG101 PROFESSIONAL ENGLISH

L	T	P	C
3	0	0	3

Pre-requisite None

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 9 hours

Grammar - Tense, Reported Speech, Modals, Conditionals; Vocabulary development - prefixes, suffixes, compound words, synonyms & antonyms.

UNIT II READING SKILLS & WRITTEN COMMUNICATION 9 hours

Reading - short comprehension passages, practice in skimming, scanning and predicting; Writing- completing sentences, developing hints; Paragraph writing- topic sentence, main ideas, coherence.

UNIT III VERBAL & NON-VERBAL ASPECTS 9 hours

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.

UNIT IV CONVERSATIONS 9 hours

Listening-short texts & conversing, formal and informal conversations, short group conversations, speaking about oneself, sharing information of a personal kind speaking about one's friend.

UNIT V BUSINESS ENVIRONMENT & ETIQUETTES 9 hours

Greeting & taking leave; Writing e-mails, memos, reports, etc.

Course Outcomes:

At the end of the course, students 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.

Text Books:

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.

Reference Books

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 http://www.cambridgeenglish.org/in/
9 https://www.rong-chang.com/
10 https://www.rong-chang.com/

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

B. Tech I Year II Semester

20MAT110 LINEAR ALGEBRA

L	T	P	C
3	0	0	3

Pre-requisite **20MAT101**

Course Description:

Linear algebra has widespread applications in engineering and science. In this course, various methods of solving system of linear equations, as applicable in the information technology and electrical circuits are highlighted. The concept of reduction of number of variables in systems has been introduced and effect of change of basis from the view point of computer graphics has been explained. Finally, basics involved in search engine operations by orthogonalisation and least squares optimization have been explained.

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 subspaces.
3. To become proficient in solving computational problems of linear algebra.
4. To understand the axiomatic structure of modern mathematics and learn to construct simple proof.
5. To gain basic knowledge of search engine operations and optimization path.

UNIT I LINEAR EQUATIONS AND MATRICES 9 hours

System of linear equations, Gaussian elimination, Gauss-Jordan method, LU and LDU factorization, block matrices, inverse of matrices, elementary matrices, permutation matrix, Eigen value and Eigen vectors, Cayley -Hamilton Theorem (without proof), applications to cryptography and electrical network.

UNIT II VECTOR SPACE 9 hours

The n-space $R\ n$ and vector space, subspaces, bases, linear combination, span, linear independence, dimensions, finite dimensional, Row and column spaces, Rank and nullity, Bases for subspace, invertibility, application in interpolation.

UNIT III LINEAR TRANSFORMATIONS 9 hours

Basic Properties of Linear transformations, invertible linear transformation, matrices of linear transformations.

UNIT IV VECTOR SPACE OF LINEAR TRANSFORMATIONS 9 hours

Vector space of linear transformations, change of bases, similarity, application to computer graphics.

UNIT V INNER PRODUCT SPACES 9 hours

Dot Products and Inner products, the lengths and angles of vectors, matrix representations of inner products, Gram-Schmidt orthogonalisation, orthogonal projections, relations of fundamental subspaces, orthogonal matrices and isometrics, singular value decomposition (SVD), applications to least square solutions.

Course Outcomes:

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

1. Solve systems of linear equations using Gaussian elimination and matrix inversion.
2. Understand the concepts of vector space and subspace, linear independence and use them in network systems. Apply principles of matrix algebra to linear transformations in solving engineering problems.
3. Use the concepts of similarity of transformations in computer graphics.
4. Demonstrate understanding of inner products, associated norms and interlink to search operations on network.

Text Books:

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

B. Tech I Year II Semester

20CHE101 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

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

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

Course Objectives:
Students will
1. 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 and industry

UNIT I IMPURITIES PRESENT IN WATER AND WATER TREATMENT **9 hours**
Impurities present in Water: Impurities in water (BIS and WHO standards), Hardness of water-determination of hardness - EDTA Method (numerical problems), Alkalinity of water (numerical problems), Estimation of Dissolved Oxygen by Winkler's method and its importance and Chlorides. Disadvantages (industry level) of using hard water (Boiler corrosion, Caustic embrittlement, Scale and Sludges). Softening of water (Ion exchange method), Treatment of brackish water by Reverse Osmosis method. Water treatment for civic applications: coagulation, sedimentation, filtration, sterilization - chlorination and ozonation. Concept of break point chlorination.

UNIT II PERIODIC PROPERTIES AND ORGANIC REACTIONS **7 hours**
Periodic properties: Electronic configurations, atomic and ionic sizes, ionization energies, oxidation states, molecular geometries. Organic Reactions: Introduction to substitution (SN^1 and SN^2), elimination (E_1 and E_2) - Addition, Condensation and Free Radical Polymerization Reaction (only the mechanism).

UNIT III SPECTROSCOPY **8 hours**
Basic Principle and Applications of UV-Visible, FT-IR, Raman, Microwave and Nuclear Magnetic Resonance (NMR) Spectroscopy

UNIT IV THERMODYNAMICS AND ELECTROCHEMISTRY **11 hours**
Thermodynamics: Systems, State Functions, Thermodynamic Functions: Work, Energy, Entropy and Free energy. Estimations of Entropy in Isothermal, Isobaric and Isochoric processes. Electrochemistry: Free energy and EMF. Cell potentials, the Nernst equation and applications. Batteries (Lead-Acid and Lithium ion) and Fuel-Cells (H_2-O_2).

UNIT V ENGINEERING MATERIALS, NANOSCIENCE & NANOTECHNOLOGY **10 hours**
Engineering Materials: Cement Materials and Manufacturing Process. Reactions in setting and hardening of Cement. Lubricants – definition, Properties of lubricants – Viscosity, Viscosity Index, Flash Point and Pour Point. Nanomaterials: Introduction, Classes/Types, Chemical synthesis of

Nanomaterials: Chemical Vapor Deposition method (Carbon Nanotubes), Characterization by powder XRD (Scherrer's equation). Applications of Nanomaterials: Solar Energy and Photocatalytic Dye Degradation (TiO_2).

Course Outcomes:

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

1. Analyse 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. P. W. Atkins & Julio de Paula, 'The Elements of Physical Chemistry', Ninth edition (Oxford University Press, Oxford 2010)

2 C. N. Banwell, Fundamentals of Molecular Spectroscopy, Fourth Edition, (Tata McGraw Hill, 2008).

3 C. N. Banwell, Fundamentals of Molecular Spectroscopy, Fourth Edition, (Tata McGraw Hill, 2008).

4 Dr. S. S. Dara and Dr. S. S. Umare, A Textbook of Engineering Chemistry,1 st Edition., (S. Chand & Company Ltd, 2000).

5. T. Pradeep, Nano: The Essentials, 1 st Edition, (Tata McGraw-Hill Publishing Company Limited, 2017).

Reference Books

1. 'Physical Chemistry', D. W. Ball, First Edition, India Edition (Thomson, 2007).

2 Perry's Chemical Engineers' Handbook, Don W. Green and Marylee Z. Southard, 9th Edition (McGraw Hill, 2018).

3 Engineering Chemistry, Dr. Suba Ramesh and others, 1st Edition (Wiley India, 2011).

4 Jain and Jain, Engineering Chemistry,16th Edition (Dhanpat Rai Publishing Company (P) Ltd, 2016).

5 Amretashis Sengupta, Chandan Kumar Sarkar (eds.), Introduction to Nano Basics to Nanoscience and Nanotechnology (Springer-Verlag, Berlin, Heidelberg, 2015)

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

B. Tech I Year II Semester

20CSE102 C PROGRAMMING AND DATA STRUCTURES

L	T	P	C
3	0	0	3

Pre-requisite: 20CSE101

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

Course Objectives:
1. To make the student understand fundamentals of C programming language and problem solving.
2. To understand the syntax and semantics of C programming language.
3. To develop algorithms for sorting, searching techniques.
4. To design and implement operations on stack, queue, and linked list.

UNIT I INTRODUCTION TO C PROGRAMMING 9 hours
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).

UNIT II FUNCTIONS & ARRAY 9 hours
Functions Introduction, User defined function, Function prototype, Function Definition and Function Call, Storage classes, Recursion **Arrays**: Defining an array, processing an array, one dimensional arrays, two dimensional arrays. Passing array as an argument to function. **Sorting:** Bubble Sort, Insertion Sort, selection sort. **Searching:** Linear and binary search.

UNIT III STRINGS & POINTERS 9 hours
Strings: Declaring and defining a string, Initialization of strings, Strings Library functions.
Pointers: Fundamentals of pointer, Pointer Declarations, Parameter passing: Pass by value, Pass by reference, Dynamic memory allocation.

UNIT IV STRUCTURES & FILES 9 hours
Structures: Defining a structure, processing a structure, Pointer to Structure, Unions.
Files: Opening and closing a data file, Reading and Writing a data file, File I/O Functions.

UNIT V DATA STRUCTURES 12 hours
Stack: stack operations, stack implementations using arrays.
Queue: queue operations, queue implementations using array, Applications of stack and queue.
Linked List: Single linked list operations.

Course Outcomes:

Upon successful completion of the course, students will be able to
1. Describe the structure of C programming language and its constructs.
2. Apply functions, arrays, sorting and searching algorithms to solve programming problems.
3. Develop C programs that incorporate string operations and pointer functionalities.
4. Construct C programs that utilize structures and file operations.
5. Choose appropriate linear data structure depending on the problem to be solved.

Text Books:

1. The C Programming Language, Brian W. Kernighan and Dennis M. 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.

Reference Books:

1. Let us C, Yashavant Kanetkar, 15_{th} Edition, BPB Publications, 2016.
2. Problem Solving & Program Design in C, Hanly, Jeri R and Elliot. B Koffman, Pearson Education, 5th edition, 2007.
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

20ME101 ENGINEERING GRAPHICS

L	T	P	C
2	0	2	3

Pre-requisite: None

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 12 hours

Introduction to AutoCAD commands, simple drawings using AutoCAD, Introduction to orthographic Projections – Theory, techniques, first angle projections and third angle projections.

UNIT II PROJECTIONS OF POINTS & LINES 12 hours

Projections of points: Positions, notation system and projections. Projections of lines: Positions, terms used, different cases, traces of lines and finding true length.

UNIT III PROJECTIONS OF PLANES & SOLIDS 12 hours

Projections of planes: Positions, terms used, different cases and projections procedure.
Projections of Solids: Projections of Regular Solids inclined to one plane (resting only on HP).

UNIT IV SECTIONS AND DEVELOPMENTS OF SOLIDS 12 hours

Section of solids: Sectional view of right regular solids (Prism and cylinder), true shapes of the sections.
Development of Surfaces: Development of surfaces of right regular solids (Prism, Cylinder and their Sectional Parts).

UNIT V INTERSECTIONS & ISOMETRIC PROJECTIONS 12 hours

Intersections of surfaces of solids: Intersection between prism Vs prism, prism Vs cylinder, cylinder Vs cylinder.
Isometric Projections: Theory of isometric drawing and orthographic views, Conversion of isometric view into orthographic views.

Course Outcomes:

Student will be able to

1. Identify various commands in AutoCAD software and apply AutoCAD skills to develop the new designs.
2. Draw the projections of points, straight lines using AutoCAD.
3. Draw the projections of the planes, solids using AutoCAD
4. Sketch the developments of solids, sections of solids using AutoCAD.
5. Draw the conversion of the isometric views to orthographic views and intersections of surfaces using AutoCAD.

Text Books:

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

2 N D Bhat, Engineering Drawing, Charotar Publishing House, Gujarath,15th Edition, 2010.

3 K.L. Narayana, P. Kanniah, Engineering Drawing, Scitech Publishers, 2nd Edition, 2010.

Reference Books:

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.

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

B. Tech I Year II Semester

20CHE201 CHEMISTRY LABORATORY

L	T	P	C
0	0	3	1.5

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

Course Description:

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

Course Objectives:

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

1. Learn to estimate the chemical impurities present in water such as hardness, alkalinity, chlorine, etc.
2. Understand and experience the formation of inorganic complex and analytical technique for trace metal determination.
3. Be trained to use the instruments to practically understand the concepts of electrochemistry.
4. Bridge theoretical concepts and their practical engineering applications, thus
5. highlighting the role of chemistry in engineering.

LIST OF EXPERIMENTS

1. Estimation of total, permanent and temporary hardness of water by EDTA method.
2. Estimation of alkalinity of water sample.
3. Estimation of dissolved oxygen by Winkler's method.
4. Determination of molecular weight of a polymer by using Ostwald's viscometer.
5. Determination of rate constant of an ester hydrolysis (Pseudo First Order reaction).
6. Determination of strength of a Strong acid (conc. H_2SO_4) by conductometric titration (Neutralisation Titration).
7. Conductometric titration of $BaCl_2$ Vs Na_2SO_4 (Precipitation Titration).
8. Dissociation constant of weak electrolyte by Conductometry.
9. Determination of percentage of Iron in Cement sample by colorimetry.
10. Estimation of ferrous ion by Potentiometric titration (Redox Titration).
11. Saponification value of oil.
12. Formation of Iron-1,10-phenanthroline complex and determination of iron by colorimetry.

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 present in water) technically.
2. Handle electro-analytical instruments like digital conductivity meter and potentiometer to perform neutralization, precipitation, and redox titrations, respectively.
3. Acquire practical skills to handle spectro-photochemical methods to verify Beer Lambert's Law.
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.

Textbook:

1. Engineering Chemistry Lab Manual (2017-18), 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.
3. Laboratory Manual on Engineering Chemistry, by Dr Sudha Rani, Dhanpat Rai Publishing house, 2009.
4. A Textbook on Experiments and calculations in Engineering Chemistry, by SS Dara, S Chand publications, 2015.
5. Laboratory Manual of Organic Chemistry, by Raj K Bansal, Wiley Eastern Limited, New age international limited, 2009.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year II Semester

20CSE201 C PROGRAMMING AND DATA STRUCTURES LABORATORY

L	T	P	C
0	0	3	1.5

Prerequisite: 20CSE101

Course Description:

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

Course Objectives:

1. To make the student understand fundamentals of C programming language and problem solving.
2. To get hands-on practices with the syntax and semantics of C programming language.
3. To develop algorithms for sorting, searching techniques.
4. To design and implement operations on stacks, queues, and linked lists.

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:
   i. Marks in Maths >=65
   ii. Marks in Physics >=55
   iii. Marks in Chemistry>=50
   OR
   iv. 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) Write a C program to accept a coordinate point in a XY coordinate system and determine in which quadrant the coordinate point lies.
   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 Tribonacci numbers in the given range.
5. a) Write a C program to find sum of digits, Decimal to Binary conversion, reversal of numbers using functions.
   b) Write a C program to find Factorial, Greatest Common Divisor, and Fibonacci using recursion.
6. 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
7. Implement the following sorting techniques.
   a) Bubble sort b) Insertion sort c) Selection sort.
8. Implement the following searching techniques.
   a) Linear Search b) Binary Search
9. a) Write a program in C to find the frequency of characters in a string.
   b) Write a C program to implement all string operations (string length, string copy, string compare, string concatenation and string reverse) without using string library functions.
10. a) Write a C program to get *N* elements in an array and sort it using Pointer.

b) Write a C program to swap two integers using pass by reference.
c) Write a C program to find the largest element using Dynamic Memory Allocation.

11. a) Write a program in C to count the number of vowels, consonants, digits, special symbols, words in a string using a pointer.
b) Write a C program to print all permutations of a given string using pointers.

12. a) Write a C program to add two distances in the inch-feet system using structures.
b) Write a C program to calculate difference between Two Time Periods (in *Hours*, *Minutes*, *Seconds* format) using structures.

13. Develop an application to match parenthesis of a given expression using Stack.

14. Develop an application to identify Palindrome string using Stack and Queue.

15. Develop an application to add two Polynomial equations using Linked List.

Course Outcomes:

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

1. Illustrate the basic programming constructs and control structures in C programming.
2. Implement functions, arrays, sorting and searching techniques to solve programming problems.
3. Apply string manipulation techniques and pointers.
4. Employ structures in C programming for computational tasks involving complex data types.
5. Develop applications using stack, queue, and linked list.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year II Semester

20CSE202 ENGINEERING AND IT WORKSHOP

L	T	P	C
0	0	3	1.5

Prerequisite: None

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

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 McGraw Hill House, 2017.

IT WORKSHOP

Prerequisite: None

Course Description:
This course helps the students to understand the basic components of a computer, installation of operating systems, working on office productivity tools word-processor, spreadsheet and presentation slides. Also it gives a basic understanding of using Google tools and various email settings 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 utilities like compression tools, PDF readers and web browser.
4. To provide technical training to the students on software tools like online forms, calendar applications, online drive, online translation tools and image processing applications.
5. To make the students to install software like Integrated Development Environments (IDE),and compliers for different programming languages.

LIST OF EXPERIMENTS

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.
   - Install ReactOS/Windows
   - Install Ubuntu or any other GNU/Linux
   - Install VirtualBox or VMWare or QEMU
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 simple Productivity tools like file and folder compression utilities and PDF readers.
   - Installation of Image Editor and Web browsers.
   - Basic Software installation in GNU Linux based system.
   - Connect the Printer and Scanner Devices perform printing and scanning operation.
5. Office Productivity Tools:
   - Generate, manipulate, search, aligning content using word processing applications.

- Creation of spreadsheet with various column and rows applying various formulas on cells.
- Create Presentation and Visualization – graphs, charts, 2D, 3D.
- Create a database template using Libreoffice Base, OpenOffice Base or MS Access.
- Draw flowchart using the Drawing tools – Google Quick draw, sketch up,

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: GNU Linux, Windows/ReactOS-Compression Utilities, PDF reader, Office Package.

Course Outcomes:

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

1. Apply the knowledge of computer hardware and assembly techniques to configure a dual-boot operating system.
2. Interpret the ability to connect to a LAN, configure web browsers and search engines effectively.
3. Develop the well-formatted documents and presentations, using Microsoft Office and LaTeX.
4. Evaluate the proficiency in using Excel for tasks like scheduling, GPA calculation, data manipulation, and formatting.
5. Analyze effective and tailored inputs to obtain desired responses from AI tools like ChatGPT.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

II YEAR I SEMESTER

B. Tech II Year I Semester

20MAT111 PROBABILITY AND STATISTICS FOR COMPUTER SCIENCE

L	T	P	C
3	0	0	3

Pre-requisite **20MAT101**

Course Description:

This course provides an introduction to probability, distributions and statistics with applications. Topics include: Conditional probability, Random variables, Probability distributions, Joint densities, Bayesian inference, descriptive statistics, Correlation and Regression, Estimation, Confidence intervals, Hypothesis testing.

Course Objectives:

The objectives of this course are

1. To extend and formalize knowledge of the theory of probability and random variables.
2. To solve real time problems in engineering and science by using discrete and continuous distributions
3. To analyze and interpret basic summary and modeling techniques for Multi-variate data
4. To analyze the data by using descriptive statistics for decision making
5. To apply the statistical inference involving confidence interval and hypothesis testing in data analysis.

UNIT I PROBABILITY 9 hours

Introduction to Probability, Sample space and events, axioms of probability, theorems on probability, conditional probability, multiplication theorem and independence of events, Baye's theorem.
Random variables (discrete and continuous), probability density functions, distribution function, mathematical expectation, properties. moment generating function.

UNIT II PROBABILITY DISTRIBUTIONS 9 hours

Discrete probability distributions - Binomial, Poisson, Geometric and their properties
Continuous probability distributions - Uniform, Exponential, Gamma, Normal distributions and their properties, Chebychev's inequality.

UNIT III JOINT DISTRIBUTIONS 9 hours

Joint densities and Independence - Marginal distributions (discrete & continuous)- Expectation and Covariance, Correlation, Conditional densities and Regression, Curves of regression, Transformation of random variables.

UNIT IV STATISTICS FOR DATA ANALYSIS 9 hours

Data Visualization, Moments, skewness, kurtosis, correlation, correlation coefficient, rank correlation, principle of least squares, lines of regression, regression coefficients and their properties.

UNIT V STATISTICAL INFERENCE 9 hours

Population, sampling, formulation of null hypothesis, alternative hypothesis, level of significance, types of errors and power of the test. Large Sample Tests: Test for single mean, single proportion, difference of means, difference of proportions, Confidence interval for parameters in one sample and two sample problems, t test for single mean, difference of means, test for ratio of variances.

Course Outcomes:

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

1. Understand the probability concepts and their importance in engineering.
2. Apply discrete and continuous probability distributions to solve various engineering problems.
3. Get an idea about joint density functions, distribution functions to the random variables and analyse the multivariate problems in engineering
4. Apply the method of least squares to estimate the parameters of a regression model.
5. Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.

Text BookS:

1. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.
2. Dr.B.S.Grewal, " Higher Engineering Mathematics", Khanna Publications, 42nd Edition.

Reference Books:

1. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2012.
3. Dean G. Duffy., "Advanced Engineering Mathematics with MATLAB", CRC Press, Third Edition 2013.

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

B. Tech II Year I Semester

20CSE103 COMPUTER SYSTEM ARCHITECTURE

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:
This course deals with basics of digital logic design and computer organization. It provides knowledge to design digital circuits for computer components with high performance. Computer arithmetic, Pipelining and Parallel processing are studied in this course. It also emphasises on CPU, Memory and I/O organization.

Course Objectives:
1. To provide knowledge for designing digital circuits.
2. To understand various data representation methods and arithmetic operations.
3. To learn about Processor, Memory and I/O organization.
4. To learn the basics of pipelined execution and parallel processing

UNIT I DIGITAL LOGIC CIRCUITS AND COMPONENTS 9 hours

Logic Gates – Boolean Algebra – Simplification of Boolean Expression using K – Map, Combinational Circuit - Binary Codes - Error Detection Codes. Encoders – Decoders – Multiplexers & Demultiplexers – Sequential Circuit **-** Flip Flops – Registers – Shift Registers.

UNIT II DATA REPRESENTATION AND COMPUTER ARITHMETIC 9 hours

Data Representation: Fixed Point, Floating point Representations –. **Computer Arithmetic**: Addition, Subtraction, Multiplication & Division Algorithms - Floating point Arithmetic Operations.

UNIT III CPU AND CONTROL UNIT 9 hours

Processor Structure and Function: - Processor Organization - Register Organization – Instruction Cycle – CISC – RISC Processors – x86 and ARM Addressing Modes – x86 and ARM Instruction Formats. **Control Unit Operation**:– Hardwired Control – Microprogrammed Control – Basic Concepts.

UNIT IV PIPELINE AND PARALLEL PROCESSING 9 hours

Instruction Pipelining: Pipelining Strategy – Pipeline performance – Pipeline Hazards – Dealing with branches – **Parallel processing**: Multi-Processor Organizations – Symmetric Multiprocessors – Multithreading and Chip Multiprocessors – Clusters.

UNIT V MEMORY AND I/O ORGANIZATIONS 9 hours

Memory Hierarchy: Main memory – ROM - RAM– Cache memory: Computer Memory System Overview – Cache memory principles – Elements of Cache design – **Data Transfer Schemes**: - Programmed I/O – Interrupt Driven I/O – Direct Memory Access – Redundant Array of Independent Disks.

Course Outcomes:

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

1. Construct digital logic circuits, combinational and sequential circuits.
2. Apply the data representation techniques and arithmetic algorithms in computers.
3. Illustrate CPU and control unit operations including instruction execution and processor types.
4. Interpret pipelining and parallel processing techniques to optimize system performance.
5. Identify the memory hierarchy and I/O organization and improving data transfer efficiency.

Text Books:

1. William Stallings, “Computer Organization and Architecture Designing for Performance”, Tenth Edition, Pearson Publications.
2. M.Morris Mano, “Computer System Architecture”, Third edition, Pearson Publications.

Reference Books:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill Publications.
2. David A. Patterson and John L. Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
3. John P. Hayes, “Computer Architecture and Organization”, Third Edition, Tata McGraw Hill, 2012.

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

B. Tech II Year I Semester

20CSE104 DATA STRUCTURES

L	T	P	C
3	0	0	3

Pre-requisite **20CSE102**

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, sorting, hashing, various types of trees, graphs, hashing and their implementation.

Course Objectives:

1. To introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.
2. To develop skills to choose appropriate data structure to solve real world problem
3. To implement recursive and non recursive algorithms for different operations on data structures.

UNIT I INTRODUCTION TO DATA STRUCTURES AND REPRESENTATION **9 hours**

Introduction: Algorithm specification, growth of functions, Asymptotic notations. Memory Representation: Linear and Linked Representations, Arrays, and Linked List: Singly Linked List and Its Operations, Doubly Linked List and its operations, Circular Lists.

UNIT II STACK & QUEUE **9 hours**

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, double ended queue.

UNIT III TREES **9 hours**

Tree: Introduction, Terminology, Binary Tree, representation, Binary Tree Traversals. Binary Search Tree: Properties, Insertion, Deletion, and Searching operations. Priority queue: Definition and Applications, implementation using Heaps, Max Heap, Min Heap, Insertion into a Max Heap, Deletion from Max Heap

UNIT IV SORTING & HASHING **9 hours**

Sorting: Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort Hashing: Dictionaries, Hash Table Representation, Static and Dynamic Hashing, Collision Resolution methods-Open Addressing, Separate Chaining, Double hashing.

UNIT V BALANCE SEARCH TREES AND GRAPHS **9 hours**

Balanced Search Trees: AVL Trees, Red Black Trees, and Splay Trees. Graphs: Terminology, Representation, operations, Graph Traversal techniques.

Course Outcomes:

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

1. Illustrate the fundamental concepts of algorithms, asymptotic notations, and memory representation in data structures.
2. Apply stack and queue operations in both array and linked list representations to solve real-world problems.
3. Analyze binary tree and binary search tree operations, including insertion, deletion, and searching.
4. Utilize various sorting algorithms and hashing techniques for efficient data organization and retrieval.
5. Solve complex computational problems using balanced search trees and graph traversal techniques.

Text Books:

1. Fundamentals of Data Structures using C, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta,Silicon Press, Second Edition. 2007.
2. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.

Reference Books:

1. Robert L. Kruse, Alexander J. Ryba, Data Structures and Program Design in C, Prentice Hall, 2ed.
2. Data Structures and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffery D.Ulman. Pearson; 1st edition
3. Data Structures, Algorithms and Applications in C by Sartaj Sahni, McGraw Hill, NY, Second Edition.

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

B. Tech II Year I Semester

20CSE105 OBJECT ORIENTED PROGRAMMING USING C++

L	T	P	C
2	1	0	3

Pre-requisite **20CSE102**

Course Description:
Object Oriented Programming (OOP) using the C++ language. Topics covered will be C++ classes/objects, input/output streams, overloading, inheritance, templates and exception handling. This is a second semester course in C/C++; students entering the course should already be familiar with the C programming language.

Course Objectives:

1. To provide basic characteristics of OOP through C++.
2. To impart skills on various kinds of overloading and inheritance.
3. To introduce the principles of virtual functions and polymorphism
4. To introduce pointers and file handling in C++ together with exception handling mechanism

UNIT I OVERVIEW OF C++ 9 hours

Getting started with C++ syntax, data-type, variables, expressions, operators, statements, arrays, strings, pointers and functions. Introduction to object oriented programming, user defined types, structures, unions, polymorphism, and encapsulation.

UNIT II CLASSES AND DATA ABSTRACTION 9 hours
Introduction, classes, Friend functions, Friend classes, Inline functions, Constructors, Arrays of objects, This pointers, Pointers to class members, Reference parameters, Dynamic allocation operators, Function overloading, Copy constructors, Operator overloading.

UNIT III INHERITANCE, VIRTUAL FUNCTION & POLYMORPHISM 9 hours
Concept of inheritance. Derived class and based class. Derived class constructors, Member function, Class hierarchies, public and private inheritance, aggregation: Classes within classes, inheritance and program development, static and dynamic binding, Virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors

UNIT IV FILE STREAMS 9 hours
C++ I/O: I/O using C functions, Stream classes hierarchy, Stream I/O, File streams and String streams, Error handling during file operations.

UNIT V GENERIC PROGRAMMING AND EXCEPTIONS 9 hours
Function templates, Overloading template functions, Class templates, Exception handling techniques.

Course Outcomes:

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

1. Explain the use of arrays, strings, pointers, and functions in C++.
2. Apply the concepts of overloading to solve simple problems.
3. Develop programs using inheritance, virtual function and polymorphism.
4. Identify potential error scenarios in file operations.
5. Make use of templates and exception handling in writing robust, scalable, and type-safe C++ programs.

Text Books:

1. The Complete Reference C++, 4th Edition, Herbert Schildt, Tata McGraw Hill.

Reference Books:

1. The C++ Programming Language, 3rd Edition, B. Stroutstrup, Pearson Education.

2. Object Oriented Programming in C++, 3rd Edition, R. Lafore, Galigotia Publications Pvt Ltd
3. Teach Yourself C++, 3rd Edition, Herbert Schildt

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

B. Tech II Year I Semester

20CSE106	**DATABASE MANAGEMENT SYSTEMS**	**L T P C** **2 1 0 3**

Pre-requisite NIL

Course Description:
This course is designed to provide a basic understanding of database systems and their design. The course material is further used for developing any web-based applications in which the database is back end. The course covers 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 the database and indexed structures, transaction management, and data recovery.

Course Objectives:

1. To understand the concept of DBMS and ER Modelling.
2. To comprehend the structure of SQL Queries and commands to manage data from the databases
3. To learn PL/SQL concepts that help in seamless processing of SQL
4. To explain the normalization, Query optimization, and relational algebra
5. To apply Transaction processing, concurrency control, recovery, security, and indexing for the real-time data
6. To gain knowledge on Database Attacks, Recovery, and Recent Trends

UNIT I INTRODUCTION 9 hours

Database Systems Concepts and Architecture: History and motivation for database systems- characteristics of database approach Advantages of using DBMS approach- Architectures for DBMS– Classification of database management systems.
Database Modelling: Types of Attributes, Entities, Relationships, ER Model.
Introduction to Relational Model: Introduction, Logical database design, Introduction to views.

UNIT II RELATIONAL MODEL 9 hours
Relational Data Model: Concept of relations, schema-instance distinction, keys, referential integrity, foreign keys, relational algebra operators, SQL - Introduction, data definition in SQL, table, key, and foreign key definitions. Querying in SQL, notion of aggregation, Integrity constraints, aggregation functions group by and having clauses.
PL/SQL concepts: Embedded SQL, Dynamic SQL, triggers and active databases, Cursors, Introduction to JDBC, Stored Procedures.
Relational Algebra and Calculus: Preliminaries, Relational algebra- Selection and Projection, Set Operations, Renaming, Joins, Division. Relational Calculus.

UNIT III DATABASE DESIGN & SCHEMA REFINEMENT 9 hours
Database Design: Dependencies and Normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FDs.
Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, and 5NF decompositions and desirable properties.

UNIT IV TRANSACTION PROCESSING & INDEXING 9 hours

Transaction processing - Concepts of transaction processing, ACID properties, concurrency control, Time-stamp based and lock-based protocols for concurrency control. Serializability of scheduling

Index Structures – Indexes on Sequential Files – Secondary Indexes – B-Trees – Hash Tables.

UNIT V DATABASE ATTACKS, RECOVERY, AND RECENT TRENDS 9 hours

Database Attacks and Recovery: SQL Injection, Recovery based on deferred update – Recovery techniques based on immediate update - Shadow Paging

Recent Trends: Need of NoSQL, CAP Theorem, different NoSQL data models.

Course Outcomes:

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

1. Understand the principles for database design, ER model.
2. Illustrate the basics of query evaluation and heuristic query optimization techniques.
3. Apply normalization relations of the relational model using normal forms.
4. Demonstrate the transaction processing techniques in the database.
5. Design database security plan for database.

Text Book(s)

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. Silberschatz,H.F.Korth S.Sudershan, Database System Concepts, McGraw Hill, 6^{th} Ed., 2010.
2. R. Elmasri S. B. Navathe, Fundamentals of Database Systems, Addison Wesley, 2015
3. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation, and Management,6th Edition,2012.
4. Pramod J. Sadalage and Marin Fowler, NoSQL Distilled: A brief guide to merging world of Polyglot persistence, Addison Wesley, 2012

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

B. Tech II Year I Semester

20CSE203 DATA STRUCTURES LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite **20CSE102**

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 graphs.

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, linked lists, arithmetic expression, queue, binary search tree and different sorting techniques.
3. Develop recursive algorithms as they apply to trees and graphs.

List of Programs:

1. Write a C program to perform the following operations on Singly Linked List
   i) Insertion ii) Deletion iii) Traversal.
2. Write a C program to perform the following operations on Circular Doubly Linked List
   i) Insertion ii) Deletion iii) Traversal.
3. Write a C program to add two polynomials using Singly Linked List
4. Write a C program to implement Stack using
   i) Arrays ii) Linked list.
5. Write a program to read an arithmetic expression in infix notation and do the following
   i)convert infix expression into postfix ii) Evaluate the Postfix Expression
6. Write a C program to implement Queue using
   i) Arrays ii) Linked list.
7. Write a C program to implement Circular Queue using Array
8. Write a C program to perform the following operations on Binary Search Tree
   i) Insertion ii) Deletion iii) Search a given Key
9. Write a C Program to Perform the Tree Traversal Techniques using recursion.
10. Write a C Program to Perform the Tree Traversal Techniques using without recursion.
11. Write a C program that implements the following sorting techniques
    i) Bubble sort ii) Selection sort iii) Quick sort.
12. Write a C program that implements the following sorting techniques
    i) Insertion sort ii) Merge sort iii) Heap sort.
13. Write a C Program to Implement All functions of a Dictionary by using Hashing.
14. Write a C program to perform the following operations on AVL Tree
    i) Insert. ii) Delete iii) Traverse
15. Write a C program to implement the following graph traversal algorithms:
    i) Depth First Search ii) Breadth First Search.

Course Outcomes:

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

1. Implement basic operations on linked lists, stacks, and queues.
2. Apply different sorting techniques to arrange data in an efficient manner.
3. Develop recursive algorithms for tree traversal and graph traversal.
4. Analyze the performance of binary search trees and AVL trees for insertion, deletion, and searching.
5. Utilize hashing techniques to implement dictionary functions.

Text Books:

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.

Reference Books:

1. Data Structures through C, YashavantP.Kanetkar, BPB Publication.
2. 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

B. Tech II Year I Semester

20CSE204 OBJECT ORIENTED PROGRAMMING USING C++ LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite **20CSE102**

Course Description:

This lab course provides in-depth coverage of object oriented programming principles and techniques using C++. Topics include classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, templates, exceptions, container classes, and low-level language features.

Course Objectives:

The objectives of the course are to have students identify and practice the object-oriented programming concepts and techniques, practice the use of C++ classes and class libraries, arrays, vectors, inheritance and file I/O stream concepts.

List of Programs:

1. a.Create a class named 'Student' with a string variable 'name' and an integer variable 'roll_no'. Assign the value of roll_no as '2' and that of name as "John" by creating an object of the class Student.
   b. Write a class having two private variables and one member function which will return the area of the rectangle.
   c. Perform addition operation on complex data using class and object. The program should ask for real and imaginary part of two complex numbers, and display the real and imaginary parts of their sum.
2. a. Write a program that asks a name say hello. Use your own function, that receives a string of characters (name) and prints on screen the hello message. (Doesn't returns anything- void type)
   b. Write a program that ask for two numbers, compare them and show the maximum. Declare a function called max_two that compares the numbers and returns the maximum.
   c. Write a C++ program that uses functions.
   i) to swap two integers ii) to swap characters iii) to swap two reals
3. a.Create a class 'Student' with three data members which are name, age and address. The constructor of the class assigns default values to name as "unknown", age as '0' and address as "not available". It has two functions with the same name 'setInfo'. First function has two parameters for name and age and assigns the same whereas the second function takes has three parameters which are assigned to name, age and address respectively. Print the name, age and address of 10 students. Hint - Use array of objects
   b. Create a class named 'Rectangle' with two data members- length and breadth and a function to calculate the area which is 'length*breadth'. The class has three constructors which are :

1 - having no parameter - values of both length and breadth are assigned zero.
2 - having two numbers as parameters - the two numbers are assigned as length and breadth respectively.
3 - having one number as parameter - both length and breadth are assigned that number.
Now, create objects of the 'Rectangle' class having none, one and two parameters and print their areas.

4. a.Using function overloading write C++program to find the volume of cube, cylinder, cone and sphere.
 b. Write a C++ program illustrating an interactive program for swapping integer, real, and character type variables without using function overloading. Write the same program by using function overloading features and compare the same with its C counterpart.
5. a. Write a C++ program to perform different arithmetic operation such as addition, subtraction, division, modulus and multiplication using inline function.
 b. Write a program to swap private data members of classes named class_1, class_2 using friend function.
1. a. Using operator overloading write a C++ program for class STRING and overload the
 operator + and == to concatenate two strings length.
7. a. Write a C++ program illustrating Constructor overloading (Both parameterized and default).
 b. Write a C++ program illustrating for overloading ++ operator to increment data.
8. a.Write a C++ program illustrating overloading of new and delete operator.
 b.Write a C++ program illustrating Abstract classes.
9. Write a C++ program illustrating Inheritance (Multiple, Multilevel, Hybrid).
10. a. Create a class 'Degree' having a function 'getDegree' that prints "I got a degree". It has two subclasses namely 'Undergraduate' and 'Postgraduate' each having a function with the same name that prints "I am an Undergraduate" and "I am a Postgraduate" respectively. Call the function by creating an object of each of the three classes.
 b. A class has an integer data member 'i' and a function named 'printNum' to print the value of 'i'. Its subclass also has an integer data member 'j' and a function named 'printNum' to print the value of 'j'. Make an object of the subclass and use it to assign a value to 'i' and to 'j'. Now call the function 'printNum' by this object.
11. a. Design a virtual base class for the employee information system.
 b. Implement a program using pure virtual function for calculating area and volume for the circle and cylinder
12. a. Write a C++ program using Copy constructor to copy data of an object to another object
13.a. Write a C++ program illustrating access data members & member functions using ‘THIS’ pointer.

b. Write a program to illustrate the use of pointers to objects which are related by inheritance

14. a.Write a C++ program to read and print employee details using Files.
    b. Write a C++ program to copy the contents of one text file to another file.
15. a. Write a C++ program that uses function template to determine the square of an integer, a float and a double
    b. Write a Template Based Program to Sort the Given List of Element
16. a. Write a Program Containing a Possible Exception. Use a Try Block to Throw it and a Catch Block to Handle it Properly.
    b. Write a Program to Demonstrate the Catching of All Exceptions

Course Outcomes:

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

1. Implement the concepts of object-oriented programming.
2. Apply the concepts like constructor, overriding, overloading
3. Select suitable inheritance while proposing solution for the given problem.
4. Make use of file streams in C++ programming.
5. Develop generic programming.

Text Books:

1. The Complete Reference C++, 4th Edition, Herbert Schildt, Tata McGraw Hill.

Reference Books:

1. The C++ Programming Language, 3rd Edition, B. Stroutstrup, Pearson Education.

2. Object Oriented Programming in C++, 3rd Edition, R. Lafore, Galigotia Publications Pvt Ltd.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech II Year I Semester

20CSE205 DATABASE MANAGEMENT SYSTEMS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite **NIL**

Course Description:

This course is designed to provide a basic understanding of database systems and their design. The course material is further used for developing any web-based applications in which the Database is back end. The course covers all basic and advanced queries of SQL, PL/SQL programs, low-level details such as representing data elements of Databases.

Course Objectives:

1. To understand the concept of DBMS and ER Modelling.
2. To understand the components of DBMS and to study database design.
3. To comprehend the structure of SQL Queries and commands to manage data from the databases
4. To comprehend the structure of SQL Queries to query, update, and manage a database.
5. To understand all constraints to develop a business application using cursors, triggers, and stored procedures

List of Programs:

1. Analyze the below problem carefully and come up with the entities in it. Identify what data has to be persisted in the Database. This contains the entities, attributes, etc. Identify the primary keys for all the entities. Identify the other keys like candidate keys, partial keys, if any. The student is required to submit a document by writing the Entities and keys.). Indicate the type of relationships (total/partial). Try to incorporate generalization, aggregation, specialization, etc. whenever required

   A) Draw an ER diagram for Library Management System

   B) Draw an ER diagram for Hospital Management System

2. Students should be allowed to choose appropriate DBMS software, install it, configure it and start working on it. Create sample tables, and insert the data into them, and perform the following using DDL and DML commands
   a. Insert the data given above in employee, department, and project tables.
   b. Retrieve all the employees' information for a particular department number
   c. Get Employee name along with his SSN and Supervisor SSN.
   d. Retrieve the employee names whose bdate is' 29-MAR-1959.'
   e. Get salaries of the employees without duplications.
   f. Retrieve the MgrSSN, MgrStartDate of the manager of 'Research' department.
   g. Change the department number of an employee having fname as 'Joyce' to 3
   h. Alter Table department add column ContactNo of NUMBER data type and insert values into this column only.
   i. Change table department by modifying the size of field ContactNo.
   j. Modify the field name ContactNo of departments table to MobileNo.
   k. Change the name of Table Department to DEPT.

l. Alter Table department by removing column MobileNo.
m. Create a table COPYOFDEPT as a copy of the table DEPT.
n. Remove the rows from COPYOF DEPT table with department number as 5.
o. Remove COPYOF DEPT table

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

4. To study various options of LIKE predicate
   a. Display all employees whose name starts with 'V' and the third character is 'v.'
   b. Display name, number, and salary of those employees whose name is 5 characters long and the first three characters are 'Vic.'
   c. Display the non-null values of employees and employee name second character should be 'n,' and the string should be 5 characters long.
   d. Display the null values of an employee, and also employee name's third character should be 'a'.
   e. What will be output if you are giving LIKE predicate as '%_%' ESCAPE '\'

5. To Perform various data manipulation commands, aggregate functions, and sorting concepts on all created tables.
   a. List total deposit from the deposit.
   b. List total loan from karolbagh branch
   c. Give maximum loan from branch vice.
   d. Count the total number of customers
   e. Count total number of customer's cities.
   f. Create table supplier from the employee with all the columns.
   g. Create table sup1 from the employee with the first two columns.
   h. Create table sup2 from the employee with no data
   i. Insert the data into sup2 from an employee whose second character should be 'n' and string should be 5 characters long in the employee's name field.
   j. Delete all the rows from sup1.
   k. Delete the detail of the supplier whose sup_no is 103.
   l. Rename the table sup2.
   m. Destroy table sup1 with all the data.
   n. Update the value dept_no to 10 where second character of emp. name is 'm'.
   o. Update the value of employee name, whose employee number is 103.

6. To know how the constraints are used to make a table contain valid data.
   Execute the following Queries on the Database to note the violations integrity constraints by any of the following operations
   a. Insert ('Robert', 'F', 'Scott', '987987987 ', '21-JUN-42', '2365 Newcastle Rd, Bellaire, TX', M, 58000, '888665555', 1) into EMPLOYEE.

   b. Insert ('Ramez', 'F', 'Scott', ' ', '21-JUN-42', '2365 Newcastle Rd, Bellaire, TX', M, 58000, '888665555', 1) into EMPLOYEE.
   c. Insert ('677678989', null, '40.0') into WORKS_ON.
   d. Insert ('453453453', 'John', M, '12-DEC-60', 'SPOUSE') into DEPENDENT
   e. Insert ('343453453', 'Varun',’’, '12-DEC-60', 'SON') into DEPENDENT
   f. Delete WORKS_ON tuples with ESSN= '333445555'.
   g. Modify MGRSSN and MGRSTARTDATE of the DEPARTMENT tuple with DNUMBER=5 to '123456789' and '01-OCT-88', respectively.

7. To study Single-row functions.
   a. Write a query to display the current date.
   b. 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
   c. Modify your query no 2 to add a column that subtracts the old salary from the new salary. Label the column Increase
   d. 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.
   e. Write a query that produces the following for each employee: <employee last name> earns <salary> monthly
   f. Write a query to calculate the annual compensation of all employees (sal+comm)

8. Displaying Data from Multiple Tables (join)
   a. Give details of customers Vivek
   b. Give the names of the customers who are borrowers and depositors and having living city Madanapalle
   c. Give city as their city name of customers having the same living branch.
   d. Write a query to display the last name, department number, and department name for all employees.
   e. Create a unique listing of all jobs that are in department 30. Include the location of the department in the output
   f. Write a query to display the employee name, department number, and department name for all employees who work in NEW YORK.
   g. Display the employee's last name and employee number along with their manager's last name and manager number. Label the columns Employee, Emp#, Manager, and Mgr#, respectively.
   h. Create a query to display the name and hire date of any employee hired after employee SCOTT.

9. To apply the concept of Aggregating Data using Group functions.
   a. List total deposit of customer having account date after 1-Jan-96.
   b. List total deposit of customers living in city Nagpur.
   c. List maximum deposit of customers living in Bombay.
   d. 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.

e. Write a query that displays the difference between the highest and lowest salaries. Label the column DIFFERENCE
f. 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
g. Find the average salaries for each department without displaying the respective department numbers.
h. Write a query to display the total salary being paid to each job title within each department.
i. Find the average salaries > 2000 for each department without displaying the respective department numbers.
j. Display the job and total salary for each job with a total salary exceeding 3000, which excludes the present and sorts the list by the total salary.
k. List the branches having the sum of deposit more than 5000 and located in city Bombay.

10. To solve queries using the concept of the subquery.
    a. Write a query to display the last name and hire date of any employee in the same department as SCOTT. Exclude SCOTT
    b. Give the name of customers who are depositors having same branch city of Mr. Arul.
    c. Give deposit details and loan details of the customer in the same city where Pramod is living.
    d. 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.
    e. Give names of depositors having the same living city as Mr. Hari and having deposit amount greater than 2000
    f. Display the last name and salary of every employee who reports to ford.
    g. Display the department number, name, and job for every employee in the accounting department.
    h. List the name of the branch having the highest number of depositors.
    i. Give the name of cities wherein the maximum number of branches are located.
    j. Give the name of customers living in the same city where maximum depositors are located.

11. Write a PL/SQL block to change the address of a particular employee by taking their employee number interactively.
    b. Write a cursor program to display manager details for each department

12. a. Create a trigger which checks whether an employee with Emp_no is present in the Employee table before inserting it into EMP.
    b. Write a procedure to insert a record into the ORDER table by validating the qty limit of the item and also check whether that item exists

Project-Based Learning:

Design and implementation of Student Information System

Choose a Mini Project and apply the database concepts as given below.

- Draw ER Diagram
- Tables Creation
- Establish the relationship between relevant tables Apply Normalization (if necessary)
- Create GUI

- Establish Connection between front end and back end as Oracle
- Prepare Project Report

Course Outcomes:

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

1. Apply the DDL and DML operations on database tables.
2. Build the complex queries to access the data using SQL join.
3. Develop the stored procedures in PL/SQL.
4. Construct the exceptions and triggers to solve real-time problems.
5. Design and develop a real-world application to access and render data.

Text Books:

1. A. Silberschatz, H. F. Korth S. Sudershan, Database System Concepts, McGraw Hill, 7th Edition 2021.
2. R. Elmasri S. B. Navathe, Fundamentals of Database Systems, Addison Wesley, 2015.

Reference Books:

1. Raghu Ramakrishnan,Database Management Systems,Mcgraw-Hill,4th edition,2015.

2. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation and Management,6th Edition,2012.

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

Mandatory Course
B. Tech. II Year I Semester

20CHE901 ENVIRONMENTAL SCIENCE

L	T	P	C
2	0	0	0

Pre-requisite 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 **6 hours**

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.

UNIT II ECOSYSTEMS **6 hours**

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.

UNIT III BIODIVERSITY AND ITS CONSERVATION **6 hours**

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.

UNIT IV ENVIRONMENTAL POLLUTION **6 hours**

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.

UNIT V SOCIAL ISSUES AND THE ENVIRONMENT 6 hours

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.

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.
3. R.N. Sharma, “Indian Social Problems “, Media Promoters and Publishers Pvt. Ltd.

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

II Year II Semester

B. Tech II Year II Semester

20HUM101 ECONOMICS AND FINANCIAL ACCOUNTING FOR ENGINEERS

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

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 positions of financial statements are explained to know the analysis of financial matters.

Course Objectives:

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 statement analysis and investment evaluation through ratios and capital budgeting techniques.

UNIT I DEMAND ANALYSIS 9 hours

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.

UNIT II PRODUCTION AND COST ANALYSIS 9 hours

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).

UNIT III MARKET STRUCTURE AND PRICING 9 hours

Classification of Markets - General Equilibrium and efficiency of Perfect competition, Monopoly, Monopolistic, Oligopoly, Duopoly – Price determination under various market conditions- Pricing objectives- Methods.

UNIT IV BASICS OF ACCOUNTING 9 hours

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).

UNIT V FINANCIAL RATIO ANALYSIS AND CAPITAL BUDGETING 9 hours

Ratio Analysis - Liquidity, Leverage, Solvency, Activity and Profitability Ratios - Capital Budgeting. (Simple Problems).

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. Exhibit the ability to apply knowledge of ratio analysis and capital budgeting techniques in financial statement analysis and investment evaluation respectively.

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

Reference Books:

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.

B. Tech II Year II Semester

20MAT112 DISCRETE MATHEMATICAL STRUCTURES

L	T	P	C
3	0	0	3

Pre-requisite **20MAT110**

Course Description:

This course introduces the concepts of discrete mathematics and their applications in computer science. It covers algebraic structures, combinatory 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 combinatory.
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 9 hours

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.

UNIT II COMBINATORY 9 hours

The Basics of Counting- The Pigeonhole Principle -Permutations and Combinations - Binomial Coefficients -Generalized Permutations and Combinations –Generating Permutations and Combinations.

UNIT III ALGEBRAIC STRUCTURES 9 hours

Semigroups and Monoids - Grammars and Languages –Types of Grammars and Languages – Groups – Subgroups – Lagrange's Theorem –Homomorphism: Introduction –Properties - Group Codes.

UNIT IV LATTICES AND BOOLEAN ALGEBRA 9 hours

Relations - Partially Ordered Relations - Hasse Diagram - Poset - Lattices - Boolean algebra - Boolean Functions - Representation and Minimization of Boolean Functions - Karnaugh map representation.

UNIT V GRAPH THEORY 9 hours

Basic Concepts of Graph Theory - Isomorphic graph - Matrix Representation of Graphs – Trees - Kruskal's and Dijkstra's algorithms - Storage Representation and Manipulation of Graphs - Introduction to Finite State Machines.

Course Outcomes:

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

1. Evaluate elementary mathematical arguments and identify fallacious reasoning (not just fallacious conclusions) for develop syntax of programming languages.
2. Apply the concepts inclusion/exclusion principle and the pigeonhole methodology in data structure and algorithm.
3. Learn elementary proofs and properties of modular arithmetical results; and explain their applications such as in coding theory and cryptography.
4. Apply proof techniques towards solving problems in Boolean algebra and computer circuit designing.
5. Apply graph theory models and finite state machines concepts to solve critical networking issues, shortest path problems, scheduling, etc.

Text Books:

1. J.P. Trembley and R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill – 13th reprint, 2012.
2. Kenneth H. Rosen, Discrete Mathematics and its applications, 6th Edition, Tata McGraw Hill, (2011)

Reference Books

1. Richard Johnsonbaugh, "Discrete Mathematics", 6th Edition, Pearson Education, 2011
2 S. Lipschutz and M. Lipson, "Discrete Mathematics", Tata McGraw Hill, 3rd Edition, 2010.
3 B.Kolman, R.C.Busby and S.C.Ross, "Discrete Mathematical structures", 6th Ed, PHI, 2010
4. C.L.Liu, "Elements of Discrete Mathematics", Tata McGraw Hill, 3rd Edition, 2008.

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

B. Tech II Year II Semester

20CSE107 OPERATING SYSTEMS FUNDAMENTALS

L	T	P	C
3	0	0	3

Pre-requisite NIL

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 9 hours

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.

UNIT II PROCESS CONCEPTS 9 hours

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.

UNIT III PROCESS SYNCHRONIZATION AND DEADLOCKS 9 hours

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.

UNIT IV MEMORY MANAGEMENT STRATEGIES 9 hours

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).

UNIT V FILE SYSTEM 9 hours

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.

Course Outcomes:

At the completion of the course the students will be able to:

1. Demonstrate the key services and structures of operating systems.
2. Illustrate the process concepts, states and the significance of process control blocks.
3. Apply process scheduling algorithms to optimize CPU utilization and response time.
4. Analyze process synchronization techniques and deadlock situations to ensure system stability.
5. Utilize memory management techniques to enhance overall system performance.

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.

Reference Books:

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

20CSE108 JAVA PROGRAMMING

L	T	P	C
3	0	0	3

Pre-requisite **20CSE105**

Course Description:

Basics of Object-Oriented Programming - objects, classes, polymorphism, inheritance, staticand 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 9 hours

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.

UNIT II STRINGS, INHERITANCE, INTERFACES, AND PACKAGES 9 hours

Strings: Strings, String Handling

Inheritance: Basics, Usage of Super, Multi-level hierarchy, Method overriding, Abstract class, Final keyword.

Interfaces: Creating, Implementing, Using, Extending, and Nesting of interfaces.

Packages: Defining, Finding and Importing packages, Member Access.

UNIT III EXCEPTION HANDLING &MULTI-THREADING 9 hours

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.

UNIT IV I/O STREAMS AND COLLECTION FRAME WORK CLASSES 9 hours

I/O Streams: Byte Stream Classes and Character Stream Classes.

Collection Frame work : Hierarchy of collection framework, Array-List, Linked-List, Vector, Stack, Queue, Priority Queue, Hash Set, Linked Hash Set, Tree Set.

UNIT V GUI PROGRAMMING AND EVENT HANDLING 9 hours

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. JDBC: Connecting to Database, querying a database and processing the results, updating data with JDBC.

Course Outcomes:

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

1. Apply object-oriented programming concepts for problem solving.
2. Create and use packages and interfaces.
3. Develop multithreaded applications with synchronization.
4. Identify suitable java collection framework and I/O classes for computed based solutions.
5. Develop GUI based applications.

Text Books:

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

Reference Books

1. Core Java Volume I – Fundamentals, by Cay S. Horstmann, Gary Cornell Pearson Education Ninth Edition
2. “Java Fundamentals - A Comprehensive Introduction”, Herbert Schildt and Dale Skrien, Special Indian Edition, McGrawHill, 2013.
3. “Java – How to Program”, Paul Deitel, Harvey Deitel, PHI.
4. “Thinking in Java”, Bruce Eckel, Pearson Education.
5. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.

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

Dept. of Computer Science & Engineering

B. Tech II Year II Semester

20CSE109 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
2	1	0	3

Pre-requisite 20CSE104

Course Description:

This course emphasis on analysis of various types of algorithms. It provides idea to design the algorithm to solve the problems using divide and conquer, greedy method, dynamic programming, backtracking, branch and bound, approximation.

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 Approximation.

UNIT I INTRODUCTION & DIVIDE AND CONQUER 9 hours

Introduction: What is an algorithm?, Algorithm specification, Space Complexity, Time Complexity, Orders of Growth, Worst-Case, Best-Case, and Average-Case Efficiencies, Asymptotic notations.

Divide and Conquer: Master's Method, Substitution Method, Recursion Tree Method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Strassen's matrix multiplication.

UNIT II GREEDY METHOD & DYNAMIC PROGRAMMING 9 hours

Greedy Method: General method, Fractional Knapsack problem, Huffman Code, Job Scheduling with Deadlines, Optimal merge pattern.

Dynamic Programming: General method, String Editing, Longest Common Subsequence, Matrix Chain Multiplication, 0/1 Knapsack problems, The traveling sales person problem.

UNIT III GRAPH ALGORITHMS 9 hours

BFT, DFT, Connected components, Biconnected Components, Spanning Trees, Minimum cost Spanning Trees, Kruskal's and Prim's algorithm, Topological sort, Shortest Path Algorithms: Dijkstra's Single Source Shortest Path Algorithm, Floyd-Warshall's All Pairs Shortest Path Algorithm.

UNIT IV BACK TRACKING & BRANCH AND BOUND 9 hours

Backtracking: General method, N-Queens Problem, Sum of subset problem, Graph Coloring Problem.

Branch and Bound: General method: FIFO, LIFO and LC, Travelling salesperson problem, 0/1 Knapsack problem.

UNIT V NP PROBLEMS & APPROXIMATION ALGORITHMS 9 hours

NP Problems: Complexity Class - P, NP, NP Complete, NP Hard. Reducibility, Cook's Theorem. **Approximation Algorithms:** Introduction, Absolute Approximation, **ϵ** - Approximation, Polynomial time Approximation.

Course Outcomes:

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

1. Analyze the performance analysis of different algorithms.
2. Identify optimal solution for different problems using greedy method and dynamic programming.
3. Apply various graph-based algorithms.
4. Make use of backtracking and branch & Bound methods to solve real world problems.
5. Identify the complexity of NP problems and Approximation algorithms.

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, 2008
2. Jon Kleinberg and Eva Tardos "Algorithm Design", Pearson Education, 2007

Reference Books

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012
2. Micheal T. Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet examples", Second Edition, Wiley Publication, 2006
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 2006

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

Dept. of Computer Science & Engineering

B. Tech II Year II Semester

20CSE206 OPERATING SYSTEMS FUNDAMENTALS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite **NIL**

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 Programs:

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.

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. Demonstrate basic operating system concepts using Linux commands.
2. Implement shell scripts to perform calculations and file type checks.
3. Design solutions for process synchronization problems.
4. Solve CPU scheduling algorithms, including Round Robin, SJF, FCFS, and Priority.
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 II Year II Semester

20CSE206 OPERATING SYSTEMS FUNDAMENTALS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite NIL

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 Programs:

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
   b) 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.

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
    c) 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 II Year II Semester

20CSE207 JAVA PROGRAMMING LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite **20CSE204**

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 Programs:

1. a) Write a Java program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula. If the discriminant b^2-4ac 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 first 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 ofthe original file followed by part<n> where n is the sequence number of the part file
   b) Write a java program to convert an Array List 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 String Toknizer class.

6. a) Write java program to create a super class called Figure that receives the dimensions oftwo 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 Exception A and exception sub class Exception B and Exception C, where Exception B inherits from Exception A and Exception C inherits from Exception B. Write a java program to demonstrate that the catch block for type Exception A catches exception of type Exception B and Exception C

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 Jtext Fields, 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 Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception 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. a) Design a GUI application for Cafeteria bill generation.

d) Create a database connection using JDBC & perform some basic operation such as add, remove, update record in database using JDBC.

Course Outcomes:

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

1. Solve real world problems using OOPs techniques.
2. Develop operations on strings and files using java libraries.
3. Experiment the multithreaded applications with synchronization.
4. Build web applications using AWT components.
5. Design GUI based applications.

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

Dept. of Computer Science & Engineering

B. Tech II Year II Semester

20CSE208 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite **20CSE203**

Course Description:

This course is aimed to provide hands on experience to analyse the time complexity of sorting, graph based, greedy, dynamic programming and backtracking algorithms.

Course Objectives:

1. To learn how to analyse 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 Programs:

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements.
2. Implement Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements.
3. Implement Fractional Knapsack problem using Greedy Method
4. Implement Job Scheduling with Deadlines using Greedy Method
5. Implement 0/1 Knapsack problem using Dynamic Programming
6. Implement Traveling Salesperson problem to find the optimal tour using Dynamic Programming
7. Find Minimum Cost Spanning Tree of a given undirected graph using
   (a) Prim's algorithm.
   (b) 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 all other vertices using Dijkstra's algorithm
10. Implement All-Pairs Shortest Paths Problem using Floyd-Warshall's algorithm
11. Find a subset of a given set S = $\{S_1, S_2, ...S_n\}$ 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:

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

1. Analyze the performance of different sorting algorithms.
2. Apply greedy method to solve simple problems.
3. Implement Dynamic Programming to find the optimal solution.
4. Solve various graph-based algorithms.
5. Make use of backtracking method to solve real world problems

Text Books:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Second Edition, Universities Press, 2008
2. Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Third Edition, Pearson Education, 2012.

Reference Books:

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited, 2012.
2. S. Sridhar, “Design and Analysis of Algorithms”, Oxford university press, 2014.
3. Web reference: http://nptel.ac.in/

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Mandatory Course
B. Tech. II Year II Semester

20HUM901 INDIAN CONSTITUTION

L	T	P	C
2	0	0	0

Pre-requisite **NIL**

Course Description:

The Constitution of India is the supreme law of India. Parliament of India can not make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state.

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 6 hours

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.

UNIT II STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT 6 hours

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

UNIT III STRUCTURE AND FUNCTION OF STATE GOVERNMENT 6 hours

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

UNIT IV CONSTITUTION FUNCTIONS 6 hours

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments –Constitutional Functionaries - Assessment of working of the Parliamentary System in India.

UNIT V INDIAN SOCIETY 6 hours

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.

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.

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.

Reference Books:

1. **S**harma, 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, Mid Term Tests, End Semester Examination.

III Year I Semester

Dept. of Computer Science & Engineering

B. Tech III Year I Semester

20CSE110 FORMAL LANGUAGES AND AUTOMATA THEORY

L	T	P	C
2	1	0	3

Pre-requisite **20MAT112**

Course Description:

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

Course Objectives:

1. To understand the language hierarchy and to construct Finite State Machines with and without output.
2. To construct Regular Expressions for the regular languages and equivalent FAs.
3. To understand the concept of Regular Grammars and Context Free Grammars.
4. To understand and formulate pushdown automata equivalent to Context free Grammars.
5. Be familiar with Turing Machines and understand computability.

UNIT I FUNDAMENTALS AND FINITE AUTOMATA 9 hours

Fundamentals of Formal Languages: Strings - Alphabets and languages - Finite Automata: Basic Definitions - Finite Automata - Deterministic finite automata – Non deterministic finite automata - Equivalence of DFA and NFA - Equivalence of NFA with and without ε –moves - Minimization of FA - Finite automata with output – Moore machines and mealy machines.

UNIT II REGULAR EXPRESSIONS AND REGULAR SETS 9 hours

Regular expressions – Regular languages - Identity rules for regular expressions – Equivalence of Finite automata and regular expressions – Pumping lemma for regular sets – Applications of the Pumping lemma - Closure proportions of regular sets.

UNIT III REGULAR GRAMMARS AND CONTEXT FREE GRAMMAR 9 hours

Chomsky Hierarchy - Regular grammars – Linear grammars - Equivalence of regular grammar and Finite Automata - Context Free Grammars - Derivations - Leftmost derivation - Rightmost derivation - Derivation tree - Ambiguity - Context Sensitive Grammars - Unrestricted Grammars.

UNIT IV SIMPLIFICATION OF CFG's AND PUSH DOWN AUTOMATA 9 hours

Simplification of CFG's - Chomsky Normal Form - Greibach Normal Form – Pushdown Automata: Definitions - Model of PDA – Language acceptance by PDA – Design of PDA - Equivalence of PDA and CFL - Deterministic PDA - Pumping lemma for CFL - Closure properties of CFL.

UNIT V TURING MACHINE AND COMPUTABILITY 9 hours

Turning Machine Definition - Model of TM - Language acceptance by TM - Design of Turing Machine - Computable languages and functions - Modifications of Turing machine - Universal TM – Multi-tape Turing Machines - Properties of Recursive and Recursively enumerable languages - Undecidability - Post’s correspondence problem - MPCP.

Course Outcomes:

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

1. Develop finite automata with or without output and differentiate between various types of finite automata based on their equivalence.
2. Construct regular expressions for regular languages and demonstrate the equivalence between finite automata and regular expressions.
3. Analyze various types of grammar and design context-free grammar from context-free language.
4. Apply various normal forms to simplify context-free grammars and design pushdown automata.
5. Design Turing machines and analyze undecidability problems.

Text Book(s)

1. Hopcroft H.E. and Ullman Jeffrey.D., “Introduction to Automata theory languages and Computation”, 3/e, 2006, Pearson Education, New Delhi, India.
2. Michael Sipser, “Introduction to the Theory of Computation”, 3rd edition, 2012, Cengage learning, India.

Reference Books

1. John C Martin, “Introduction to Languages and Theory of Computation”, 1/e, 2009, Tata McGraw Hill Education, Hyderabad, India.
2. Harry R Lewis and Christos H Papadimitriou, “Elements of the Theory of Computation”, Second Edition, Prentice Hall of India, Pearson Education, New Delhi, 2003.
3. George Tourlakis, “Theory of computation”, 1/e, 2012, John Wiley, India.
4. Peter Linz, “An Introduction to Formal Language and Automata”, Third Edition, Narosa Publishers, New Delhi, 2002.
5. Mishra K L P and Chandrasekaran N, “Theory of Computer Science - Automata, Languages and Computation”, 2/e, 2007, PHI, New Delhi, India.

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

Dept. of Computer Science & Engineering

B. Tech III Year I Semester

20CSE111 COMPUTER NETWORKS

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:
The main emphasis of this course is to understand the basic concepts of Computer Networks, Introducing the layered approach for design of computer networks, introduce to computer communication, TCP/IP layers functionalities, and operations of network protocols in the TCP/IP suite, and elucidating the design issues for a computer network.

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 9 hours

NETWORK FUNDAMENTALS:
Introduction, Advantages and Applications, Network Types, Topologies, Internet History, Standards and Administration. **Network Models:** Protocol Layering, The ISO Model, TCP/IP Protocol Suite, Cross-layering.

THE PHYSICAL LAYER
Data and Signals, Transmission impairment, Data rate limits, Performance. **Transmission media:** Introduction, Guided Media, Unguided Media. **switching:** Circuit Switched Networks, Packet switching.

UNIT II THE DATA LINK LAYER 9 hours
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, and connecting devices.

UNIT III THE NETWORK LAYER 9 hours

Network layer design issues, Routing algorithms, (Optimal, Shortest path, Distance Vector routing, Link State routing, Hierarchical routing, Routing in adhoc networks), Congestion control algorithms, Quality of service, Internetworking, **The network layer in the Internet:** IP Classes, IPV4 and IPV6, IP Addressing, NAT, IP support protocols, OSPF, BGP, RIP, IGMP.

UNIT IV THE TRANSPORT LAYER 9 hours

The Transport Service, Elements of Transport Protocols, Flow control, Congestion Control, **The internet transport protocols:** UDP, TCP, SCTP. Performance problems in computer networks, Network performance measurement.

UNIT V THE APPLICATION LAYER 9 hours

Introduction, Client Server Programming, WWW and HTTP, FTP, e-mail, TELNET, Secure Shell, Domain Name System, SNMP. **Case study-** Computer Networks in health care.

Course Outcomes:

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

1. Understand the various functionalities of layers and the transmission media.
2. Apply error detection and error correction wherever required.
3. Analyze the concepts of routing and congestion control.
4. Analyze the computer network logically by enumerating the layers of the TCP/IP.
5. Make use of application-level protocols for file communication, and file transfer.

Text Book(s)

1. "Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education,5th edition, 2012.
2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson,6th edition, 2021.

Reference Books

1. "Internetworking with TCP/IP – Principles, protocols, and architecture", Volume 1, Douglas E. Comer, 5th edition, PHI
2. Peterson, Larry L., and Bruce S. Davie. Computer networks: a systems approach. Elsevier, 2007.
3. "Data communications & networking with TCP/IP protocol suite", Behrouz A. Forouzan, Mc Graw Hill Education, 2021.
4. Droms, R. (2001). Computer networks and internets: with internet applications. Prentice Hall.

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

B. Tech III Year I Semester

20CSE112 MACHINE LEARNING

L	T	P	C
3	0	0	3

Pre-requisite **Programming for problem solving(Python)**

Course Description:

This course is designed to provide basic understanding on machine learning concepts and its types. Different algorithms of supervised and unsupervised learning are explained in detail which are extensively used in day today applications. Resampling methods also discussed with various evaluation parameters such as Precision, Recall, F-score to evaluate the ML algorithms. Advanced concepts in machine learning also discussed with necessary examples.

Course Objectives:

1. To understand the basic concept of machine learning and its types.
2. To demonstrate the different algorithms of supervised learning.
3. To experience the unsupervised methods with example.
4. To learn about the resampling method and various evaluation parameters.
5. To understand the advanced concepts in machine learning.

UNIT I MACHINE LEARNING PRELIMINARIES 9 hours

Linear Algebra basics, Probability and Statistics basics, Machine learning and traditional AI – learning from samples, Labelled and unlabeled samples – supervised algorithms (Classification) and unsupervised algorithms (Clustering), semi-supervised algorithm, 2-class classification and multi-class classification, Data distribution, Noisy data and outlier, Normalizing the data.

UNIT II UNSUPERVISED LEARNING 9 hours

Clustering algorithms - K-means, K-medoids, Fuzzy C means, DBSCAN clustering and anomaly detection, Hierarchical clustering, Competitive Learning and Self-Organizing Map (SOM) - Clustering and data mining - A-priori algorithm, Frequent Pattern (FP) growth algorithm,

UNIT III SUPERVISED LEARNING 9 hours

Regression and Classification, Correlation – Eigenvalue and regression - Linear regression – univariate and multivariate, Ridge regression, Bayesian Linear Regression - Bayes' theorem – a-prior and posterior, Naïve Bayes, Maximum Likelihood Estimation and Maximum A Posterior - Classification – Multi Layer Perceptron (MLP), Support Vector and Support Vector Machine (SVM), Kernel trick, Logistic Regression, Decision Tree, Random Forest.

UNIT IV MODEL EVALUATION AND GENERALIZATION 9 hours

Clustering – Cluster numbers and clustering indices - Classification – Accuracy and Precision, Confusion matrix, False Positive, False Negative, F-score, ROC curve, Training – Testing –

Validation datasets, Cross validation – Leave-one-out, k-fold cross validation - Generalization - Bias Variance dilemma, Regularization technique,

UNIT V ADVANCED TOPICS IN MACHINE LEARNING 9 hours

Text Mining – Singular Value Decomposition (SVD) and Latent Semantic Analysis, Topic modeling, Latent Dirichlet Allocation - Recommendation Systems – Matrix rank reduction techniques, SVD, Matrix completion algorithms - Social Network – Scale free networks and their properties, Clustering scale free networks –different techniques, Graph Spectral Analysis, Identifying members and cluster centers, applications.

Course Outcomes:

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

1. Illustrate the fundamental concepts of machine learning.

2. Identify clusters and association rules in data using unsupervised learning techniques.

3. Develop a model using supervised techniques to perform classification or regression.

4. Analyze the model performance using various metrics and regularization techniques.

5. Construct models using dimensionality reduction techniques to solve various applications.

Text Book(s)

1. Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, Prentice Hall of India, 2015.
2. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.

Reference Books

1. Christopher Bishop, "Pattern Recognition and Machine Learning", Springer, 2006. 2. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012. 3. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, CRC Press, 2014.
2. https://nptel.ac.in/courses/ 106106139/84

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

Dept. of Computer Science & Engineering

B. Tech III Year I Semester

20CSE209 COMPUTER NETWORKS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CSE111

Course Description:

This course helps the students to understand and implement OSI layers, simulation of various protocols, Error detection techniques, Routing and Congestion Algorithms simulation using NS, and protocol analysis, packet analysis, and traffic analysis using Wireshark.

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 Programs:

1. Implement a program for OSI functionality to transmit data from client to server.
2. Implement a program for the following Encoding Techniques
   NRZ, NRZ-I ,Manchester
3. Implement a program for framing Techniques
   a) Character Count b) Bit Stuffing and Destuffing c) Byte Stuffing and Destuffing
4. Implement a program for Flow control based on Sliding Window protocol
   a) Go Back N ARQ b) Selective repeat ARQ
5. Implement a program for CRC polynomials.
6. Simulation of Transferring data between two nodes using NS.
7. Simulation of data transfer and packet loss using NS.
8. Simulation of Congestion Control Algorithm using NS.
9. Simulate a 3 nodes point-to-point network with duplex links between them. Set the queue size vary the bandwidth and find the number of packets dropped.
10. Simulate a 4 nodes point-to-point network, and connect the links as follows: n0-n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP n1-n3. Apply relevant Applications over TCP and UDP agents changing the parameter and determine the number of packets sent by TCP/UDP.
11. Simulate an Ethernet LAN using N-nodes (6-10), change error rate and data rate and compare the throughput.
12. Protocol analysis with Wireshark.
13. Packet Capture & Traffic Analysis with Wireshark.

Course Outcomes:

After completing this course, the students should be able to

1. Understand the OSI layers functionality.
2. Apply the Encoding and framing techniques.
3. Apply the various error detection and correction techniques.
4. Simulate the various congestion control protocols using NS tool.
5. Analyze packets and traffic using packet analyzer tool.

Text Book(s)

1. Data Communications and Networking, Behrouz A. Forouzan, 6th Edition , Tata McGraw Hill, 2021.

Reference Books

1. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose, K.W.Ross, Third Edition, Pearson Education
2. Understanding Communications and Networks, Third Edition, W.A.Shay, Cengage Learning. Implementation and Management,6th Edition,2012.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech III Year I Semester

20CSE210 MACHINE LEARNING LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CSE101

Course Description:

This course is designed to provide basic understanding on machine learning and its various techniques. The course material further used for developing real time applications using ML algorithms using Python. Course covers from all basic and advanced concepts of ML algorithms and real time implementation.

Course Objectives:

1. To understand complexity of Machine Learning algorithms and their limitations;
2. To understand modern notions in data analysis-oriented computing;
3. To be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
4. To be capable of performing experiments in Machine Learning using real-world data.
5. To provide sufficient skill to utilize the ML concept in real time applications.

List of Programs:

1. Installing Python and exploring the packages required for machine learning including numpy,

scikit-learn, and matplotlib, IPython hmmpytk and pgmpy.

2. Read the training data from .CSV file and extract the data from a database using python.

3. Build linear regression model to predict sales of products.

4. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Python ML library classes can be used for this problem.

5. Cluster the following eight points (with (x, y) representing locations) into three clusters:

A1(2, 10), A2(2, 5), A3(8, 4), A4(5, 8), A5(7, 5), A6(6, 4), A7(1, 2), A8(4, 9)

Initial cluster centers are: A1(2, 10), A4(5, 8) and A7(1, 2). –

6. The distance function between two points a = (x1, y1) and b = (x2, y2) is defined asP(a, b) = |x2 – x1| + |y2 – y1|

Use K-Means Algorithm to find the three cluster centers after the second iteration.

7. Implement classification using SVM.

8. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

9. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in python can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

10. Implement Principle Component Analysis for Dimensionality Reduction.

11. Implement the python program on recommender system.

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

1. Utilize Python libraries to handle data and explore machine learning algorithms.
2. Build regression models to solve practical problems.
3. Apply various clustering techniques to group data points.
4. Develop classification models to classify data and predict outcomes.
5. Demonstrate the use of dimensionality reduction techniques and recommendation systems.

Text Book(s)

1. Ethem Alpaydin, “Introduction to Machine Learning”, Third Edition, Prentice Hall of India, 2015.
2. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.

Reference Books

1. Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006. 2.
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
3. Stephen Marsland, “Machine Learning – An Algorithmic Perspective”, Second Edition, CRC Press, 2014.
4. https://nptel.ac.in/courses/ 106106139/84

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Mandatory Course

III Year I Semester

20CE901 DISASTER MANAGEMENT

L	T	P	C
2	0	0	0

Pre-requisite: 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. 2. To ensure the students for the understanding on vulnerability, disasters, disaster prevention
3. and risk reduction.
4. To gain a preliminary understanding of approaches for the Disaster Risk Reduction (DRR)
5. To enhance awareness of institutional processes available in the country for the disaster risk mitigation.

UNIT I INTRODUCTION 6 hours

Introduction, Etymology of disaster, Concepts and definitions: disaster, hazard, vulnerability, risks, Resilience, prevention and mitigation.

UNIT II TYPES OF DISASTERS 6 hours

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.

UNIT III DISASTER IMPACTS 6 hours

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.

UNIT IV DISASTER RISK MITIGATION MEASURES 6 hours

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.

UNIT V IMPACT OF DEVELOPMENTAL ACTIVITIES 6 hours

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.

Course Outcomes:

The students after completing the course will be able to:

1. Explain various disaster concepts
2. Differentiate between categories of disasters
3. Analyze impact of various types of disasters
4. Select disaster risk mitigation measures
5. Identify the impact of development activities

Text Books:

1. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

Data Books:

1. C P Kothandaraman & S Subramanyan, Heat and Mass Transfer data book, New Age International Publishers, Eight Edition.

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, Mid Term Tests

III Year II Semester

B. Tech III Year II Semester

20CSE113 COMPILER DESIGN

L	T	P	C
3	0	0	3

Pre-requisite **20CSE110**

Course Description:

The course is intended to learn the basic techniques that underlie the practice of Compiler design. 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 provide knowledge on list the different stages in the process of compilation and lexical analysis.
2. To design top-down parsers.
3. To design bottom-up parsers and Identify synthesized and inherited attributes.
4. To learn the use of intermediate code generation and runtime environments and implementation intermediate code generation.
5. To develop skill to apply the concept of optimization and develop algorithms to generate code for a target machine.

UNIT I INTRODUCTION TO COMPILER AND LEXICAL ANALYSIS 9 hours

Introduction to Compiler - Phases of a compiler - Lexical Analysis : The Role of the Lexical Analyzer - Input Buffering - Specification of Tokens - The Lexical - Analyzer Generator Lex.

UNIT II TOP DOWN PARSING 9 hours

Introduction: The Role of the Parser - Context free grammar - Eliminating Ambiguity - Eliminating of Left Recursion and Left Factoring -Top-Down Parsing: Recursive descent parsing - Non-Recursive Predictive parsing - LL (1) Grammars.

UNIT III BOTTOM UP PARSING AND SYNTAX DIRECTED TRANSLATION 9 hours

Bottom-Up Parsing : Shift reduce parsing – Operator precedence parser - LR parsers: Simple LR parser - Canonical LR parser - LALR parser - The Parser Generator YACC - Syntax Directed Translation : Syntax directed definition - S-attributed and L - attributed definitions - Construction of syntax trees.

UNIT IV INTERMEDIATE CODE GENERATOR AND RUN TIME ENVIRONMENTS 9 hours

Intermediate Code Generation: Intermediate Languages - Boolean expressions - Flow-of-Control Statements - Assignment Statements - Run time Environments : Storage organization - Storage Allocation strategies - Symbol table structure - Symbol table attributes and management.

UNIT V CODE OPTIMIZATION AND CODE GENERATION 9 hours

Code Optimization: Basic Blocks and Flow Graphs - Optimization of Basic Blocks - The principle sources of optimization - Introduction to data flow analysis, DAG - Code Generation: Issues in the Design of a Code Generator - The Target Language - A Simple Code Generator - Peephole optimization - Register allocation and assignment.

Course Outcomes:

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

1. Understand the phases of compiler and Lexical Analyzer.
2. Develop the parser using Top-Down Parsing.
3. Apply the Bottom-up Parser followed by syntax directed translation schemes.
4. Construct intermediate code for a given high level programming language.
5. Build the optimized code generation for intermediate code.

Text Book(s)

1. Alfred V. Aho - Monica S.Lam - Ravi Sethi - Jeffrey D. Ullman,“Compilers-Principles - Techniques and Tools”, 2nd edition, Pearson Education, 2018.
2. Principles of compiler design - A.V. Aho, J.D.Ullman Pearson Education, 2002.

Reference Books

1. Modern Compiler Design, Grune, D., Van Reeuwijk, K., Bal, H.E., Jacobs, C.J.H., Langendoen, K. Springer-Verlag New York, 2012.
2. Modern Compiler Implementation in C, Andrew N.Appel, Cambridge University Press, 2005.
3. Lex & Yacc, John R. Levine, Tony Mason, Doug Brown, O’reilly, Second edition, 1992.

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

B. Tech III Year II Semester

20CSE114 INTERNET OF THINGS

L	T	P	C
3	0	0	3

Pre-requisite Nil

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 9 hours

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.

UNIT II EMBEDDED DEVICES – I (ARDUINO) 9 hours

Embedded Computing Basics; Microcontrollers; System-on-Chips; Choosing Your Platform; Arduino; Developing on the Arduino; Some Notes on the Hardware; Openness.

UNIT III EMBEDDED DEVICES – II (RASPBERRY PI) 9 hours

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.

UNIT IV COMMUNICATION IN THE IOT 9 hours

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.

UNIT V PROTOTYPING ONLINE COMPONENTS 9 hours

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.

Course Outcomes:

After completing this Unit, students will be able to

1. Understand the basic principles and design concepts of IoT.
2. Interpret the use of Arduino for basic embedded system applications.
3. Illustrate the use of Raspberry Pi to develop IoT applications.
4. Analyze communication protocols such as TCP/IP and DNS for IoT applications.
5. Examine IoT prototypes using APIs and communication protocols.

Text Book(s)

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 III Year II Semester

20CSE115 SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

The course covers the topics include process models, software requirements, software design, software testing, software process/product metrics, quality management and UML diagrams. This course presents software engineering techniques and explains the software development life-cycle, including software specification, requirement analysis, design implementation, testing and maintenance.The main goal of this course is to help 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 learn design concepts and various design models.
4. To make students to learn about testing strategies.
5. To provide better understanding of software quality and assurance techniques.

UNIT I BASIC CONCEPTS OF SOFTWARE ENGINEERING & PROCESS MODEL 9 hours

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 Models-Adaptive process models, Scrum, Dynamic systems development Method and Crystal.

UNIT II SOFTWARE REQUIREMENT ENGINEERING AND SYSTEM MODELS 9 hours

Software Requirements: Functional and Non-functional requirements, User requirements, System requirements, Interface specification, and 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 and Object models.

UNIT III SOFTWARE DESIGN AND ENGINEERING 9 hours

Design Engineering: Design process, Design concepts, Design model, Pattern based software design, Object oriented analysis and design (using UML): Class diagrams, Use case 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.

UNIT IV SOFTWARE TESTING AND METRIC PROCESS 9 hours

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.

UNIT V SOFTWARE QUALITY ASSURANCE 9 hours

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.

Course Outcomes:

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

1. Understand Software Types, Characteristics, Lifecycle Models, CMMI, and Agile Process Models.
2. Demonstrate about software requirements and requirements engineering processes through various system models.
3. Apply design concepts, models, and patterns for object-oriented and component-level software design.
4. Illustrate software testing strategies, validation, and product metrics for quality assurance.
5. Utilise software quality concepts, assurance practices, reviews, and ISO 9000 standards for reliability.

Text Book(s)

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

Reference Books

1. Rajib Mall, Fundamentals of Software Engineering, PHI Learning Private Limited, 4th Edition, 2014.
2. Pankaj Jalote, Software Engineering, A Precise Approach, Wiley India, 2010.
3. Waman S Jawadekar , Software Engineering: A Primer, Tata McGraw-Hill, 1st Edition, 2008.

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

B. Tech III Year II Semester

20CSE211 COMPILER DESIGN LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CSE201, 20CSE203

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 implementation of the data structure used by the compiler and implementation of different phases of compiler.

Course Objectives:

1. To implement lexical analyser.
2. To implement 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 Programs:

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. 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.
3. 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
4. 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.
5. Write a LEX program to count the number of comment lines in a given C program and eliminate them and write into another file.
6. Implement a program to perform symbol table operations.
7. Implement a program to eliminate left recursion and left factoring from a given CFG.
8. Write a program to find FIRST and FOLLOW for predictive parser.
9. Implement a non-recursive decent parsing.

10. Implement a Shift Reduce parser.
11. Create YACC (or BISON) and LEX specification files to implement a basic calculator which accepts variables and constants of integer and float type.
12. 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. Design a lexical analyzer in C/C++ for efficient tokenization, handling spaces, comments, and long identifiers.
2. Use LEX/FLEX to create lexical analyzers for token separation and analysis in C programs.
3. Develop LEX programs to process constants, HTML tags, and comments in input files.
4. Implement and optimize parsing algorithms including non-recursive parsing and grammar transformations.
5. Design an intermediate code generator and implement a basic calculator using YACC/BISON and LEX.

Text Book(s)

1. Alfred V. Aho - Monica S.Lam - Ravi Sethi - Jeffrey D. Ullman,“Compilers-Principles - Techniques and Tools”, 2nd edition, Pearson Education, 2018.
2. Principles of compiler design - A.V. Aho, J.D.Ullman Pearson Education, 2002.

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1. Modern Compiler Design, Grune, D., Van Reeuwijk, K., Bal, H.E., Jacobs, C.J.H., Langendoen, K. Springer-Verlag New York, 2012.
2. Modern Compiler Implementation in C, Andrew N.Appel, Cambridge University Press, 2005.
3. Lex & Yacc, John R. Levine, Tony Mason, Doug Brown, O’reilly, Second edition, 1992.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech III Year II Semester

20CSE212 INTERNET OF THINGS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite Nil

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.

List of Programs:

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.

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. Identify the sensors and actuators for an IoT application.
2. Construct a specific application for various IoT protocols.
3. Design an IoT application with a cloud platform.
4. Create an experiment with embedded boards using an IoT prototype.
5. Build an IoT application using various sensors, actuators, and a cloud platform.

Text Book(s)

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: Continuous Internal Evaluation and End Semester Examination

B. Tech III Year II Semester

20CSE213 SOFTWARE ENGINEERING LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite NIL

Course Description:

This course is introduced to give hands on experience in developing a software project by using the software engineering principles and techniques that are used in developing quality software products. The course will also give an overview of UML and how to use UML diagrams and views to support requirements, architectural and systems design.

Course Objectives:

1. To make students to learn different phases of life cycle models in software engineering.
2. To make students to learn about functional and non-functional 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.

List of Experiments:

To develop a mini-project the following 12 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
7. UML interaction diagrams.
8. Draw the State chart diagram.
9. Identify the User interface, domain objects, and technical services.
10. Draw the partial layered, logical architecture diagram with UML package diagram notation.
11. Draw the Component and Deployment diagrams.
12. Implement the Domain objects layer.
13. Implement the User Interface layer.
14. Code the Project and show the demo of your project in any IDE.

Suggested domains for Mini-project

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 successful completion of the course, students will be able to

1. Develop a problem statement, define requirements, and create an IEEE SRS, risk management, and project plan.
2. Build the use case, activity, and domain models using UML for business activities and conceptual classes.
3. Analyze object interactions and represent them using UML diagrams, including state charts and user interfaces.
4. Design UML package, component, deployment diagrams, and develop domain objects and UI layers.
5. Implement the project functionality through coding in a chosen IDE..

Text Book(s)

1.Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide,2nd Edition, Pearson Education-2005
2.Gamma, Belm, Johnson, “Design Patterns: Elements of Reusable Object Oriented Software”, Pearson Education -1995.
3. Meilir Page-Jones ,"Fundamentals of Object Oriented Design in UML , Pearson Education-2000
4.Atul Kahate ,Object Oriented Analysis & Design, The McGraw-Hill-2004

Reference Books

1. Roger S Pressman, Software Engineering: A practitioner’s Approach, McGraw Hill, 9th Edition 2020.
2. Ian Sommerville, Engineering Software Products: An Introduction to Modern Software Engineering, Pearson Education, 1st Edition 2019.
3. Rajib Mall, Fundamentals of Software Engineering, PHI Learning Private Limited, 4th Edition, 2014.
4. Pankaj Jalote, Software Engineering, A Precise Approach, Wiley India, 2010.
5. Waman S Jawadekar , Software Engineering: A Primer, Tata McGraw-Hill, 1st Edition, 2008.

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

Mandatory Course
B. Tech III Year I Semester

20HUM902** / 20HUM102# UNIVERSAL HUMAN VALUES

L	T	P	C
2**/3#	0	0	0**/3#

Pre-requisite None.

Course Description:

This course discusses students' role in their family and briefly touches issues related to their role in the society and the nature.

Course Objectives:

This course enables students to

1. Understand Happiness and Prosperity correctly and basic Human Aspirations
2. Able to self-verify the Harmony in the Human Being
3. Visualize a universal harmonious order in society which leads to Undivided Society at Universal Order- from family to world family.
4. Understanding Harmony in the Nature and Existence - Whole existence as Coexistence
5. Implicate the UHV in professional ethics.

UNIT I The Process for Value Education - Basic Human Aspirations 8 hours

L1: Purpose and motivation for the course, recapitulation from Universal Human Values-I

L2: Self-Exploration– what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration

L3: Continuous Happiness and Prosperity- A look at basic Human Aspirations

L4: Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority

L5: Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

L6: Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

T1 & T2: Discussion on natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT II Understanding Harmony in the Human Being - Harmony in Myself! 8 hours

L7: Understanding human being as a co-existence of the sentient 'I' and the material 'Body'

L8: Understanding the needs of Self ('I') and 'Body' - happiness and physical facility

L9: Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

L10: Understanding the characteristics and activities of 'I' and harmony in 'I'

L11: Understanding the harmony of I with the Body: Self-regulation and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.

L12: Programs to ensure Self-regulation and Health.

T3 & T4: Discussion on the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT III Understanding Harmony in the Family and Society 7 hours

L13: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

L14: Understanding the meaning of Trust; Difference between intention and competence

L15: Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

L16: Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

L17: Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

T5 & T6: Reflection on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT IV Understanding Harmony in the Nature and Existence 6 hours

L18: Understanding the harmony in the Nature

L19: Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature

L20: Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

L21: Holistic perception of harmony at all levels of existence.

T7 & T8: Discussion on human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT V Implications of Holistic Understanding of Harmony on Professional Ethics 11 hours

L22: Natural acceptance of human values

L23: Definitiveness of Ethical Human Conduct

L24: Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

L25; Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

L26: Case studies of typical holistic technologies, management models and production systems

L27: Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

L28: Sum up.

T9-T14: Exercises and Case Studies For e.g. Individual discussion on the conduct as an engineer or scientist etc.

Course Outcomes:

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

1. Understood the natural acceptance in human being as the innate acceptance,
2. More aware of themselves,
3. Maintain harmony with family and society by recognizing Harmony in Human-Human Relationship,
4. Try to get Harmony in the Nature and Existence by realizing existence as Coexistence
5. More responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind with better critical ability.

Text Book(s)

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

Mode of Evaluation: Assignment / Quiz, Classroom participation, Mini project / Report, Internal Mid Examination and external semester end examination.

Open Elective -II

Open Elective - II

20MAT301 ADVANCED NUMERICAL METHODS

L	T	P	C
3	0	0	3

Pre-requisite: 20MAT101, 20MAT107, 20MAT110

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:

6. To introduce computation methods of solving algebraic and transcendental equations.
7. To avail the basics of numerical techniques for solving the system of linear equations
8. To familiarize the knowledge of interpolation and numerical calculus.
9. To use numerical calculus for solving ordinary differential equations.
10. To introduce the computational techniques for solving partial differential equations.

UNIT I SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS 9 hours

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

UNIT II SOLUTIONS OF SYSTEM OF ALGEBRAIC EQUATIONS 9 hours

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

UNIT III INTERPOLATION & NUMERICAL CALCULUS 9 hours

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

UNIT IV NUMERICAL SOLUTIONS TO ORDINARY DIFFERENTIAL EQUATIONS 9 hours

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.

UNIT V NUMERICAL SOLUTION TO PARTIAL DIFFERENTIAL EQUATIONS 9 hours

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

Course Outcomes:

At the end of the course, students will 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, 43rd edition (2014), Khanna publishers.
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

20MAT302 ENGINEERING OPTIMIZATION

L	T	P	C
3	0	0	3

Pre-requisite: 20MAT101, 20MAT106, 20MAT104, 20MAT108, 20MAT109, 20MAT110.

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 solve dynamic programming problem using recursive relations.
5. Analyze the techniques of project management and queuing models.

UNIT I CLASSICAL OPTIMIZATION 9 hours

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.

UNIT II LINEAR PROGRAMMING PROBLEM 9 hours

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.

UNIT III TRANSPORTATION PROBLEM AND ASSIGNMENT PROBLEM 9 hours

Transportation problem: definition and algorithm, transshipment problem. Assignment problem, travelling salesman problem.

UNIT IV DYNAMIC PROGRAMMING 9 hours

Introduction, developing optimal decision policy, Dynamic Programming Problem (DPP) under certainty, DPP approach for solving LPP.

UNIT V PROJECT MANAGEMENT AND QUEUING MODELS 9 hours

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) :(∞/FCFS), (M/M/1): (N/FCFS).

Course Outcomes:

At the end of the course, students will be 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 and assignment problems in engineering situations.
4. Apply the Bellman principle of optimality to solve dynamic 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.

Reference Books

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, 2ndedition.

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

Open Elective - II

20PHY301 OPTICAL PHYSICS AND ITS APPLICATIONS

L	T	P	C
3	0	0	3

Pre-requisite: None

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

Course Objectives:
Students will

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 9 hours
Corpuscular and wave theory, Fermat's principle, Matrices for translation, refraction and reflection, Unit and nodal planes, Eigenvalues and Eigenvectors.

UNIT II ABERRATIONS AND OPTICAL INSTRUMENTS 9 hours
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.

UNIT III WAVE OPTICS & INTERFERENCE 9 hours
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).

UNIT IV DIFFRACTION & POLARISATION 9 hours
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.

UNIT V FIBER OPTICS 9 hours
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

Course Outcomes:

At the end of the course, students will 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 Books:

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

20PHY302 LASER PHYSICS AND ADVANCED LASER TECHNOLOGY

L	T	P	C
3	0	0	3

Pre-requisite: 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 9 hours

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.

UNIT II GASES AND LIQUIDS LASING MEDIUM 9 hours
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.

UNIT III SOLID STATE LASERS 9 hours
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);

UNIT IV PULSED OPERATION OF LASERS 9 hours

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.

UNIT V LASER APPLICATIONS 9 hours

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.

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
3. Femtosecond Laser Pulses Principles and Experiments: Claude Rulli`ere, Springer
4. Principles of Laser: O. Svelto
5. Laser Physics: Peter W Miloni, Joseph H Eberly.

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

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

Open Elective - II

20CHE301 INTRODUCTION TO PETROLEUM INDUSTRY

L	T	P	C
3	0	0	3

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 Objectives:
Students will

1. To understand the basic concepts of crude oil, distillation process, internals, petroleum products and their properties, Instruments used for fuel testing.
2. To understand the type of chemicals and their application in petroleum industry.
3. To introduce the basic principles of hydroprocessing and fluid catalytic cracking and familiarize the processes involved there.
4. To familiarize the basic concepts of catalysis, bioprocesses in the refinery.
5. Health, environment, process safety and management in petroleum companies.

UNIT I BASIC PROCESSES IN PETROLEUM REFINING AND FUEL TESTING **9 hours**

Source of Crude oils and types, Overview of refinery process, Atmospheric Distillation, Vacuum distillation, Desalter, Desulphurization, Cracking, catalysis, Effluent treatment plant. Density, viscosity, pour point, flashpoint, octane number, cetane number, Fire point, Chromatography, Ductility, Water content, Sulphur analysis, MCRT, SARA, HFRR, calorofic value etc.

UNIT II CHEMICALS AND THEIR IMPORTANCE IN PETROLEUM INDUSTRY **9 hours**

Types of products in the refinery and their structural properties, Netralizing amines, Corrosion inhibitors, Multifunctional additives, viscosity improvers, drag reducing agents, antioxidants, Lubricity improvers, Antifoam additives, Oil spill absorbers, Dispersants and their applications, Types of Catalysts used in the refinery, Chemicals for ETP plant.

UNIT III ROLE OF HYDROPROCESSING AND FLUID CATALYTIC CRACKING IN PETROLEUM INDUSTRY **9 hours**

Objectives, Hydrocracking Reactions, Hydrocracking feedstocks, Modes of Hydrocracking, Effects of process variables, Hydro treating process and catalysts Resid hydro processing, FCC Cracking, Catalyst coking and regeneration, Design concepts, New Designs for Fluidized-Bed Catalytic Cracking Units

UNIT IV ROLE OF CATALYSTS, BIOPROCESSES IN PETROLEUM INDUSTRY 9 hours

Types of catalyst and their importance, Design of catalyst, selection of catalyst, Catalytic processes. Introduction to biotechnology, oil recovery from reservoirs, refining of petroleum using biodesulphurisation, Bioremediation, commercial processes for bioethanol, propanol.

UNIT V HEALTH, ENVIRONMENT, PROCESS SAFETY AND MANAGEMENT IN PETROLEUM INDUSTRY 9 hours

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, precautions safety, Occupational safety and management, different elements and their role.

Course Outcomes:

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

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, Amal Elkilani, Fundamentals of Petroleum Refining, Elsevier,2009

2. David T Day, Handbook of the Petroleum Industry, Volume 1, ISBN: 137595962X, CHIZINE PUBN, 2017

3. S. P. Srivastava Jenő Hancsók, *Fuels and fuel additives*, Wiley VCH Verlag Gmbh & Co, Weinheim, 2004.

4. Robert O. Anderson, *Fundamentals of the Petroleum Industry*–University of Oklahoma Pres, 1987.

5. James G.Speight, *Handbook of Petroleum Product Analysis*, John Wiley & Sons, Inc, 2015

6. Physical Chemistry by G.W. Castellan (Addison Wesley Publishing Company)

Reference Books

1. Sankara Papavinasam, Corrosion Control in the Oil and Gas Industry, Elsevier, 2013
2. Petroleum Engineering Handbook (Vol. 1 through 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.

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

Open Elective – II

20CHE302 GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT

L	T	P	C
3	0	0	3

Pre-requisite: Basic Chemistry at Intermediate 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 and solvents and green processes for Nanoscience.

Course Objectives:
Students will

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 I PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY 9 hours

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.

UNIT II CATALYSIS AND GREEN CHEMISTRY 9 hours

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.

UNIT III ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS 9 hours

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbondioxide, super critical water and water as a reaction solvent: water based coatings, Ionic liquids as catalyst and solvent.

UNIT IV EMERGING GREENER TECHNOLOGIES AND ALTERNATIVE ENERGY SOURCES 9 hours

Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Fuel Cells(Hydrogen—oxygen fuel cell), Photochemical Reactions: Advantages of and Challenges Faced by Photochemical Processes, Examples of Photochemical Reactions(caprolactum), Chemistry Using Microwaves: Microwave Heating, Microwave-assisted Reactions, Sonochemistry.

UNIT V GREEN PROCESSES FOR GREEN NANOSCIENCE 9 hours

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing Green 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

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

Reference Books

1. Edited by Alvise Perosa and Maurizio Selva , Hand Book of Green chemistry Volume 8: Green Nanoscience, wiley-VCH

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

Open Elective – II

20CE301 GROUND IMPROVEMENT TECHNIQUES

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
Identification of problematic soils; ground improvement techniques; densification in granular soils; densification in cohesive soils; soil stabilization; confinement; reinforced earth; geo-synthetics; improvement of expansive soils.

Course Objectives:
Students will

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 9 hours

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.

UNIT II DENSIFICATION 9 hours
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.

UNIT III STABILIZATION 9 hours
Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride- sodium silicate and gypsum.

UNIT IV REINFORCED EARTH & GEOSYNTHETICS 9 hours
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.

UNIT V EXPANSIVE SOILS **9 hours**

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

Course Outcomes:

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

1. Evaluate 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. Choose the best method for stabilizing the soil for a given soil condition.
4. Choose-the best geosynthetic materials in different engineering applications.
5. Assessing various 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.

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

Open Elective – II

20CE302 ENVIRONMENTAL IMPACT ASSESSMENT

L	T	P	C
3	0	0	3

Pre-requisite: None

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

Course Objectives:
Students will
1. To impart knowledge on Environmental management and Environmental Impact Assessment.
2. To give the student the brief knowledge about various legislations and audit protocols.
3. To give student knowledge about the framing of environmental audit through case studies.

UNIT I CONCEPTS AND METHODOLOGIES IN EIA 9 hours

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.

UNIT II IMPACT OF DEVELOPMENTAL ACTIVITIES 9 hours
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.

UNIT III IMPACT ON VEGETATION AND WILD LIFE 9 hours
Assessment of Impact of development Activities on Vegetation and wildlife - environmental Impact of Deforestation - Causes and effects of deforestation.

UNIT IV ENVIRONMENTAL AUDIT 9 hours
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.

UNIT V ENVIRONMENTAL POLLUTION ACTS 9 hours

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.

Course Outcomes:

The students after completing the course will be able to:

1. Apply the various methods used in predicting environmental impacts.
2. Apply site information to interpret impacts on land and groundwater.
3. Evaluate environmental impacts of various development activities on existing ecosystem.
4. Apply the procedures and various protocols involved in preparation of environmental audit report.
5. Apply 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

20CE303 WATERSHED MANAGEMENT

L	T	P	C
3	0	0	3

Pre-requisite: None

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 9 hours

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. 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 9 hours
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.

UNIT III EROSION AND SEDIMENTATION 9 hours
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.

UNIT IV WATER HARVESTING 9 hours

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 modelling- environmental guidelines for water quality.

UNIT V COVER MANAGEMENT 9 hours

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.

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

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

Open Elective – II

20ME301 MATERIAL SCIENCE FOR ENGINEERS

L	T	P	C
3	0	0	3

Pre-requisite: None

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 9 hours

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

UNIT II CRYSTAL IMPERFECTIONS AND DIFFUSION 9 hours

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.

UNIT III ELECTRICAL PROPERTIES OF MATERIALS 9 hours

Introduction and Electrical Conduction: Ohm’s Law, Electrical Conductivity, Electronic and Ionic Conduction - Energy Band Structures in Solids, Electron Mobility - Electrical Resistivity of Metals Semi conductivity: 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.

UNIT IV MAGNETIC PROPERTIES OF MATERIALS 9 hours

Introduction and Basic Concepts, Diamagnetism, Paramagnetism, Ferromagnetism, Anti ferromagnetism, Ferrimagnetism, Influence of Temperature on Magnetic Behavior, Domains and Hysteresis, Magnetic Anisotropy, Soft and Hard Magnetic Materials, Magnetic Storage, Superconductivity.

UNIT V PHOTONIC MATERIALS 9 hours

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

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

Reference Books

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

20ME302 ELEMENTS OF MECHANICAL ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite: None

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 THERMODYNAMICS 9 hours

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.

UNIT II BOILERS, TURBINES AND PUMPS 9 hours

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.

UNIT III IC ENGINES AND REFRIGERATION SYSTEMS 9 hours

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.

UNIT IV MATERIALS, CASTING AND TRANSMISSION 9 hours

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.

UNIT V TOOLS AND MANUFACTURING SYSTEMS 9 hours

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.

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 Books:

1. "Basic Mechanical Engineering" by Pravin Kumar, Pearson Edition ISBN: 9789332505759, 9789332505759.

Reference Books

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

220EEE301 INDUSTRIAL ELECTRICAL SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite: 20EEE101

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 9 hours

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.

UNIT II RESIDENTIAL AND COMMERCIAL ELECTRICAL SYSTEMS 9 hours

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.

UNIT III ILLUMINATION SYSTEMS 9 hours

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.

UNIT IV INDUSTRIAL SUBSTATION SYSTEMS 9 hours

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.

UNIT V INDUSTRIAL SYSTEM AUTOMATION 9 hours

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.

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 Books

1. S. Singh and R. D. Singh, “Electrical estimating and costing”, Dhanpat Rai and Co., 1997.
2. H. Joshi, “Residential Commercial and Industrial Systems”, McGraw Hill Education, 2008.
3. https://www.bis.gov.in/

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

Open Elective – II

20EEE302 INTRODUCTION TO MEMS

L	T	P	C
3	0	0	3

Pre-requisite: 20EEE101

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 9 hours

Overview – History and industry perspectives – Working principles – Mechanics and dynamics –– Scaling law

UNIT II MICRO SENSORS & ACTUATORS 9 hours
Micro sensors: Pressure sensors, accelerometers, gyroscopes-Micro actuators: comb drive actuators – Micro-electromechanical systems.

UNIT III MICRO MANUFACTURING 9 hours
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.

UNIT IV MODELING IN MEMS 9 hours
Micro system design: Finite Element Methods-– Modeling of simulation – piezoelectric, Gyroscope

UNIT V MEMS APPLICATIONS 9 hours
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

Course Outcomes:

Upon successful completion of the course, students will be 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

Reference Books

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

Open Elective – II

20ECE301 BIO-MEDICAL ELECTRONICS

L	T	P	C
3	0	0	3

Pre-requisite: None

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:
This course enables students to

1. Acquire the basic knowledge on human physiology and biological transducers.
2. Learn about bio-electrodes and bio-amplifiers used in bio-signal acquisition.
3. Understand the working principle of bio-medical measuring instruments.
4. Study various types of imaging techniques used in medicine.
5. Learn the applications of medical instrumentation in designing artificial medical aids

UNIT I HUMAN PHYSIOLOGY AND BIOMEDICAL TRANSDUCERS 9 hours

Introduction to human physiology - Biomedical transducers for measuring displacement, velocity, force, acceleration, potential, dissolved ions and gases.

UNIT II BIO-ELECTRODES AND AMPLIFIERS 9 hours
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.

UNIT III BIOMEDICAL MEASURING INSTRUMENTS 9 hours
Measurement of blood pressure and temperature, Blood flow meter, Cardiac output measurement, Respiratory measurement, Blood cell counter, Impedance plethysmography.

UNIT IV MEDICAL IMAGING 9 hours
X-ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear imaging, Ultrasonic Imaging.

UNIT V PROSTHESES AND AIDS 9 hours
Pacemakers, Defibrillators, Heart-lung machine, Artificial kidney, Aids for the handicapped, Safety aspects

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 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

Reference Books

1. A.M. Cook and J.G. Webster, eds., Medical Devices and Human Engineering, Taylor & Francis, 2014
2. R.S.Khandpur,"Handbook of Biomedical Instrumentation", 2nd edition, Tata McGraw - Hill, New Delhi, 2005
3. LeslieCromwell,"BiomedicalInstrumentationandMeasurement",Prentice-Hall, New Delhi, 2011.

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

Open Elective – II

20ECE302 VLSI DESIGN

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
This course describes about various VLSI design methodologies, fundamentals of CMOS technology. It incorporates basics of MOSFET models, CMOS design rules, Design of VLSI Systems, combinational logic design, sequential logic design, logic families and VLSI Design flow.

Course Objectives:
This course enables students to

1. Study the fundamentals of CMOS circuits and its characteristics
2. Learn the design and realization of combinational digital circuits.
3. Learn the design and realization of sequential digital circuits.
4. Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed
5. Learn the different FPGA architectures and testability of VLSI circuits.

UNIT I INTRODUCTION TO MOS TRANSISTOR 9 hours

MOS Transistor, CMOS logic, Inverter, Pass Transistor, Transmission gate, Layout Design Rules, Gate Layouts, Stick Diagrams, Long-Channel I-V Charters tics, C-V Charters tics, Non ideal I-V Effects, DC Transfer characteristics, RC Delay Model, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate, Scaling.

UNIT II COMBINATIONAL MOS LOGIC CIRCUITS 9 hours

Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass Transistor Logic, Transmission Gates, Domino, Dual Rail Domino, CPL, DCVSPG, DPL, Circuit Pitfalls.
Power: Dynamic Power, Static Power, Low Power Architecture.

UNIT III SEQUENTIAL CIRCUIT DESIGN 9 hours

Static latches and Registers, Dynamic latches and Registers, Pulse Registers, Sense Amplifier Based Register, Pipelining, Schmitt Trigger, Monostable Sequential Circuits, Astable Sequential Circuits.
Timing Issues: Timing Classification Of Digital System, Synchronous Design.

UNIT IV DESIGN OF ARITHMETIC BUILDING BLOCKS AND SUBSYSTEM 9 hours

Arithmetic Building Blocks: Data Paths, Adders, Multipliers, Shifters, ALUs, power and speed tradeoffs, Case Study: Design as a tradeoff.

Designing Memory and Array structures: Memory Architectures and Building Blocks, Memory Core, Memory Peripheral Circuitry.

UNIT V IMPLEMENTATION STRATEGIES AND TESTING 9 hours

FPGA Building Block Architectures, FPGA Interconnect Routing Procedures. Design for Testability: Ad Hoc Testing, Scan Design, BIST, IDDQ Testing, Design for Manufacturability, Boundary Scan

Course Outcomes:

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

1. Realize the concepts of digital building blocks using MOS transistor.
2. Design combinational MOS circuits and power strategies
3. Design and construct Sequential Circuits and Timing systems.
4. Design arithmetic building blocks and memory subsystems.
5. Apply and implement FPGA design flow and testing.

Text Books:

1. Neil H.E. Weste, David Money Harris “CMOS VLSI Design: A Circuits and Systems Perspective”, 4th Edition, Pearson , 2017.
2. Jan M. Rabaey ,Anantha Chandrakasan, Borivoje. Nikolic, ”Digital Integrated Circuits:A Design perspective”, Second Edition , Pearson , 2016.

Reference Books

1. Operating Systems - Internals and Design Principles. Stallings, 6th Edition2009. Pearson education.
2. William Stallings, “Operating Systems – Internals and Design Principles”, 7th Edition, Prentice Hall, 2011.

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

Open Elective - IV

Open Elective - IV

20PHY303 THIN FILM TECHNOLOGY AND ITS APPLICATIONS

L	T	P	C
3	0	0	3

Pre-requisite: 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 8 hours

Introduction - Role of thin films in devices - Thin film definition - Crystalline and amorphous films - Crystal defects - Nucleation and growth - film formation.

UNIT II THIN FILM DEPOSITION TECHNIQUES 10 hours

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.

UNIT III PROPERTIES OF THIN FILMS 8 hours

Structural-Optical-Electrical-Magnetic-Mechanical and Thermal properties of thin films.

UNIT IV CHARACTERIZATION OF THIN FILMS 10 hours

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).

UNIT V APPLICATIONS OF THIN FILMS 9 hours

Transparent conducting coating - Optical coating – Solar cells – Photocatalytic – Sensors - Superconductivity- Superhard coatings – Thin film transistors.

Course Outcomes:

At the end of the course, 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.

Reference Books:

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. G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties & Applications" Imperial College Press, 2004.
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 Tests, End Semester Examination

Open Elective - IV

20CHE303 INTRODUCTION TO NANO SCIENCE AND TECHNOLOGY

L	T	P	C
3	0	0	3

Pre-requisite: None

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.

Course 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 — 8 hours

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.

UNIT II TYPES AND SYNTHESIS OF NANOSTRUCTURES — 10 hours

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).

UNIT III PROPERTIES OF NANOMATERIAL — 8 hours

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.

UNIT IV CHARACTERIZATION OF NANOMATERIALS — 10 hours

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).

UNIT V APPLICATIONS OF NANOMATERIALS 9 hours

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.

Course Outcomes:

At the end of the course, 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.

Reference Books

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 Tests, End Semester Examination

Open Elective - IV

20CHE304 COMPUTATIONAL METHODS IN MATERIALS SCIENCE AND ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite: 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 — 9 hours

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.

UNIT II PROGRAMMING AND PLOTTING — 9 hours

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.

UNIT III DATA TYPES AND HANDLING TECHNIQUES — 9 hours

Classification, and understanding of data properties, data handling - plotting, fitting, functional forms, interpolation, and integration.

UNIT IV COMPUTATIONAL MODELING AND SIMULATIONS — 9 hours

Understanding the materials properties; atomistic and electronic modelling of materials; concepts in molecular dynamics and its application using Quantum ESPRESSO.

UNIT V CURRENT TRENDS IN COMPUTATIONAL MATERIALS SCIENCE — 9 hours

Applied materials for various engineering field; research literature exploration; real-time application of computational methods in materials science and engineering, mini-project.

Course Outcomes:

At the end of the course, 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.

Reference Books

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 Tests, End Semester Examination

Open Elective - IV

20CE304 GREEN BUILDINGS AND ENERGY CONSERVATION

L	T	P	C
3	0	0	3

Pre-requisite: 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 9 hours

Introduction to bioclimatic architecture - Sustainability in building science and Functional planning - Orientation - Elements of building design and drawing - Building regulations and bylaws - Traditional and VernacularArchitecture - Climate zones - Design Charts - sun path diagram - Solar angles - Indices of thermal comfort - Vernacular buildings in different climate zones.

UNIT II CLIMATE RESPONSIVE SCIENTIFIC PROCESS OF DESIGN 9 hours

Introduction - various steps in Site planning - Plan form Building envelope Land form -Topography - vegetation - water bodies; Orientation - S/V ratio - P/A ratio - Walls, Fenestration - Roof and floors - Active and passive solar strategies - Passive solar architecture.

UNIT III THERMAL FLOW IN BUILDINGS 9 hours

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.

UNIT IV GREEN BUILDING MATERIALS AND CONSTRUCTION 9 hours

Material properties - Energy efficiency using various materials - emerging new materials Construction techniques- Techniques for roof, wall and foundations.

UNIT V ECONOMY OF GREEN BUILDING 9 hours

Cost of building - operation and maintenance - Green building rating system - Evaluation criteria of LEED - TERI GRIHA case studies - Case studies in different climate zones.

Course Outcomes:

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

1. Use various regulations and by laws for green building construction0.
2. Do site planning for Green Building.
3. Compute thermal flow through different building elements
4. Identify energy efficient building materials
5. Compute cost of building/operation and maintenance

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.

Reference Books

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, CharotharPublishing House

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

Open Elective - IV

20CE305 ENVIRONMENTAL ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:

The course covers demand, quality and treatment of water along with characterization, water and wastewater treatment plant units and design , low cost treatment of wastewater and household drainage. Similarly, air pollution, noise pollution and solid waste management are also included. Further the course also covers basic laboratory

Course Objectives:

1. To explain different sources of water, water quality standards, water demands, distribution of water, population forecast, characteristics of water.
2. To analyze various water treatment plant units and their design considerations, advanced water treatment systems.
3. To explain the generation and collection of wastewater; wastewater treatment plant design, various wastewater treatment units and sludge treatment.
4. To explain various impacts of air and noise pollution and various methods to control them air and noise pollution
5. To describe about solid waste generation, characterization, impacts and various management techniques

UNIT I WATER SUPPLY ENGINEERING 9 hours

Water- Sources of Water, Water quality standards, Quantity of water: water demands, percapita demand, design period, population forecast, fluctuation in demand. General requirement for water supply: Sources, Types of intakes, Pumping and distribution of water; Quality of water: Physical, chemical, and biological characteristics of water and significance, necessity of treatment, water quality standards for various water uses.

UNIT II WATER TREATMENT 9 hours

Engineering system for water purification: Aeration, Screening, Coagulation and Flocculation, Sedimentation, Softening, Filtration, Disinfection; Methods of treatment: Removal of color, tastes and odor control, removal of iron and manganese, fluoridation and defluorination. Advanced water treatment: Ion exchange, electro-dialysis, RO (principles only.

UNIT III WASTEWATER TREATMENT 9 hours

Generation and collection of wastewaters- sanitary, storm and combined sewerage systems, quantities of sanitary wastes and storm water, design of sewerage system. Engineered system for wastewater treatment: Primary treatment, Screening, Grit removal, Sedimentation, Sedimentation aided with coagulation. Secondary treatment: Basis of microbiology, Growth and food utilization, Suspended growth systems, Attached growth systems, Secondary clarification, Disinfections of effluents; Sludge treatment and disposal: Sludge characteristics, thickening, disposal.

UNIT IV AIR AND NOISE POLLUTION 9 hours

Air - Composition and properties of air, urban air pollution, Air quality standards, Measures and major equipment for air pollution control, Noise - Basic concept, measurement, and various noise control methods.

UNIT V SOLID WASTE MANAGEMENT 9 hours

Solid waste management-Municipal solid waste, Composition, and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment, and disposal of MSW. Effects of solid waste on environment: effects on air, soil, water surface and ground, health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle, Disposal methods.

Course Outcomes:

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

1. Estimate water demand and population forecasting and characteristics of water
2. Estimate water generation and perform basic design of the unit operations that are used in water treatment plants.
3. Explain various wastewater generation sources and different units of wastewater treatment and sludge treatment techniques
4. Describe the impacts of air and noise pollution and review various air and noise pollution control methods
5. Discuss about the impacts of solid waste and various solid waste management techniques

Text Books:

1. Environmenatal Engineering (Volume I & II) by S. K. Garg-Khanna Publishers.
2. Rao M and Rao H. V. N. Air Pollution, McGraw Hill Education, 2017.
3. Jagbir Singh and Ramanathan A. L., Solid Waste Management: Present and Future Challenges, I K International Publishing House Pvt. Ltd., 2009
4. Environmental Engineering by H. S. Peavy, D.R. Rowe and G. Tchobanoglous, MGH.

Reference 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. Punmia, B.C, Ashok Kr Jain, Arun Kr Jain., Waste Water Engineering, Laxmi Publications, 1998.

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 Tests, End Semester Examination

Open Elective - IV

20ME303 TOTAL QUALITY MANAGEMENT

L	T	P	C
3	0	0	3

Pre-requisite: None

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. TQM encompasses various principles, techniques, and tools for identifying and solving problems, fostering a culture of quality, promoting teamwork, and striving for excellence in all areas of the organization. The goal of TQM is to achieve sustainable and long-term success by consistently delivering high-quality products and services that meet or exceed customer expectations while improving overall organizational performance.

Course Objectives:

Students will

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. Facilitate the understanding of standards of quality.

UNIT I INTRODUCTION 9 hours

Introduction - Evolution of Quality - Historical Perspective, Basic Concepts of Quality – Quality control, Quality management and Quality Assurance - Definition of TQM – Basic concepts of TQM - TQM Framework - Contributions by Deming, Juran, Crosby and Feigenbaum – Dimensions of product and service quality

UNIT II TQM PRINCIPLES 9 hours

TQM principles - Strategic quality planning, Quality statements – Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention – Role of Leadership and Commitment in Quality Deployment, Team Building, Motivation and Rewards, Total Employee Empowerment, Performance appraisal - Continuous process improvement – Supplier partnership – Partnering, Supplier selection,

UNIT III TOOLS OF TQM 9 hours

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 – KAIZEN, 5S, JIT, Documentation – Failure mode and Effect Analysis (FMEA)

UNIT IV TQM TECHNIQUES 9 hours

Quality circles – Quality Function Deployment (QFD) – House of Quality – Design of Experiments – Taguchi quality engineering – Orthogonal Arrays – Signal to Noise Ratio – TPM – Concepts, improvement needs – Cost of Quality – Performance measures

UNIT V IMPELMENTATION OF TQM 9 hours

Introduction – Benefits of ISO Registration – ISO 9000 Series of Standards –Implementation – Environmental Management System: Introduction – ISO 14000 Series Standards – Concepts of ISO 14001 – Requirements of ISO 14001, Case studies on TQM principles followed by Indian Industries.

Course Outcomes:

At the end of the course, students 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 Books:

1. Dale H. Besterfield, et al., Total Quality Management, Pearson Education Asia, Third Edition, Indian Reprint (2003).

Reference Books

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 Tests, End Semester Examination

Open Elective – II

20ME304 ENTREPRENEURSHIP

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
This course is designed to ignite the entrepreneurship idea into the young minds of engineers. This course gives the complete details to setup an enterprise which includes the generating business ideas, writing business plan and 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 9 hours

Introduction to Entrepreneurship, history of entrepreneurship development, social Entrepreneurship, Intrapreneurship, 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. Realities & Case studies about successful Entrepreneur

UNIT II CREATING AND STARTING THE VENTURE 9 hours

Sources of new Ideas, Methods of generating ideas. The Business Plan Nature and scope of Business plan, Writing Business Plan, Evaluating Business plans, implementation of business plans. Case studies of successful business plan, Marketing plan, financial plan, and organizational plan, Launching formalities. Developing business plan and evaluation with team.

UNIT III FINANCING AND MANAGING THE NEW VENTURE 9 hours

Sources of capital, venture capital, angel investment, Record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. Ecommerce 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

UNIT IV PLANT LAYOUT 9 hours

Definition of plant layout and its types, 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.

UNIT V MARKET ANALYSIS AND PROJECT MANAGEMENT 9 hours

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. Project Organization- Project Planning, Monitoring, Control and Learning. Detailed life cycle and post-mortem analysis, Resource allocation, Risk and uncertainty, Budget constraints, Project feasibility.

Course Outcomes:

Upon completion of this course the students shall be able to:

1. Describe the sources of new business ideas, methods to develop new ideas and use the problem-solving techniques.
2. Write a business plan which includes financial plan, organizational plan and marketing plan.
3. Identify the financial sources for new business ventures.
4. Select a plant layout and draw a plant layout.
5. Design a workplace and analyse the market research for new business.

Text Books:

1. Entrepreneurship, Robert Hisrich, & Michael Peters, 5/e TMH.
2. Entrepreneurship, Dollinger, Pearson, 4/e, 2004.

Reference Books

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 Tests, End Semester Examination

Open Elective – IV

20EEE303 ROBOTICS

L	T	P	C
3	0	0	3

Pre-requisite Nil 20EEE108

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 areas for multidisciplinary research, with lots of commercial applications already in market.

Course Objectives:

This course enables students to

1. To know the fundamentals of Robotics & its applications.
2. To know about sensors and make them to handle the selection of sensors for robot design.
3. To know about kinetic and Jacobian modelling.
4. To know about robot programming and implementation.

UNIT I INTRODUCTION, TRANSFORMATION AND MAPPING 9 hours

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.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS 9 hours

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers.

Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION 9 hours

Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors, binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing

Image Data- Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications- Inspection, Identification, Visual Serving and Navigation.

UNIT IV ROBOT KINEMATICS 9 hours

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems.

UNIT V ROBOT PROGRAMMING, IMPLEMENTATION AND ECONOMICS 9 hours

Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs. RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

Course Outcomes:

After completing this Unit, students will be able to

1. Understand the fundamentals of Robotics.
2. Analyze the robot drive system.
3. Understand the various sensors and actuators.
4. Analyze the mechanical structure and notations kinematic model.
5. Implement the basic commands for robots.

Text Book(s)

1. Mittal, R. K. and Nagrath, I.J., Robotic and Control, Tata McGraw Hill, New Delhi, 2003.
2. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, 2015. ISBN: 978-8173719547

Reference Books

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., Robot Sensors, Vision Vol.-I. Springer Verlag, 1986.
5. Groover, M.P., Industrial Robotics Technology, programming & Application, McGraw Hill,

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

Open Elective – IV

20EEE304 ELECTRICAL SAFETY

L	T	P	C
3	0	0	3

Pre-requisite Nil 20EEE101

Course Description:

To provide a comprehensive exposure to electrical hazards, various grounding techniques, safety procedures and various electrical maintenance techniques.

Course Objectives:

This course enables students to

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 9 hours

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, Classification of insulating materials, locking devices- voltage measuring instruments- proximity and contact testers-safety electrical one-line diagram-electrician's safety kit.

UNIT II GROUNDING AND BONDING 9 hours

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 Ground resistance measurement using megger.

UNIT III SAFETY METHODS 9 hours

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.

UNIT IV SAFETY TEAM 9 hours

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.

UNIT V MAINTENANCE OF ELECTRICAL EQUIPMENT 9 hours

Safety related case for electrical maintenance- reliability centred maintenance (RCM) - eight-step maintenance programme- frequency of maintenance- maintenance requirement for specific equipment and location- regulatory bodies- national electrical safety code- Indian standard for electrical safety in work place- occupational safety and health administration standards.

Course Outcomes:

After completing this Unit, students will be able to

1. Understand various types of dielectric materials, their properties in various conditions.
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(s)

1. Dennis Neitzel, Al Winfield, 'Electrical Safety Handbook', McGraw-Hill Education, 4th Edition,2012.

Reference Books

1. John Cadick, 'Electrical Safety Handbook', McGraw-Hill School Education Group, 1994.

2. The Institution of Electric Engineers, 1994.

3. Ray A. Jones, Jane G. Jones, 'Electrical safety in the workplace', Jones & Bartlett Learning, 2000.

4. Tareev, 'Electrical Engineering Materials', Verlag Technik, Berlin

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

Open Elective – IV

20ECE303 EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite None

Course Description:
The course will provide strong foundation on embedded system design. The course covers theory and logic to develop programming expertise. Student will understand application of embedded microcontrollers ARM.

Course Objectives:
This course enables students to

1. To provide knowledge on the basics, building blocks of Embedded System.
2. To provide basic of operating system and Real time programming languages
3. To teach automation using scheduling algorithms and Real time operating system.
4. To understand firmware design and Architectural Support for Operating Systems for various applications
5. To discuss on different Phases & Modeling of a new embedded product.

UNIT I THE CONCEPT OF EMBEDDED SYSTEMS 9 hours

Embedded System Design, Introduction to Embedded Hardware Elements, Sensors and Actuators, Embedded Processors, Memory Architectures. Embedded System vs. General Purpose computing systems, Examples of embedded systems, Embedded memories, Embedded microcontroller cores

UNIT II SOFTWARE ASPECTS OF EMBEDDED SYSTEMS – I 9 hours

Operating System Basics, types of Operating Systems, Task and Task States, Semaphores and shared Data, RTOS services and design using RTOS, Tasks, Process and Threads, Multiprocessing and Multitasking, Real time programming languages.

UNIT III SOFTWARE ASPECTS OF EMBEDDED SYSTEMS- II 9 hours

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication Synchronization Issues, Task Synchronization Techniques, Device Drivers, how to Choose an RTOS, Integrated Development Environment (IDE).

UNIT IV FIRMWARE AND ARCHITECTURAL SUPPORT FOR OPERATING SYSTEMS 9 hours

Firmware and Bootloader, an introduction to operating systems, The ARM system control coprocessor Embedded ARM Applications, CP15 protection unit registers, CP15 MMU registers, ARM MMU architecture, Synchronization, Context switching, Input/Output, Example and exercises, The ARM7500 and ARM7500FE.

UNIT V MODELLING WITH HARDWARE/SOFTWARE DESIGN APPROACHES **9 hours**

Modelling embedded systems- embedded software development approach -Overview of UML modelling with UML, UML Diagrams-Hardware/Software Partitioning, Co-Design Approaches for System Specification and modelling- Co-Synthesis- features comparing Single-processor Architectures & Multi-Processor Architectures-design approach on parallelism in uniprocessors & Multiprocessors.

Course Outcomes:

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

1. To understand the functionalities of processor internal blocks, with their requirement
2. Understand the basics of operating systems and then to learn the programming language used for real time operating system.
3. systems and related terms.
4. Understand the role and features of RT operating system, that makes multitask execution possible by processors.
5. Understand that using multiple CPU based on either hard-core or softcore helps data overhead management with processing.

Text Book(s)

1. M.A. Mazdi & J.G. Mazdi, The 8051 Microcontroller and Embedded System, Pearson Education India , 2013
2. Andrew N. Sloss & Dominic Symes, ARM System Developer's Guide Designing and Optimizing System Software, Morgan Kaufmann Publisher, 2004.

Reference Books

1. Steve Furber, Arm System-On-Chip Architecture, 2000.
2. J.K. Peckol, Embedded Systems A contemporary Design Tool, Wiley Student Edition , 2008
3. K J Ayala, The 8051 Microcontroller Architecture, Programming and Application, Penram International Publishing (India)
4. S. Heath, Embedded Systems Design, Elsevier, 2009

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

Open Elective – IV

20ECE304 DSP ARCHITECTURE

L	T	P	C
3	0	0	3

Pre-requisite 20ECE110

Course Description:

The course will provide an insight into the architectures of DSP processors for handling the bottlenecks in executing DSP algorithms. On the application side the students can develop FPGA based DSP Systems and can understand the concept of multicore DSP as HPC infrastructure

Course Objectives:

This course enables students to

1. Understand the programmable digital signal processing hardware.
2. study the architecture of TMS320CX processor and block diagram
3. Know syntax and write the assembly language programming for digital signal processors.
4. Study the architecture of FPGA based DSP for various applications.
5. Study about High-Performance Computing using P-DSP.

UNIT I PROGRAMMABLE DSP HARDWARE 9 hours

Introduction: Digital signal-processing system, discrete Fourier Transform (DFT) and fast Fourier transform (FFT), differences between DSP and other microprocessor architectures. Processing Architectures (von Neumann, Harvard), DSP core algorithms (FIR, IIR, Convolution, Correlation, FFT), IEEE standard for Fixed and Floating-Point Computations, Special Architectures, Modules used in Digital Signal Processors (like MAC unit, Barrel shifters), On-Chip peripherals, DSP benchmarking.

UNIT II STRUCTURAL AND ARCHITECTURAL CONSIDERATIONS 9 hours

Parallelism in DSP processing, Commercial digital Signal-processing Devices, Basics of TMS320C54x and C55x Families in respect of Architecture improvements and new applications fields, Data Addressing Modes of TMS32OC54xx., TMS320C5416 DSP Architecture, Memory Map, Interrupt System, Peripheral Devices, Illustrative Examples for assembly coding.

UNIT III VLIW ARCHITECTURE 9 hours

Current DSP Architectures, GPUs as an alternative to DSP Processors, TMS320C6X Family, Addressing Modes, Optimizations, Heuristics. Replacement of MAC unit by ILP, Detailed study of ISA, Assembly Language Programming, Code Composer Studio, Mixed C and Assembly Language programming, On-chip peripherals, Simple application developments as an embedded environment.

UNIT IV FPGA BASED DSP SYSTEMS 9 hours

Limitations of P-DSPs, FPGA based signal processing design-case study of a complete design of DSP processor.

UNIT V HIGH PERFORMANCE COMPUTING USING P-DSP 9 hours

Modified bus structures and memory access in PDSPs, special addressing modes in PDSPs, Preliminaries of HPC, MPI, OpenMP, multicore DSP as HPC infrastructure.

Course Outcomes:

After completing this Unit, students will be able to

1. Identify and formalize architectural level characterization of DSP hardware.
2. Design and test various digital signal processors.
3. Write assembly language programming for various digital signal processors.
4. Utilize FPGA based DSP hardware for Control, Audio and Video Signal processing applications.
5. Understand the High-Performance Computing using P-DSP.

Text Book(s)

1. B. Venkataramani, M. Bhaskar, "Digital Signal Processors: Architecture, Programming and Applications", Tata McGraw-Hill Education Private Limited, 2011.

2. Phil Lapsley; Jeff Bier; Amit Shoham; Edward A. Lee, "DSP Processor Fundamentals: Architectures and Features", Wiley-IEEE Press, 1997.

Reference Books

1. Emmanuel C. Ifeachor, Barrie W. Jervis, "Digital Signal Processing: A practical approach", Pearson-Education, PHI, 2002.

2. Sen M. Kuo, Woon-Seng S. Gan, "Digital Signal Processors: Architectures, Implementations, And Applications", Pearson/Prentice Hall, 2005.

3. Peter Pirsch, "Architectures for Digital Signal Processing", John Wiley & Sons, 2009

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

Open Elective – IV

20ECE305 COMMUNITY RADIO TECHNOLOGY

L	T	P	C
3	0	0	3

Pre-requisite

Course Description:

This course offers a comprehensive exploration of Community Radio, from foundational concepts to practical implementation. It begins with an introduction to the principles of Community Radio and guides students through the process of establishing a Community Radio Station (CRS). Key topics include Studio Technology, Operations and Management along with detailed instruction in Audio Pre-Production and Post-production techniques. Students will also gain essential knowledge of Radio Transmission technology, including the setup of an FM transmitter. By the end of the course, students will have a thorough understanding of Community Radio principles and the Practical skills required to effectively operate a Community Radio station.

Course Objectives:

This course enables students to

1. Associate the concept of fundamentals in Community Radio in Local Communication and development.
2. Gain knowledge of Studio technology and operations including Soundboards, Microphones, Recording, scheduling, content creation, and team coordination.
3. Develop skills in Audio Pre-production and post-production such as recording, editing, and mixing audio content.
4. Categorize the Radio Transmission Technology comprising signal requirements aligning with factors affecting Coverage and Shadow Areas.
5. Explore Radio Transmission technology essentials and understand the technical aspects of setting up and maintaining an FM transmitter.

UNIT I COMMUNITY RADIO FUNDAMENTALS AND SETUP 9 hours

Introduction to Radio Broadcasting in India - Community Radio: Evolution - Community Radio Policy – Technical principles; Components of a CR Station - Radio Waves and Spectrum - Basics of Electricity - Power Backup and Voltage Stabilization

UNIT II STUDIO TECHNOLOGY & OPERATIONAL PRACTICES 9 hours

Basics of Sound - Analog and Digital Audio - Components of the Audio Chain - Studio Acoustics; Good Engineering Practices for Studio Setup - Studio Equipment: Preventive & Corrective Maintenance - Content Distribution: Alternative Mechanisms

UNIT III AUDIO PRE & POST PRODUCTION 9 hours

Audio Hardware and Field Recording – Microphones - Audio Cables and Connectors - Free and Open-Source Software - Telephony for Radio - Landline Systems - GSM/CDMA - Voice Over Internet Protocol (VoIP); Sound Recording and Editing - Mixing and Mastering - File Formats and Compression Transmission - Storing and Retrieval

UNIT IV RADIO TRANSMISSION TECHNOLOGY 9 hours

Transmission Chain Overview – Live and Pre-recorded Transmission - Principles of FM Transmission – FM Transmitter console- Antenna System - Types of Mast/Towers - Layers of Atmosphere and Radio Wave Propagation - Factors Affecting Coverage and Shadow Areas - Signal Requirements and Coverage Planning Parameters

UNIT V FM TRANSMITTER SETUP 9 hours

Connecting Audio Feed to the Transmitter - Back Panel Connectors - Mounting and Connecting the Transmitter - Probable Causes of Failure of Transmitters - Fault Diagnostics and Corrective Maintenance - Transmitter Operation and Upkeep Issues

Course Outcomes:

Upon the completion of the course, Student will be able to

1. Interpret the evolution with a framework of Community Radio with Technical Principles and essential Radio Spectrums.
2. Apply Studio Technology and Operational practices with the components of the Audio Chain including Acoustics and Equipment maintenance.
3. Conduct Comprehensive Audio Pre & Post-production to operate field Recordings with Hardware and Open-source software to manage sound recording, editing, mixing, mastering, and file compression.
4. Infer the principles of FM transmission, Antenna systems, Radio wave propagation and factors affecting coverage.
5. Demonstrate knowledge of the connecting audio feeds for Transmitter setup by resolving operational Issues with corrective maintenance.

Text Book(s)

1. Pooja Murada R. Sreedher, “Community Radio in India”, Aakar Books, 2019.
2. Prof. Raj Misra , “Community Radio By the people, For the People”, Orange Books Publication, 2022

   Fraser, Colin, and Sonia Restrepo Estrada, “Community radio handbook”. Paris: Unesco, 2001.

Reference Books

1. Juliet Fox, "Community Radio's Amplification of Communication for Social Change", 7th Edition, Palgrave Macmillan (Springer International Publishing.), 2019.
2. Kanchan K. Malik, Vinod Pavarala, "Community Radio in South Asia: Reclaiming the Airwaves", Routledge India, 2020.
3. Vinod Pavarala and Kanchan K. Malik, "Other voices: the struggle for community radio in India",Sage Publications India Pvt Ltd, 2007.
4. Michael C. Keith, "The Radio Station: Broadcast, Satellite & Internet", 7th Edition, Focal Press (Elsevier Inc.), 2007.
5. "Certificate in Community Radio Technology (CCRT)" https://www.cemca.org/resources/certificate-community-radio-technology-ccrt-0

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

Open Elective - V

Open Elective - V

20HUM301 PRINCIPLES OF MANAGEMENT

L	T	P	C
3	0	0	3

Pre-requisite **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 controlling, operations management, value chain management and management audit.

UNIT I INTRODUCTION **9 hours**

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.

UNIT II PLANNING **9 hours**

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.

UNIT III ORGANIZING **9 hours**

Organizational structures - HRM process, Contemporary issues in HRM – Departmentation – decentralization – delegation of Authority - Managing Change and Innovations.

UNIT IV COMMUNICATION, MOTIVATION AND LEADING 9 hours

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

UNIT V CONTROLLING 9 hours

Process of Control – Problems of Control Process-Types of Control – Techniques of Control-Essential conditions for effective control- Contemporary issues in control – Strategic role of Operations Management - Value Chain Management.

Management Audit: Objectives-Importance-Activities of Management Auditor.

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, management audit and apply to achieve the corporate objectives.

Text Book(s)

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

2. P. Subba Rao "Management and Organizational Behavior", Himalaya Publishing House.

Reference Books

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, End Semester Examination.

Open Elective - V

20HUM302 HUMAN RESOURCE DEVELOPMENT

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

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, compensation management and
5. Explain the trade unions, industrial relations and grievance.

UNIT I INTRODUCTION 9 hours

Understanding the nature and scope of Human Resource Management- Definition, Evolution of HRD, Functions - objectives, organization of department. Human Resource Management v/s Personnel Management, Role and responsibility of HRM.

UNIT II HUMAN RESOURCE PLANNING 9 hours

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.

UNIT III RECRUITMENT, SELECTION AND PERFORMANCE APPRAISAL 9 hours

Recruiting and selecting employees-, Selection process, Barriers, selection in India. Performance Management, Process of Performance Appraisal, Methods of Performance Appraisal - Errors in Performance Appraisal.

UNIT IV TRAINING AND DEVELOPMENT 9 hours

Meaning – importance and benefits of Training and Development, Training v/s Development – Training Methods - challenges in training - Career development: Definition-objectives—importance of career development – Reward Management – Compensation Management: Nature-Objectives-Components of Compensation- Theories of Compensation-Factors influencing employee compensation.

UNIT V INDUSTRIAL RELATIONS, TRADE UNIONS 9 hours

Trade Unions: Importance-Objectives- Functions and Structure of the Trade Unions- Trade Union movement in India- Industrial Relations: Nature--Importance- Approaches-essential conditions for sound IR. Industrial Disputes: Meaning – Types- Causes-Industrial disputes settlement machinery. Grievance: Sources and Process of Redressal,

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, compensation management and
5. Examine the trade unions, industrial relations and grievance.

Text Book(s)

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.
3 VSP Rao, Human Resource Management-Text & Cases, Excel Books.

Reference Books

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.

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

Open Elective - V

20HUM303 SOFT SKILLS

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

Soft skills are the personal attributes that make a student a valuable employee and a wholesome personality. They include aspects like communication, teamwork, problem-solving, and time management. Employers are increasingly looking for employees with strong soft skills, as they are essential for success in the workplace. This course will help students analyze themselves and build soft skills needed for their personal and career success.

Course Objectives:

The course is intended to:

1. Analyze their strengths and skills, and build confidence in presenting themselves
2. Work seamlessly as a team and negotiate for solutions
3. Think laterally and critically to evaluate a situation and present it with clarity
4. Write business emails effectively
5. Prepare holistically for a job interview

UNIT I SELF ANALYSIS AND DEVELOPMENT 10 hours

Personal ethics (politeness, empathy, and honesty); self-motivation / building confidence and assertiveness; identifying one's unique selling points (USPs) through skills introspection and recognizing strengths and weaknesses; nurturing strengths and fixing weaknesses; self-introduction.

UNIT II TEAM WORKING AND DYNAMICS 12 hours

Brainstorming techniques, team building, collaboration, and negotiation skills; team role plays (involving negotiation and decision making); group discussion etiquette (greetings and body language), idea generation, and common GD phrases; group discussion practice

UNIT III THINKING AND REASONING SKILLS 6 hours

Lateral thinking, critical thinking and logical reasoning through texts, images, and videos; Speaking activities (e.g. JAM) involving lateral thinking and reasoning through thought-provoking pictures, videos, cartoons, comic strips or articles.

UNIT IV PRESENTATION SKILLS 7 hours

Presentation etiquette; slides design; and presentation practice.

UNIT V INTERVIEW SKILLS 10 hours

Preparing resume and cover letter for job interviews; interview etiquette: dress code, body language, tone, and greeting; HR interviews: answering common interview questions, practice for HR interviews.

Course Outcomes:

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

1. Understand and express themselves with confidence
2. Work as an active team member
3. Think and express their views logically and speak on varied topics without hesitations.
4. Prepare business presentations and emails effectively
5. Attend job interviews with confidence

Text Book(s)

1. Sabina Pillai and Agna Fernandez; Soft Skills and Employability Skills; Cambridge University Press, 2018.

2. Archana Ram, PlaceMentor, 2018, Oxford University Press

Reference Books

1. Karen Kindrachuk, Introspection, 2010, 1st Edition

2 Karen Hough, The Improvisation Edge: Secrets to Building Trust and Radical Collaboration at work, 2011, Berrett-Koehler Publishers

3. Colin Swatridge, Oxford Guide to Effective Argument and Critical Thinking 1st Edition, Oxford University Press

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

Open Elective - V

20HUM304 NATIONAL CADET CORPS

L	T	P	C
3	0	0	3

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:

6. Analyse the NCC structure and different ranks in Indian Armed Forces along with foot drill.
7. Notify the leadership traits and the need of national integrity towards nation building.
8. Instill respect and responsibility towards personal health and hygiene, develop dynamic personality with adequate qualities.

9. Identify different disasters and judging measurements on the ground.
10. Recognise various communication devices, analyse the Military Organization.

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

Professional Elective - I

Professional Elective – I

20CSE401 CRYPTOGRAPHY AND NETWORK SECURITY

L	T	P	C
3	0	0	3

Course Pre-requisite: 20CSE110

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 9 hours

Introduction: Security Attacks, Services & Mechanisms, A Model for Network security. Symmetric Key Cryptography: Classical encryption techniques, Block cipher operations, DES, AES.

UNIT II ASYMMETRIC CIPHERS 9 hours

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.

UNIT III CLASSIFICATION AND PREDICTION 9 hours

Authentication requirements, Message Authentication Code, Cryptographic Hash functions: Applications of Cryptographic Hash functions, Secure Hash Algorithm., HMAC, Digital Signatures, Digital Signature Standard.

UNIT IV MUTUAL TRUST 9 hours

Key management and Distribution: Symmetric key distribution using Symmetric and Asymmetric encryption, Distribution of public keys, User authentication Protocols- Kerberos X.509 certificates.

UNIT V NETWORK AND INTERNET SECURITY 9 hours

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.

Course Outcomes:

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

1. Explain 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. Illustrate the threats.
5. Implement security schemes to protect information system resources

Text Book(s)

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.

Reference Books

1. Atul Kahate, Cryptography and Network Security, 2nd ed., Tata Mcgraw Hill education Private Limited, 2011.
2. Computer Security, Dieter Gollman,3rd ed, Wiley Publications,2011.
3. Introduction to Computer Security, Matt Bishop,1st ed,Addison-Wesley Professional,2004.

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

Professional Elective - I

20CSE402 REAL TIME OPERATING SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

This course covers the principles of real-time systems, Modeling of a Real-Time System, Task assignment and scheduling, Resource management, Real-time operating systems, RTOS services, Programming language with real-time support, System design techniques, Inter task communication, Fault tolerant techniques, Reliability evaluation methods; Performance analysis

Course Objectives:

1. To provide knowledge on Real Time operating system concepts.
2. To develop an understanding of various Real Time systems Application
3. To learn about RTOS concepts on multitasking and inter-process communication
4. To learn the basics of RTOS Scheduling and resource sharing.

UNIT I REAL TIME SYSTEMS 9 hours

Introduction- Issues in real time computing- Structure of a real time system- Task classes- Performance measures for real time systems- Task assignment and scheduling algorithms - Mode changes- Fault tolerant scheduling - Real Time Models.

UNIT II µC/OS- II RTOS CONCEPTS 9 hours

Foreground/Background process- Resources - Tasks - Multitasking -Priorities - Schedulers -Kernel - Exclusion - Inter task communication-Interrupts - Clock ticks - µC/OS- II Kernel structure - µC/OS- II -Initialisation - Starting µC/OS- II.

UNIT III µC/OS- II RTOS FUNCTIONS 9 hours

Task Management - Time management - Semaphore management - Mutual exclusion semaphore – Event Management –Message management - Memory management - Porting µC/OS- II – Comparison and Study of Various RTOS like QNX- VX Works-PSOS.

UNIT IV REAL TIME SCHEDULING 9 hours

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems

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UNIT V RESOURCES SHARING 9 hours

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority- Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Module Resources, Controlling Concurrent Accesses to Data Objects.

Course Outcomes:

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

1. Understand concepts of Real-Time systems and modeling.
2. Recognize the characteristics of a real-time system.
3. Understand and develop document on an architectural design of a real-time system
4. Develop and document Task scheduling, resource management, real-time operating systems and fault tolerant applications of Real-Time Systems
5. Able to get a broad understanding of the technologies and applications for the emerging and exciting domain of real-time systems

Text Book(s)

1. Krishna C.M., Kang G. Shin, "Real Time Systems", Tata McGraw-Hill Edition, 2010.

2. Philip A.Laplante, "Real Time Systems Design and Analysis-An Engineers Handbook", II Edition-IEEE Press, IEEE ComputerSociety Press, 2001

3 Real Time Systems – Jane W. S. Liu, Pearson Education Publication

Reference Books

1. Real Time Systems – Jane W. S. Liu, Pearson Education Publication

2. Jean J Labrosse, "MicroC/OS-II The Real Time Kernel" II Edition,CMP Books, 2002

3. Real Time Systems – Mall Rajib, Pearson Education

4 Real-Time Systems: Scheduling, Analysis, and Verification – Albert M. K. Cheng, Wiley.

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

Professional Elective - I

20CSE403 ARTIFICIAL INTELLIGENCE

L	T	P	C
3	0	0	3

Pre-requisite: NIL

Course Description:

This course is aimed to provide basic understanding of different intelligent agents in terms of Artificial Intelligence. This Course covers introduction to artificial intelligence, solving problems by various algorithms, Knowledge and Reasoning, Uncertain Knowledge and Reasoning.

Course Objectives:

1. To provide a broad understanding of the basic techniques for building intelligent computer systems and an understanding of how AI is applied to problems.
2. To Gain knowledge in problem formulation and building intelligent agents.
3. To understand the search technique procedures applied to real world problems.
4. To learn the types of logic and knowledge representation schemes.
5. To understand the applications of Al: namely Game Playing, Theorem Proving and Expert Systems.

UNIT I FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE 9 hours

Introduction, A.I. Representation, Non-AI &AI Techniques, Representation of Knowledge, Knowledge Base Systems, State Space Search, Production Systems, Problem Characteristics, types of production systems, Intelligent Agents and Environments, concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT II UNINFORMED SEARCH STRATEGIES 9 hours

Formulation of real world problems, Breadth First Search, Depth First Search, Depth Limited Search, Iterative Deepening Depth First Search, Bidirectional Search, Comparison of Uninformed search Strategies, Searching with partial information, Sensor-less problems, Contingency problems.

UNIT III INFORMED SEARCH STRATEGIES 9 hours

Generate & test, Hill Climbing, Best First Search, A* and AO* Algorithm, Constraint satisfaction, Game playing: Minmax Search, Alpha-Beta Cut offs, Waiting for Quiescence.

UNIT IV KNOWLEDGE REPRESENTATION 9 hours

Propositional Logic: Representation, Inference, Reasoning Patterns, Resolution, Forward and Backward Chaining. First order Logic: Representation, Inference, Reasoning Patterns, Resolution, Forward and Backward Chaining.

UNIT V PLANNING AND UNCERTAINTY 9 hours

Planning: Planning problem, Planning with State Space Search, Partial Order Planning, Hierarchical Planning, Conditional Planning. Non Monotonic Reasoning, Logics for Non Monotonic Reasoning, Justification based Truth Maintenance Systems, Semantic Nets, Statistical Reasoning, Fuzzy logic: fuzzy set definition and types, membership function, designing a fuzzy set for a given application. Probability and Bayes' theorem, Bayesian Networks.

Course Outcomes:

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

1. Discuss the techniques used for building expert systems by integrating AI to solve real-world problems.
2. Apply appropriate uninformed search strategy to solve complex problems.
3. Utilize suitable informed search approach to solve real world problems.
4. Infer knowledge using suitable knowledge representation schemes for complex problems.
5. Apply suitable reasoning strategy to draw conclusions for non-monotonic AI problems.

Text Book(s)

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.

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

Professional Elective - I

20CSE404 WEB TECHNOLOGIES

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

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 the concepts of web essentials and Markup languages.
2. To familiarize about the style sheets and client side scripting programming.
3. To understand the concepts of DOM and Java Servlet.
4. To understand about the representation of XML data and Server side programming using JSP
5. To introduce the concepts of Java Web Services.

UNIT I WEB ESSENTIALS 9 hours

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.

UNIT II STYLE SHEETS AND CLIENT SIDE PROGRAMMING 9 hours

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.

UNIT III HOST OBJECTS 9 hours

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.

UNIT IV REPRESENTING WEB DATA 9 hours

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.

UNIT V WEB SERVICES 9 hours

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, Web Applications and Security.

Course Outcomes:

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

1. Understand about Client side server communication protocol & HTML languages.
2. Apply the style sheets and Client side scripting programming in appropriate applications.
3. Build the application using Servlet in Server side programming.
4. Construct the XML code to represent the web data and Server side programming using JSP.
5. Develop web applications using web services.

Text Book(s)

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.

Reference Books

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, PearsonEducation, 2011 .
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Fouth Edition, Pearson Education, 2008.
3. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.

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

Professional Elective - I

20CSE405 DIGITAL IMAGE PROCESSING

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

This course provides the fundamental knowledge on processing images and their application areas. In this course, different image processing operations such as enhancement, filtering, coding and segmentation are presented.

Course Objectives:

1. Acquire the basic knowledge on fundamentals of digital images.
2. Learn about image enhancement in spatial domain, image filtering and color image processing.
3. Understand various image segmentation and image coding schemes.
4. Learn image transform to analyze and modify image.
5. Learn concepts of degradation function and restoration techniques.

UNIT I DIGITAL IMAGE FUNDAMENTALS 9 hours

Image Processing Fundamentals -- Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighbors of a pixel, adjacency, connectivity, regions and boundaries , distance measures.

UNIT II IMAGE ENHANCEMENT, FILTERING AND COLOR IMAGE PROCESSING 9 hours

Image Enhancements and Filtering: Gray level transformations, histogram equalization, smoothing filters – sharpening filters – two dimensional DFT and its inverse - frequency domain filters – low pass and high pass filters.

Color Image Processing: Color models–RGB, YUV, HIS - color complements, color slicing, tone and color corrections – Color image smoothing and sharpening - Color Segmentation.

UNIT III IMAGE COMPRESSION AND SEGMENTATION 9 hours

Image Coding : Fundamentals of image compression, image data redundancies, Image Compression Model, Huffman Coding, Arithmetic Coding, Run Length Coding, Bit Plane Coding, Block Transform Coding, JPEG compression standard – DCT based image compression

Image Segmentation : Point, Line, and Edge Detection, Thresholding, Segmentation by Region Growing and by Region Splitting and Merging, Super pixels.

UNIT IV IMAGE TRANSFORMS AND OBJECT RECOGNITION 9 hours

Image Transforms, 2D Discrete Fourier Transform, Properties of 2D-DFT, Walsh Transform, Haar Transform, Hadamard Transform, Slant Transform, Discrete Cosine Transform. Automated Object-recognition Systems, Selection of Measurement Parameters, Approaches to Object Recognition, Neural-network approach to object recognition

UNIT V IMAGE RESTORATION 9 hours

Image-restoration Model, Classification of Image-restoration Techniques, Image Degradation, Types of Image Blur, Linear Image-restoration Techniques, Non-linear Image-restoration Techniques, Image Denoising, Classification of Noise in Image, Applications of Digital Image Restoration– Adaptive filters – Band pass Filters – Notch Filters – Optimum Notch Filtering -Inverse Filtering -Wiener filtering.

Course Outcomes:

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

1. Understand visual perception, image sensing ,acquisition, image sampling, quantization, relationships between pixels.
2. Understand gray level image enhancement following colour image processing.
3. Develop algorithms for image segmentation following with coding in image processing.
4. Use various 2D Discrete Fourier transform technique to analyse modified image.
5. Understand the restoration concepts with filtering techniques.

Text Book(s)

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Pearson, 4th edition, 2018
2. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India, 2nd edition, 2004.
3. Digital Image Processing, Gonzalez, Woods, PHI , 2nd edition
4. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Pearson, Third Edition, 2010

Reference Books

1. Digital Image Processing S Jayaraman. S Esakkirajan, T Veerakumar Tata McGraw Hill Education Private Limited New Delhi,2009.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB, Pearson Education, Inc., 2011.

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

Professional Elective - III

Professional Elective - III

20CSE406 DATA WAREHOUSING AND DATA MINING

L	T	P	C
3	0	0	3

Pre-requisite 20CSE106

Course Description:

This course will introduce the concepts of data warehousing and data mining, which gives a complete description about the principles used architectures, applications, design and implementation of data warehousing and data mining concepts.

Course Objectives:

This course enables students to

1. To understand data warehouse, business analysis and online analytical processing (OLAP).
2. To study algorithms for finding hidden and interesting patterns in data
3. To understand and apply various classification and clustering techniques
4. To understand he basic concepts of graph mining.
5. To apply various classification and clustering techniques using Weka tool.

UNIT I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING (OLAP) 9 hours

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

UNIT II DATA MINING - FREQUENT PATTERN ANALYSIS 9 hours

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT III CLASSIFICATION AND CLUSTERING 9 hours

Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines –– Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis-Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.

UNIT IV GRAPH MINING 9 hours

Introduction to Graph data structures and graph databases - Paths, flows, fundamental graph algorithms - Mining Subgraph Patterns -Triangles, k-cores, k-trusses, cycles, cliques, frequent subgraphs-Graph and subgraph isomorphism, approximate pattern matching - Transportation Theory-Spectral Graph Theory - Spectral clustering, Laplacian matrix, Graph Fourier Transform

UNIT V **WEKA TOOL – CASE STUDY** **9 hours**

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database - Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.

Course Outcomes:

After completing this course, students will be able to

1. Understand the functionality of the various data mining and data warehousing component.
2. Apply frequent pattern and association rule mining techniques for data analysis.
3. Apply appropriate classification and clustering techniques for data analysis.
4. Demonstrate deep knowledge of the fundamental graph mining algorithms and methods.
5. Use Weka tools and analysis different dimension of data.

Text Book(s)

1. Jiawei Han and Micheline Kamber, ―Data Mining Concepts and Techniques‖, Third Edition, Elsevier, 2012.

Reference Books

1. Alex Berson and Stephen J.Smith, ―Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.
2. K.P. Soman, Shyam Diwakar and V. Ajay, ―Insight into Data Mining Theory and Practice‖, Eastern Economy Edition, Prentice Hall of India, 2006.
3. Ian H.Witten and Eibe Frank, ―Data Mining: Practical Machine Learning Tools and Techniques‖, Elsevier, Second Edition.

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

Professional Elective - III

20CSE407 DATA VISUALIZATION TECHNIQUES

L	T	P	C
3	0	0	3

Pre-requisite 20CSE101

Course Description:

This course is aimed to provide the basic understanding of different data visualization techniques. This course covers introduction to data visualization, data abstraction, different visualizing techniques using Matplotlib in Python, univariate, bivariate, multivariate analysis and time series analysis.

Course Objectives:

This course enables students to

1. To understand the Objectives of Data Visualization and data abstraction.
2. To study of concept of univariate and bivariate data exploration and analysis.
3. To learn about data exploration and visualization techniques for multivariate and time series.
4. To explore and implement data visualization technique's using Matplotlib.
5. To study and apply data visualization techniques usings Tableau

UNIT I INTRODUCTION - DATA ABSTRACTION 9 hours

Introduction to Data Visualization – History of Visualization – Need for Visualization - Interactive Visualization – Web Specific Components – Common Types of Data Visualization – Data Visualization and Infographics – Dashboards.**Data Abstraction:** Actions – Targets. Charts – Data Pre-processing - Choosing the optimal charts – Making charts effective – Context in Visualization - Analyzing Visual Patterns.

UNIT II UNIVARIATE & BIVARIATE ANALYSIS 9 hours

Univariate Analysis: Introduction to Single variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series.

Bivariate Analysis: Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines – Transformations.

UNIT III MULTIVARIATE AND TIME SERIES ANALYSIS 9 hours

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data – **Fundamentals of TSA** – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.

UNIT IV VISUALIZING USING MATPLOTLIB – PYTHON 9 hours

Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

UNIT V VISUALIZING USING TABLEAU 9 hours

Introduction to Tableau - Creating Charts in Tableau-Formatting the Charts-Creating Multiple Axis Charts-Filters-Sets and Groups-Tableau Charts - Dashboard-Building Interaction in the Dashboards**Case study** - Analyze the HR data of an IT firm – Analyze Titanic Dataset and give various charts

Course Outcomes:

After completing this course, students will be able to

1. Able to define the Objectives of Data Visualization and data abstraction techniques.
2. Apply univariate and bivariate data exploration and analysis in real time project.
3. Use data exploration and visualization techniques for multivariate and time series data.
4. Implement data visualization technique's using Matplotlib.
5. Apply data visualization techniques using Tableau.

Text Book(s)

1. Mico Yuk. Data Visualization For Dummies,1st edition, 2014, Wiley.
2. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008.

Reference Books

1. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 2015.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019.

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

Professional Elective - III

20CSE408 MALWARE ANALYSIS

L	T	P	C
3	0	0	3

Pre-requisite **20CSE103**

Course Description:

Malware analysis divides malware to gather information about the malware functionality, how the system was compromised so that you can defend against future attacks. This course is aimed for gain the fundamental knowledge and skills in malware analysis.

Course Objectives:

This course enable the students to

1. Identify various malwares and understand the behaviour of malwares in real world applications.
2. Implement different malware analysis techniques.
3. Analyse the malware behaviour in Assembly language.
4. Understand the purpose of malware analysis.
5. Identify the various tools for malware analysis.

UNIT I INTRODUCTION TO MALWARE ANALYSIS 9 hours

Malware-Malware Analysis-Types of Malware Analysis-Setting Malware lab Environment-Malware Sources- Static Analysis-File type.

UNIT II STATIC AND DYNAMIC ANALYSIS 9 hours

Finger Printing the Malware-Multiple Anti Virus scanning-Extraction strings- Determining File Obfuscation-Inspection PE Header Information-Compare and Classify the malware-Dynamic Analysis tools- steps-DLL Analysis.

UNIT III ASSEMBLY LANGUAGE AND DISASSEMBLY PRIMER 9 hours

Computer Basics-CPU Registers-Data Transfer Instructions-Arithmetic Operations-Bitwise operators-Branching and Conditionals-loops-Functions-Array and strings-Structures- X64 Architectures-Code Analysis tools-Static code Analysis using IDA

UNIT IV DEBUGGING MALICIOUS CONCEPTS 9 hours

Debugging Concepts-Debugging a Binary using X64dbg-Debugging binary using IDA-Malware Functions-Malware Persistence Methods.

UNIT V CODE INJECTION AND HOOKING 9 hours

Virtual Memory-User Mode and Kernal Mode-Code Injection Techniques-Hooking Techniques-Malware Obfuscation Techniques -Malware Encryption-Custom Encoding -Malware UnPacking. Case studies: Hunting Malware Using Memory Forensics, Detecting Advanced Malware using Memory Forensics.

Course Outcomes:

At the end of the course students can able to

1. Understand the fundamental concepts in malware analysis.
2. Implement concepts of static Analysis and Dynamic Analysis.
3. Perform code analysis in assembly language.
4. Design and implement Debugging of Malicious Binaries.
5. Implement malicious programs that use code injection and hooking techniques.

Text Book(s)

1. Monnappa K A, Learning Malware Analysis, Published by Packt Publishing Ltd.2018,First edition,ISBN 978-1-78839-250-1.

Reference Books

1. Michael Sikorski, Andrew Honig,Practical Malware Analysis. The Hands-on Guide to dissecting malicious Software,No Starch Press, ISBN:978-1-59327-290-6.
2. Honig, Andrew;Sikorski, Michael, Practical Malware Analysis, No Starch Press,First edition,ISBN:1593272901, 9781593272906.

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

Professional Elective - III

20CSE409 NETWORK DESIGN AND TECHNOLOGIES

L	T	P	C
3	0	0	3

Pre-requisite **20CSE111**

Course Description:

This course covers general issues of design and implementation of advanced modern operating systems. The focus is on issues that are critical to the applications of distributed systems and computer networks, which include interprocess communication, distributed processing, sharing and replication of data and files.

Course Objectives:

This course enable the students

1. To understand the principles required for network design
2. To explore various technologies in the wireless domain
3. To study about cellular networks
4. To understand the difference between 4G & 5G technologies.
5. To understand the paradigm of Software defined networks.

UNIT I NETWORK DESIGN 9 hours

Advanced multiplexing – Code Division Multiplexing, DWDM and OFDM – Shared media networks – Switched networks – End to end semantics – Connectionless, Connection oriented, Wireless Scenarios –Applications, Quality of Service – End to end level and network level solutions. LAN cabling topologies – Ethernet Switches, Routers, Firewalls and L3 switches – Remote Access Technologies and Devices – Modems and DSLs – SLIP and PPP – Core networks, and distribution networks.

UNIT II WIRELESS NETWORKS 9 hours

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

UNIT III CELLULAR NETWORKS 9 hours

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

UNIT IV 4G NETWORKS 9 hours

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

UNIT V SOFTWARE DEFINED NETWORKS 9 hours

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

Course Outcomes:

At the end of the course students will be able to

1. Identify the components required for designing a network
2. Design a network at a high-level using different networking technologies
3. Analyze the various protocols of wireless and cellular networks
4. Discuss the features of 4G and 5G networks
5. Experiment with software defined networks

Text Book(s)

1. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks", 5th Edition, Pearson, 2011
2. Larry Peterson and Bruce Davie, ―Computer Networks: A Systems Approach‖, 5th edition, Morgan Kauffman, 2011

Reference Books

1. Erik Dahlman, Stefan Parkvall, Johan Skold, ―4G: LTE/LTE-Advanced for Mobile Broadband‖, Academic Press, 2013.
2. Jonathan Rodriguez, ―Fundamentals of 5G Mobile Networks‖, Wiley, 2015
3. Thomas D.Nadeau and Ken Gray, ―SDN – Software Defined Networks‖, O"Reilly Publishers, 2013.
4. Ying Dar Lin, Ren-Hung Hwang and Fred Baker, ―Computer Networks: An Open Source Approach‖, McGraw Hill, 2011
5. Walrand,"Communications Network: A First Course", 2nd Edition, McGraw Hill, 2002.

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

Professional Elective - III

20CSE410 DESIGN PATTERNS

L	T	P	C
3	0	0	3

Pre-requisite 20CSE213

Course Description:

This course describes simple and elegant solutions to specific problems in object-oriented software design. The course also includes a design case study to demonstrate how design patterns apply in practice.

Course Objectives:

This course enable students to

1. Introduce the fundamental concepts of design patterns and it's types
2. Expose the students to a variety of design pattern and its types in various platforms.
3. Apply the various types of patterns to get the solutions for various problems.
4. Familiarize the student with application program interfaces for various design patterns.
5. Enable students to create simple and complex patterns.

UNIT I INTRODUCTION TO DESIGN PATTERN 9 hours

Introduction: Design Pattern, MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern..

UNIT II CREATIONAL PATTERNS 9 hours

A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, and Supporting Multiple Look – and - Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT III STRUCTURAL PATTERN 9 hours

Structural Pattern Part - I: Adapter, Bridge, and Composite

Structural Pattern Part - II: Decorator, Façade, Flyweight, Proxy.

UNIT IV BEHAVIOURAL PATTERN 9 hours

Behavioural Patterns Part - I: Chain of Responsibility, Command

Behavioural Patterns Part - II: Mediator, Memento, Observe

UNIT V BEHAVIOURAL PATTERN-II 9 hours

Behavioural Patterns Part – II (cont'd): State, Strategy, Template Method, Visitor, Discussion of Behavioural Patterns. What to Expect from Design Patterns, A Brief History, The Pattern Community An Invitation, A Parting Thought.

Course Outcomes:

At the end of the course, students can able to

1. Interpret the design pattern and its types.
2. Develop design solutions using creational patterns.
3. Apply structural patterns to solve design problems.
4. Construct design solutions by using behavioural patterns.
5. Design and develop a solution for a given problems using design patterns.

Text Book(s)

1. Erich Gamma , Design Patterns , Publisher: Pearson Education India, 1995, ISBN 8131769461, 9788131769461.

Reference Books

1. Eric Freeman, Head First Design Patterns, O Reilly Media Inc., 2004, ISBN 9780596007126.
2. Allan Shalloway, Design Patterns Explained: A New Perspective on Object-Oriented Design (Software Patterns Series), Pearson Education India,2004,ISBN 978-0321247148

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

Professional Elective - III

20CSE411 DevOps

L	T	P	C
3	0	0	3

Pre-requisite **20CSE115**

Course Description:

This course is aimed to provide basic understanding of DevOps and its effective pillars such as collaboration, affinity, tools, scaling. This course covers each section of effective DevOps in detail with case studies.

Course Objectives:

This course enables students to

1. Introduce the fundamental concepts of DevOps and its misconceptions
2. Expose the student about the collaboration concepts of DevOps
3. Create a basic understanding of DevOps affinity and its misconceptions.
4. Familiarize the student with DevOps tools and its ecosystem.
5. Enable students to understand the DevOps Scaling and growth strategies.

UNIT I INTRODUCTION to DEVOPS 9 hours

A History of Devops; Foundational Terminology and Concepts; Software Development; Development, Release, and Deployment Concepts; Infrastructure Concepts; Cultural Concepts; Devops Misconceptions and Anti-Patterns; Common Devops Misconceptions; Devops Anti-Patterns.

UNIT II COLLABORATION 9 hours

Collaboration: Individuals Working Together; Defining Collaboration; Individual Differences and Backgrounds; Opportunities for Competitive Advantage; Mentorship; Mindsets and Learning Organizations; Communication and Conflict Resolution Styles; Empathy and Trust; Humane Staffing and Resources; Collaboration Misconceptions; Collaboration Troubleshooting.

UNIT III AFFINITY 9 hours

Team building; Teams and Organizational Structure; Finding Common Ground Between Teams; Case Study - United States Patent and Trademark Office; Benefits of Improved Affinity; Requirements for Affinity; Measuring Affinity; Affinity Misconceptions; Affinity Troubleshooting.

UNIT IV TOOLS 9 hours

Tools: Ecosystem Overview; Software Development; Automation; Monitoring; Evolution of the Ecosystem; Tools: Accelerators of Culture; Irrelevance of Tools; The Impacts of Tools on Culture; Selection of Tools; Auditing Your Tool Ecosystem; Elimination of Tools; Case Study - Examining Etsy.

UNIT V SCALING 9 hours

Understanding scaling; Considering Enterprise Devops; Organizational Structure; Team Flexibility; Organizational Lifecycle; Complexity and Change; Scaling for Teams; Case Studies: Growing and Scaling Teams; Team Scaling and Growth Strategies; Scaling for Organizations; Examining Target.

Course Outcomes:

After completing this course, students will be able to

1. Understand the DevOps foundation terminology, misconceptions and anti-patterns.
2. Apply the DevOps collaboration strategies.
3. Illustrate the DevOps affinity schemes.
4. Understand the DevOps tools in a specific problem scenario.
5. Utilize the DevOps scaling approaches for teams and organization.

Text Book(s)

1. Jennifer Davis, Ryn Daniels, Effective DevOps, O'Reilly Publishers, 2018, ISBN:9781491926307.

Reference Books

1. Joakim Verona, Practical DevOps, Packt Publishers, 2016, ISBN: 978-1-78588-287-6.
2. Gene Kim, Jez Humble, Patrick Debois, John Willis, The DevOps Handbook, ITRevolution Publishers, 2021, ISBN:9781950508402.

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

Professional Elective – IV

Professional Elective - IV

20CSE412 REAL TIME SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite 20CSE106, 20CSE111

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:

This course enables students to

1. To study the basic of tasks and scheduling
2. To understand the Uniprocessor and Multi-Processor Scheduling.
3. To analyze real time communication.
4. To understand the real time databases and reliability models for Hardware Redundancy.
5. To learn the real time modelling and tools.

UNIT I INTRODUCTION TO TASK SCHEDULING 9 hours

Introduction - Issues in Real Time Computing, Structure of a Real Time System, Task classes, Performance Measures for Real Time Systems, Task Assignment and Scheduling – Classical uniprocessor scheduling algorithms, RM algorithm with different Cases-Priority ceiling precedence constraints- usingof primary and alternative tasks.

UNIT II UNI AND MULTI-PROCESSOR SCHEDULING 9 hours

Uniprocessor scheduling of IRIS tasks, Task assignment, Utilization balancing – Next fit- Bin packing- Myopic off-line - Focused addressing and bidding- Buddy strategy- Fault Tolerant Scheduling. -Aperiodic scheduling - Spring algorithm, Horn algorithm- Bratley. - Sporadic scheduling.

UNIT III REAL TIME COMMUNICATION 9 hours

Introduction - VTCSMA – PB CSMA- Deterministic collision resolution protocol- DCR for multi packet messages- dynamic planning based- Communication with periodic and aperiodic messages.

UNIT IV REAL TIME DATABASES 9 hours

Basic Definition, Real time Vs 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 System.

UNIT V REAL-TIME MODELLING AND CASE STUDIES 9 hours

Petrinets and applications in real- time modelling, Air traffic controller system – Distributed air defence system.

Course Outcomes:

After completing this Unit, students will be able to

1. To understand advanced concepts in theory of computer science.
2. To understand advanced concepts in applications of computer science.
3. To apply knowledge of advanced computer science to formulate the problems incomputing and solve them.
4. To learn emerging concepts in theory and applications of computer science.
5. To design and conduct experiments as well as to analyze and interpret data.

Text Book(s)

1. C.M. Krishna, Kang G. Shin, “Real Time Systems”, Tata McGraw - Hill, 2010.

Reference Books

1. C. Siva Ram Murthy, G. Manimaran, “Resource management in real-time systems and networks”, PHI, 2009..
2. Giorgio C. Bortuzzo, “Hard real-time computing systems: predictable schedulingalgorithms and applications”, Springer, 2008.

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

Professional Elective - IV

20CSE413 DEEP LEARNING

L	T	P	C
3	0	0	3

Pre-requisite 20CSE112

Course Description:

Deep learning (DL) is a subset of machine learning, which is essentially a neural network with three or more layers. These neural networks attempt to simulate the behaviour of the human brain—albeit far from matching its ability—allowing it to "learn" from large amounts of data. Deep Learning drives many artificial intelligence (AI) applications and services that improve automation, performing analytical and physical tasks without human intervention.

Course Objectives:

This course enables students to

1. Introduce the fundamental techniques and principles of Neural Networks
2. Expose the student the different models in CNN and their applications
3. To learn and analyze deep unsupervised learning.
4. Study the application of deep learning models for computer vision tasks.
5. Enable proper understanding of applications of deep learning models for NLP tasks.

UNIT I INTRODUCTION 9 hours

Need for Artificial Intelligence – Neurons and Perceptrons - Supervised Learning with Neural Networks, why is Deep Learning taking off - Multiplayer Perceptron - Feed Forward Neural networks - Gradient descent and the back propagation algorithm - vanishing gradient problem - ReLU Heuristics for avoiding bad local minima - Heuristics for faster training –Regularization & Dropout.

UNIT II CONVOLUTIONAL NEURAL NETWORKS 9 hours

CNN Architecture - CNN Models – AlexNet – VGGNet – ResNet – DenseNet – InceptionNet – Vanishing Gradient problem with Recurrent Neural Networks: Long Short Term Memory (LSTM), Gated Recurrent Unit, Encoder Decoder architectures – Data augmentation – Transfer Learning

UNIT III DEEP UNSUPERVISED LEARNING 9 hours

Auto encoders - Variational Auto-encoders - Adversarial Generative Networks, Popular variants of GAN – Applications of GAN - DBM Attention and memory models - Dynamic memory networks - Deep and restricted Boltzmann Machines

UNIT IV APPLICATIONS OF DEEP LEARNING TO COMPUTER VISION: 9 hours

Image segmentation - object detection using YOLOv7 - automatic image captioning - Image generation with Generative adversarial networks - video to text with LSTM models - Attention models for computer vision tasks –Image segmentation with U-Net

UNIT V APPLICATIONS OF DEEP LEARNING TO NLP 9 hours

Introduction to NLP and Vector Space Model of Semantics, Word Vector Representations: Continuous Skip-Gram Model, Continuous Bag-of-Words model (CBOW), Opinion Mining using Recurrent Neural Networks: Parsing and Sentiment Analysis using Recursive Neural Networks: Sentence Classification using Convolutional Neural Networks.

Course Outcomes:

After completing this Unit, students will be able to

1. Understand the basic concepts of Neural Networks and Deep Learning.
2. Interpret the architecture of various CNN and RNN deep models.
3. Analyze the structure and functional strategies of various deep unsupervised models.
4. Make use of various CNN Model to perform computer vision task.
5. Apply the concept of RNN models for sequence data to solve relevant problems.

Text Book(s)

1. Charu C. Aggarwal,"Neural Networks and Deep Learning: A Textbook”, Springer; 1st ed. 2018 edition.

2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, " Deep Learning”, published by MIT Press

Reference Books

1. Francois Chollet, “Deep Learning with Python”, Manning Publications; 1st edition

2. Simon Haykin, "Neural Networks and Learning Machines", Pearson Prentice Hall, 3rd Edition

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

Professional Elective – IV

20CSE414 EXPLORATORY DATA ANALYSIS

L	T	P	C
3	0	0	3

Pre-requisite: Data Visualization and Python for Data Science

Course Description:

This course will help in learning pre-processing tasks in Data Science, AI and ML operations. The way of collecting raw data and importance of pre-processing is explained clearly in this course. Different tools for performing pre-processing methods can be learned from this course. The applications of different technique in time series analysis is also included in the scope of course.

Course Objectives:

This course enables students to

1. Understand the methods for data preparation.
2. Learn general and common methods for selecting features and other basic pre-processing steps.
3. Familiar with the use of predictive analytics, data science and Data Visualization
4. Provide basic statistical and visualization methods for understanding data
5. Learn how to handle time-series and multi-variate data

UNIT I Introduction to Exploratory Data Analysis 9 hours

EDA fundamentals – Steps in data exploration - Significance of EDA – Making sense of data - The basic data types - Data Type Portability –Data transformation techniques - Merging database, reshaping, and pivoting, Transformation techniques.

UNIT II Preprocessing and Feature Selection 9 hours

Introduction to Missing data, Traditional methods for dealing with missing data. Improving the accuracy of analysis. Feature selection algorithms: filter methods, wrapper methods and embedded methods, Forward selection backward elimination, Relief, greedy selection, genetic algorithms for features election

UNIT III Dimensionality Reduction 9 hours

Introduction to Single variable: Distribution Variables – Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality. Introduction, Principal Component Analysis (PCA), Kernel PCA, Canonical Correlation Analysis, Factor Analysis, Multi-dimensional scaling, Correspondence Analysis

UNIT IV Visualization and Outlier Analysis 9 hours

Software tools for EDA – Visual Aids for EDA - Extreme Value Analysis, Clustering based, Distance Based and Density Based outlier analysis, Outlier Detection in Categorical Data.

UNIT V Multivariate And Time Series Analysis 9 hours

Introducing a Third Variable – Causal Explanations – Three-Variable Contingency Tables and Beyond – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Grouping – Resampling.

Course Outcomes:

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

1. Outline the fundamentals of Exploratory Data Analysis process.
2. Understand different pre-processing and feature selection methods.
3. Express the importance of scaling, transformation, and dimensionality reductions techniques.
4. Describe the data using basic statistics and visualization methods.
5. Demonstrate many techniques for handling time-series data

Text Book(s)

1. "Hands-On Exploratory Data Analysis with Python" by Suresh Kumar Mukhiya, Usman Ahmed, Packt Publishing, 2020.
2. "Python Data Science Handbook: Essential Tools for Working with Data" by Jake Vander Plas, 1st Edition, O Reilly, 2017.
3. "Python Data Science Handbook: Essential Tools for Working with Data" by Catherine Marsh, Jane Elliott, Wiley Publications, 2nd Edition, 2008.

Reference Books

1. "Data Mining The Textbook" by Charu C. Aggarwal, Springer, 2015th Edition, 2015.
2. "Analysis of Multivariate and High dimensional data" by Inge Koch, Cambridge University Press, 2014.
3. "Exploratory and multivariate data analysis" by Michael Jambu, Academic Press Inc., 1990.
4. "Data Classification Algorithms and Applications" by Charu C. Aggarwal, CRC press, 2015

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

Professional Elective - IV

20CSE415 SOFTWARE PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

Pre-requisite 20CSE115

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:

This course enables students to

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. Understand and assess the cost of risk involved in a project management
5. Understand the various software management tools.

UNIT I SPM CONCEPTS 9 hours

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.

UNIT II SOFTWARE MEASUREMENTS 9 hours

Monitoring & measurement of Software development – cost, size and time metrics – methods and tools for metrics – issues of metrics in multiple projects.

UNIT III SOFTWARE QUALITY 9 hours

Quality in Software 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.

UNIT IV RISK ISSUES 9 hours

The risk issues in Software development and implementation – identification of risks – resolving and avoiding risks – tools and methods for identifying risk management.

UNIT V SPM TOOLS 9 hours

Software project management using Primavera & Redmine - Case study on SPM tools.

Course Outcomes:

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

1. Apply software project management tools and techniques to manage resources, estimate costs.
2. Analyze software development metrics, including cost, size, and time, using appropriate tools to monitor and measure project progress.
3. Categorize software quality assurance practices, standards, and certifications, and their impact on both organizations and customers.
4. Select appropriate tools and methods to manage, resolve, and avoid risks effectively.
5. Examine project management tools such as Primavera and Redmine through case studies.

Text Book(s)

1. Richard H. Thayer, "Software Engineering Project Management", John Wiley & Sons, 2nd Edition-2001
2. Royce, Walker, "Software Project Management", Pearson Education, 2002 4. Kelker, S. A., "Software Project Management", Prentice Hall, 2003

Reference Books

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.
5. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.

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

Professional Elective - IV

20CSE416 INFORMATION RETRIEVAL

L	T	P	C
3	0	0	3

Pre-requisite: 20CSE112

Course Description:

Information retrieval is the science of searching for information in a document, searching for documents themselves, and also searching for the metadata that describes data, and for databases of texts, images or sounds. This course studies the basic principles and practical algorithms used for information retrieval and text mining.

Course Objectives:

This course enables students to

1. To understand the basics of Information Retrieval and Text retrieval systems.
2. Expose the student to a variety of retrieval models.
3. To learn about text similarity measure.
4. To understand various search engine system operations.
5. To learn the theories and techniques behind the recommender systems.

UNIT I OVERVIEW OF IR & TEXT RETRIEVAL SYSTEMS 9 hours

Information Retrieval, IR vs RDBMS, IR system, The Software Architecture of the IR System. Overview of text retrieval systems: Boolean retrieval, The term vocabulary and postings lists, Dictionaries and tolerant retrieval, Index construction and compression.

UNIT II RETRIEVAL MODELS & EVALUATION 9 hours

Vector Space Model, Variant TF-IDF(Term Frequency/Inverse Document Frequency) functions, Latent Semantic Indexing Model, Neural Network Model. Evaluation in information retrieval, Retrieval Metrics, Precision and Recall, Reference Collection, User-based Evaluation, Relevance Feedback and Query Expansion, Explicit Relevance Feedback.

UNIT III TEXT CLASSIFICATION & TEXT CLUSTERING 9 hours

The text classification problem, Naive Bayes text classification, k- nearest neighbors, Support vector Machine, Feature Selection, Vector-space clustering; K-means algorithm, Hierarchical clustering, DBSCAN algorithm, PAM and PAMK, EM algorithm, BERT model, Hybrid Model.

UNIT IV WEB RETRIEVEL AND WEB CRAWLING 9 hours

The Web – Search Engine Architectures – Cluster based Architecture – Distributed Architectures – Search Engine Ranking – Link based Ranking – Simple Ranking Functions – Learning to Rank – Evaluations -- Search Engine Ranking – Search Engine User Interaction – Browsing – Applications of a Web Crawler – Taxonomy – Architecture and Implementation.

UNIT V RECOMMENDER SYSTEM 9 hours

Recommender Systems Functions – Data and Knowledge Sources – Recommendation Techniques – Basics of Content-based Recommender Systems – High Level Architecture – Advantages and Drawbacks of Content-based Filtering – Collaborative Filtering – Matrix factorization models – Neighborhood models.

Course Outcomes:

Upon completion of the course, the students will be able to:
1. To understand about text retrieval systems.
2. Discuss the models and methodologies of IR system evaluation.
3. Apply appropriate method of classification and clustering.
4. Design and implement innovative features in a search engine.
5. Design and implement a recommender system.

Text Book(s)

1. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, ―Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
2. Ricci, F, Rokach, L. Shapira, B.Kantor, ―Recommender Systems Handbook‖, First Edition, 2011.

Reference Books

1. Information Retrieval: Implementing and Evaluating Search Engines. Stefan Buttcher, Charlie Clarke, Gordon Cormack, MIT Press, 2010.
2. Search Engines: Information Retrieval in Practice. Bruce Croft, Donald Metzler, and Trevor Strohman, Pearson Education, 2009.

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

Professional Elective - IV

20CSE417 BIG DATA ANALYTICS

L	T	P	C
3	0	0	3

Pre-requisite 20CSE106, 20CSE112

Course Description:

Big data analytics describes the process of uncovering trends, patterns, and correlations in large amounts of raw data to help make data-informed decisions. These processes use familiar statistical analysis techniques—like clustering and regression—and apply them to more extensive datasets with the help of newer tools.

Course Objectives:

This course enables students to

1. To understand the key requirements and issues in big data.
2. To know the fundamental concepts of big data analytics and clustering concepts.
3. To provide an overview of Apache Hadoop and map reduce techniques.
4. To study and understand the working principles of spark.
5. To gain knowledge on Database analysis and SQL.

UNIT I INTRODUCTION TO BIG DATA 9 hours

Basics of big data – Issues – Case for Big data – Big data options Team challenge – Big data sources - Acquisition – Nuts and Bolts of Big data. Features of Big Data - Evolution of Big data– Best Practices for Big data Analytics - Big data characteristics.

UNIT II DATA ANALYTICS AND VISUALIZATION 9 hours

Predictive Analytics- Simple linear regression- Multiple linear regression- classification – clustering - association. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications. Case Studies: social media data analysis.

UNIT III HADOOP ENVIRONMENT 9 hours

Introduction – Components of Hadoop - Analyzing the Data with Hadoop – Scaling out - Hadoop Streaming - Design of HDFS - Java interfaces to HDFS Basics - Developing a Map Reduce Application - Map Reduce concepts -Anatomy of a Map Reduce Job run – Failures - Job Scheduling - Shuffle and Sort – Task execution - Map Reduce Types and Formats - Map Reduce Features.

UNIT IV SPARK 9 hours

Installing spark - Spark applications - Jobs - Stages and Tasks - Resilient Distributed databases - Anatomy of a Spark Job Run - Spark on YARN - SCALA: Introduction - Classes and objects - Basic types and operators – Built-in control structures - functions and closures - inheritance.

UNIT V ANALYTICS FOR UNSTRUCTURED DATA 9 hours

The Hadoop Ecosystem – NoSQL - In-Database Analytics - SQL Essentials - In-Database Text Analysis - Advanced SQL.

Course Outcomes:

After completing this Unit, students will be able to

1. Analyze the characteristics and challenges of big data.
2. Apply key data analytics techniques such as regression, classification, and clustering.
3. Utilize Hadoop and MapReduce for efficient data processing.
4. Develop programs using Spark and Scala for distributed data processing.
5. Demonstrate database solutions using SQL and NoSQL for big data analytics.

Text Book(s)

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", 1st Edition, Wiley, 2018.
2. Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley Publication, 1st Edition, 2015.

Reference Books

1. Kim H. Pries, Robert Dunnigan, “Big Data Analytics: A Practical Guide for Managers”, CRC Press, 2015.
2. Holden Karau, Andy Konwinski, Patrick Wendell, and MateiZaharia “Learning Spark”, O'Reilly, 1 st Edition, 2015.
3. https://www.sciencedirect.com/topics/computer-science/hadoop-ecosystem.

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

Professional Elective – V

Professional Elective - V

20CSE418 CYBER SECURITY

L	T	P	C
3	0	0	3

Pre-requisite: 20CSE111

Course Description:

This course enables the students to gain knowledge on various Cybercrimes. The course briefs the students regarding the Indian IT Act, Global perspective of Cybercrimes, Cyber stalking, cyber cafe, key loggers, DoS attacks, crimes on mobile, wireless devices, etc. The knowledge gained in this course can be applied to identify, classify, estimate the criminal plans of the attackers and predict the web threats and security implications.

Course Objectives:

This course enables students to

- Introduce the fundamentals of Cybercrime and its legal perspectives with respect to India.
- Acquaint the student with various types of attacks and Cyber offenses
- Make the student aware of securing devices and Inner perimeter
- Familiarize the student with methods to secure the perimeter.

UNIT I INTRODUCTION TO CYBERCRIME 9 hours

Introduction, Cybercrime, and Information Security, Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT II CYBER OFFENSES 9 hours

How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber Cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT III TOOLS AND METHODS USED IN CYBERCRIME 9 hours

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow

UNIT IV SECURING DEVICES AND INNER PERIMETER 9 hours

The Three Layers of Security, Securing Host Devices, Securing Outer-Perimeter Portals, Additional Inner-Perimeter Access Options, The Inner Perimeter, Operating Systems, Operating System Security Choices, Common Operating System Security Tools, Using Local Administrative Tools, Implementing Data Encryption

UNIT V SECURING THE PERIMETER 9 hours

Perimeter Security in the Real World, Security Challenges, The Basics of Internet Security, Understanding the Environment, Hiding the Private Network, Understanding Private Networks, Protecting the Perimeter, Understanding the Perimeter, Firewalls, Network Appliances, Proxy Servers, Demilitarized Zones (DMZs), Honeypots, Extranets.

Course Outcomes:

After completing this Unit, students will be able to

1. Explain the types of Cybercrimes happening all around and legal act.
2. Understand the various crime offences and tools used it.
3. Apply the tools to secure inner perimeter.
4. Illustrate the contribution of key loggers, password crackers, viruses, and worms towards enabling the possibilities of Cybercrime
5. Asses the methods to protect the perimeter.

Text Book(s)

1. Charles J. Brooks,ChristopherGrow,PhilipCraig,Donald Short, Cyber Security Essentials 1/e,Sybex Wiley

Reference Books

1. Chwan-Hwa(John) Wu,J.DavidIrwin, Introduction to Cyber Security, 1/e, CRC Press T&FGroup, 2013
2. Nina Godbole and Sunil Belapure, Cyber Security: Understanding Cyber Crimes, ComputerForensics and Legal Perspectives, 1/e, Wiley INDIA

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

Professional Elective - V

20CSE419 SOFTWARE QUALITY ASSURANCE

L	T	P	C
3	0	0	3

Pre-requisite 20CSE115

Course Description:
This course covers the principles, techniques, and tools for ensuring software quality throughout the software development life cycle. Topics include testing methodologies, defect tracking, test planning and execution, and quality assurance processes. Students will gain knowledge in Quality management standards and quality assurance concepts.

Course Objectives:
1. Understand the basic tenets of software quality and quality factors.
2. Be exposed to the Software Quality Assurance (SQA) architecture and the details of SQA components.
3. Be familiar with the software quality infrastructure.
4. Explore various software quality management models and various metrics
5. Apply the concepts in preparing the quality plan and documents.

UNIT I INTRODUCTION TO SOFTWARE QUALITY &ARCHITECTURE 9 hours

Need for Software quality – Quality challenges – Software quality assurance (SQA) – Definition and objectives – Software quality factors- McCall's quality model – SQA system and architecture – Software Project life cycle Components – Pre project quality components – Development and quality plans.

UNIT II SQA COMPONENTS AND PROJECT LIFE CYCLE 9 hours

Software Development methodologies – Quality assurance activities in the development process- Verification & Validation – Reviews – Software Testing – Software Testing implementations – Quality of software maintenance – Pre-Maintenance of software quality components – Quality assurance tools – CASE tools for software quality – Software maintenance quality – Project Management

UNIT III SOFTWARE QUALITY INFRASTRUCTURE 9 hours

Procedures and work instructions - Templates - Checklists – 3S development - Staff training and certification Corrective and preventive actions – Configuration management – Software change control – Configuration management audit -Documentation control – Storage and retrieval.

UNIT IV SOFTWARE QUALITY MANAGEMENT & METRICS 9 hours

Project process control – Computerized tools - Software quality metrics – Objectives of quality measurement – Process metrics – Product metrics – Implementation – Limitations of software metrics – Cost of software quality – Classical quality cost model – Extended model – Application of Cost model

UNIT V STANDARDS, CERTIFICATIONS & ASSESSMENTS 9 hours

Quality management standards – ISO 9001 and ISO 9000-3 – capability Maturity Models – CMM and CMMI assessment methodologies - Bootstrap methodology – SPICE Project – SQA project process standards – IEEE standard 1012 & 1028 – Organization of Quality Assurance – Department management responsibilities – Project management responsibilities – SQA units and other actors in SQA systems.

Course Outcomes:

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

1. Illustrate the factors and models of Software Quality Assurance (SQA) and its architecture.
2. Outline the process of software development life cycle.
3. Identify the various procedures and configuration management of Software Quality Infrastructure.
4. Apply various the metrics for assessment of software quality.
5. Analyze the standards of an organization using assessment methods.

Text Book(s)

1. Daniel Galin, "Software Quality Assurance", Pearson Publication, 2009.

Reference Books

1. Mordechai Ben-Menachem "Software Quality: Producing Practical Consistent Software", International Thompson Computer Press, 1997
2. Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education, 2002.
3. Alan C. Gillies, "Software Quality: Theory and Management", International Thomson Computer Press,2019
4. Glenford J. Myers, Tom Badgett, Corey Sandler, "The Art of Software Testing", Third Edition, John Wiley, 2012.
5. Ron Patton, "Software testing", Second Edition, Pearson Education, 2009.

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

Professional Elective - V

20CSE420 HUMAN COMPUTER INTERACTION

L	T	P	C
3	0	0	3

Pre-requisite 20CSE115

Course Description:

HCI is an interdisciplinary field that integrates theories and methodologies across many domains including cognitive psychology, neurocognitive engineering, computer science, human factors, and engineering design. Students will gain theoretical knowledge of and practical experience in the fundamental aspects of human perception, cognition, and learning as relates to the design, implementation, and evaluation of interfaces

Course Objectives:

This course enables students to

1. To learn the foundations of Human Computer Interaction.
2. To become familiar with the design technologies for individuals and persons with disabilities.
3. To be aware of mobile HCI.
4. To learn the guidelines for Cognitive models and Communication and collaboration models.
5. To learn the guidelines for Designing Web Interfaces

UNIT I FOUNDATIONS OF HCI 9 hours

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

UNIT II DESIGN & SOFTWARE PROCESS 9 hours

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

UNIT III MODELS AND THEORIES 9 hours

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV MOBILE HCI 9 hours

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

UNIT V WEB INTERFACE DESIGN 9 hours

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

Course Outcomes:

After completing this Unit, students will be able to

1. Develop effective dialog for HCI.
2. Develop effective HCI for individuals and persons with disabilities.
3. Assess the importance of user feedback.
4. Apply the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
5. Develop meaningful user interface.

Text Book(s)

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction‖, 3rd Edition, Pearson Education, 2004

Reference Books

1. Brian Fling, ―Mobile Design and Development‖, First Edition, O‘Reilly Media Inc., 2009
2. Bill Scott and Theresa Neil, ―Designing Web Interfaces‖, First Edition, O‘Reilly, 2009.

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

Professional Elective - V

20CSE421 DATABASE SECURITY

L	T	P	C
3	0	0	3

Pre-requisite 20CSE106

Course Description:

This database security course begins by teaching you how to recognize and alleviate different categories of database security threats. You will study the procedures of identifying susceptibilities that appear in databases and the methods of safeguarding a database from inference attacks.

Course Objectives:

1. To understand the fundamentals of security, and how it relates to information systems.
2. To learn good password policies, and techniques to secure passwords in an organization.
3. To learn and implement administration policies for users.
4. To identify risks and vulnerabilities in operating systems from a database perspective.
5. To understand the various database security models and their advantages and disadvantages.

UNIT I SECURITY ARCHITECTURE & OPERATING SYSTEM SECURITY **9 hours**

Security Architecture: Introduction-Information Systems- Database Management Systems-Information. Security Architecture- Database Security–Asset Types and Value-Security Methods. Operating System Security Fundamentals: Introduction-Operating System Overview-Security. Environment – Components- Authentication Methods-User Administration-Password Policies-Vulnerabilities-E-mail Security.

UNIT II ADMINISTRATION OF USERS & PROFILES, PASSWORD POLICIES **9 hours**

Administration of Users: Introduction-Authentication-Creating Users, SQL Server User-Removing, Modifying Users-Default, Remote Users-Database Links-Linked Servers-Remote Servers-Practices for Administrators and Managers-Best Practices Profiles, Password Policies.

UNIT III PRIVILEGES AND ROLES **9 hours**

Privileges and Roles: Introduction-Defining and Using Profiles-Designing and Implementing Password Policies-Granting and Revoking User Privileges-Creating, Assigning and Revoking User Roles-Best Practices.

UNIT IV DATABASE APPLICATION SECURITY MODELS & VIRTUAL PRIVATE DATABASES **9 hours**

Database Application Security Models: Introduction-Types of Users-Security Models- Application Types-Application Security Models-Data Encryption.

Virtual Private Databases: Introduction-Overview of VPD-Implementation of VPD using Views, Application Context in Oracle-Implementing Oracle VPD-Viewing VPD Policies and Application contexts using Data Dictionary, Policy Manager Implementing Row and Column level Security with SQL Server.

UNIT V AUDITING DATABASE ACTIVITIES 9 hours

Auditing Database Activities: Using Oracle Database Activities-Creating DLL Triggers with Oracle Auditing Database Activities with Oracle-Auditing Server Activity with SQL Server 2000-Security and Auditing Project Case Study.

Course Outcomes:

After completing this Unit, students will be able to

1. Understanding the fundamentals of security, and how it relates to information systems.
2. Learning good password policies, and techniques to secure passwords in an organization.
3. Learning and implementing administration policies for users.
4. Identifying the risks and vulnerabilities in operating systems from a database perspective.
5. Understanding the various database security models and their advantages and disadvantages.

Text Book(s)

1. Hassan A. Afyouni, “Database Security and Auditing”, Third Edition, Cengage Learning, 2009.

Reference Books

1. Ron Ben Natan,” Implementing Database Security and Auditing”, Elsevier Digital Press, 2005.

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

Professional Elective - V

20CSE422 SOFTWARE DEFINED NETWORKS

L	T	P	C
3	0	0	3

Pre-requisite 20CSE111

Course Description:

This course introduces software defined networking, an emerging paradigm in computer networking that allows a logically centralized software program to control the behavior of an entire network.

Course Objectives:

The main learning goals of this course are the following:

1. Understand the fundamentals, opportunities and challenges associated with SDNs.
2. To apply various SDN Principles with different Architectures.
3. To understand the various SDN controllers and their configurations.
4. Obtain skills to do advanced networking research and programming.
5. Apply concepts of Virtualization, Framework solutions on Data Centres.

UNIT I INTRODUCITION TO SDN 9 hours

Introduction to SDN: why SDN. Centralized and distributed control planes -Evolution versus Revolution, The Control Plane, Data Plane; Moving Information Between Planes; Why Can Separation Be Important; Distributed Control Planesvices; Logical Versus Literal.

UNIT II SDN PROTOCOL 9 hours

Open flow-wire protocol; Replication; FAWG (Forwarding Abstraction Workgroup); Config and Extensibility; Hybrid Approaches; Dual Function Switches.

UNIT III SDN CONTROLLERS 9 hours

General Concepts-VMware - Nicira - VMware/Nicira - OpenFlow-Related - Mininet - NOX/POX - Trema - Ryu - Big Switch Networks/Floodlight - Layer 3 Centric - Plexxi - Cisco OnePK

UNIT IV CONCEPT OF NETWORK ROGRAMMABILITY 9 hours

The Application-Network Divide-The Command-Line Interface-NETCONF and NETMOD-SNMP-Modern Programmatic Interfaces-Google's Protocol Buffers-JSON-I2RS-Modern Orchestration

UNIT V DATA CENTER CONCEPTS AND CONSTRUCTS 9 hours

Introduction-The Multitenant Data Canter-The Virtualized Multitenant Data Center-Orchestration-Connecting a Tenant to the Internet/VPN-Data Center Interconnect (DCI)- Fallacies of Data Center Distributed Computing-DCI approaches-SDN Solutions for the Data Center Network.

Course Outcomes:

After completing this Unit, students will be able to

1. Understanding the fundamentals, opportunities and challenges associated with SDNs.
2. Applying various SDN Principles with different Architectures
3. Understanding of the various SDN controllers and their configurations.
4. Obtained the skills to do advanced networking research and programming.
5. Applying the concepts of Virtualization, Framework solutions on Data Centres.

Text Book(s)

1. SDN - Software Defined Networks by Thomas D. Nadeau & Ken Gray, O'Reilly,2013, ISBN: 978-1-449-34230-2

Reference Books

1. Software Defined Networking with OpenFlow By Siamak Azodolmolky, PacktPublishing, 2013
2. Software Defined Networks: A Comprehensive Approach by Paul Goransson and Chuck Black, Morgan Kaufmann Publications, 2014

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

Professional Elective - V

20CSE423 REINFORCEMENT LEARNING

L	T	P	C
3	0	0	3

Pre-requisite **20MAT110, 20MAT111**

Course Description:

The course deals with building first the model based dynamic programming techniques and subsequently the model free, data driven algorithms, and deals with the theoretical foundations of these. The aim of the course is to familiarize the students with the basic concepts as well as with the state-of-the-art research literature in reinforcement learning.

Course Objectives:

This course enables students to

1. Introduce the fundamental concepts on Reinforcement Learning
2. Develop a deeper understanding on Markov Decision Processes and Dynamic Programming.
3. Create a basic understanding on Monte-Carlo methods and Temporal difference learning.
4. Familiarize the student on Eligibility traces.
5. Enable students to apply the approximate solution methods.

UNIT I THE REINFORCEMENT LEARNING PROBLEM 9 hours

Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An extended Example-Tic-Tac Toe, History of Reinforcement Learning, Tabular Solution Methods: Multi-arm Bandits- An n-Armed Bandit Problem, Action-Value Methods, Incremental Implementation, Tracking a Nonstationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandits, Associative Search (Contextual Bandits).

UNIT II MARKOV DECISION PROCESSES AND DYNAMIC PROGRAMMING 9 hours

Markov Decision Processes: The Markov Property, Markov Decision Processes, Value Functions, Optimal Value Functions, Optimality and Approximation.

Dynamic programming: Policy Evaluation, Value iteration, Policy iteration, Asynchronous DP, Generalized policy iteration.

UNIT III MONTE-CARLO METHODS AND TEMPORAL DIFFERENCE LEARNING 9 hours

Monte-Carlo methods: Policy evaluation, Roll outs, On policy and Off policy learning, Importance sampling.

Temporal Difference learning: TD prediction, Optimality of TD(0), Sarsa, Q-learning, R-learning, Games and after states.

UNIT IV ELIGIBILITY TRACES 9 hours

Eligibility traces: n-step TD prediction, TD (lambda)-forward and backward views, Q(lambda), Sarsa(lambda), replacing traces and accumulating traces.

UNIT V APPROXIMATE SOLUTION METHODS 9 hours

Function Approximation:Value prediction, Gradient descent methods, Linear function approximation, Off-policy Approximation.
Policy Approximation: Actor-Critic Methods, R-Learning, Average Reward Setting.

Course Outcomes:

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

1. To understand the fundamentals about Reinforcement Learning.
2. To structure a reinforcement learning problem.
3. To understand and apply basic RL algorithms for simple sequential decision-making problems in uncertain conditions.
4. To evaluate the performance of the solution.
5. To interpret state-of-the-art RL research and communicate their results.

Text Book(s)

1. R. S. Sutton and A. G. Barto, Reinforcement Learning - An Introduction, MIT Press, Second edition, 2015.

Reference Books

1. Marco Wiering and Martijn van Otterlo,Reinforcement Learning: State-of-the-Art, Springer, 2012.
2. Csaba Szepesvari, Algorithms for Reinforcement learning, Morgan & Claypool Publishers, 2009.

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

Skill Oriented Course

Skill Oriented Course – I
B. Tech II Year I Semester

20CSE601 WEB SCRIPTING

L	T	P	C
1	0	2	2

Pre-requisite **NIL**

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, XML, JavaScript (Node and Angular) and jQuery and exploring the use of event-driven programming in JavaScript to add interactive elements such as buttons and text fields to web pages. This course provides the knowledge necessary to design and develop dynamic, database-driven web pages using PHP. 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 using Node JavaScript and Angular JavaScript
5. To build jQuery enabled web applications.

UNIT – I: HTML & CSS **6 Hours**
Introduction to HTML, HTML5 New Features, Structural, Content, Application-focused tags. History of CSS, The Power of CSS, Selectors and Pseudo Classes, Fonts and Text Effects, Colors.
- a. Creation College Website using HTML.
- b. Design a website using style sheets so that the pages have uniform style.

UNIT – II: INTRODUCTION TO JAVASCRIPT **6 Hours**
Introduction to JavaScript, Comments, Variables, Exploring JavaScript Data Types, Popup Boxes, Objects, Functions, Conditions, Loops, Form Validation.
- a. Design a form and validate all the controls placed on the form using Java Script.
- b. Write a JavaScript program to measure the time taken by a function to execute.

UNIT – III: JQUERY WITH HTML **6 Hours**
Introduction to jQuery, Installation, Selectors, Events, Effects, Callbacks, jQuery and HTML, jQuery
- a. Working on Blink text using jQuery.
- b. Using jQuery right click to toggle background color.

UNIT – IV: INTRODUCTION TO XML AND PHP DATABASE **6 Hours**

Introduction to XML, Creating XML Documents, XSL, PHP Concepts: Sessions, authenticating users Database Access: Database Concepts, MYSQL database connectivity and operations.

a. Display Library information using XML.
b. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page,
c. Write a PHP program to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.

UNIT – V: NODEJS AND ANGULAR JS **6 Hours**

Introduction to Node JS, Advantage of Node JS, File System: Using file operation. Data base Connectivity: Connecting strings and configuring. Database operations on create table data -Angular JS forms.

a. Working on file write, read and delete using Node.js
b. Write a Node JavaScript program to connect to that database and extract data from the tables and display them.
c. Using AngularJS to read input value from text box and will be displayed it.
d. Using AngularJS to demonstrate Arithmetic operations of two numbers.

Course Outcomes:

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

1. Design pages with HTML and 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 Node JavaScript and Angular JavaScript for faster performance.

Text Books:

1. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens.
2. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Leeand B.Ware(Addison Wesley) Pearson Education.
3. Professional Angular JS, Valeri Karpov and Diego Netto, John Willey Edition.
4. Beginning Node.JS by Basarat Syed, 2014.

Reference Books:

1. HTML & CSS:The Complete Reference ,Thomas.A Powel "Fifth Edition"Kindle Edition,2017
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
3. HTML & CSS:The Complete Reference ,Thomas.A Powel "Fifth Edition"Kindle Edition,2017
4. 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, Mid Term Tests, End Semester Examination.

Skill Oriented Course – I

B. Tech II Year I Semester

20CSE602 ANDROID APPLICATION DEVELOPMENT

L	T	P	C
1	0	2	2

Pre-requisite **NIL**

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 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. They will design and develop Mobile applications with the use of J2ME, like SMS, MMS, Gaming, Multimedia, JavaFX & Android.

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 6 Hours

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.

a) Develop an android application to display a simple text in the emulator

b) Develop an android application to display the internal keyboard in the emulator

UNIT- II USER INTERACTION 6 Hours

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

a) Write an android program to display a message in the toast

b) 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

c) Develop an application to perform 5 arithmetic operations: Addition, Subtraction, Multiplication, Division and Modulo operation with necessary user interface creation

d) Develop an android application to process a student mark list by creating proper UI using the necessary controls

UNIT-III THREADS, LOADERS AND ASYNCTASK LOADER, SERVICES 6 Hours

Threading in Android – AsyncTask – Loaders – AsyncTask Loader -Alarms and system services – Examples on alarms and services – Services: Services Life Cycle – Intent Service – Implementing Intent Service – Notifications.

1. Write an android application to create a calculator
2. 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.

UNIT IV: SAVING, RETRIEVING AND LOADING DATA 6 Hours

Android File systems and Files, Databases on Android - SQLite - Status Contract Class, Update Refresh Service – Cursors – Backups - Content Providers: Overview – Role of Content Providers, Content Resolver.

a) 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)
b) 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)
c) i. Design an android application to create a service that shows the service is running in the background in the form of a toast

UNIT-V APPLICATIONS WIDGETS, INTERACTION AND SENSORS 6 Hours

App Widgets: Creation of Application Widgets - Interaction and Animation- Sensors: Sensor API in Android - Motion Sensor, Position Sensor, Sensor Values, Sensor Manager Class, Sensor Event class, Sensor Event Listener.

a) Develop an android application to demonstrate the concept of Fragments in Android
b) 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)
c) Demonstrate the usage of Sensors in android by developing proper application.

Course Outcomes:

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

1. Identify various components of Android SDK tool and build user interface using XML.
2. Develop user interfaces using various layouts and views using android building blocks.
3. Apply various services in android building blocks.
4. Construct the database using SQLite and organize the content providers in android applications.
5. Build various widgets, wall papers and utilize sensors for an android application.

Text Books:

1. Android Programming-The Big Nerd Ranch Guide, Bill Philips, Christ Stewart, Kristin Mariscano, Big Nerd Ranch publishers, 3rd Edition,2017
2. Android Programming for Beginners, John Horton, PACKT publishers,2018
3 Learning Android, By Marko Gargenta& Masumi Nakamura, O'Reilly, II Edition,2014
4 Android Application Development All in One for Dummies, Barry Burd, Wiley, 2nd Edition,2015

Reference Books:

1. Android application Development-Black Book, Pradeep Kothari, dreamtech,2014
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,2017
4 Android System Programming, Roger Ye, PACKT publishers,2017
5 Programming Android, By Zigurd Mednieks, Laird Dornin, G. Blake Meike & Masumi Nakamura,O'Reilly,2011

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

Skill Oriented Course – II
B.Tech II Year II Semester

20ENG601 CORPORATE COMMUNICATION

L	T	P	C
1	0	2	2

Pre-requisite: **18ENG201**

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 SKILLS **8 hours**

Listening/watching interviews, conversations, documentaries, etc.; Listening to lectures, discussions from TV/Radio/Podcast.

UNIT II SPEAKING **10 hours**

Articulation of sounds; Intonation.; Conversational skills (Formal and Informal); Group Discussion; Making effective Oral presentations**:** Role play.

UNIT III READING SKILLS **8 hours**

Reading for main ideas; Applying background knowledge to predict content; Skimming; Scanning; Making inferences; Reading different genres of texts ranging from newspapers to creative writing; Reading Comprehension.

UNIT IV WRITING SKILLS **9 hours**

Writing an introduction; Essay structure; Descriptive paragraphs; Writing a conclusion.
Writing job applications and resume; Emails; Letters; Memorandum; Reports; Writing abstracts and summaries; Interpreting visual texts.

UNIT V INTERVIEW SKILLS 10 hours

Different types of interviews: Answering questions and offering information; Mock interviews; Body Language.

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.

Text Books:

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.
3. S.P. Dhanavel; English and Communication Skills for Students of Science and Engineering; Orient Blackswan, 2009.
4. M. Ashraf Rizvi; Effective Technical Communication; Tata Mc Graw Hill Co. ltd, 2005.

Reference:

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/

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

Skill Oriented Course - III
B. Tech III Year I Semester

20CSE603 MULTIMEDIA COMPUTING

L	T	P	C
1	0	2	2

Pre-requisite NIL

Course Description:

This course provides interactive, computer-based applications that allow students to communicate ideas and information with digital and print elements. It helps to develop and manage online graphics and content. It provides an interaction between users and digital information.

Course Objectives:

1. This course aims to develop student's competency in producing dynamic and creative graphic solutions for multimedia productions.
2. It introduces students with the advanced scripting skills necessary for implementing highly interactive, rich internet applications using multimedia technologies and authoring tools.
3. Students will develop aesthetic value and competencies in multimedia authoring.
4. Artistic visual style and layout design are stressed, as well as the editing and integration of graphic video, audio, images and animation, files.
5. The course allows students to master industry-wide software and technologies to create highly interactive, rich internet applications.

List of Programs:

UNIT 1 : Introduction to Editing and multimedia Technologies 6 Hours

Video editing is used to structure and present all video information, including films and television shows, video advertisements and video essays. Non-linear editing systems (NLE) allow video to be edited on computers with specialized software. Offline editing is the process by which raw footage is copied from an original source, without affecting the original film stock or video tape. Online editing is the process of reassembling the edit to full resolution video after an offline edit has been performed.

(a) Video Editing
(b) Audio Editing
(c) Image Editing

Unit 2: Principles of Animation **6 Hours**

The term 2D means 2 dimensional which means that an image for the animation can be moved in two-dimensional space that is X-axis and Y-axis. 3D animation is an animation that is created in three-dimensional space which makes the characters and objects appear realistic and lively. Thus, a 3D animation has height, width as well as depth.

(a) 2D Animation
(b) 3D Animation

Unit 3: Multimedia Technologies **6 Hours**

Multimedia combines different media for text, sound, and images into one presentation to create a more enriched and entertaining message. Multimedia technologies include the machines and systems used to create and transmit these messages. You experience multimedia when you go to the movies, watch television, play video games, or explore Web sites on the Internet.

(a)Write a Program to create an animated e-card using adobe flash
(b)Write a Program to create an animation to indicate a ball bouncing on steps
(c)Write a Program to simulate a ball hitting another ball

Unit 4 : Multimedia Technologies using flash **6 Hours**

For computer-drawn animation, the beginning and ending images in a sequence are drawn first. The artist then saves the images to the animation program's memory. The computer fills in the images in between the beginning and the ending images. Feature-length animated films contain hundreds of thousands of separate digital images. Without the aid of computers, these films would take years to draw.

(a)Write a Program to change a circle into a square using flash
(b)Write a Program to perform motion tweening operation using flash

Unit 5 : Video motion analysis **6 Hours**

In video and computer games, the graphics on the screen are always changing. Game software has many animation sequences and sounds stored in its memory. Each move you make with the controller tells the computer which sequence to run. As you play, you create a story.

(a)Write a Program to change and object shape using a shape tweening concept
(b)Write a Program to create a 24 spokes on a wheel using flash

Course Outcomes:

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

1. Describe different realizations of multimedia tools and the way in which they are used.
2. Compare various data compression schemes.
3. Analyse user interface for a given application
4. Ability to apply different multimedia development tools to produce web based and standalone user interfaces
5. Demonstrate 2D and 3D animations using animation software.

Text Book(s)

1. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew PHI Learning, 2004.

2. AJAX, Rich Internet Applications, and Web Development for Programmers, Paul J Deitel and Harvey M Deitel, Deitel Developer Series, Pearson Education, 2008. (UNITS 4,5)

Reference Books

1. Professional Adobe Flex 3, Joseph Balderson, Peter Ent, et al, Wrox Publications,Wiley India, 2009
2. Multimedia Communications: Applications, Networks, Protocols and Standards, FredHalsall, Pearson Education, 2001, RP 2005

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

Skill Oriented Course - III
B. Tech III Year I Semester

20CSE604 PYTHON FOR DATA SCIENCE

L	T	P	C
1	0	2	2

Pre-requisite **20CSE101, Basic Programming Knowledge**

Course Description:
This course is designed to equipping students to be able to use python programming for solving data science problems.

Course Objectives:
1. To train the students in solving computational problems.
2. To elucidate solving mathematical problems using Python programming language.
3. To understand the fundamentals of Python programming concepts and its applications.
4. Practical understanding of building different types of models and their evaluation.

UNIT I INTRODUCTION TO DATA SCIENCE **6 Hours**

Introduction to Data Science and its importance - Data Science and Big data-, The life cycle of Data Science- The Art of Data Science - Work with data – data Cleaning, data Managing, data manipulation. Establishing computational environments for data scientists using Python with IPython and Jupyter.

a. Launch the IPython shell and the Jupyter notebook.
b. Write a python script to control the behaviour of IPython using magic commands. Create a file called hello.py
c. Replace the missing values with the expected, or mean income of custdata dataset.
d. Import data in python.

UNIT II INTRODUCTION TO NUMPY **6 Hours**

NumPy Basics: Arrays and Vectorized Computation- The NumPy ndarray- Creating ndarrays- Data Types for ndarrays- Arithmetic with NumPy Arrays- Basic Indexing and Slicing - Boolean Indexing-Transposing Arrays and Swapping Axes. Universal Functions: Fast Element-Wise Array Functions- Mathematical and Statistical Methods-SortingUnique and Other Set Logic.

a. Create NumPy arrays from Python Data Structures, Intrinsic NumPy objects and Random Functions.
b. Manipulation of NumPy arrays- Indexing, Slicing, Reshaping, Joining and Splitting.
c. Computation on NumPy arrays using Universal Functions and Mathematical methods.
d. Import a CSV file and perform various Statistical and Comparison operations on rows/columns.
e. Load an image file and do crop and flip operation using NumPy Indexing.
f. Write a program to compute summary statistics such as mean, median, mode, standard deviation and variance of the given different types of data.

UNIT III DATA MANIPULATION WITH PYTHON 6 Hours

Introduction to pandas Data Structures: Series, DataFrame, Essential Functionality: Dropping Entries Indexing, Selection, and Filtering- Function Application and Mapping- Sorting and Ranking. Summarizing and Computing Descriptive Statistics- Unique Values, Value Counts, and Membership. Reading and Writing Data in Text Format.

a. Create Pandas Series and DataFrame from various inputs.
b. Import any CSV file to Pandas DataFrame and perform the following:
    i. Visualize the first and last 10 records
    ii. Get the shape, index and column details.
    iii. Select/Delete the records(rows)/columns based on conditions.
    iv. Perform ranking and sorting operations.
    v. Do required statistical operations on the given columns.
    vi. Find the count and uniqueness of the given categorical values.
    vii. Rename single/multiple columns.

UNIT IV DATA CLEANING, PREPARATION AND VISUALIZATION 6 Hours

Data Cleaning and Preparation: Handling Missing Data - Data Transformation: Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Detecting and Filtering Outliers- String Manipulation: Vectorized String Functions in pandas. Plotting with pandas: Line Plots, Bar Plots, Histograms and Density Plots, Scatter or Point Plots.

a. Import any CSV file to Pandas DataFrame and perform the following:
    i. Handle missing data by detecting and dropping/ filling missing values.
    ii. Transform data using apply() and map() method.
    iii. Detect and filter outliers.
    iv. Perform Vectorized String operations on Pandas Series.

v. Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.

UNIT V MACHINE LEARNING USING PYTHON 6 Hours

Introduction Machine Learning: Categories of Machine Learning algorithms, Dimensionality reduction-Introducing ScikitApplication: Exploring Hand-written Digits. Feature EngineeringNaive Bayes Classification - Linear Regression - kMeans Clustering.

a. Write a program to demonstrate Linear Regression analysis with residual plots on a given data set.
b. Write a program to implement the Naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
c. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions using Python ML library classes.
d. Write a program to implement k-Means clustering algorithm to cluster the set of data stored in .CSV file. Compare the results of various "k" values for the quality of clustering.

Course Outcomes

1. Understand the Data Science Lifecycle and its Practical application using Python.
2. Demonstrate Data Manipulation and Statistical Analysis using Numpy.
3. Utilize pandas data structures such as Series and Data Frame, focusing on essential functionality, data manipulation, statistics, and reading/writing text .
4. Infer the handling of missing values, transformations, outlier filtering, string manipulation, and plotting with pandas: line, bar, histogram, and scatter plots.
5. Examine ML algorithms through dimensionality reduction, Scikit application for hand-written digit exploration, feature engineering, Naive Bayes classification, linear regression, and k- means clustering.

Text Book(s)

1. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, 2nd Edition,2018.
2. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2017.

Reference Books

1. Y. Daniel Liang, "Introduction to Programming using Python", Pearson,2012.
2. Francois Chollet, Deep Learning with Python, 1/e, Manning Publications Company, 2017.

3. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python 3", 3rd edition, Available at https://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
4. Paul Barry, "Head First Python a Brain Friendly Guide" 2nd Edition, O'Reilly, 2016 4. Dainel Y.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019

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

Skill Oriented Course - IV
B. Tech III Year II Semester

20CSE605 FULL STACK DEVELOPMENT

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

Pre-requisite 20CSE601

Course Description:

Full Stack Web Development course will make students to become master in front-end technology. It provides basic information and experiments to grow to be a Full-Stack web developer. With fast growing technologies, the students can update their knowledge on technologies. This will help the students to learn the complete set of process like designing, development and deployment.

Course Objectives:

1. To build web applications using HTML, Javascript, CSS and PHP with client side validations.
2. To create and integrating Plug-ins with JQuery (Events, Animation).
3. To build XML documents with DTD, Schemas and style sheets.
4. To develop a web application with database interaction using Node JavaScript and Angular JavaScript
5. To implement MongoDBModels.

List of Programs:

UNIT – I: HTML & CSS **6 Hours**

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.

a. Develop static pages (using only HTML) of an online ticket reservation.
b. Design a website using style sheets so that the pages have uniform style.

UNIT – II: Introduction to JavaScript **6 Hours**

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

a. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
b. Design a form and validate all the controls placed on the form using Java Script.
c. Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXTSHRINKING” in BLUE color. Then the font size decreases to 5pt.

UNIT – III: PHP **6 Hours**

Overview of PHP Data types and Concepts: Variables and data types, Operators, Expressions and Statements. Advanced Concepts: Using Sessions, authenticating users. PHP and Database Access: Basic Database Concepts, connecting to a MYSQL database, Retrieving and Displaying results, Modifying, Updating and Deleting data.

a. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.
b. Design Webpage for Data collection, store, retrieve and manipulate data using SQL database using PHP

UNIT – IV: jQuery, NodeJS and Angular JS **6 Hours**

Introduction to jQuery, Installation, Selectors, Events, Effects, Callbacks, jQuery and HTML, jQuery. Introduction to Node JS, Advantage of Node JS, File System: Using file operation (open, read, write and delete). Introduction to AngularJS: What is Angular JS? Why Angular JS? Features of Angular JS. Working with Angular JS forms.

(a) Working on Blink text using jQuery.
(b) Using jQuery right click to toggle background color.
(c) Develop a Form and validate using Angular JS
(d) Working on file write, read and delete using Node.js

UNIT – V: XML & MongoDB **6 Hours**

Introduction to XML, Creating ML Documents, Creating XML DTDs, XMLSchemas, XSL. Introduction to MongoDB – Data Modelling, Data Types.

(a) Design an XML document to store information about a students. The information must include Rollno, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.

(b) Implement MongoDB data models.

Course Outcomes:

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

1. Design pages with HTML and 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 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 MongoDB) and apply Node JavaScript and Angular JavaScript for faster performance.

Text Book(s)

1. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann andJon Stephens.
2. HTML & CSS:The Complete Reference ,Thomas.A Powel “Fifth Edition”Kindle Edition,2017.
3. Professional Angular JS, Valeri Karpov and Diego Netto, John Willey Edition.
4. Beginning Node.JS by Basarat Syed, 2014.
5. MongoDB Basics 1st ed. Edition by Peter Membrey (Author), David Hows (Author), Eelco Plugge (Author)

Reference Books

1. Web Coding Bible, An Accelerated Course, Chong Lip Phang, 2015
2. Java Script for ProgrammersPaul J. Deitel, Deitel & Associates, Inc.Harvey M. Deitel, Deitel& Associates, Inc.

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

Skill Oriented Course - IV
B. Tech III Year II Semester

20CSE606 AI TOOLS, TECHNIQUES AND APPLICATIONS

L	T	P	C
1	0	2	2

Pre-requisite

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:

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

List of Programs:

UNIT – 1: MACHINE LEARNING **6 Hours**

Machine Learning: Supervised Learning - Linear Regression, Logistic Regression, Unsupervised Learning – K-means clustering, Anomaly Detection.

a) 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.
b) Build a classification model that estimates the probability of admission based on the exam scores using logistic regression.
c) Implement the unsupervised learning algorithm using K-means clustering
d) Implement an anomaly detection algorithm using a Gaussian model and apply it to detect failing servers on a network.

UNIT – 2: NLP AND BOT TECHNOLOGIES **6 Hours**

Speech Recognition, Text-to-Speech, 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?

a) Liv.ai - App for Speech recognition and Synthesis through APIs
b) Building a Chatbot
d) Build a virtual assistant

UNIT – 3: IMAGE PROCESSING &APPLICATIONS 6 Hours

Feature detection and matching, Segmentation, Object detection, Face recognition, Recognition Databases and test sets

a) Perform Data Labelling for various images using object recognition

UNIT – 4: NEURAL NETWORKS 6 Hours

Neural Networks, Deep Learning, Different types of Deep Neural Networks - CNN, RNN.

a) Implement un-regularized and regularized versions of the neural network cost function and compute gradients via the backpropagation algorithm.

b) Build a Convolutional Neural Network for Cat vs Dog Image Classification

UNIT – 5: SMART APPLICATIONS 6 Hours

Smart Agriculture, Smart Transportation &Autonomous Vehicles, Smart Homes, Smart cities

a) Mini project on Smart Application

Course Outcomes:

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

1. Apply supervised and unsupervised machine learning techniques to solve real-world problems.
2. Construct interactive chatbot systems and virtual assistants by leveraging speech recognition.
3. Utilize image processing techniques to perform image labeling and face recognition.
4. Develop regularized neural network models to solve image classification tasks.
5. Analyze smart applications in various domains through a mini project.

Text Book(s)

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

Reference Books

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

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

Skill Oriented Course - V

20CSE607 BLOCKCHAIN ARCHITECTURE

L	T	P	C
1	0	2	2

Pre-requisite : 20CSE108, 20CSE209

Course Description:

This course provides a broad overview of the essential concepts of blockchain technology and by initially exploring the Bitcoin protocol followed by the Ethereum protocol. It familiarizes with the functional/operational aspects of cryptocurrency eco-system.

Course Objectives:

This course enables students to

1. Understand the importance of fundamentals of blockchain technology
2. Acquire knowledge about cryptography and algorithms.
3. Understand the knowledge in the concepts of bitcoin and consensus algorithms.
4. Implement decentralized blockchain-based software Ethereum
5. Examine the needed frameworks, standards, tools and libraries to build blockchains and related applications using Hyper ledger.

UNIT I INTRODUCTION TO BLOCKCHAIN 6 hours

Introduction to Blockchain Technology - The growth of blockchain technology - Distributed systems - The history of blockchain - Benefits and limitations of blockchain - Types of blockchain - Consensus- CAP theorem and blockchain -Decentralization using blockchain - Methods of decentralization - Routes to decentralization- Platforms for decentralization

1. Write a simple java program for the creation of blocks.
2. Create a simple blockchain using python.
3. Write a java program for implementing distributed systems.

UNIT II CRYPTOGRAPHY IN BLOCKCHAIN 6 hours

Cryptography in Blockchain: Introduction -Cryptographic primitives -Symmetric Cryptography - Data Encryption Standard (DES) - Advanced Encryption Standard - Asymmetric Cryptography - public and private keys -RSA - Secure Hash Algorithms.

1. Write a java program for the generation of public and private keys.
2. Write a java program for reading a content from the file and generate message digest.
3. Write a java program for implementing SHA
4. Write a java program for implementing DES
5. Write a java program for implementing RSA

UNIT III INTRODUCTION TO BITCON 6 hours

BitCoin - Introduction – Transactions - Structure - Transactions types – Blockchain - Wallets and its types - Bitcoin payments - Bitcoin improvement proposals (BIPs)-Bitcoin investment and buying and selling bitcoins -Bitcoin installation - Bitcoin limitations - Consensus Algorithms - Smart Contract - History of Smart Contract - Ricardian contracts

1. Write a simple java program for creating merkle root.
2. Write a simple java program for adding transactions to the blockchain.
3. Write a simple java program for implementing proof of work consensus algorithm

UNIT IV ETHEREUM 6 hours

Ethereum - The yellow paper - The Ethereum network -Ethereum block chain- Components of the Ethereum block chain - Accounts and its types - The Ethereum Virtual Machine- Blocks and blockchain- Mining - Wallets - Applications developed on Ethereum -Scalability and security issues - Blockchain usecases in Banking & Financial Service

1. Using solidity, create a smartcontract named MYCONTRACT and try to work with different types of variables.
2. Create a smartcontract called EXCEPTION that triggers three types of exception: require, assert and revert.
3. Create a smartcontract that deposits and withdraw money form the account.
4. Write a smart contract in solidity to print the array of integers and its length.
5. Write a smart contract that automates lottery system.

UNIT V HYPERLEDGER 6 hours

Hyperledger as a protocol - The reference architecture - Fabric - Hyperledger Fabric - Distributed Ledger - Sawtooth lake - Corda - Hyperledger projects.

1. Install Hyperledger Fabric and docker containers.
2. Create a chaincode for voting application
3. Create a chaincode for supply chain management system

Course Outcomes:

After completing this Unit, students will be able

1. To understand the fundamentals of blockchain technology.
2. To obtain knowledge on analysing various cryptographic algorithms.
3. To implement Bitcoin to develop solutions in the appropriate domains.
4. To device a decentralized blockchain-based software Ethereum
5. To apply Hyperledger Fabric to implement the Block chain Application.

Text Book(s)

1. Imran Bashir, Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd Revised edition edition. Birmingham: Packt Publishing, 2018.

Reference Books

1. Andreas M. Antonopoulos, Mastering bitcoin, First edition. O'Reilly,2015.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder"Bitcoin and Cryptocurrency Technologies a Comprehensive Introduction", Princeton University Press.
3. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming', Create Space Independent Publishing Platform, 2017.
4. MerunasGrincalaitis, "Mastering Ethereum: Implement Advanced Blockchain Applications Using Ethereum-supported Tools, Services, and Protocols" Packt Publishing.
5. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, "Blockchain Architecture Design and Use Cases"[MOOC], NPTEL: https://nptel.ac.in/courses/106/105/106105184

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

Skill Oriented Course - V

20CSE608 NoSQL

L	T	P	C
1	0	2	2

Pre-requisite: 20CSE106

Course Description:

This course will provide you with technical hands-on knowledge of NoSQL databases and Database-as-a-Service (DaaS) offerings .Explore the origins of NoSQL databases and the characteristics that distinguish them from traditional relational database management systems. Understand the basic architecture and data models of a NoSQL database (key-value stores, document databases, column-family stores, graph databases)Discuss the criteria that decision makers should consider when choosing between relational and non-relational databases and techniques for selecting the NoSQL database that best addresses specific use cases.

Course Objectives:

1. To learn to implement and work with NoSQL databases
2. To understand the basic storage architecture of distributed file systems
3. To learn about the various tools available such as MongoDB, Cassandra.
4. To perform CRUD operations (create, read, update and delete) on data in NoSQL Environment
5. To develop Application with Graph Data model

UNIT I Introduction to NoSQL 6 hours

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch. Application and Integration of Databases, Attack of the Clusters, The Emergence of NoSQL. Benefits of using NoSQL DB. Backend Management, Deployment, Front-End Development, Open Source, Drawbacks of Using NoSQL DB, NoSQL vs. SQL

1. Installation and setup of MongoDB client and server
2. Create a database and collection using MongoDB environment. For example a document collection meant for analysing Restaurant records can have fields like restaurant_id, restaurant_name, customer_name, locality, date, cuisine, grade, comments. etc.

Create database using INSERT, UPDATE, UPSERTS, DELETE and INDEX.

4. Practice writing simple MongoDB queries such as displaying all the records, display selected records with conditions

UNIT II NoSQL Development 6 hours

Schemaless Development, Data Models, Distribution Models, Consistency. Categories of NoSQL: Key-Value Stores, Wide-Column Family Stores, Document Databases, Graph Databases, Object-Oriented Databases, and Others, NoSQL Scalability, Searching.

Wide-Column NoSQL Databases - NoSQL Databases: Cassandra, Bigtable, MapReduce, and Others.

4. Practice exercise on element, array based and evaluation query operators -$exists, $type, $mod, $regex
5. Exercise on MongoDB shell commands and user management

UNIT III An Open-Source NoSQL Database 6 hours

Various open source NoSQL Databases : MongoDB, CouchDB, Apache Casandra, Neo4J, Redis, Apache HBase, RavenDB – Pros and cons , Applications of open source databases.

Indexing and Ordering Data Sets : Essential Concepts Behind A Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

6. Installation and configuration of Cassandra. Find out two use cases where Cassandra is preferred over MongoDB
7. Create database in Casandra using – Create, Alter and Drop. Add records using Inset, Update, Delete and Truncate.
8. Exercise based on Cassandra Query Language i.e. selecting records, select records with specific conditions

UNIT IV NoSQL Operations 6 hours

The set of essential operations – CRUD - Create, Read, Update and Delete operations in the context of a NoSQL database environment. Practical experience of CRUD operations for document databases using MongoDB. Queries using MongoDB

9. Experiment with MongoDB comparison and logical query operators - $gt, $gte, $lt, $lte, $in, #nin, $ne, $and, $or, $not

UNIT V Data Modeling With Graph & Case Studies 6 hours

Building Graph Model, Edges, Nodes, Relationships, Example NoSQL Databases: Neo4J, InfoGrid.Graph NoSQL databases using Neo4,NoSQL database development tools and programming languages, Graph Databases, Graph Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases. Connected Data, Routing, Dispatch, and Location-Based Services, Recommendation Engines, When Not to Use. Case Study: Optimizing Transportation Routes

10. Mini-project

Course Outcomes:

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

1. Examine various types of NoSQL Databases.
2. Compare and use the different types of NoSQL Databases.
3. Analyze the application and Integration of NoSQL Databases.
4. Apply Nosql Development tools.
5. Build graph model and performance tuning of Graph NoSQL databases.

Text Book(s)

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019

Reference Books

1. Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN-13: 978-9332557338)
2. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/Dreamtech Press, 2013. (ISBN-13: 978-9351192022)
3. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694)

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

MINOR COURSE

Computer Science & Engineering

Minor

20MDCSE101 DATA STRUCTURES

L	T	P	C
3	0	0	3

Pre-requisite **20CSE102**

Course Description:

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

Course Objectives:

1. To introduce the fundamental concept of data structures and to emphasize the importance of data structures in developing and implementing efficient algorithms.
2. To develop skills to choose appropriate data structure to solve real world problem
3. To implement recursive and non recursive algorithms for different operations on data structures.

UNIT I INTRODUCTION TO DATA STRUCTURES AND REPRESENTATION **9 hours**

Introduction: Algorithm specification, growth of functions, Asymptotic notations. Memory Representation: Linear and Linked Representations, Arrays, and Linked List: Singly Linked List and Its Operations, Doubly Linked List and its operations, Circular Lists.

UNIT II STACK & QUEUE **9 hours**

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, double ended queue.

UNIT III TREES **9 hours**

Tree: Introduction, Terminology, Binary Tree, representation, Binary Tree Traversals. Binary Search Tree: Properties, Insertion, Deletion, and Searching operations. Priority queue: Definition and Applications, implementation using Heaps, Max Heap, Min Heap, Insertion into a Max Heap, Deletion from Max Heap

UNIT IV SORTING & HASHING **9 hours**

Sorting: Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Quick Sort, Heap Sort Hashing: Dictionaries, Hash Table Representation, Static and Dynamic Hashing, Collision Resolution methods-Open Addressing, Separate Chaining, Double hashing.

UNIT V BALANCE SEARCH TREES AND GRAPHS **9 hours**

Balanced Search Trees: AVL Trees, Red Black Trees, and Splay Trees. Graphs: Terminology, Representation, operations, Graph Traversal techniques.

Course Outcomes:

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

1. Describe how each data structure is represented using linear and linked representations
2. Apply stack and queue to solve real world problems
3. Demonstrate different methods for traversing trees
4. Compare various sorting and hashing techniques.
5. Develop applications using Tree and Graph data structures.

Text Book(s)

1. Fundamentals of Data Structures using C++, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta,Silicon Press, Second Edition. 2007.
2. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.

Reference Books

1. Robert L. Kruse, Alexander J. Ryba, Data Structures and Program Design in C++, Prentice Hall, 2ed.
2. Data Structures and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffery D.Ulman. Pearson; 1st edition
3. Data Structures, Algorithms and Applications in C++ by Sartaj Sahni, McGraw Hill, NY, Second Edition.

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

Minor

20MDCSE102 DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:
This course is designed to provide a basic understanding of database systems and their design. The course material is further used for developing any web-based applications in which the database is back end. The course covers 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 the database and indexed structures, transaction management, and data recovery.

Course Objectives:
1. To understand the concept of DBMS and ER Modelling.
2. To comprehend the structure of SQL Queries and commands to manage data from the databases
3. To learn PL/SQL concepts that help in seamless processing of SQL
4. To explain the normalization, Query optimization, and relational algebra
5. To apply Transaction processing, concurrency control, recovery, security, and indexing for the real-time data
6. To gain knowledge on Database Attacks, Recovery, and Recent Trends

UNIT I INTRODUCTION 9 hours

Database Systems Concepts and Architecture: History and motivation for database systems-characteristics of database approach Advantages of using DBMS approach- Architectures for DBMS– Classification of database management systems.
Database Modelling: Types of Attributes, Entities, Relationships, ER Model.
Introduction to Relational Model: Introduction, Logical database design, Introduction to views.

UNIT II RELATIONAL MODEL 9 hours

Relational Data Model: Concept of relations, schema-instance distinction, keys, referential integrity, foreign keys, relational algebra operators, SQL - Introduction, data definition in SQL, table, key, and foreign key definitions. Querying in SQL, notion of aggregation, Integrity constraints, aggregation functions group by and having clauses.
PL/SQL concepts: Embedded SQL, Dynamic SQL, triggers and active databases, Cursors, Introduction to JDBC, Stored Procedures.
Relational Algebra and Calculus: Preliminaries, Relational algebra- Selection and Projection, Set Operations, Renaming, Joins, Division. Relational Calculus.

UNIT III DATABASE DESIGN & SCHEMA REFINEMENT 9 hours

Database Design: Dependencies and Normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FDs.
Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, and 5NF decompositions and desirable properties.

UNIT IV TRANSACTION PROCESSING & INDEXING 9 hours

Transaction processing - Concepts of transaction processing, ACID properties, concurrency control, Time-stamp based and lock-based protocols for concurrency control. Serializability of scheduling
Index Structures – Indexes on Sequential Files – Secondary Indexes – B-Trees – Hash Tables.

UNIT V DATABASE ATTACKS, RECOVERY, AND RECENT TRENDS 9 hours

Database Attacks and Recovery: SQL Injection, Recovery based on deferred update – Recovery techniques based on immediate update - Shadow Paging
Recent Trends: Need of NoSQL, CAP Theorem, different NoSQL data models.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Apply design principles for database design, ER model
2. Demonstrate the basics of query evaluation and heuristic query optimization techniques
3. Access normalization relations of the relational model using normal forms
4. Implement transaction processing techniques in the database.
5. Design database security plan for database

Text Book(s)
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. Silberschatz,H.F.Korth S.Sudershan, Database System Concepts, McGraw Hill, 6th Ed., 2010.
2. R. Elmasri S. B. Navathe, Fundamentals of Database Systems, Addison Wesley, 2015
3. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation, and Management,6th Edition,2012.
4. Pramod J. Sadalage and Marin Fowler, NoSQL Distilled: A brief guide to merging world of Polyglot persistence, Addison Wesley, 2012

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

Minor

20MDCSE103 SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

The course covers the topics include process models, software requirements, software design, software testing, software process/product metrics, quality management and UML diagrams. This course presents software engineering techniques and explains the software development life-cycle, including software specification, requirement analysis, design implementation, testing and maintenance.The main goal of this course is to help 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 learn design concepts and various design models.
4. To make students to learn about testing strategies.
5. To provide better understanding of software quality and assurance techniques.

UNIT I BASIC CONCEPTS OF SOFTWARE ENGINEERING & PROCESS MODEL **9 hours**

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 Models-Adaptive process models, Scrum, Dynamic systems development Method and Crystal.

UNIT II SOFTWARE REQUIREMENT ENGINEERING AND SYSTEM MODELS **9 hours**

Software Requirements: Functional and Non-functional requirements, User requirements, System requirements, Interface specification, and 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 and Object models.

UNIT III SOFTWARE DESIGN AND ENGINEERING 9 hours

Design Engineering: Design process, Design concepts, Design model, Pattern based software design, Object oriented analysis and design (using UML): Class diagrams, Use case 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.

UNIT IV SOFTWARE TESTING AND METRIC PROCESS 9 hours

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.

UNIT V SOFTWARE QUALITY ASSURANCE 9 hours

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.

Course Outcomes:

Upon successful completion of the course, 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 Book(s)

1. Roger S Pressman, Software Engineering: A practitioner’s Approach, McGraw Hill, 9th Edition 2020.
2. Ian Sommerville, Engineering Software Products: An Introduction to Modern Software Engineering, Pearson Education, 1st Edition 2019.

Reference Books

1. Rajib Mall, Fundamentals of Software Engineering, PHI Learning Private Limited, 4th Edition, 2014.
2. Pankaj Jalote, Software Engineering, A Precise Approach, Wiley India, 2010.
3. Waman S Jawadekar , Software Engineering: A Primer, Tata McGraw-Hill, 1st Edition, 2008.

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

Minor

20MDCSE104 WEB TECHNOLOGIES

L	T	P	C
3	0	0	3

Pre-requisite NIL

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 9 hours

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.

UNIT II STYLE SHEETS AND CLIENT SIDE PROGRAMMING 9 hours

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.

UNIT III HOST OBJECTS 9 hours

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.

UNIT IV REPRESENTING WEB DATA 9 hours

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.

UNIT V 9 hours

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, Web Applications and Security.

Course Outcomes:

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

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. To introduce Server side programming with Java Servlets and JSP
5. Design and implement the various Web services concepts of JAX-RPC

Text Book(s)

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.

Reference Books

1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, PearsonEducation, 2011 .
2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Fouth Edition, Pearson Education, 2008.
3. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.

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

Minor

20MDCSE105 DATA VISUALIZATION TECHNIQUES

L	T	P	C
3	0	0	3

Pre-requisite **20CSE101**

Course Description:

This course is aimed to provide the basic understanding of different data visualization techniques. This course covers introduction to data visualization, data abstraction, different visualizing techniques using Matplotlib in Python, univariate, bivariate, multivariate analysis and time series analysis.

Course Objectives:

This course enables students to

6. To understand the Objectives of Data Visualization and data abstraction.
7. To study of concept of univariate and bivariate data exploration and analysis.
8. To learn about data exploration and visualization techniques for multivariate and time series.
9. To explore and implement data visualization technique's using Matplotlib.
10. To study and apply data visualization techniques usings Tableau

UNIT I INTRODUCTION - DATA ABSTRACTION 9 hours

Introduction to Data Visualization – History of Visualization – Need for Visualization - Interactive Visualization – Web Specific Components – Common Types of Data Visualization – Data Visualization and Infographics – Dashboards.**Data Abstraction:** Actions – Targets. Charts – Data Pre-processing - Choosing the optimal charts – Making charts effective – Context in Visualization - Analyzing Visual Patterns.

UNIT II UNIVARIATE & BIVARIATE ANALYSIS 9 hours

Univariate Analysis: Introduction to Single variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series.

Bivariate Analysis: Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines – Transformations.

UNIT III MULTIVARIATE AND TIME SERIES ANALYSIS 9 hours

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data – **Fundamentals of TSA** – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.

UNIT IV VISUALIZING USING MATPLOTLIB – PYTHON 9 hours

Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

UNIT V VISUALIZING USING TABLEAU 9 hours

Introduction to Tableau - Creating Charts in Tableau-Formatting the Charts-Creating Multiple Axis Charts-Filters-Sets and Groups-Tableau Charts - Dashboard-Building Interaction in the Dashboards**Case study** - Analyze the HR data of an IT firm – Analyze Titanic Dataset and give various charts

Course Outcomes:

After completing this course, students will be able to

1. Explain the Objectives of Data Visualization and data abstraction techniques.
2. Apply univariate and bivariate data exploration and analysis in real time project.
3. Use data exploration and visualization techniques for multivariate and time series data.
4. Implement data visualization technique's using Matplotlib.
5. Able to apply data visualization techniques usings Tableau.

Text Book(s)

1. Mico Yuk. Data Visualization For Dummies,1st edition, 2014, Wiley.
2. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008.

Reference Books

1. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 2015.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019.

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

Minor

20MDCSE201 WEB TECHNOLOGIES LABORATORY

L	T	P	C
0	0	4	2

Pre-requisite NIL

Course Description:
This course is designed to provide basic understanding on Web page design. The course material further used for developing any web based applications in which database is back end. Course covers few real life use cases implementation.

Course Objectives:
1. To understand the concepts of Web page design using HTML/XML and style sheets
2. To understand the concepts of creation of user interfaces using Java frames.
3. To Learn to create dynamic web pages using server side scripting.
4. To Learn to write Client Server applications.
5. To provide sufficient skill to utilize the various applications with AJAX

List of Programs:

1. Create a web page with the following using HTML.
   a) To embed an image map in a web page.
   b) To fix the hot spots.
   c) Show all the related information when the hot spots are clicked.
2. Create a web page with the following
   a. Cascading style sheets.
   b. Embedded style sheets.
   c. Inline style sheets. Use our college information for the web pages
3. Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document.

4. Client Side Scripts for Validating Web Form Controls using DHTML.

5. To Write programs in Java using Servlets:

a) To invoke servlets from HTML forms.

b) Session Tracking.

6. Write programs in Java to create three-tier applications using JSP and Databases
   a. For conducting online examination
   b. For displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
7. Programs using XML – Schema – XSLT/XSL.
8. Programs using DOM and SAX parsers.
9. To Write a programs in Java using Ajax.
10. Consider a case where we have two web Services- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Database.

Course Outcomes:

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

1. Design Web pages using HTML/DHTML and style sheets.
2. Create dynamic web pages using server side scripting.
3. Implement the Client Server applications.
4. Implement and use the frameworks JSP Strut.
5. Design and develop a real world application with AJAX

Text Book(s)

1. 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", Third Edition, Pearson Education, 2006.
2. Marty Hall and Larry Brown,"Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Minor

20MDCSE106 DATA WAREHOUSING AND DATA MINING

L	T	P	C
3	0	0	3

Pre-requisite 20MDCSE104

Course Description:
This course will introduce the concepts of data warehouse and data mining, which gives a complete description about the principles used architectures, applications, design and implementation of data mining and data ware housing concepts.

Course Objectives:
This course enables students to

1. To understand data warehouse, business analysis and online analytical processing (OLAP).
2. To understand data mining concepts and data processing methods.
3. To study algorithms for finding hidden and interesting patterns in data
4. To understand and apply various classification and clustering techniques.
5. To apply various classification and clustering techniques using weka tools.

UNIT I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING (OLAP) 9 hours

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

UNIT II DATA MINING – INTRODUCTION 9 hours

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT III DATA MINING - FREQUENT PATTERN ANALYSIS 9 hours

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT IV CLASSIFICATION AND CLUSTERING 9 hours

Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines –– Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis-Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.

UNIT V WEKA TOOL – CASE STUDY 9 hours

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database - Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.

Course Outcomes:

After completing this course, students will be able to

1. Design a Data warehouse system and perform business analysis with OLAP tools.
2. Apply suitable pre-processing and visualization techniques for data analysis.
3. Apply frequent pattern and association rule mining techniques for data analysis.
4. Apply appropriate classification and clustering techniques for data analysis.
5. Able to use weka tools and analysis different dimension of data.

Text Book(s)

1. Jiawei Han and Micheline Kamber, ―Data Mining Concepts and Techniques‖, Third Edition, Elsevier, 2012.

Reference Books

1. Alex Berson and Stephen J.Smith, ―Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.
2. K.P. Soman, Shyam Diwakar and V. Ajay, ―Insight into Data Mining Theory and Practice‖, Eastern Economy Edition, Prentice Hall of India, 2006.
3. Ian H.Witten and Eibe Frank, ―Data Mining: Practical Machine Learning Tools and Techniques‖, Elsevier, Second Edition.

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

Minor

20MDCSE107 CYBER SECURITY

L	T	P	C
3	0	0	3

Pre-requisite: Nil

Course Description:

This course enables the students to gain knowledge on various Cybercrimes. The course briefs the students regarding the Indian IT Act, Global perspective of Cybercrimes, Cyber stalking, cyber cafe,key loggers, DoS attacks, crimes on mobile, wireless devices, etc. The knowledge gained in this course can be applied to identify, classify, estimate the criminal plans of the attackers and predict the web threats and security implications.

Course Objectives:

This course enables students to

- Introduce the fundamentals of Cybercrime and its legal perspectives with respect to India.
- Acquaint the student with various types of attacks and Cyber offenses
- Make the student aware of securing devices and Inner perimeter
- Familiarize the student with methods to secure the perimeter.

UNIT I INTRODUCTION TO CYBERCRIME 9 hours

Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT II CYBER OFFENSES 9 hours

How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT III TOOLS AND METHODS USED IN CYBERCRIME 9 hours

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow

UNIT IV SECURING DEVICES AND INNER PERIMETER 9 hours

The Three Layers of Security, Securing Host Devices, Securing Outer-Perimeter Portals, Additional Inner-Perimeter Access Options, The Inner Perimeter, Operating Systems, Operating System Security Choices, Common Operating System Security Tools, Using Local Administrative Tools, Implementing Data Encryption

UNIT V SECURING THE PERIMETER 9 hours

Perimeter Security in the Real World, Security Challenges, The Basics of Internet Security, Understanding the Environment, Hiding the Private Network, Understanding Private Networks, Protecting the Perimeter, Understanding the Perimeter, Firewalls, Network Appliances, Proxy Servers, Demilitarized Zones (DMZs), Honeypots, Extranets.

Course Outcomes:

After completing this Unit, students will be able to

1. Explain the types of Cybercrimes happening all around
2. Select tools and practices that boost up the crime rate
3. Demonstrate the tools to secure inner perimeter
4. Demonstrate the contribution of key loggers, password crackers, viruses, and worms towards enabling the possibilities of Cybercrime
5. Assess the methods to protect the perimeter

Text Book(s)

1. Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, Cyber Security Essentials 1/e, Sybex Wiley

Reference Books

1. Chwan-Hwa(John) Wu, J. David Irwin, Introduction to Cyber Security, 1/e, CRC Press T&F Group, 2013

2. Nina Godbole and Sunil Belapure, Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, 1/e, Wiley INDIA

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

HONORS

Honors

20HDCSE101 GO PROGRAMMING

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:
This course aims to introduce Go Programming Language. Go Programming Language has the features of procedural programming and parallel programming. This course will help the students to write programs using the GO language interfaces, concurrent routines and packages.

Course Objectives:
1. To understand the data types and constructs of GO Language.
2. To write GO Programs using basic programming constructs
3. To write GO programs using functions and arrays
4. To write GO programs using structures and interfaces
5. To write GO programs using concurrent routines
6. To do packaging and file handling in Go

UNIT I INTRODUCTION AND CONSTRUCTS 9 hours

Go Runtime and Compilations, Keywords and Identifiers, Constants and Variables, Operators and Expressions , Local Assignments, Booleans, Numerics, Characters, Pointers and Addresses, Strings, if-else and switch, for Statements, Counter-controlled Iterations, Condition-controlled Iterations, Range Loops, Using break and continue

UNIT II FUNCTIONS AND ARRAYS 9 hours

Parameters and Return Values, Call by Value and Reference, Named Return Variables, Blank Identifiers, Variable Argument Parameters, Using defer statements, Recursive Functions, Functions as Parameters, Closures
Array Literals, Multidimensional Arrays, Array Parameters, Slices and Slice Parameters, Multidimensional Slices, Reslicing, Maps and Map Parameters, Map Slices

UNIT III STRUCTURES AND INTERFACE 9 hours

Structures and Structure Parameters, Structure Tags and Fields, Embedded Structures Recursive Structures, Method Declarations, Functions vs. Methods, Pointer and Value Receivers, Method Values and Expressions, Interface Types and Values, Type Assertions and Type Switches, Method Sets with Interfaces, Embedded Interfaces, Empty Interfaces, Working with Interfaces

UNIT IV CONCURRENCY AND PARALLELISM 9 hours

Concurrency vs. Parallelism, Goroutine Functions and Lambdas, Wait Groups, Channels, Sending and Receiving, Unbuffered and Buffered Channels, Directional Channels, Multiplexing with select, Timers and Tickers

UNIT V 9 hours

Packages and Workspaces, Exporting Package Names, Import Paths and Named Imports, Package Initializations, Blank Imports, Unit Testing with Test Functions, Table Tests and Random Tests, Benchmarking

Files and Directories, Reading Directories , Reading Files, Writing Files, Copying Files, Error Strategies, Panic and Recover, Package Error Handling , Regular Expressions

Course Outcomes:

Upon successful completion of the course, students will be able to
1. apply basic programming constructs of GO Programs
2. apply functions and arrays of GO Programs
3. apply structures and interfaces using GO programs
4. demonstrate concurrent routines using GO programs
5. use packaging and file handling in Go

Text Book(s)

1. Caleb Doxsey, Introducing Go: Build Reliable, Scalable Programs 1st Edition Released January 2016,Publisher(s): O'Reilly Media, Inc., ISBN: 9781491941959
2. Jay McGavren, Head First Go, April 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781491969557

Reference Books

1. Alan A. A. Donovan · Brian W. Kernighan, The Go Programming Language, Oct 26, 2015 Addison-Wesley; 380pp; ISBN: 978-0134190440
2. Jon Bodner, Learning Go, March 2021, Publisher(s): O'Reilly Media, Inc. ISBN: 9781492077213

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

Honors

20HDCSE102 ADVANCED INFORMATION SYSTEMS SECURITY

Course Prerequisite: NIL

L	T	P	C
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 9 hours

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.

UNIT II:RISK MANAGEMENT AND INFORMATION SECURITY 9 hours

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.

UNIT III: POLICIES, STANDARDS, PRACTICES AND BUSINESS CONTINUITY 9 hours

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.

UNIT IV: SECURITY TECHNOLOGY 9 hours

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 .

UNIT V: BIOMETRIC CONTROLS **9 hours**

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.

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. Thomas 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

20HDCSE103 DATA COMMUNICATIONS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

To develop an understanding of the various aspects of data communications and computer networking systems. Topics include: data transmission, multiplexing, switching, error detection and few use cases.

Course Objectives:

1. To understand the fundamental concepts of encoding techniques
2. To familiarize with various multiplexing techniques
3. To understand the importance of error correcting codes in data transmission

UNIT I WAVEFORM ENCODING 9 hours

Introduction to Waveform Encoding- Pulse Code Modulation: Sampling, Quantization, Transmission, Reception, Error, SNR, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Sigma Delta Modulation, Linear Predictive Coder (LPC)

UNIT II ANALOG AND DIGITAL TRANSMISSION 9 hours

Physical Layer- Digital and Analog Signals, Periodic Analog Signals, Signal Transmission, Limitations of Data Rate, Digital Data Transmission, Performance Measures, Line Coding, Digital Modulation, Media and Digital Transmission System

UNIT III MULTIPLEXING 9 hours

Multiplexing- Multiplexing Techniques: FDM, TDM, STDM, Transmission Media: Classification and Selection of Media, Switching Networks: Packet, Circuit, Massage, Telephone Networks: Packet and Circuit Switching in telephone networks

UNIT IV ERROR DETECTION AND CORRECTION 9 hours

Error Detection and Correction- Types of Errors, Two dimensional parity check, Detection verses correction, Block Coding, Linear Block Coding, Cyclic Codes, Checksum, Standardized Polynomial Code, Error Correction Methods, Forward Error Correction

UNIT V APPLICATIONS 9 hours

Case Study- Wireless Data Transfer, Remote Weather Monitoring System, Energy Management in Wireless System, Emission Monitoring System, Railway Information and Surveillance System, Central Distribution Hub

Course Outcomes:

On completion of the course students will be able to

1. explain waveform encoding
2. describe the analog and digital transmission
3. discuss the multiplexing techniques
4. implement error correction and detection codes for correct transmission of data
5. apply data communication concepts in practical areas

Text Book(s)

1. Behrouz A. Forouzan, Sophia Chung Fegan, "Data Communications and Networking", 5th edition, Science Engineering & Math Publications, 2012
2. William Stallings, "Data and Computer Communications", 8th edition, Pearson Education India, 2007

Reference Books

1. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition Paperback – 1 July 2017, McGraw Hill
2. Simon Haykin, Data Communications, 4th Edition, 2001, John Wiley & Sons

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

Honors

20HDCSE104 MINING MASSIVE DATASETS

L	T	P	C
3	0	0	3

Pre-requisite 20CSE112

Course Description:

This course aims to provide comprehensive knowledge on developing and applying machine learning algorithms for massive datasets. The emphasis is on techniques that are efficient and scale well.

Course Objectives:

1. To appreciate the need of map reduce functions
2. To understand the methods used for finding similar items
3. To understand the mining techniques used in data streams
4. To extend the use of machine learning methods to massive data set
5. To use the deep learning methods

UNIT I MAP REDUCE 9 hours

Distributed File Systems, MapReduce,Algorithms Using MapReduce, Frequent Itemsets Mining - Handling Larger Datasets in Main Memory

UNIT II FINDING SIMILAR ITEMS 9 hours

Applications of Near-Neighbor Search, Shingling of Documents, Similarity-Preserving Summaries of Sets, Locality-Sensitive Hashing for Documents, Applications of Locality-Sensitive Hashing

UNIT III MINING DATA STREAMS 9 hours

The Stream Data Model, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Ones in a Window, Decaying Windows

UNIT IV LARGE-SCALE MACHINE LEARNING 9 hours

The Machine-Learning Model, Perceptron, Parallel Implementation of Perceptrons,The Mechanics of an SVM, Parallel Implementation of SVM, The Framework for Nearest-Neighbor Calculations, Dealing with High-Dimensional Euclidean Data, Dealing with Non-Euclidean Distances, Using a Decision Tree, Parallel Design of Decision Trees

UNIT V NEURAL NETS AND DEEP LEARNING 9 hours

Introduction to Neural Nets, Dense Feedforward Networks - Activation Functions, Convolutional Neural Networks, Recurrent Neural Networks, Regularization

Course Outcomes:

Upon completion of the course the students will be able to

1. Describe the use of map reduce functions
2. Apply the methods used for finding similar items
3. Apply the mining techniques used in data streams
4. Explain how massive data set can be modeled using machine learning algorithms
5. Elaborate the working of deep learning methods

Text Book(s)

1. Jure Leskovec, Anand Rajaraman, Jeffrey Ullman, "Mining of Massive Datasets", Standford Press,2011.

Reference Books

1. Nick Pentreath, "Machine Learning with Spark", Packt Publishing
2. Ron Bekkerman, Mikhail Bilenko, John Langford "Scaling Up Machine Learning: Parallel and Distributed Approaches", Cambridge University Press, 2012.

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

Honors

20HDCSE105 GP - GPU COMPUTING

L	T	P	C
3	0	0	3

Pre-requisite 20CSE103, 20CSE107

Course Description:

This course teaches the basics of parallel processing model, GPU programming using CUDA and applications of parallel processing.

Course Objectives:

1. To learn the architecture of GPU and basics of parallelism
2. To learn about the evolution of GPU computing
3. To learn GPU programming using CUDA
4. To study the methods of performance improvement in GPU

UNIT I INTRODUCTION 9 hours

Graphics Processing Units (GPU) as Parallel Computers - Architecture of a modern GPU - Why more speed or parallelism? - Parallel Programming Languages and Models - Overarching Goals - History of GPU computing - Evolution of Graphics Pipelines - GPU Computing.

UNIT II PARALLEL PROGRAMMING 9 hours

Goals of Parallel Programming - Problem Decomposition - Algorithm Selection - Computational Thinking - Introduction to OPENCL: Background - Data Parallelism Model - Device Architecture - Kernel Functions - Device Management & Kernel Launch.

UNIT III INTRODUCTION TO CUDA 9 hours

Data Parallelism - CUDA Program Structure - AMatrix - Matrix Multiplication Example - Device Memories and Data Transfer - Kernel Functions and Threading - Function declarations - Kernel launch - Predefined variables - Runtime API - CUDA Threads: CUDA Thread Organization - Using blockIdx and threadIdx - Synchronization and Transparent Scalability - Thread Assignment - Thread Scheduling and Latency Tolerance - CUDA Memories: Importance of Memory Access Efficiency - CUDA Device Memory Types - A Strategy for Reducing Global Memory Traffic - Memory as a Limiting Factor to Parallelism.

UNIT IV PERFORMANCE CONSIDERATIONS 9 hours

Thread execution - Global memory bandwidth - Dynamic partitioning of SM resources - Data prefetching - Instruction mix - Thread Granularity - Floating Point considerations: FP format - Representable numbers - Special bit patterns and precision - Arithmetic accuracy and rounding - Algorithm considerations - Debugging and Profiling: Debugging CUDA programs - Profiling CUDA programs - CUDA and MPI .

UNIT V CASE STUDIES 9 hours

Advanced MRI Reconstruction, Molecular Visualization and Analysis, Image Processing, Graph algorithms, Simulations, Deep Learning

Course Outcomes:

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

1. Explain the basics of GPUs and GPU architecture
2. Discuss the parallel programming concepts and OpenCL
3. Write programs for GPUs using CUDA
4. Explain the methods for performance improvisation
5. Apply parallel applications targeting GPUs

Text Book(s)

1. David Kirk, Wen-mei Hwu, “Programming Massively Parallel Processors: A Hands-on Approach”, Third Edition, Morgan Kaufmann, 2017.

2. Shane Cook, CUDA Programming: A Developer's Guide to Parallel Computing with GPUs, Morgan Kaufman; 2012 (ISBN: 978-0124159334)

Reference Books

1. Wilkinson, M.Allen, Parallel Programming Techniques and Applications using networked workstations and parallel computers, Prentice Hall, 1999

2. David Kirk and Wen-mei Hwu, Programming Massively Parallel Processors: A Hands-On Approach, 2nd Edition, Publisher: Morgan Kaufman, 2012, ISBN: 9780124159921

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

Honors

20HDCSE106 CLOUD DESIGN - PERFORMANCE, SCALABILITY AND SECURITY

L	T	P	C
3	0	0	3

Pre-requisite None

Course Description:

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 9 hours

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

UNIT II PERFORMANCE MANAGEMENT 9 hours

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.

UNIT III MANAGEMENT OF CLOUD SERVICES 9 hours

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).

UNIT IV APPLICATION DEVELOPMENT 9 hours

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.

UNIT V SECURITY CONCEPTS 9 hours

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.

Course Outcomes:

Upon completion of this course, the 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 Book(s)

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",

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

Honors

20HDCSE107 NATURAL LANGUAGE PROCESSING

L	T	P	C
3	0	0	3

Pre-requisite 20CSE110

Course Description:

Natural language processing (NLP) draws from many disciplines, including computer science and computational linguistics, in its pursuit to fill the gap between human communication and computer understanding. Students will learn how this system works and how can they utilize and what application can be build. After successful completion of this course, students will be familiar with NLP concepts.

Course Objectives:

This course enables students to

1. To understand the steps involved in Natural language processing
2. To learn about the lexical, syntactic and semantic analysis of natural language processing
3. To explore the various parsing techniques for natural languages
4. To understand the statistical models for Natural language processing
5. To learn about the various applications involved in Natural language processing

UNIT I LEXICAL ANALYSIS 9 hours

Lexical Analysis - Regular expression and Automata for string matching - Words and Word Forms - Morphology fundamentals - Morphological Diversity of Indian Languages - Morphology Paradigms - Finite State Machine / Transducers Based Morphology - Automatic Morphology Learning - Parts of Speech - N-gram Models - Hidden Markov Models.

UNIT II SPEECH PROCESSING 9 hours

Biology of Speech Processing - Place and Manner of Articulation - Word Boundary Detection - Argmax based computations - HMM and Speech Recognition - Text to Speech Synthesis - Rule based-Concatenative based approach

UNIT III PARSING 9 hours

Theories of Parsing - Parsing Algorithms - Earley Parser - CYK Parser - Probabilistic Parsing - CYK - Resolving attachment and structural ambiguity - Shallow Parsing - Dependency Parsing - Named Entity Recognition - Maximum Entropy Models - Conditional Random Fields.

UNIT IV LEXICAL KNOWLEDGE NETWORKS 9 hours

Meaning: Lexical Knowledge Networks - Wordnet Theory - Indian Language Wordnets and Multilingual Dictionaries - Semantic Roles - Word Sense Disambiguation - WSD and Multilinguality - Metaphors - Coreference and Anaphora Resolution.

UNIT V APPLICATIONS 9 hours

Applications: Sentiment Analysis - Text Entailment - Machine Translation - Question Answering System - Information Retrieval - Information Extraction - Cross Lingual Information Retrieval (CLIR).

Course Outcomes:

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

1. Justify the various steps necessary for processing natural language
2. Suggest appropriate lexical and parsing techniques for a given natural language
3. Apply appropriate statistical models for a given natural language application
4. Modify existing algorithms to suit any natural language for processing
5. Suggest appropriate pre-processing steps essential for the various applications involving natural language processing

Text Book(s)

1. Jurafsky Daniel, Martin James, "Speech and Language Processing", Second Edition, Tenth Impression, Pearson Education, 2018.

Reference Books

1. AllenJames,"NaturalLanguageUnderstanding",SecondEdition,BenjaminCumming,1995.
2. CharniackEugene,"StatisticalLanguageLearning",MITPress,1993.
3. Christopher Manning, Schutze Heinrich, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.

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

Honors

20HDCSE108 CRYPTO CURRENCIES

L	T	P	C
3	0	0	3

Pre-requisite 20CSE111

Course Description:

Cryptocurrency is vastly discussed now days in all research domains to bring the decentralization. This course is to understand the concept of cryptocurrency. Students will learn how this system works and how can they utilize and what application can be build. After successful completion of this course, students will be familiar with cryptocurrency concepts. Also they can build their own application using the learned concepts.

Course Objectives:

This course enables students to

1. Understand the concept of public and private keys in cryptocurrency systems.
2. Explain the purpose and uses of digital signatures in cryptography.
3. Design and analyze consensus mechanisms using PoW, PoS, or PoB for specific use cases.
4. Describe the protocols used in Bitcoin, including the mining strategy and rewards.
5. .Analyze the impact of cryptocurrency on the global economy and financial systems.

UNIT I FUNDAMENTALS OF CRYPTOCURRENCY 9 hours

Cryptocurrency Fundamentals: Public and Private Keys in Cryptocurrency Systems, The UTXO Model, Transactions, The Merkle Root, Signing and Validating Transactions, The Coinbase Transaction, Bitcoin Transaction Security, Hashes, Block Hashes, Wallet Types: Custodial Versus Noncustodial, Wallet Type Variations, Mining, Block Generation, Consensus, Proof-of-Work, Proof-of-Stake

UNIT II CRYPTOGRAPHY 9 hours

Cryptographic hash functions and digital signatures: Cryptographic hashes, Digital signatures, Private key Security ,Memory Hard Algorithm, Zero Knowledge Proof.

UNIT III DISTRIBUTED CONSENSUS 9 hours

Distributed Consensus: Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, Sybil Attack, Energy utilization and alternate.

UNIT IV CRYPTOCURRENCY 9 hours

Cryptocurrency: History, Distributed Ledger, Bitcoin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Sidechain, Namecoin

UNIT V CRYPTOCURRENCY REGULATION 9 hours

Stakeholders, Roots of Bitcoin, Legal Aspects - Cryptocurrency Exchange, Black Market and Global Economy, Money laundering and terrorist financing, Tax evasion.

Course Outcomes:

After completing this Unit, students will be able to

1. Understand the concept of transactions in cryptocurrencies and the significance of the Merkle Root
2. Design and implement security measures to protect private keys in cryptographic systems.
3. Develop strategies to adjust the difficulty level in a blockchain network based on changing circumstances.
4. Apply knowledge of cryptocurrency history to analyze and assess the impact of historical events on the development of cryptocurrencies.
5. Understand the concepts and techniques used in money laundering, terrorist financing, and tax evasion in the context of cryptocurrency.

Text Book(s)

1. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).
2. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies

Reference Books

1. Kalle Rosenbaum, *Grokking Bitcoin*, MANNING Publication
2. Lorne Lantz & Daniel Cawrey, *Mastering Blockchain Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications*, O'REILLY Publications

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

Honors

20HDCSE109 DIGITAL FORENSICS

L	T	P	C
3	0	0	3

Pre-requisite 20CSE111

Course Description:

With the rapid growth of internet users over the globe, the rate of cybercrime is also increasing. Nowadays, Internet applications become an essential part of every discipline with their variety of domain-specific applications. The basic objectives to offer this course as an open elective category to aware engineering graduates of every discipline to understand cybercrimes and their Operandi to analyze the attack.

Course Objectives:

This course enables students to

1. Provides an in-depth study of the rapidly changing and fascinating field of computer forensics
2. To learn about investigation, preventing and fighting computer crimes
3. To preserve the digital evidence in a secure manner from the social networks
4. To take out the operating system artifacts
5. To gain knowledge on Forensics tools

UNIT I DIGITAL FORENSICS SCIENCE 9 hours

Forensics science, computer forensics, and digital forensics. Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber criminalistics area, holistic approach to cyber-forensics.

UNIT II CYBER CRIME SCENE ANALYSIS 9 hours

Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation

UNIT III EVIDENCE MANAGEMENT & PRESENTATION 9 hours

Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, define and apply probable cause.

UNIT IV COMPUTER FORENSICS 9 hours

Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case. Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data

UNIT V FORENSICS TOOLS 9 hours

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool

Course Outcomes:

After completing this Unit, students will be able to
1. Describe Forensic science and Digital Forensic concepts
2. Determine various digital forensic Operandi and motive behind cyber attacks
3. Interpret the cyber pieces of evidence, Digital forensic process model and their legal perspective.
4. Discuss the tools used in forensics
5. Demonstrate various forensic tools to investigate the cybercrime and to identify the digital pieces of evidence

Text Book(s)

1. Nelson, B., Phillips, A., & Steuart, C. (2016). Guide to Computer Forensics and Investigations (5th ed.). Boston, MA: CENGAGE Learning. ISBN 1-285-06003-2, 978- 1-285-06003-3.
2. Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.

Reference Books

1. John Sammons, The Basics of Digital Forensics, 2nd Edition, Elsevier, 2014
2. John Vacca, Computer Forensics: Computer Crime Scene Investigation, 2nd Edition, Laxmi Publications, 2005.

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

Honors

20HDCSE601 ADVANCED MACHINE LEARNING

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Pre-requisite 20CSE112

Course Description:

This course helps the students to understand and implement advanced Machine Learning (ML) algorithms such as Exploratory Data Analysis, Dimensionality Reduction techniques, cross-validation on a learning problem, Apriori algorithm, FP-Growth algorithm, K-means clustering, hierarchical clustering algorithms, DBSCAN clustering algorithm, density-based clustering, graph-based clustering, Web scraping.

Course Objectives:

1. To understand feature engineering techniques in machine learning
2. To learn simple regression algorithms
3. To apply comparative analysis among simple and advanced regression algorithms
4. To explore various types of clustering methods
5. To analyze feature extraction in NLP and object detection techniques using OpenCV

UNIT I: INTRODUCTION **9 Hours**

Exploratory Data Analysis (EDA), Outliers, Dimensionality Reduction, Apriori Algorithm, FP-Growth Algorithm

1) Implement a program to perform Exploratory Data Analysis on real time datasets using the following approaches: a) Univariate Analysis b) Multivariate Analysis c) Visualization using correlation matrix
2) Implement a program to evaluate and compare learning curves of leave-one-out with two, three, five and ten-fold cross-validation on a learning problem using real time dataset
3) Implement a program to perform any of the following Dimensionality Reduction techniques on real time datasets. a) Principal Component Analysis b) Single value Decomposition c) Linear Discriminant Analysis d) Factor Analysis
4) Implement a program to generate Association Rules using the Apriori algorithm
5) Implement a program to generate Association Rules using the FP-Growth algorithm

UNIT II: SIMPLE REGRESSION **9 Hours**

Simple Linear Regression, Multiple Linear Regression, One Hot Encoding, Polynomial Linear Regression

1) Implement a program to evaluate r2_score for finding the accuracy using simple linear regression
2) Implement a program to perform multiple linear regression model for predicting house prices

3) Implement a program to convert textual data into numeric data using one hot encoding

Implement polynomial regression for finding salary based on experience data

UNIT III: ADVANCED REGRESSION **9 Hours**

Ride Regression, Lasso Regression, Elastic net Regression, Logistic Regression: binary classification and multi-class classification

1) Implement a program using Ridge Regression to predict height depending on weight
2) Implement a program using Lasso regression on Boston house prices and select the best feature that mostly influences the price of the house
3) Develop a program to create Elastic Net model and find out which factor is most determining factor for diabetes in India.
4) Apply binary and multi-class classification techniques to develop a program using logistic regression

UNIT-IV: CLUSTERING **9 Hours**

K-Means, Hierarchical, DBSCAN, density-based, graph-based clustering algorithms

1) Develop a program to implement K-means clustering algorithm
2) Develop a program to implement hierarchical clustering algorithm
3) Develop a program to implement the DBSCAN clustering algorithm
4) Implement a program for density-based clustering algorithm
5) Implement a program for graph-based clustering algorithm

UNIT-V: NLP AND COMPUTER VISION **9 Hours**

Tokenization, Stemming, Lemmatization, Stop words, Parts of Speech (Pos), Count Vectorizer

Face Detection, Contours

1) Implement bag of words technique for converting text into vectors
2) Implement a program to extract SURF/SIFT feature using OpenCV on a sample image
3) Write a program to implement YOLO algorithm
4) Develop a program to eliminate multiple rectangular boxes

Course Outcomes:

After completing this course, the students should be able to

1. Understand various Feature Extracting, Feature Engineering techniques and Exploratory Data Analysis on real time datasets
2. Develop various simple regression techniques
3. Implement various advanced regression techniques
4. Develop clusters from real time data using various Clustering Algorithms
5. Implement bag of words and object detection techniques using NLP and computer vision

Text Book(s)

1. Dipanjan Sarkar, Raghav Bali, Tushar Sharma. Practical Machine Learning with Python-A Problem-Solver's Guide to Building Real-World Intelligent Systems, Apress. 2018.

Reference Books

1. Sikar Dutt, Subramanian Chandra mouli, Amit Kumar Das, Machine Learning, Ninth Impression, Pearson, 2022.
2. Manohar Swamynathan, Mastering Machine Learning with Python in Six Steps -A Practical Implementation Guide to Predictive Data Analytics Using Python, Apress,2017.

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