MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE

MADANAPALLE

(UGC-AUTONOMOUS)

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DEPARTMENT OF COMPUTER SCIENCE & TECHNOLOGY

Course Structure
&
Detailed Syllabi

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 & TECHNOLOGY

Vision and Mission of the Department

Vision of the Department	To bring forth globally competent engineers with societal consciousness, who thrive in academics and research in Computer Science and technology.
Mission of the Department	**M1**: To deliver technical education of the highest quality by improving the curriculum and using effective pedagogical techniques by qualified faculty. **M2**: To foster interaction between Industry and academia, to improve students' abilities in research, innovation, and entrepreneurship. **M3**: To prepare the students to become professionally competent and intellectually adept by imparting required Skills to mitigate the societal problems.

Programme Educational objectives (PEOs)

PEO1: Graduates will have successful career by contributing for innovation of new technologies and systems in the key domains of Computer Science and Technology.
PEO2: Graduates will be able to perform technical/ administrative roles in information technology industry / R&D sectors and pursue higher education in reputed institutions.
PEO3: Graduates will be ethically and socially responsible towards the societal development and opting a career as an entrepreneur with moral values in various domains of Computer Science & Technology

Program Specific Outcomes (PSOs)

PSO1: Ability to design algorithms using mathematical models and implement problems through different programming tools to solve real world problems.
PSO2: Ability to apply Software Engineering Principles & Practices in the domain of Database Management Systems, Compilers, Computer Networks, Operating Systems and allied areas, Mobile and web based applications under realistic constraints
PSO3: Ability to implement the principles and techniques of Artificial Intelligence and Machine Learning, IoT and Cloud Computing, Data Analytics & Security by applying them to develop intelligent systems and data-driven solutions.

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

B. Tech Four Year Curriculum Structure

Branch: COMPUTER SCIENCE & TECHNOLOGY

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 Program (Mandatory)	Three weeks' duration at the start of First Year (Refer Annexure - I)
2	Holistic Development Activities (Every Student from Semester 2 – 8 should register for at least one activity)	Three hours per week (Activity list is enclosed in Annexure - I)
3	Virtual Laboratory (Students are encouraged to choose and register for any of the Virtual laboratories he /she is interested)	As specified by the Virtual Laboratory

R20 - Curriculum Structure

I Year I 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	20MAT101	Engineering Calculus	3	1	0	4	4
3	BSC	20CHE101	Engineering Chemistry	3	0	0	3	3
4	ESC	20ME101	Engineering Graphics	2	0	2	4	3
5	ESC	20CSE101	Programming for Problem Solving (Python)	2	0	3	5	3.5
6	BSC	20CHE201	Chemistry Laboratory	0	0	3	3	1.5
7	ESC	20CSE202	Engineering and IT Workshop	0	0	3	3	1.5
Total				**13**	**1**	**11**	**25**	**19.5**

I Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	BSC	20MAT110	Linear Algebra	3	0	0	3	3
2	BSC	20PHY102	Applied Physics	3	1	0	4	4
3	ESC	20EEE101	Basic Electrical Engineering	3	1	0	4	4
4	ESC	20CSE102	C Programming and Data Structures	3	0	0	3	3
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
8	ESC	20CSE201	C Programming and Data Structures Laboratory	0	0	3	3	1.5
Total				**12**	**2**	**11**	**25**	**19.5**

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

II Year I 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	20MAT111	Probability and Statistics for Computer Science	3	0	0	3	3
3	ESC	20CST101	Digital Design	3	0	0	3	3
4	PCC	20CST102	Data Structures and Algorithms	3	0	0	3	3
5	PCC	20CST103	Database Systems	3	0	0	3	3
6	ESC	20CST201	Digital Design Laboratory	0	0	3	3	1.5
7	PCC	20CST202	Data Structures and Algorithms Laboratory	0	0	3	3	1.5
8	PCC	20CST203	Database Systems Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course – I (Refer Annexure - IV)	1	0	2	3	2
10	MC	20HUM901	Indian Constitution	2	0	0	2	0
Total				**18**	**0**	**11**	**29**	**21.5**

II Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	BSC	20MAT112	Discrete Mathematical Structures	3	0	0	3	3
2	PCC	20CST104	Computer Architecture	3	0	0	3	3
3	PCC	20CST105	Network and Communication	3	0	0	3	3
4	PCC	20CST106	Object Oriented Programming Using Java	3	0	0	3	3
5	PCC	20CST107	Operating Systems	3	0	0	3	3
6	PCC	20CST204	Network and Communication Laboratory	0	0	3	3	1.5
7	PCC	20CST205	Object Oriented Programming Using Java Laboratory	0	0	3	3	1.5
8	PCC	20CST206	Operating Systems Laboratory	0	0	3	3	1.5
9	SOC		Skill Oriented Course – II (Refer Annexure - IV)	1	0	2	3	2
10	MC	20CHE901	Environmental Science	2	0	0	2	0
Total				**18**	**0**	**11**	**29**	**21.5**

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

III Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week L	T	P	Total	Credits
1	PCC	20CST108	Automata Theory and Compiler Design	3	0	0	3	3
2	PCC	20CST109	AI Tools, Techniques and Applications	3	0	0	3	3
3	PCC	20CST110	Software Engineering	3	0	0	3	3
4	OE		Open Elective-1	3	0	0	3	3
5	PE		Professional Elective-1	3	0	0	3	3
6	PCC	20CST207	AI Tools, Techniques and Applications Laboratory	0	0	3	3	1.5
7	PCC	20CST208	Software Engineering Laboratory	0	0	3	3	1.5
8	SC		Skill Oriented Course – III (Refer Annexure - IV)	1	0	2	3	2
9	MC	20HUM902**/ 20HUM102#	Universal Human Values	2/3	0	0	2/3	0/3
10	PROJ	20CST701	Summer Internship-1*	0	0	3	3	1.5
Total				**18/19**	**0**	**11**	**29/30**	**21.5/24.5**

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

** 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

III Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week L	T	P	Total	Credits
1	PCC	20CST111	Cryptography and Network Security	3	0	0	3	3
2	PCC	20CST112	Cloud Computing	3	0	0	3	3
3	PCC	20CST113	Internet and Web Programming	3	0	0	3	3
4	OE		Open Elective-2	3	0	0	3	3
5	PE		Professional Elective-2	3	0	0	3	3
6	PCC	20CST209	Cryptography and Network Security Laboratory	0	0	3	3	1.5
7	PCC	20CST210	Cloud Computing Laboratory	0	0	3	3	1.5
8	PCC	20CST211	Internet and Web Programming Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course – IV (Refer Annexure - IV)	1	0	2	3	2
10	MC	20CE901	Disaster Management	2	0	0	2	0
Total				**18**	**0**	**11**	**29**	**21.5**

(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-3	3	0	0	3	3
2	PE		Professional Elective-4	3	0	0	3	3
3	PE		Professional Elective-5	3	0	0	3	3
4	OE		Open Elective-3	3	0	0	3	3
5	OE		Open Elective-4	3	0	0	3	3
6	OE-HSMC		Open Elective-5 (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	20CST702	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	20CST703	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 advanced courses 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.	20CST401	Introduction to Machine Learning
2.	20CST402	GPU Architecture and Programming
3.	20CST403	Principles of Cyber Security
4.	20CST404	Graphics and Multimedia
5.	20CST405	Wireless Sensor Networks
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.	20CST4M01	Computation Complexity
2.	20CST4M02	Introduction to Soft Computing
3.	20CST4M03	Online Privacy
4.	20CST4M04	Privacy and Security in Online Social Media
5.	20CST4M05	Ethical Hacking
6.	20CST4M06	Introduction to Internet of Things
7.	20CST4M07	Advanced Computer Architecture
8.	20CST4M08	Social Network Analysis
9.	20CST4M09	Software Project Management
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.	20CST406	Perception and Computer Vision
2.	20CST407	Big Data Analytics
3.	20CST408	Digital Forensics
4.	20CST409	Modeling and Simulation
5.	20CST410	Network Programming
Any advanced courses can be appended in future.		

Professional Elective – IV		
Sl. No.	**Course Code**	**Course Title**
1.	20CST411	Image and Video Processing
2.	20CST412	Advanced Algorithms
3.	20CST413	Fundamentals of Fog and Edge Computing
4.	20CST414	Human Computer Interaction
5.	20CST415	Sensor and Actuator Devices
Any advanced courses can be appended in future.		

Professional Elective – V		
Sl. No.	**Course Code**	**Course Title**
1.	20CST416	Multi Agent Systems
2.	20CST417	Deep Learning Techniques
3.	20CST418	Quantum Computing
4.	20CST419	Augmented Reality and Virtual Reality
5.	20CST420	Data Analytics and Visualization
Any advanced courses can be appended in future.		

ANNEXURE - IV

COMPUTER SCIENCE TECHNOLOGY – SKILL ORIENTED COURSE

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

Sl. No.	Course Code	Skill Oriented Course – II
1	20CST601	Web Development using FLASK Framework
2	20CST602	Data Science using R
Any advanced courses can be appended in future.		

Sl. No.	Course Code	Skill Oriented Course – III
1	20CST603	Computer Graphics
2	20CST604	Data Mining
Any advanced courses can be appended in future.		

Sl. No.	Course Code	Skill Oriented Course – IV
1	20CST605	Software Testing
2	20CST606	Pattern Recognition
Any advanced courses can be appended in future.		

Sl. No.	Course Code	Skill Oriented Course - V
1	20CST607	Statistics with R Programming
2	20CST608	Middleware Technologies
3	20CST609	Selenium with Java
Any advanced courses can be appended in future.		

Annexure V

Minor in Computer Science and Technology

(Applicable to CE, EEE, ME and ECE)

Stream Name: Data Analytics (DA)

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
III Year I Semester								
1	**Professional Core Course**	20MDCST101	Data Structures and Algorithms (Except EEE Branch)	3	0	0	3	3
2	**Professional Core Course**	20MDCST102	Design and Analysis of Algorithms (For EEE Branch)	3	0	0	3	3
3	**Professional Core Course**	20MDCST103	Database Systems	3	0	0	3	3
III Year II Semester								
4	**Professional Core Course**	20MDCST104	Big Data Analytics	3	0	0	3	3
5	**Professional Core Course**	20MDCST105	Data Mining and Data Warehousing	3	0	0	3	3
6	**Professional Core Course**	20MDCST201	Big Data Management and Data Analytics Laboratory	0	0	4	4	2
IV Year I Semester								
7	**Professional Elective Course**	20MDCST106	Deep Learning	3	0	0	3	3
8	**Professional Elective Course**	20MDCST107	Data Visualization	3	0	0	3	3
			Total	**18**	**0**	**4**	**22**	**20**

Annexure VI

Honors in Computer Science & Technology

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)**	20HDCST101	Research Methods for the Study of Evolution	3	0	0	3	3
2		20HDCST102	Natural Language Processing	3	0	0	3	3
3		20HDCST103	Introduction to Game Theory	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)**	20HDCST104	High Performance Computing	3	0	0	3	3
5		20HDCST105	Advanced Computer Networks and Communications	3	0	0	3	3
6		20HDCST106	Game Design Studio	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)**	20HDCST107	Evolutionary Computing	3	0	0	3	3
8		20HDCST108	Advanced Software Engineering	3	0	0	3	3
9		20HDCST109	Experiential Learning in Data Science	3	0	0	3	3
10	**SOC**	20HDCST601	Soft Computing using Python	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

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 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

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 I 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 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.

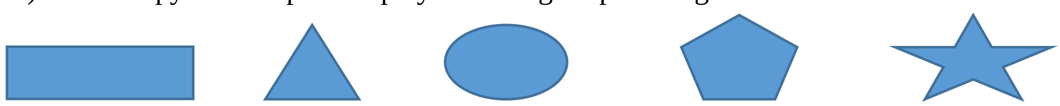
Object Oriented Programming using Python: Introduction to OOP, Creating Classes and Objects in Python, Creating Methods in Python

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

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.

Textbooks:

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 I 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. Attain complete knowledge of a computer hardware
2. Install Operating Systems and troubleshooting using Utility software.
3. Able to do document task through office productivity software.
4. Attain technically strong usage of Google Tools and Email handling.
5. Able to install basic computer engineering software.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

I Year II Semester

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

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 II 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.

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. Understand fundamentals of C programming language and its constructs.
2. Design and implement applications using functions, arrays, sorting and searching techniques.
3. Design and implement applications using strings and pointers.
4. Design and implement applications using structures and File processing.
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, 2nd 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, 15th 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

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 II 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 II 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

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. Understand fundamentals of C programming language and its constructs.
2. Design applications using functions, arrays, sorting and searching techniques.
3. Design and implement solutions using strings and pointers.
4. Design and develop solutions using structures and File processing.
5. Design and develop applications on stack, queue, and linked list depending on the problems to be solved.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

II Year I Semester

B. Tech. II Year I 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 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:
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.

E Books:

1 http://nptel.ac.in/courses/IIT-MADRAS/Principles_of_Communication1/Pdfs/1_5.pdf

2 https://www.khanacademy.org

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

B. Tech. II Year I Semester

20CST101 DIGITAL DESIGN

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

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

Course Objectives:

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

UNIT I BINARY SYSTEMS, BOOLEAN ALGEBRA AND LOGIC GATES **9 hours**
Binary Systems: Digital Computer and Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Compliments, Signed Binary Numbers, Binary Codes. Boolean Algebra and Logic Gates: Basic Definitions, Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates.

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

UNIT III COMBINATIONAL LOGIC **9 hours**
Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Demultiplexers.

UNIT IV SYNCHRONOUS SEQUENTIAL LOGIC 9 hours

Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Design Procedure, Registers, Shift Registers, Ripple Counters, Synchronous Counters.

UNIT V MEMORY AND PROGRAMMABLE LOGIC 9 hours

Memory Hierarchy & different types of memories, Random access memory, memory decoding, Error Detection and Correction, Read-only Memory, Programmable Logic Array, Programmable Array Logic, Design of Digital Systems- Algorithmic State Machines.

Course Outcomes:

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

1. Compare different number systems and logic gates.
2. Understand the logical elements to design various logical units.
3. Design combinational circuits.
4. Design synchronous sequential circuits.
5. Illustrate the memory hierarchy.

Text Books:

1. Digital Design, M. Morris Mano, Micheal D. Ciletti, 5th Edition, 2013, Pearson.

2. G Raghurama, TSB Sudharshan "Introduction to Computer Organization". EDD notes 2007

Reference Books:

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

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

B. Tech. II Year I Semester

20CST102 DATA STRUCTURES AND ALGORITHMS

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 linked lists, stacks, queues, various types of trees, graphs and their implementation.

Course Objectives:

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

UNIT I LIST ADT 9 hours

Introduction: Abstract Data Type (ADT) – introduction to data structures – representation – implementation- Algorithmic notation- Analyzing programs- List: Singly Linked List and Its Operations, Doubly Linked List and its operations, Circular Lists-Applications of Linked List.

UNIT II STACK & QUEUE 9 hours

Stacks: Definition- representations – operations - applications of stack-balancing symbols – conversion of infix to postfix expression – evaluating a postfix expression
Queue: Definition - array and linked list representations - operations - Applications of queue: Priority queues - De queues – circular queue.

UNIT III SORTING & HASHING 9 hours

Sorting techniques: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort and Radix Sort, Comparison of sorting methods. Hashing: Dictionaries, HashTable Representation, Static and Dynamic Hashing, Collision Resolution methods-Open Addressing, Separate Chaining, Double hashing.

UNIT IV TREE **9 hours**

Tree: Introduction, Terminology, Binary Tree, representation, Binary Tree Traversals.
Binary Search Tree: Properties, Insertion, Deletion, and Searching operations. Application of Trees: AVL Trees, Red Black Trees.

UNIT V GRAPH **9 hours**

Graph: Terminology, Representation, operations, Graph Traversal techniques: BFS & DFS, Applications – Topological Sort, Spanning trees, shortest path.

Course Outcomes:

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

1. Understand the concept of algorithms to implement linked lists.
2. Implement Stack and queue using arrays and linked lists.
3. Assess sorting and hashing techniques based on their complexities.
4. Construct binary search tree and applications.
5. Develop solutions for problems based on graphs.

Text Book(s)

1. Data Structures and Algorithms Made Easy, Narasimha Karumanchi, CareerMonk Publications; 5th edition.
2. D. Samanta, "Classic Data Structures", Second Edition, Prentice-Hall of India,

Reference Books

1. Robert Kruse, C.L. Tondo and Bruce Leung, "Data Structures and Program

2. Design in C", Prentice-Hall of India, Pvt. Ltd., Second edition, 2007.
3. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures", Galgotia Book Source, Pvt. Ltd., 2004.

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

B. Tech. II Year I Semester

20CST103 DATABASE SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

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

Course Objectives:

1. To understand the concept of DBMS and ER Modeling.
2. To explain the normalization, Query optimization and relational algebra.
3. To have an introductory knowledge about the storage and query processing techniques and the basic concepts of Information retrieval techniques
4. To learn about the internal storage structures using different file and indexing techniques which will help in physical DB design
5. To apply the concurrency control, recovery, security and indexing for the real time data.

UNIT I DATABASE SYSTEMS CONCEPTS AND DATA MODELING 9 hours

Introduction to Databases- File System Vs Database System - Data Models- Schemas and Instances - DBMS Architecture- Centralized - Client Server - Database Applications.

Entity Relationship Model: Types of Attributes, Relationship, Structural Constraints - Relational Model, Relational model Constraints - Mapping ER model to a relational schema - Integrity Constraints.

UNIT II SQL 9 hours

The Database Language SQL – Simple Queries in SQL – Queries Involving More than One Relation, Sub Queries, aggregate operators, null values, complex integrity constraints, triggers and active databases Embedded SQL, Dynamic SQL, Cursors, Introduction to JDBC, Stored Procedures.

UNIT III SCHEMA REFINEMENT 9 hours

Translating SQL Queries into Relational Algebra and Relational Calculus, Guidelines for Relational Schema – Functional dependency; Normalization, Boyce Codd Normal Form, Multi-valued dependency and Fourth Normal form; Join dependency and Fifth Normal form.

UNIT IV DATA STORAGE AND TRANSACTION MANAGEMENT 9 hours

Storage strategies: Indices, B-trees, B^+-trees, hashing. Two-Phase Locking Techniques for Concurrency Control -ACID Property– Concurrency Control based on timestamp – Recovery Concepts – Recovery based on deferred update – Recovery techniques – Buffer management.

UNIT V DATABASE SECURITY AND RECENT TRENDS 9 hours

Database Authentication, Authorization and access control, DAC, MAC and RBAC models, SQL injection. Introduction, Need of NoSQL, CAP Theorem and Recent trends.

Course Outcomes:

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

1. Construct an ER model and derive the relational schemas from the model.
2. Understand the conceptual and logical database design using SQL queries.
3. Apply Normalization to improve database design.
4. Interpret the basic issues of storage and transaction management.
5. Analyse the fundamental security concepts for database.

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: Assignments, Mid Term Tests, End Semester Examination.

B. Tech. II Year I Semester

20CST201 DIGITAL DESIGN LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite Nil

Course Description:

This course helps the students verify the functioning of combinational circuits and sequential circuits. Students also simulate digital circuits using Hardware.

Course Objectives:

1. To get acquainted with Digital Training System.
2. To study the basic logic gates: AND, OR, INVERT, NAND, NOR, and XOR.
3. To understand formulation of Boolean function and truth table for logic circuits.
4. To conduct Experiment on combinational circuits using hardware.
5. To conduct Experiment on Sequential circuits using hardware.

List of Programs:

1. Familiarization of bench equipment's
2. Implementation of Boolean functions using logic gates (Hardware) logic gates 74xx
3. Operation of 4-bit counter
4. Adders and Subtractors (Hardware)
    a. half adder
    b. half subtractor
    c. full adder
    d. full subtractor
    e. ripple carry look ahead adder
5. 3-8 decoder-74138 & 8-3 encoder-74x148
6. 8x1 Multiplexers-74x151 and 2x4 demultiplexers-74x155
7. Latches & Flip-flops (Hardware)
a. D-flipflop 74x74 b. jk flipflop 74x109
8. 4-bit comparators-74x85
9. Decade counters-74x90
10. Universal shift registers-74x194
11. Sequential circuits

Course Outcomes:

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

1. Understand the functionality of digital systems.
2. Experiment the basic functionalities of logic gates.

3. Demonstrate the working of logic circuits.
4. Experiment with the combination circuits using hardware.
5. Practicing the Sequential circuits using hardware.

Text Books:

1. Digital Design, M. Morris Mano, Micheal D. Ciletti, 5th Edition, 2013, Pearson.

2. G Raghurama, TSB Sudharshan “Introduction to Computer Organization”. EDD notes 2007

Reference Books:

1. Donald D. Givonne, “Digital Principles and Design” TMH, 2003.
2. Digital Logic & State Machine Design, David J. Comer, Oxford University Press, 3rd Reprinted Indian Edition, 2012.
3. Digital Logic Design, R.D. Sudhakar Samuel, Elsevier.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech. II Year I Semester

20CST202 DATA STRUCTURES AND ALGORITHMS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 18CSE102, 18CSE201

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, applications of trees and applications of Graph.

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

List of Programs:

1. Write a Program to Implement Singly Linked List and its operations.
2. Write a Program to Implement Stack Operations by using Array.
3. a) Write a program that uses stack operations to convert a given infix expression into its postfix.
   b) Write a program that uses stack operations to evaluate given postfix expression.
   c) Write a C program to reverse the elements in the stack using recursion.
4. Write a Program to implement the operations of Queue using array.
5. Write a Program to Sort the set of elements by using
   i) Quick Sort. ii) Merge Sort. iii) Insertion sort iv) Selection sort
6. Write a Program to Implement the Binary Search Tree Operations.
7. a) Write a Program to Perform the Tree Traversal Techniques by using Iterative Method.
   b) Write a Program to Perform the Tree Traversal Techniques by using recursion.
8. Write a program to implement the following graph traversal algorithms:
   a) Depth First Search b) Breadth First Search.
9. Write a program for implementing Shortest Path Algorithm.
10. Write a Program to Implement the Minimum spanning tree.

Course Outcomes:

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

1. Implement linked list and its operation.
2. Implement stack and queue with array.
3. Implement sorting techniques using arrays.
4. Perform different operation on binary and AVL trees.
5. Implement graph traversal techniques.

Text Books:

1. Data Structures and Algorithms Made Easy, Narasimha Karumanchi, CareerMonk Publications; 5th edition.
2. D. Samanta, “Classic Data Structures”, Second Edition, Prentice-Hall of India, Pvt. Ltd., India 2012.

Reference Books:

1. Robert Kruse, C.L. Tondo and Bruce Leung, “Data Structures and Program Design in C”, Prentice-Hall of India, Pvt. Ltd., Second edition, 2007.
2. Mark Allen Weiss”, Data Structures and Algorithm Analysis in C”, Pearson Education, Second edition, 2006.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech. II Year I Semester

20CST203 DATABASE SYSTEMS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite -NIL-

Course Description:

This course is designed to provide basic understanding on database systems and its design. The course material further used for developing any web-based applications in which database is back end. Course covers from all basic and advanced queries of SQL, PL/SQL programs and real time implementation.

Course Objectives:

1. To understand the components of DBMS and to study the database design.
2. To study the retrieval of data using relational algebra and calculus and the concept of normal forms in the design of database.
3. To comprehend the structure of SQL Queries to query, update, and manage a database.
4. To understand all constraints to develop a business application using cursors, triggers and stored procedures.
5. To provide sufficient skill to utilize the DBMS concept in real time applications.

List of Programs:

1. Design Conceptual database schema using ER Modelling Software Tools.
2. Development of Relational Database Schemas for Deposit/Customer/ borrow/ branch using DDL Constructs of SQL.
3. To Perform various data manipulation commands such as select, insert , update etc. of SQL on Relational Database.
4. To Perform various DCL and TCL construct of SQL on Relational Database.
5. Implement different types of referential and integrity constraints on Relation Database.
6. To apply the concept of Aggregating Data using Group functions.
7. To retrieve the queries using Group by, Having and Order by clauses of SQL.
8. Design and development of Banking database and perform various type of JOIN operations.
9. a) Create a cursor to update the salary of employees in EMP table.
   b) Write a PL/SQL program to raise an Exception when the bonus exceeds salary.
10. Design and implementation real time project with database connection.

Course Outcomes:

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

1. Perform table creation, maintain, and manipulate a relational database using SQL.
2. Implement complex queries using SQL.
3. Apply Queries using Advanced Concepts of SQL.
4. Build PL/SQL programs including stored procedures, functions, cursors and triggers.
5. 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 and End Semester Examination

Mandatory Course
B. Tech. II Year I 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.

B. Tech II Year II Semester

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:

Upon successful completion 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

20CST104 COMPUTER ARCHITECTURE

L	T	P	C
3	0	0	3

Pre-requisite: 20CST101

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

Course Objectives:

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

UNIT I OVERVIEW & INSTRUCTIONS 9 hours

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

UNIT II ARITHMETIC OPERATIONS 9 hours

Signed/Unsigned integer representation- ALU - Addition and subtraction – Multiplication – Sequential multiplication- Booths Algorithm- Modified Booths Algorithm- Division- restoring and non-restoring division – Floating point representation- floating point arithmetic – floating point addition/subtraction- floating point multiplication/division.

UNIT III PROCESSOR AND CONTROL UNIT 9 hours

Basic MIPS implementation – Building datapath – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards: Dynamic Branch Prediction – Exceptions.

UNIT IV PARALLELISM **9 hours**

Instruction-level-parallelism: Static and dynamic multiple issue processors – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors.

UNIT V MEMORY AND I/O SYSTEMS **9 hours**

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

Course Outcomes:

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

1. Understanding of the fundamental of computing systems.
2. Analyse the basic arithmetic and logical operations.
3. Analyse pipelining and hazards.
4. Understand parallel processing architectures.
5. Evaluate performance of memory and I/O systems.

Text Books:

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

Reference Books:

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

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

B. Tech. II Year II Semester

20CST105 NETWORK AND COMMUNICATION

L	T	P	C
3	0	0	3

Pre-requisite: NIL

Course Description:

The course introduces the concepts of Network Communication and the relevant protocols which are related to Communication.The course will well prepare the students to verify and validate the Network Communication and make the student familiar with the different layers of networks. Students will be also made well knowledge in internetworking and routing protocols.

Course Objectives:

1. Understand the division of network functionalities into layers
2. Be familiar with the components required to build different types of networks
3. Be exposed to the required functionality at each layer
4. Learn the flow control and congestion control algorithms
5. An exposure towards total interaction between different network layers.

UNIT I FUNDAMENTALS & LINK LAYER 9 hours

Overview of Data Communications- Networks –Data and Signals-Multiplexing-Transmission Medium- Building Network and its types– Overview of Internet – Protocol Layering – OSI Model – Physical Layer – Overview of Data and Signals – introduction to Data Link Layer – Link layer Addressing- Error Detection and Correction

UNIT II MEDIA ACCESS & INTERNETWORKING 9 hours

Overview of Data link Control and Media access control – Ethernet (802.3) – Wireless LANs – Available Protocols – Bluetooth – Bluetooth Low Energy – WiFi – 6LowPAN–Zigbee – Network layer services – Packet Switching – IPV4 Address – Network layer protocols (IP, ICMP, Mobile IP)

UNIT III ROUTING 9 hours

Routing – Unicast Routing – Algorithms – Protocols – Multicast Routing and its basics – Overview of Intradomain and interdomain protocols – Overview of IPv6 Addressing – Transition from IPv4 to IPv6

UNIT IV TRANSPORT LAYER 9 hours

Introduction to Transport layer –Protocols-Socket Programming- User Datagram Protocols (UDP) and Transmission Control Protocols (TCP) –Services – Features – TCP Connection – State Transition

Diagram – Flow, Error and Congestion Control – Congestion avoidance (DECbit, RED) – QoS – Application requirements.

UNIT V APPLICATION LAYER 9 hours

Application Layer Paradigms – Client Server Programming – World Wide Web and HTTP – DNS- - Electronic Mail (SMTP, POP3, IMAP, MIME) – Introduction to Peer-to-Peer Networks – Need for Cryptography and Network Security – Firewalls

Course Outcomes:

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

1. Understand the networking architecture and Link layers.
2. Articulate the functionality at data link layer with its application.
3. Analyse the basic routing protocol.
4. Illustrate the TCP/UDP protocols for reliable transport layer communication.
5. Prioritize the protocols and security policies of application layer.

Text Books:

1. Behrouz A. Forouzan, ―Data communication and Networking‖, Fifth Edition, Tata McGraw – Hill, 2013

Reference Books:

1. James F. Kurose, Keith W. Ross, ―Computer Networking - A Top-Down Approach Featuring the Internet‖, Seventh Edition, Pearson Education, 2016.
2. Nader. F. Mir,―Computer and Communication Networks‖, Pearson Prentice Hall Publishers, 2nd Edition, 2014.
3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, ―Computer Networks: An Open Source Approach‖, Mc Graw Hill Publisher, 2011.
4. Larry L. Peterson, Bruce S. Davie, ―Computer Networks: A Systems Approach‖, Fifth Edition, Morgan Kaufmann Publishers, 2011.

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

B. Tech. II Year II Semester

20CST106 OBJECT ORIENTED PROGRAMMING USING JAVA

L	T	P	C
3	0	0	3

Pre-requisite 20CSE102

Course Description:

This course explains the fundamental ideas behind the object-oriented approach to programming. Knowledge of java helps to create the latest innovations in programming. Like the successful computer languages that came before, java is the blend of the best elements of its rich heritage combined with the innovative concepts required by its unique environment. This course involves OOP concepts, java basics, inheritance, polymorphism, interfaces, inner classes, packages, Exception handling, multithreading, collection framework and files.

Course Objectives:

1. To teach principles of object-oriented programming paradigm including abstraction, encapsulation, inheritance and polymorphism.
2. To impart fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
3. To inculcate concepts of inheritance to create new classes from existing one & Design the classes needed given a problem specification;
4. To familiarize the concepts of packages and interfaces.
5. To facilitate students in handling exceptions.

UNIT I INTRODUCTION TO JAVA WITH CLASS AND OBJECTS 9 hours

JAVA BASICS: Review of Object oriented concepts, Data types, Variables, Scope and life time of variables, arrays, operators, control statements, type conversion and casting, simple java program, constructors, methods, Static block, Static Data, Static Method String and String Buffer Classes, Using Java API Document.

UNIT II INHERITANCE AND POLYMORPHISM & PACKAGES AND INTERFACES 9 hours

INHERITANCE AND POLYMORPHISM: Basic concepts, Types of inheritance, Member access rules, Usage of this and Super key word, Method Overloading, Method overriding, Abstract classes, Dynamic method dispatch, Usage of final keyword.

PACKAGES AND INTERFACES: Defining package, Access protection, importing packages, Defining and Implementing interfaces, and Extending interfaces.

UNIT III EXCEPTION HANDLING AND MULTI THREADING 9 hours

EXCEPTION HANDLING: Exception types, Usage of Try, Catch, Throw, Throws and Finally keywords, Built-in Exceptions, Creating own Exception classes.

MULTI THREADING: Concepts of Thread, Thread life cycle, creating threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter Thread communication.

UNIT IV I / O STREAMS AND EVENT HANDLING 9 hours

I / O STREAMS: Concepts of streams, Stream classes- Byte and Character stream, reading console Input and Writing Console output, File Handling.

EVENT HANDLING: Events, Event sources, Event Listeners, Event Delegation Model (EDM), Handling Mouse and Keyboard Events, Adapter classes, Inner classes.

UNIT V AWT CONTROLS 9 hours

The AWT class hierarchy, user interface components- Labels, Button, Text Components, Check Box, Check Box Group, Choice, List Box, Panels – Scroll Pane, Menu, Scroll Bar. Working with Frame. class, Colour, Fonts and layout managers.

Course Outcomes:

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

1. Understand the Object-Oriented Programming paradigm using JAVA concepts.
2. Analyse inheritance, polymorphism, packages, and interfaces of OOPs concepts.
3. Apply exception handling and multithreading mechanisms for software application.
4. Infer file handling and event handling system.
5. Develop GUI based application using AWT controls.

Text Books:

1. Herbert schildt (2010), The complete reference, 7th edition, Tata Mc graw Hill, New Delhi

Reference Books:

1. Head First Java, O’rielly publications
2. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition, Pearson Education, India.
3 J. Nino, F. A. Hosch (2002), An Introduction to programming and OO design using Java, John Wiley & sons, New Jersey.

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

B. Tech. II Year II Semester

20CST107 OPERATING SYSTEMS

L T P C
3 0 0 3

Pre-requisite

Course Description:
Student will understand Modern Operating System and their principles. The course will cover theory as well as practice aspects of a subject through scheduled lectures and labs, course will cover details of processes, CPU scheduling, memory management, file system, storage subsystem, and input/output management.

Course Objectives:
1. To understand the basic concepts and functions of operating systems.
2. To understand Processes and Threads
3. To analyze Scheduling algorithms.
4. To understand the concept of Deadlocks.
5. To analyze various memory management schemes.
6. To understand I/O management and File systems.

UNIT I OPERATING SYSTEMS OVERVIEW 9 hours

Operating system overview: Objectives – functions - Computer System Organization-Operating System Structure - Operating System Operations- System Calls, System Programs.

UNIT II PROCESS MANAGEMENT 9 hours
Processes: Process Concept - Process Scheduling - Operations on Processes – Inter process Communication. Process Synchronization: The Critical-Section Problem - Semaphores - Classic Problems of Synchronization – Monitors. Case Study: Windows 10 operating system

UNIT III SCHEDULING AND DEADLOCK MANAGEMENT 9 hours
CPU Scheduling: Scheduling Criteria - Scheduling Algorithms. Deadlocks: Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock. Case Study: MAC operating system

UNIT IV STORAGE MANAGEMENT 9 hours
Main Memory: Swapping - Contiguous Memory Allocation, Segmentation, Paging. Virtual Memory: Demand Paging - Page Replacement - Allocation of Frames - Thrashing. Case Study: Android operating system

UNIT V MASS STORAGE MANAGEMENT 9 hours

Mass Storage Structure: Disk Structure - Disk Scheduling - Disk Management. File-System Interface: File Concepts, Directory Structure - File Sharing – Protection. File System. Case Study: Linux operating system

Course Outcomes:

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

1. Understand the structure and functionality of OS.
2. Apply the process management concept for operating systems.
3. Illustrate CPU scheduling algorithms and handle the deadlocks.
4. Analyse the concepts of memory management techniques.
5. Demonstrate the concept of mass storage management.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2020.
2. Richard Petersen, "Linux: The Complete Reference", 6th Edition, Tata McGraw-Hill, 2008

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.

B. Tech. II Year II Semester

20CST204 NETWORK AND COMMUNICATION LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite **NIL**

Course Description:
This course helps the students to understand comprising simulation of various protocols and performance; TCP/IP Level Programming, Routing Algorithms and internetworking. Communication between Computer networks will be highlighted and the performance will also be calculated in the Networking layers.

Course Objectives:

1. To provide the students the ideas of Cabling, outlet installation, addressing, LAN setup, and configuring a router.
2. To provide students with a theoretical and practical base in computer networks protocols
3. Student will be able purse his study in advanced networking courses
4. Prepare students for easy transfer from academia into practical life
5. To provide the students the awareness of simulation tools

List of Programs

1. Practice LAN setup and Router configuration
2. Create a socket for HTTP for webpage upload and download
3. Write a program for client Server chat application
4. Perform Protocol analysis, Packet Capture & Traffic Analysis with Wireshark
5. Implementation of Link State Routing Algorithm
6. Write a socket program for echo/ping/talk commands
7. Implementation of Distance Vector Routing Algorithm
8. Write a program to generate CRC code for checking error
9. Write a program to transfer data between two nodes using NS
10. Write a program to simulate data transfer and packet loss using NS
11. Study on Network simulator and Simulation of Congestion Control Algorithm using Network Simulator.

Course Outcomes:

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

1. Recognize Cabling, outlet installation, addressing, LAN setup, and configuring a router.
2. Implement congestion control protocols.
3. Implement client-server model using socket programming.
4. Implement error detection and correction techniques.
5. Simulate the various network and transport layer protocols.

Text Books:

1. Behrouz A. Forouzan, ―Data communication and Networking‖, Fifth Edition, Tata McGraw – Hill, 2013.

Reference Books:

1. Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education,5thedition, 2012.
2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson,5th edition, 2010.
3. "Understanding Communications and Networks", Third Edition, W.A.Shay, Cengage Learning.
4. "Computer Networking: A Top-Down Approach Featuring the Internet", James F.Kurose, K.W.Ross, Third Edition, Pearson Education.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech. II Year II Semester

20CST205 OBJECT ORIENTED PROGRAMMING USING JAVA LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CSE201, 20CST202

Course Description:
This course explains the fundamental ideas behind the object-oriented approach to programming. Knowledge of java helps to create the latest innovations in programming. Like the successful computer languages that came before, java is the blend of the best elements of its rich heritage combined with the innovative concepts required by its unique environment. This course involves OOP concepts, java basics, inheritance, polymorphism, interfaces, inner classes, packages, Exception handling, multithreading, collection framework and files.

Course Objectives:

1. To teach principles of object-oriented programming paradigm including abstraction, encapsulation, inheritance and polymorphism.
2. To impart fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
3. To inculcate concepts of inheritance to create new classes from existing one & Design the classes needed given a problem specification;
4. To familiarize the concepts of packages and interfaces.
5. To facilitate students in handling exceptions.

LIST OF EXPERIMENTS **45 hours**

1. (i).To Write a program to read a matrix of size m x n form the keyboard and display the same using function.

   (ii).To Write a function power () which raise a number m to a power n. The function takes double value of m and integer value of n and returns the result. Use a default value of n is to make the function to calculate squares when this argument is omitted.

2. (i).To write a Program to show that the effect of default arguments can be alternatively achieved by overloading.

   (ii).To write a class ACCOUNT that represents your bank account and then use it. The class should allow you to deposit money, withdraw money, calculate interest, and send you a message if you have insufficient balance

3. To write a program to create an abstract class named Shape that contains an empty method named number of Sides ( ). Provide three classes named Trapezoid, Triangle and Hexagon such that each one of the classes inherits the class Shape. Each one of the classes contains only the method number Of Sides ( ) that shows the number of sides in the given geometrical figures.

4. To write a program to demonstrate the concept of Default Constructor, Parameterized Constructor , Copy Constructor and Constructor overloading Concept.

5. (i).To write a program to implement the Multiple Inheritance
   (ii).To develop a java Program application to generate pay slip for different category of employees using the concept of Multilevel inheritance.
   (iii).To develop a java Program demonstrates hybrid inheritance using a combination of single inheritance and multiple inheritances using Interfaces.

6. To write a Program to show the concept of run time polymorphism using virtual function.

7. To write a Program to create a package that access the member of external class as well as same package.

8. (i).To write a Program to handle the Exception using try and multiple catch block.
   (ii).To write a Program to Implement the Nested try Statements.
   (iii).To write a Java Program to Implement Throw and Throws.
   (iv).To write a Java Program to Implement Custom Exception

9. (i).Creating a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number

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

10. (i).Creating a Java program for writing to a file and Reading from a text file using FileInputStram and FileOutputStram.

    (ii).Creating a Java program for Reading from a text file using FileReader and BufferedReader class.

    (iii).Creating a Java program writing to a file using FileWriter and BufferedWriter class.

11. (i).Creating a Java program to handle the Mouse Event Using Event Handling Concept.

    (ii).Creating a Java program to handle the key Event using Event Handling Concept.

12. (i).Creating a Java program to demonstrate the login window using Button in AWT control.

    (ii).Creating a Java program to demonstrate the Choice Box using AWT control.

Course Outcomes:

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

1. Examine the necessity of object-oriented programming paradigm using JAVA.
2. Implement the concept of class, inheritance and polymorphism using JAVA program.
3. Develop simple JAVA programs using packages and exception handling.
4. Implement JAVA programs using multithreading and File I/O.
5. Develop GUI applications using AWT control.

Text Books:

1. Herbert schildt (2010), The complete reference, 7th edition, Tata Mc graw Hill, New Delhi

Reference Books:

1. Head First Java, O'rielly publications
2. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition, Pearson Education, India.
3 J. Nino, F. A. Hosch (2002), An Introduction to programming and OO design using Java, John Wiley & sons, New Jersey.
4 Y. Daniel Liang (2010), Introduction to Java programming, 7th edition, Pearson education, India

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech. II Year II Semester

20CST206 OPERATING SYSTEMS LABAROTARY

L	T	P	C
0	0	3	1.5

Pre-requisite: 20CSE201, 20CST202

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

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

LIST OF EXPERIMENTS

1. To Study basic concepts in OS with the help of Linux commands.
2. a) Write a shell script that accepts two integers as its arguments and computers the value of first number raised to the power of the second number.
   b) Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.
3. a) Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
   b) Write a shell script that computes the gross salary of a employee according to the following rules:
   i) If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic.
   ii)If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic
4. Simulate the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority
5. Program on process creation and Execution
   a) To display Environment variables.
   b) To implement Different types of exec functions.
6. a) Write a program to create a chain of Processes.
   b) Demonstration of Zombie and Orphan process.
7. Write a program for Producer Consumer Problem.
8. Write a program to create pipes.

9. Write a Program to implement banker’s algorithm for deadlock avoidance.
10. Simulate MVT and MFT.
11. Simulate page replacement algorithms.
12. Simulate all file allocation strategies
    a) Sequential b) Indexed c) Linked

Course Outcomes:

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

1. Understand basic commands in Linux shell environment.
2. Develop shell script for simple logical problems.
3. Implement CPU Scheduling algorithms.
4. Demonstrate solutions for inter process communication.
5. Implement page replacement and file allocation algorithms.

Text Books:

1. Operating System Concepts Essentials, 9th Edition by Abraham Silberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Richard Petersen, “Linux: The Complete Reference”, 6th Edition, Tata McGraw-Hill, 2008

Reference Books:

1. Operating Systems - Internals and Design Principles. Stallings, 6th Edition2009. Pearson education.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Mandatory Course
B. Tech. II Year II 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.

III Year I Semester

B. Tech III Year I Semester

20CST108 AUTOMATA THEORY AND COMPILER DESIGN

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course deals with the set of abstract machines that serve as models for computation - Finite automata, Pushdown automata, and Turing machines - and examines the relationship between these automata and formal languages. It also introduces the system software like compiler, assembler, and interpreter. It provides the complete description of inner working of the Compiler phases.

Course Objectives:

1. To give an overview of the theoretical foundations of computer science from the perspective of formal languages
2. To illustrate finite state machines to solve problems in computing
3. To familiarize Regular grammars, context frees grammar.
4. To learn the process of translating a modern high-level language to executable code.
5. To apply the optimization techniques to have a better code for code generation

UNIT I AUTOMATA FUNDAMENTALS AND REGULAR EXPRESSIONS 9 hours

Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with Epsilon Transitions – Regular Expressions - Conversion of Regular Expression into DFA using Subset construction method - Minimization of DFA - Proving Languages not to be Regular.

UNIT II CONTEXT FREE GRAMMAR AND LANGUAGES 9 hours

CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of Pushdown Automata – Pumping Lemma for CFL - Introduction to Turing Machines.

UNIT III INTRODUCTION TO COMPILER AND LEXICAL ANALYSIS 9 hours

Compiler – Interpreter – Assembler – Language Processor - Phases of a compiler – Lexical Analysis – Role of Lexical Analyzer – Specification of Tokens – Recognition of Tokens – Lex.

UNIT IV SYNTAX ANALYSIS 9 hours

Role of Parser - Top Down Parsing - General Strategies Recursive Descent Parser - Predictive Parser - LL(1) - Parser-Shift Reduce Parser - LR Parser - SLR - YAAC.

UNIT V INTERMEDIATE CODE, CODE GENERATION AND CODE OPTIMIZATION 9 hours

Issues in Code Generation - Design of a simple Code Generator - Principal Sources of Optimization – Peep-hole optimization – DAG - Optimization of Basic Blocks.

Course Outcomes:

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

1. Understand the finite state machines for a language.
2. Construct PDA and Turing machines for a set of languages.
3. Understand the role of lexical analyzer in a compiler.
4. Apply parsers strategies to construct YAAC tool.
5. Implement code generation and optimization techniques to generate machine code.

Text Book(s)

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Third Edition, Pearson Education, 2006.
2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers: Principles, Techniques and Tools", Second Edition, Pearson Education, 2014.

Reference Books

1. J.Martin, "Introduction to Languages and the Theory of Computation", Third Edition, TMH, 2003.
2. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.

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

B. Tech III Year I Semester

20CST109 AI TOOLS, TECHNIQUES AND APPLICATIONS

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

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

Course Objectives:
The objectives of this course are

1. Expose fundamental concepts in AI
2. Demonstrate the capability to create simple AI applications using Natural Language Processing, Speech recognition, Computer Vision, Pattern recognition..
3. Present various modelling and formulation techniques to solve problems using AI techniques.
4. Introduce state-of-art AI tools and techniques to solve various problems faced by Engineers in design and analysis.
5. To develop intelligent systems by assembling solutions to concrete computational problems

UNIT I FUNDAMENTALS OF AI 9 hours

What is AI? Historical background, Turing test, Definition of AI, Applications of AI, Knowledge representation and reasoning, Hypothesis testing, Null and alternate hypothesis, Analysis Of Variance (ANOVA), Linear Regression –univariate and multivariate, Ridge regression, Machine Learning – What is Machine Learning? Supervised and Unsupervised Learning.

UNIT II UNSUPERVISED LEARNING 9 hours

Unsupervised Learning – K-means clustering, Competitive Learning, Self-Organizing Map (SOM), Outlier and Anomaly Detection, Semi-supervised Learning - Reinforcement Learning.

UNIT III SUPERVISED LEARNING 9 hours

Supervised Learning – Single Layer Perceptron (SLP), Nearest Neighbor Classifier, k-Nearest Neighbor Classifier, Parzen window, Kernel method, Evaluation of Classifier Performance – Confusion matrix, FP, FN, F-score, ROC, Log loss, Cross entropy, Multi-Layer Perceptron (MLP) and Back-Propagation Training, Decision Tree, Random forest, Support Vector Machine (SVM), Logistic Regression.

UNIT IV NATURAL LANGUAGE PROCESSING 9 hours

Stemming and Lemmatization, Term Frequency (TF), Inverse Document Frequency (IDF), Document classification, UV Factorization, Latent Semantic Analysis/Indexing, Topic modelling concepts and tools Introduction to Speech Recognition, Hidden Markov.

UNIT V IMAGE PROCESSING 9 hours

Image processing - Noise Removal, Image Enhancement, Segmentation Object Classification and detection – Filters and Transforms for feature extraction, Boltzmann machine and Convolution Neural Network (CNN), Introduction to Deep Neural Network (DNN) and its use for object detection.

Course Outcomes:

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

1. Understand Artificial Intelligence (AI) methods and their foundations.
2. Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation and learning.
3. Analyse and illustrate how search algorithms play vital role in problem solving.
4. Illustrate the construction of learning and expert system.
5. Discuss current scope and limitations of AI and societal implications.

Text Book(s)

1. Tom Markiewicz & Josh Zheng,Getting started with Artificial Intelligence, Published by O’Reilly Media,2017
2. Russell, S. and Norvig, P. 2015. Artificial Intelligence - A Modern Approach, 3rd edition, Prentice Hall.
3. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer 2010.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2016.

Reference Books

1. Aurélien Géron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O’Reilly Media, 2017
2. Luger, G.F. 2008. Artificial Intelligence -Structures and Strategies for Complex Problem Solving, 6th edition, Pearson.
3. Munesh Chandra Trivedi, A classical approach to Artificial Intelligence, Khanna Publications.
4. Chandra S.S. & H.S. Anand, Artificial Intelligence and Machine Learning, PHI Publications

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

B. Tech III Year I Semester

20CST110 SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

The basic objective of Software Engineering is to develop methods and procedures for software development that can scale up for large systems to consistently produce high-quality software at low cost and with a small cycle time. Software Engineering is the systematic approach to the development, operation, maintenance, and retirement of software. This course provides a thorough introduction to the fundamental's principles of software engineering. The organization broadly be based on the classical analysis-design-implementation framework.

Course Objectives:

1. To make students to learn different Life Cycle models.
2. To make students to learn different phases in Software Engineering.
3. To make students to learn testing strategies.

UNIT I INTRODUCTION 9 hours

Software engineering, Dual role of software, Software Crisis history, Various Myths Associated with Software, Different Software Process Models, The Linear Sequential Model, The Prototyping Model, The RAD Model, Evolutionary Process Models, Component-Based Development, Process, Product and Process. Overview of Quality Standards like ISO 9001, SEI-CMM

UNIT II SOFTWARE DESIGN 9 hours

Software Requirement Analysis, Design and Coding Problem Analysis, Software Requirement and Specifications, Behavioural and non-behavioural requirements, Software Prototyping, Cohesion & Coupling, Classification of Cohesiveness & Coupling, Function Oriented Design, Object Oriented Design, User Interface Design, Top-down and Bottom-up Structured Programming, Information hiding.

UNIT III SOFTWARE TESTING 9 hours

Software Reliability, Testing and Maintenance, Failure and Faults, Reliability Models: Basic Model, Logarithmic Poisson Model, Software process, Functional testing: Boundary value analysis, Equivalence class testing, and Structural testing: path testing, Data flow and mutation testing, Unit testing, Integration and System testing, Debugging, Testing Tools & Standards. Management of maintenance, Maintenance Process, Maintenance Models, Reverse Engineering, Software RE-engineering.

UNIT IV SOFTWARE METRICS 9 hours

Software Metrics and Project Planning Size Metrics like LOC, Token Count, Function Count, Design Metrics, Data Structure Metrics and Information Flow Metrics. Cost estimation, Static, Single and Multivariate models, COCOMO model, Putnam Resource Allocation Model, Risk Management.

UNIT V EMERGING TRENDS IN SOFTWARE ENGINEERING 9 hours

Technology Evolution, Prospects for a True Engineering Discipline, Observing Software Engineering Trends, Identifying "Soft Trends", Technology Directions, Tools-Related Trends.

Course Outcomes:

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

1. Understand various software engineering principles and their application.
2. Demonstrate the software through function oriented and object-oriented design.
3. Apply testing and maintenance strategies for software.
4. Apply software metrics and risk management policies for effective project planning.
5. Adept at analyzing technology evolution, evaluating, identifying and assessing trends in software engineering.

Text Book(s)

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Editions, 8th Edition 2019.
2. Ian Sommerville, Software engineering, Pearson education Asia, 9th Edition, 2011.

Reference Books

1. Pankaj Jalote, Software Engineering– A Precise Approach, Wiley India 2010.
2. Software Engineering Fundamentals by Ali Behhforoz & Frederick Hudson, OXFORD.

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

B. Tech III Year I Semester

20CST207 AI TOOLS, TECHNIQUES AND APPLICATIONS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite -NIL-

Course Description:
Performing data labelling, building custom models, object recognition, speech recognition, building chatbot, configuring neural network, building virtual assistant, and building convolutional neural network.

Course Objectives:
The objectives of this course are to
1. To understand the importance of artificial intelligence in computing.
2. To experiment with a machine learning model for simulation and analysis.
3. To select and apply appropriate algorithms and AI techniques to solve complex problems.
4. To design and develop an expert system by using appropriate tools and techniques.
5. To formulate real-world problems as state-space problems, optimization problems or constraint satisfaction problems.

List of Programs:

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

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Label the data based on object recognition.
2. Develop virtual assistant using speech recognition.
3. Develop Chatbots based on the user requirements.
4. Design and configure Neural Networks for various real-world applications.
5. Develop a convolution neural network model for image classification.

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. Aurélien Géron, Hands on Machine Learning with Scikit-Learn and Tensor Flow [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: Continuous Internal Evaluation and End Semester Examination

B. Tech III Year I Semester

20CST208 SOFTWARE ENGINEERING LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite -NIL-

Course Description:

This course presents software engineering techniques and explains the software development life cycle. The main goal of this course is to build their ability to do useful applications that could be released for real-world use.

Course Objectives:

1. To make students learn different Life Cycle models.
2. To make students learn different phases in Software Engineering.
3. To make students learn testing strategies.

List of Programs:

ATM Transaction, Online Ticket Reservation and Student Course Registration.
For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java. (Model to code conversion)
10. Perform reverse engineering in java. (Code to Model conversion)
11. Draw the deployment diagram.

Course Outcomes:

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

1. Identify software requirements specification for the project.
2. Sketch use case and class diagram by associating with different types of relationship.
3. Draw a sequence and collaboration diagram with their relationship.
4. Outline a state chart and component diagram with their relationship.
5. Implement forward and reverse engineering using Java.

Text Book(s)

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Editions, 8th Edition, 2019.

2. Ian Sommerville, Software engineering, Pearson education Asia, 9th Edition, 2011.

Reference Books

1. Pankaj Jalote, Software Engineering– A Precise Approach, Wiley India 2010.

2. Software Engineering Fundamentals by Ali Behhforoz & Frederick Hudson, OXFORD.

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.

III Year II Semester

B. Tech III Year II Semester

20CST111 CRYPTOGRAPHY AND NETWORK SECURITY

L	T	P	C
3	0	0	3

Pre-requisite **20CST105**

Course Description:

This course provides a way to understand the various security techniques in the areas of cryptography and cryptanalysis. It also develops a basic understanding of the algorithms used to protect users online and some of the design choices behind these algorithms.

Course Objectives:

The purpose of learning this course is to:

1. Understand the classical encryption techniques.
2. Apply the traditional models to identify the vulnerabilities in a network.
3. Utilize the traditional cryptography algorithms, their strength and weakness.
4. Understand the models to countermeasure any kind of active or passive attack.
5. Utilize algorithms to check data integrity which supports authentication.

UNIT I CONVENTIONAL AND MODERN ENCRYPTION 10 hours

Model of network security – Security attacks, services and attacks – OSI security architecture – Classical encryption techniques – SDES – Block cipher Principles- DES – Strength of DES - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – RC4 - Differential and linear cryptanalysis – Placement of encryption function – traffic confidentiality

UNIT II PUBLIC KEY ENCRYPTION 9 hours

Number Theory – Prime number – Modular arithmetic – Euclid's algorithm - Fermet's and Euler's theorem – Primality – Chinese remainder theorem – Discrete logarithm – Public key cryptography and RSA – Key distribution – Key management – Diffie Hellman key exchange – Elliptic curve cryptography

UNIT III AUTHENTICATION 9 hours

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS

UNIT IV SECURITY PRACTICE 9 hours

Authentication applications – Kerberos – X.509 Authentication services - E-mail security – IP security - Web security

UNIT V SYSTEM SECURITY 8 hours

Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security

Course Outcomes:

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

1. Understand cryptography and network security concepts and application.
2. Apply the key encryption mechanisms for secure communication.
3. Apply authentication systems principles for system design.
4. Understand secure web authentication in application.
5. Apply advanced security measures in designing effective intrusion detection systems.

Text Books:

1. William Stallings, Cryptography and Network Security: Principles and Practice, 7th Edition, 2017.

2. Chris Chapman, Network Performance and Security, 1st Edition, 2016.

Reference Books:

1. Michael Gregg, The Network Security Test Lab, John Wiley & Sons, Inc, 2015.

2. Shancang Li Li Da Xu, Securing the Internet of Things, Elsevier, 1st Edition, 2017.

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

B. Tech III Year II Semester

20CST112 CLOUD COMPUTING

L	T	P	C
3	0	0	3

Pre-requisite 20CST105, 20CST107

Course Description:

This course will cover a top-down view of cloud computing, from applications and administration to programming and infrastructure. The aim is to provide skills and knowledge about operations and management in cloud technologies and design cloud infrastructure to meet the business needs.

Course Objectives:

1. To learn the design and development process involved in creating a cloud-based application.
2. To implement and use parallel programming using various tools.
3. To learn Various service models such as IaaS and PaaS and deployment models such as private, public, hybrid, and community.
4. To provide skills to design suitable cloud infrastructure that meets the business services and customer needs.
5. To identify various security and privacy issues in cloud.

UNIT I INTRODUCTION TO CLOUD COMPUTING 9 hours

Inception and need for cloud computing: Motivations from distributed computing predecessors - Evolution - Characteristics - Business Benefits – Challenges in cloud computing - Exploring the Cloud Computing Stack - Fundamental Cloud Architectures – Advanced Cloud Architectures - Specialized Cloud Architectures

UNIT II SERVICE DELIVERY AND DEPLOYMENT MODELS 9 hours

Service Models (XaaS): Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) – Software as a Service(SaaS) - Deployment Models: Types of cloud - Public cloud - Private cloud – Hybrid cloud – Service level agreements - Types of SLA – Lifecycle of SLA- SLA Management.

UNIT III VIRTUALIZATION 9 hours

Virtualization as Foundation of Cloud – Understanding Hypervisors – Understanding Machine Image and Instances - Managing Instances – Virtual Machine Provisioning and Service Migrations

UNIT IV CLOUD COMPUTING: APPLICATIONS AND PARADIGMS 9 hours

Existing Cloud Applications and Opportunities for New Applications - Architectural Styles for Cloud Applications - Workflows: Coordination of Multiple Activities - Coordination Based on a State Machine Model: The ZooKeeper - The Map Reduce Programming Model - A Case Study: The GrepTheWeb Application

UNIT V CLOUD PLATFORMS AND SECURITY 9 hours

Comparing Amazon web services, Google AppEngine, Microsoft Azure from the perspective of architecture (Compute, Storage Communication) services and cost models. Cloud application development using third party APIs, Working with EC2, Security Clouds

Course Outcomes:

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

1. Understand the fundamentals and architecture of Cloud Computing.
2. Identify suitable service delivery and deployment models for cloud computing.
3. Understand virtualization principle on cloud computing.
4. Infer architectural style, workflow of real-world applications.
5. Analyze cloud service providers architecture, cost models, and security features.

Text Books:

1. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 1st Edition, 2013.
2. Dongarra, Jack, Fox, Geoffrey, Hwang, Kai,"Distributed and Cloud Computing",.1st Edition, Morgan Kaufmann, 2013.
3. Marinescu, Dan C. Cloud Computing: Theory and Practice. Morgan Kaufmann, 2017.

Reference Books:

1. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering Cloud Computing: Foundations and Applications Programming, Tata Mcgraw Hill, 1st Edition, 2017.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Mc Graw Hill Education, 1st Edition, 2017.

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

B. Tech III Year II Semester

20CST113 INTERNET AND WEB PROGRAMMING

L	T	P	C
3	0	0	3

Pre-requisite 20CSE102, 20CST103

Course Description:

This course aims to comprehend and analyze the basic concepts of web programming and internet protocols. It also aims to describe how the client-server model of Internet programming works. This course aims to demonstrate the uses of scripting languages and their limitations.

Course Objectives:

After successfully completing the course, the student should be able to

1. Differentiate web protocols and web architecture.
2. Make use of JavaScript, HTML and CSS effectively to create interactive and dynamic websites.
3. Implement client-side scripting and server-side script using PHP, JSP and Servlets.
4. Develop XML based web applications.
5. Improve the network and firewall security.

UNIT I INTRODUCTION TO INTERNET & WEB ESSENTIALS 9 hours

Overview of Internet- Networks - Web Protocols — Web Organization and Addressing - Web Browsers and Web Servers -Web System Architecture – URL - Domain Name – HTTP request message-response message.

UNIT II WEB DESIGNING & XML 9 hours

HTML5 – Form elements, Input types and Media elements, CSS3 - Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Multiple Column Layout, User Interface- Anatomy of xml document - XML Markup-working with elements and attributes - creating valid documents-xml objects-XSL, XSLT, XML Schema-JSON, Case Study.

UNIT III CLIENT-SIDE & SERVER-SIDE SCRIPTING 9 hours

JavaScript- Introduction –Functions – Arrays – Operators – DOM, Built-in Objects, Regular Expression, Exceptions, Event handling, Validation- AJAX - JQuery.
Introduction to PHP – Operators – Conditionals – Looping – Functions – Arrays- Date and Time Functions – String functions - File Handling - File Uploading.

UNIT IV SESSION MANAGEMENT and DATABASE CONNECTIVITY 9 hours

Sessions-Cookies-MySQL Basics – Querying single and multiple MySQL Databases with PHP – PHP Data Objects.

UNIT V INTERNET SECURITY 9 hours

Introduction to Internet Security-Understanding Firewalls-Hackers-TCP/IP from a security view point – sockets and services-Encryption. Firewall Technology-packet filtering- Network Address Translation-application-level proxies-VPN- ideal firewall.

Course Outcomes:

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

1. Understand the fundamentals of Internet web protocols.
2. Design interactive web interfaces integrating HTML5, CSS3, XML, and JSON.
3. Apply interactive web content using JavaScript and PHP.
4. Infer dynamic web applications integrating PHP, MySQL.
5. Apply the security fundamental in Internet and Web programming.

Text Books:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, Internet & World Wide Web - How to Program, 5th edition, Pearson Education, 2012.
2. Thomas A.Powell, The Complete Reference Web design, Tata McGraw-Hill, 2000.

Reference Books:

1. Lindsay Bassett, Introduction to JavaScript Object Notation, 1st Edition, O’Reilly Media, 2015
2. Fritz Schneider, Thomas Powell , JavaScript – The Complete Reference, 3rd Edition, Mc-Graw Hill, 2017

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

B. Tech III Year II Semester

20CST209 CRYPTOGRAPHY AND NETWORK SECURITY LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CST204, 20CST205

Course Description:

This course provides a practical way to understand the various security techniques in the areas of cryptography algorithms and identifies various vulnerabilities in a network. It also explores the various cryptography algorithms and provides counter measures for various attacks.

Course Objectives:

The purpose of learning this course is to:

1. To provide deeper understanding into cryptography, its application to network security, Threats/vulnerabilities to networks and countermeasures.
2. To familiarize symmetric and asymmetric cryptography.
3. To implement the algorithms DES, RSA, MD5, SHA-1.
4. To use network security tools and vulnerability assessment tools.
5. To use various penetration tool for real-world application.

List of Programs:

1. Write a Java program to perform encryption and decryption using the following algorithms a. Ceaser cipher b. Substitution cipher c. Hill Cipher
2. Write a C/JAVA program to implement the DES algorithm logic.
3. Write a Java program to implement RSA algorithm.
4. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
5. Apply AES algorithm for practical application.
6. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
7. Calculate the message digest of a text using the MD5 algorithm in JAVA.
8. Implement the SIGNATURE SCHEME - Digital Signature Standard.
9. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.
10. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool

Course Outcomes:

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

1. Develop code for classical encryption and decryption techniques.
2. Build cryptosystems using symmetric and public key encryption algorithms.
3. Construct code for authentication algorithms.
4. Develop a signature scheme using Digital signature standard.
5. Demonstrate the network security system using open-source tools.

Text Books:

1. Michael Gregg, The Network Security Test Lab, John Wiley & Sons, Inc, 2015.

2. Shancang Li Li Da Xu, Securing the Internet of Things, Elsevier, 1st Edition, 2017.

Reference Books:

1. Roberta Bragg, Mark Rhodes-Ousley, Keith Strassberg, Network Security: The Complete Reference, Tata Mc Graw Hill, 2017.
2. Hakima Chaouchi, Maryline Laurent-Maknavicius, Wireless and Mobile Network Security, 2010.

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

B. Tech III Year II Semester

20CST210 CLOUD COMPUTING LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CST204

Course Description:

This course is designed to provide basic understanding on cloud computing and its design principles. It provides knowledge in different Virtualization technologies such as Virtual Box, VMware workstation and to create and deploy a web application in a variety of cloud environments. It also illustrates to mimic a cloud environment to build novel scheduling algorithms for cloud data centre automation.

Course Objectives:

1. To develop web applications in cloud.
2. To learn the design and development process involved in creating a cloud-based application.
3. To provide skills and knowledge about operations and management in cloud technologies so as to implement large scale systems.

List of Programs:

1. Install VirtualBox/VMware Workstation with different flavors of Linux or windows OS on top of windows OS.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Install the Hadoop framework and create an application using Map Reduce Programming Model
5. Experiment cloud scheduling algorithms using any Cloud tools.
6. Experiment cloud load balancing algorithms using Cloud Sim or any tools.
7. Launch EC2 AWS – Instance Creation, Migration.
8. Experiment VPC in EC2 Instances.
9. Create the Load balance in EC2.
10. Design and implementation the Web application and launch in AWS Server.

Course Outcomes:

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

1. Configure virtualization tools such as Virtual Box, VMware workstation.
2. Create and deploy a Virtual Machine in a Cloud environment.
3. Simulate a cloud environment to implement Load Balancer.
4. Configure VPC and load balancer in AWS.
5. Develop a real-world application in AWS.

Text Books:

1. Raj Kumar Buyya, James Broberg, Andrzej, M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 1st Edition, 2013.
2. Marinescu, Dan C. Cloud Computing: Theory and Practice. Morgan Kaufmann, 2017.

Reference Books:

1. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering Cloud Computing: Foundations and Applications Programming, Tata McGraw Hill, 1st Edition, 2017.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Mc Graw Hill Education, 1st Edition, 2017.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech III Year II Semester

20CST211 INTERNET AND WEB PROGRAMMING LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CST203, 20CST205

Course Description:

This course aims to implement the basic concepts of web programming and internet protocols. This lab will help to demonstrate how the client-server model of Internet programming works. This course is designed to demonstrate the uses of scripting languages and their limitations.

Course Objectives:

1. Apply JavaScript, HTML and CSS effectively to create interactive and dynamic websites.
2. Implement client-side scripting and server-side script using PHP, JSP and Servlets.
3. Develop XML based web applications.

List of Programs:

1. Design a web page using different text formatting tags.
2. Design a web page with links to different pages and allow navigation between pages.
3. Develop a JavaScript program to get Register Number as Input and print the student's total mark and grades.
4. Design a web form and validate all the controls placed on the form using Java Script.
5. Write a Java Program for Session tracking using a hit count.
6. Write a java program to invoke servlets from HTML form.
7. Design a DTD, corresponding XML document and display it in browser using CSS.
8. Design XML Schema and corresponding XML document.
9. Design and Connect to a database using XML & display its contents using HTML Page.
10. Write a JavaScript program to create a database named "College". Create a table named "Student" with following fields (sno, sname, percentage). Insert 3 records of your choice. Display the names of the students whose percentage is between 35 to 75 in a tabular format.

Course Outcomes:

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

1. Design web pages using HTML/XML and style sheets.
2. Build dynamic web pages with validation using JavaScript.
3. Implement session tracking using servlets.
4. Apply DTD, XML Schema and connect to database.
5. Design the webpage using PHP.

Text Books:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, Internet & World Wide Web - How to Program, 5th edition, Pearson Education, 2012.
2. Thomas A.Powell, The Complete Reference Web design, Tata McGraw-Hill, 2000.

Reference Books:

1. Lindsay Bassett, Introduction to JavaScript Object Notation, 1st Edition, O'Reilly Media, 2015
2. Fritz Schneider, Thomas Powell , JavaScript – The Complete Reference, 3rd Edition, Mc-Graw Hill, 2017
3. Connolly, Randy. Fundamentals of web development. Pearson Education, 2015.

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

Open Elective – I

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

UNIT I SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS 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, 2nd edition.

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”, 2^{nd} 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

6. Realize the concepts of digital building blocks using MOS transistor.
7. Design combinational MOS circuits and power strategies
8. Design and construct Sequential Circuits and Timing systems.
9. Design arithmetic building blocks and memory subsystems.
10. 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 – IV

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:

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

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

20CST401 INTRODUCTION TO MACHINE LEARNING

L	T	P	C
3	0	0	3

Pre-requisite **20CST109**

Course Description:

The course introduces the concepts of machine learning algorithms with various mathematical model. It also provides better understanding supervised, semi-supervised and unsupervised learning algorithms and support vector machine in machine learning. It also enhances their experience in solving real world problems.

Course Objectives:

1. To understand the need for machine learning for various types of problem solving.
2. To know the mathematics involved in various machine learning algorithms.
3. To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning.
4. To analyze about support vector machine in machine learning.
5. To implement latest developments of machine learning in real-world applications.

UNIT I INTRODUCTION 9 hours

Machine Learning – Types of Machine Learning – Supervised Learning - The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning- Concept Learning task – Concept Learning as Search - Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm.

UNIT II NEURAL NETWORKS & MULTI-LAYER PERCEPTRON 9 hours

Neural Networks – Perceptron – Linear Separability – Linear Regression, The Multi-Layer Perceptron – Back Propagation of Error-Multi-layer Perceptron in Practice – Deriving Back Propagation – Applications of MLP.

UNIT III RBF NETWORKS & DIMENSIONALITY REDUCTION 9 hours

Radial Basis Function Network - Concepts –Training - Interpolation and Basis Functions – Solutions using RBF. Dimensionality Reduction –Linear Discriminant Analysis-Principal Component Analysis-Factor Analysis-Independent Component Analysis-Locally Linear Embedding-Isomap.

UNIT IV SUPPORT VECTOR MACHINE 9 hours

Optimal Separation-Kernels-Choosing kernels-The Support Vector Machine Algorithm-Implementation and Examples-Extensions to the SVM: Multi-Class Classification, SVM regression.

UNIT V EVOLUTIONARY LEARNING 9 hours

Evolutionary Learning-The Genetic Algorithm-Genetic Operators-Using Genetic Algorithms-Genetic Programming – Applications.

Course Outcomes:

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

1. Understand types of machine learning approaches.
2. Apply neural networks and Multi-layer Perceptron in practice.
3. Analyze the Dimensionality Reduction and RBF networks in machine learning.
4. Determine the Support Vector Machine (SVM) with Kernal methods.
5. Examine the Genetic algorithm and its Operators in evolutionary learning.

Text Books:

1. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.

2. Tom M Mitchell, "Machine Learning", McGraw Hill Education, 2013.

Reference Books:

1. Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, Adaptive Computation and Machine Learning Series, MIT Press, 2014.
2. Jason Bell, "Machine learning – Hands on for Developers and Technical Professionals", First Edition, Wiley, 2014.

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

Professional Elective – I

20CST402 GPU ARCHITECTURE AND PROGRAMMING

L	T	P	C
3	0	0	3

Pre-requisite 20CST103

Course Description:

This course explores how the interdisciplinary field brings together techniques from databases, statistics, machine learning, and information retrieval. We will discuss the main data mining methods currently used, including data warehousing and data cleaning, clustering, classification, association rules mining, and web mining.

Course Objectives:

1. To understand the basics of GPU architectures.
2. To write programs for massively parallel processors.
3. To understand the issues in mapping algorithms for GPUs.
4. To introduce different GPU programming models.
5. To apply the GPU Programming for the real-world.

UNIT I GPU ARCHITECTURE 12 hours

Evolution of GPU architectures – Understanding Parallelism with GPU –Typical GPU Architecture – CUDA Hardware Overview – Threads, Blocks, Grids, Warps, Scheduling – Memory Handling with CUDA: Shared Memory, Global Memory, Constant Memory and Texture Memory.

UNIT II CUDA PROGRAMMING 9 hours

Using CUDA – Multi GPU – Multi GPU Solutions – Optimizing CUDA Applications: Problem Decomposition, Memory Considerations, Transfers, Thread Usage, Resource Contentions.

UNIT III PROGRAMMING ISSUES 8 hours

Common Problems: CUDA Error Handling, Parallel Programming Issues, Synchronization, Algorithmic Issues, Finding and Avoiding Errors.

UNIT IV OPENCL BASICS 8 hours

OpenCL Standard – Kernels – Host Device Interaction – Execution Environment – Memory Model – Basic OpenCL Examples.

UNIT V ALGORITHMS ON GPU 8 hours

Parallel Patterns: Convolution, Prefix Sum, Sparse Matrix – Matrix Multiplication – Programming Heterogeneous Cluster.

Course Outcomes:

Upon successful completion of the course, students will be able to
1. Understand the GPU Architecture.
2. Implement the GPU concepts using CUDA.
3. Implement efficient algorithms in GPUs for common application kernels, such as matrix multiplication.
4. Integrate the OpenCL with real-time applications.
5. Design efficient parallel programming patterns to solve problems.

Text Books:

1. Shane Cook, CUDA Programming: ―A Developer's Guide to Parallel Computing with GPUs (Applications of GPU Computing), First Edition, Morgan Kaufmann, 2012.
2. David R. Kaeli, Perhaad Mistry, Dana Schaa, Dong Ping Zhang, ―Heterogeneous computing with OpenCL 2.0, Morgan Kauffman, 2015.

Reference Books

1. David B. Kirk, Wen-mei W. Hwu, Programming Massively Parallel Processors – A Hands-on Approach, Third Edition, Morgan Kaufmann, 2016.
2. Nicholas Wilt, ―CUDA Handbook: A Comprehensive Guide to GPU Programming, Addison – Wesley, 2013.

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

Professional Elective – I

20CST403 PRINCIPLES OF CYBER SECURITY

L	T	P	C
3	0	0	3

Pre-requisite **20CST105**

Course Description:

This course introduces the basic concepts of number theory, cryptographic techniques and also cover about the integrity and authentication process. It focusses to provide knowledge about various cyber threats, attacks, vulnerabilities, defensive mechanisms, security policies and practices.

Course Objectives:

1. To learn the concepts of number theory for encryption techniques.
2. To understand different types of key cryptographic techniques.
3. To study the various integrity and authentication.
4. To familiarize various cyber threats, attacks, vulnerabilities, defensive mechanisms, security Policies and practices.

UNIT I INTRODUCTION TO NUMBER THEORY 9 hours

Finite Fields and Number Theory: Modular arithmetic, Euclidian Algorithm, Primality Testing: Fermat's and Euler's theorem, Chinese Reminder theorem, Discrete Logarithms.

UNIT II CRYPTOGRAPHIC TECHNIQUES 9 hours

Symmetric key cryptographic techniques: Introduction to Stream cipher, Block cipher: DES, AES, IDEA Asymmetric key cryptographic techniques: principles, RSA, Key distribution and Key exchange protocols.

UNIT III INTEGRITY AND AUTHENTICATION 9 hours

Hash functions, Secure Hash Algorithm (SHA)Message Authentication, Message Authentication Code (MAC), Digital Signature Algorithm.

UNIT IV CYBERCRIMES AND CYBER OFFENSES 9 hours

Classification of cybercrimes, planning of attacks, social engineering: Human based, Computer based: Cyberstalking, Cybercafe and Cybercrimes.

UNIT V CYBER THREATS AND CYBERSECURITY POLICIES 9 hours

Phishing, Password cracking, Keyloggers and Spywares, DoS and DDoS attacks, SQL Injection Identity Theft (ID): Types of identity theft, Techniques of ID theft. What security policies are: determining the policy needs, writing security policies.

Course Outcomes:

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

1. Understand the fundamental mathematical concepts related to security.
2. Interpret the cryptographic techniques in real time applications.
3. Comprehend the authenticated process and integrity, and the fundamentals of cybercrimes and cyber offenses.
4. Realize the cyber threats, attacks, vulnerabilities, and its defensive mechanism.
5. Design suitable security policies for the given requirements.

Text Books:

1. Cryptography and Network security, William Stallings, Pearson Education, 7th Edition, 2016.
2. Cyber Security, Understanding cybercrimes, computer forensics and legal perspectives, Nina Godbole, Sunit Belapure, Wiley Publications, Reprint 2016.

Reference Books:

1. Writing Information Security Policies, Scott Barman, New Riders Publications, 2002.

2. Cryptography and Network security, Behrouz A. Forouzan , Debdeep Mukhopadhyay, McGraw Hill Education, 2 nd Edition, 2011

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

Professional Elective – I

20CST404 GRAPHICS AND MULTIMEDIA

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

This course will give the introduction to the field of graphics and multimedia computing to meet the diverse requirements of application areas such as entertainment, industrial design, virtual reality, intelligent media management, social media and remote sensing. It covers both the underpinning theories and the practices of computing and manipulating digital media including graphics / image, audio, animation, and video.

Course Objectives:

1. To study the graphics techniques and algorithms.
2. To study the multimedia concepts and various I/O technologies.
3. To enable the students to develop their creativity

UNIT I OUTPUT PRIMITIVES 9 hours

Introduction - Line - Curve and Ellipse Algorithms – Attributes – Two-Dimensional Geometric Transformations – Two-Dimensional Viewing.

UNIT II THREE-DIMENSIONAL CONCEPTS 9 hours

Three-Dimensional Object Representations – Three-Dimensional Geometric and Modeling Transformations – Three-Dimensional Viewing – Color models – Animation.

UNIT III MULTIMEDIA SYSTEMS DESIGN 9 hours

An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

UNIT IV MULTIMEDIA FILE HANDLING 9 hours

Compression & Decompression – Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – video image and animation – Full motion video – Storage and retrieval Technologies.

UNIT V HYPERMEDIA 9 hours

Multimedia Authoring & User Interface – Hypermedia messaging - Mobile Messaging – Hypermedia message component – creating Hypermedia message – Integrated multimedia message standards – Integrated Document management – Distributed Multimedia Systems.

Course Outcomes:

Upon successful completion of the course, students will be able to
1. Design two-dimensional graphics.
2. Apply two-dimensional transformations.
3. Design three-dimensional graphics.
4. Apply three-dimensional transformations.
5. Apply Illumination and color models.

Text Books:
1. Donald Hearn and M.Pauline Baker, "Computer Graphics C Version", Pearson Education, 2003.
2. Prabat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design", PHI, 2003.

Reference Books:
1. Andleigh, P. K and Kiran Thakrar, ―Multimedia Systems and Design, PHI, 2003.

2. Hughes JF, Van Dam A, McGuire M, Foley JD, Sklar D, Feiner SK, Akeley K. Computer graphics: principles and practice. Pearson Education; 2014.

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

Professional Elective – I

20CST405 WIRELESS SENSOR NETWORKS

L	T	P	C
3	0	0	3

Pre-requisite 20CST105

Course Description:

This course introduces the concept of Wireless Sensor Network (WSN) to the students. It articulates the classification of WSN and related issues & challenges. It also describes different types of routing, MAC, dissemination protocols and explains design principles of wireless sensor networks.

Course Objectives:

1. Understand the concept of WSN, issues and challenges, classification of WSN.
2. Analyze and learn the classification of routing and MAC protocols.
3. Understand Dissemination protocol for large sensor network.
4. Design principles of WSNs.
5. Understand the hardware components & design constraints and Operating systems used in WSNs.

UNIT I INTRODUCTION TO SENSOR NETWORKS 9 hours

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks. Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks.

UNIT II PROTOCOLS 9 hours

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and ZigBee.

UNIT III DISSEMINATION 9 hours

Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

UNIT IV WIRELESS SENSOR NETWORK 9 hours

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication.

UNIT V ARCHITECTURE & ENVIRONMENT 9 hours

Single-node architecture, Hardware components& design constraints. Operating systems and execution environments, introduction to TinyOS and nesC.

Course Outcomes:

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

1. Design wireless sensor networks for a given application.
2. Understand emerging research areas in the field of sensor networks.
3. Understand MAC protocols used for different communication standards used in WSN.
4. Explore novel protocols to address challenges in WSN.
5. Examine a single-node system considering hardware components and constraints.

Text Books:

1. WaltenegusDargie , Christian Poellabauer, “ Fundamentals Of Wireless Sensor Networks Theory And Practice” , By John Wiley & Sons Publications ,2011
2. SabrieSoloman, “Sensors Handbook" by McGraw Hill publication. 2009.

Reference Books

1. Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks”, Elsevier Publications, 2004.

2. Kazem Sohrby, Daniel Minoli, “Wireless Sensor Networks”: Technology, Protocols and Applications, Wiley-Inter science.

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

Professional Elective – III

Professional Elective - IV

20CST406 PERCEPTION AND COMPUTER VISION

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

The objective of learning computer vision is to develop the skills and knowledge necessary to create algorithms and programs that can automatically analyze and interpret digital images and videos. This involves understanding the fundamental principles of image processing, pattern recognition, and machine learning, and applying these techniques to real-world problems such as object detection, face recognition, autonomous navigation, and medical image analysis.

Course Objectives:

1. To understand the fundamental concepts related to Image formation and processing.
2. To learn feature detection, matching and detection
3. To become familiar with feature-based alignment and motion estimation
4. To develop skills on 3D reconstruction
5. To understand image-based rendering and recognition

UNIT I INTRODUCTION TO IMAGE FORMATION AND PROCESSING 9 hours

Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization.

UNIT II FEATURE DETECTION, MATCHING AND SEGMENTATION 9 hours

Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.

UNIT III FEATURE-BASED ALIGNMENT & MOTION ESTIMATION 9 hours

2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow - Layered motion.

UNIT IV 3D RECONSTRUCTION 9 hours

Shape from X - Active range finding - Surface representations - Point-based representations Volumetric representations - Model-based reconstruction - Recovering texture maps and albedos.

UNIT V IMAGE-BASED RENDERING AND RECOGNITION 9 hours

View interpolation Layered depth images - Light fields and Lumi graph - Environment mattes - Video-based rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets.

Course Outcomes:

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

1. Understand basic knowledge, theories and methods in image processing and computer vision
2. Understand the feature detection, matching and segmentation process for perception and Computer Vision.
3. Apply 2D a feature-based based image alignment, segmentation, and motion estimations
4. Examine the need and usage of 3D image reconstruction techniques.
5. Interpret Image & Video based rendering techniques.

Text Book(s)

1. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer- Texts in Computer Science, Second Edition, 2022.
2. Computer Vision: A Modern Approach, D. A. Forsyth, J. Ponce, Pearson Education, Second Edition, 2015.

Reference Books

1. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.
2. Christopher M. Bishop; Pattern Recognition and Machine Learning, Springer, 2006 3. E. R. Davies, Computer and Machine Vision, Fourth Edition, Academic Press, 2012

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

Professional Elective – III

20CST407 BIG DATA ANALYTICS

L	T	P	C
3	0	0	3

Pre-requisite 20CST102, 20CST103

Course Description:
This course introduces fundamental concepts and tools required to understand Big Data analytics. The also discusses big data applications in Data Science and covers the applications and technologies needed to process the large-scale data.

Course Objectives:

1. To learn data mining and big data basics
2. To learn the big data in technology perspective
3. To learn Hadoop framework for data analytics
4. Applying HIV and PIG paradigms to solve problems.
5. To interpret the potential applications in big data scenario.

UNIT I INTRODUCTION TO DATA MINING AND BIG DATA 9 hours

Introduction to Data mining, KDD process, Data Mining Techniques: Mining Frequent patterns, Association rule, Cluster analysis, Classification and Regression. Introduction to Big Data - What is Big Data? Explosion in Quantity of Data, Big Data Characteristics, Types of Data, Common Big data Customer Scenarios, BIG DATA vs. HADOOP, A Holistic View of a Big Data System, Limitations of Existing Data Analytics Architecture.

UNIT II DATA ANALYTICS LIFE CYCLE 9 hours

Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists- Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.

UNIT III INTRODUCTION TO HADOOP 9 hours

Why DFS? What is Hadoop? Hadoop Distribution, Hadoop Key Characteristics, RDBMS vs. Hadoop, Hadoop 2.x Cluster Architecture, Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node, Hadoop 2.0 New Features – Name Node High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN Hadoop Distributed File System.

UNIT IV HIVE & PIG 9 hours

Exploring Hive: Introducing Hive, Getting Started with Hive, Hive Services, Data Types, Built- in Functions, Hive-DDL, Data Manipulation, Data Retrieval Queries, Using Joins. Analyzing Data with Pig: Introducing Pig, Running Pig, Getting started with Pig Latin, working `with operators in Pig, Debugging Pig, Working with Functions in pig, Error Handling in Pig.

UNIT V DATA SCIENCE AND APPLICATIONS 9 hours

Streams and Files - Streams – Text Input and Output – Reading and Writing Binary Data.
Data Loading Techniques & Data Analysis, Text Analytics for Large unstructured information, Analytic Stack, Big Data Applications - Fraud detection in Stock markets, Sentiment Analysis.

Course Outcomes:

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

1. Understand the basic concepts of Data Mining and data analytics
2. Analyze the importance of Data Analytics.
3. Examine Hadoop's architecture, storage, and key features.
4. Apply the HIVE and PIG concepts for Big Data Operations.
5. Apply analytical tools to solve real world problems.

Text Book(s)

1. Jiawei Han, Jian Pei, Hanghang Tong, Data Mining: Concepts and Techniques, Fourth Edition, Morgan Kaufmann, 2022.
2. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.
3. Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014.
4. Eric Siegel, Thomas H. Davenport, "Predictive Analytics: The Power to Predict Who WillClick, Buy, Lie, or Die", Wiley, 2013.

Reference Books

1. Chuck Lam ,Hadoop in Action, Manning, Second Edition ,2016
2. Mark Gardener, Beginning R: The Statistical Programming Language, Wiley, 2013

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

Professional Elective – III

20CST408 DIGITAL FORENSICS

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

This course on Computer Forensics aims to provide an in-depth understanding of the principles, techniques, and tools used in the investigation of computer-related crimes. The course will cover topics such as digital evidence acquisition, preservation, analysis, and presentation. Students will learn how to conduct forensic investigations of computers, networks, and digital devices, and how to present their findings in a court of law.

Course Objectives:

The purpose of learning this course is to:

1. Understand the fundamental principles and concepts of digital forensics.
2. Develop skills for collecting and analyzing various types of digital evidence.
3. Gain knowledge of the legal and ethical considerations in conducting digital forensic investigations.
4. Acquire proficiency in using digital forensic tools and techniques.
5. Apply critical thinking and problem-solving skills to real-world digital forensic scenarios.

UNIT I INTRODUCTION TO COMPUTER FORENSICS 9 hours

Introduction to Digital Forensics - Digital evidence types and characteristics, Applications of digital forensics, Digital forensics challenges and limitations.

Types of Digital Evidence - Computer and mobile device evidence, Network and cloud evidence, social media and web-based evidence, IoT device and vehicle forensics.

Forensic Investigations Process - Incident response and evidence collection, Evidence handling and analysis, Reporting and documentation.

UNIT II DIGITAL EVIDENCE ACQUISITION 9 hours

Digital Evidence Collection and Preservation - Evidence identification and collection, Data integrity and preservation, Chain of custody and documentation.

Types of Digital Evidence - Computer and mobile device evidence, Network and cloud evidence, Social media and web-based evidence, IoT device and vehicle forensics.

Digital Evidence Storage and Handling - Digital evidence storage methods, Secure handling and storage of digital evidence.

UNIT III DIGITAL EVIDENCE ANALYSIS 10 hours

File Systems and Data Recovery - Introduction to file systems and data structures, File system analysis, Disk structures and metadata, Recovering deleted and hidden files.

Network Forensics and Malware Analysis - Network analysis and reconstruction, Network traffic capture and analysis, Malware analysis and investigation.

UNIT IV DIGITAL FORENSIC TOOLS AND TECHNIQUES 10 hours

Digital Forensic Toolkits - Introduction to digital forensic toolkits, Choosing and configuring a toolkit, Available commercial toolkits.

Cloud Forensics - Introduction to cloud forensics, Cloud storage and security models, Cloud service provider analysis, Cloud data acquisition and analysis. Case Study: An open-source digital forensics platform – Autopsy.

UNIT V LEGAL AND ETHICAL ISSUES IN COMPUTER FORENSICS 7 hours

Digital Forensic Laws and Regulations - Overview of digital forensic laws and regulations, Legal principles and procedures, Legal issues related to digital evidence.

Ethics in Digital Forensics - Overview of ethics in digital forensics, Ethical considerations for digital forensic examiners, Ethical principles for handling digital evidence, Ethical conflicts and challenges in digital forensics.

Course Outcomes:

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

1. Identify and classify different types of digital evidence, including computer systems, networks, mobile devices, and cloud services.
2. Demonstrate proficiency in digital evidence collection, preservation, and analysis techniques.
3. Explain and adhere to legal and ethical standards in digital forensic investigations.
4. Utilize digital forensic tools and techniques to investigate and solve forensic cases.
5. Analyze and evaluate digital forensic findings, and effectively communicate the results through comprehensive reports.

Text Book(s)

1. "Computer Forensics: Principles and Practices" by Linda Volonino and Reynaldo Anzaldua, 1st edition, Publisher: Pearson (August 31, 2006).
2. "Computer Forensics and Cyber Crime: An Introduction" by Marjie T. Britz, 3rd edition, Publisher: Pearson (July 14th, 2021).
3. "Digital Forensics: Threatscape and Best Practices" by John Sammons and Michael R. Masino, 1st Edition, Publisher: CRC Press (2022)

Reference Books

1. "Practical Digital Forensics" by Richard Boddington, 2nd Edition, Publisher: Packt Publishing (2021)
2. "Digital Forensics and Incident Response: A Practical Guide to Deploying Digital Forensic Techniques" by Gerard Johansen and Mark Menzies, 1st Edition, Publisher: Wiley (2020)
3. "Guide to Computer Forensics and Investigations" by Bill Nelson, Amelia Phillips, and Christopher Steuart, 6^{th} edition, Publisher: Cengage India Private Limited (1 October, 2020).

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

Professional Elective – III

20CST409 MODELING AND SIMULATION

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

The course on Modelling and Simulation provides students with a comprehensive understanding of the principles, techniques, and tools involved in creating and analyzing models to simulate real-world systems. Students will gain hands-on experience in designing models, selecting appropriate simulation techniques, and analyzing the results to make informed decisions. The course aims to enhance students' problem-solving and analytical skills, enabling them to tackle complex system dynamics and optimize performance.

Course Objectives:

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

1. Understand the fundamental concepts and principles of modelling and simulation.
2. Develop mathematical and computational models for real-world systems.
3. Apply various simulation techniques to study system behavior and performance.
4. Analyze and interpret simulation results to make informed decisions.
5. Gain practical experience in using simulation software tools.

UNIT I INTRODUCTION TO MODELLING AND SIMULATION 9 hours

Introduction to Modelling and Simulation-Definition and Scope -Importance and Applications -Advantages and Limitations -Classification of Models-Deterministic -Stochastic -Static - Dynamic Models-Descriptive -Prescriptive Models-Physical- Mathematical –Continuous- Discrete Models-Systems and their Components-Understanding Systems and their Characteristics-Components of a System -System Boundaries and Interfaces-Input and Output Analysis

UNIT II MATHEMATICAL MODELS, SIMULATION PROCESS AND TECHNIQUES 9 hours

Mathematical Representation of Systems-Types of Mathematical Models -Linear vs. Nonlinear Models-Algebraic, Differential, and Difference Equation Models- Overview -Steps involved in Simulation-Model Formulation and Abstraction-Model Execution and Output Analysis-Verification and Validation of Simulation Models-Statistical Analysis of Simulation Results-Stability Analysis-Sensitivity Analysis and Optimization Techniques in Simulation

UNIT III DISCRETE EVENT SIMULATION 9 hours

Event Scheduling and Time Advance Mechanisms-Event-Based Simulation Paradigm-Discrete Event Simulation Concepts-Event List and Event Scheduling-Random Number Generation and Variate Generation-Importance and Techniques-Common Probability Distributions -Input Data Analysis and Verification-Importance of Input Data Analysis-Data Collection and Data Types-Data Preprocessing and Cleaning

UNIT IV CONTINUOUS SIMULATION 9 hours

Differential Equations and Integration Methods-Simulation of Dynamic Systems- Modeling Dynamic Systems using Differential Equations-Continuous System Simulation Techniques-Sensitivity Analysis and Parameter Estimation- Validation and Verification of Continuous Simulation Models

UNIT V SIMULATION SOFTWARE TOOLS 9 hours

Overview of Simulation Software Tools-Introduction -Role and Importance of Simulation Tools -Types of Simulation Software Tools-Introduction to a Widely Used Simulation Tool - Model Creation and Parameterization- Experiment Design and Simulation Runs- Output Analysis and Visualization-Advanced Topics in Modelling and Simulation (Real Time Examples and Case studies)

Course Outcomes:

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

1. Formulate and represent real-world systems as mathematical models.
2. Apply appropriate simulation techniques to study system behavior.
3. Design simulation experiments and analyze the obtained results.
4. Evaluate the performance of simulated systems and suggest improvements.
5. Develop real-time model using simulation software tools for modeling and analysis.

Text Book(s)

1. "Simulation Modeling and Analysis" by Averill M. Law and David Kelton

2. "System Simulation: The Art and Science" by Jerry Banks, John S. Carson II, and Barry L. Nelson

Reference Books

1. "Simulation Modeling and Analysis with Expertfit Software" by Averill M. Law and W. David Kelton

2. Simulation and the Monte Carlo Method" by Reuven Y. Rubinstein and Dirk P. Kroese

3 "Principles of Modeling and Simulation: A Multidisciplinary Approach" by John A. Sokolowski and Catherine M. Banks

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

Professional Elective – III

20CST410 NETWORK PROGRAMMING

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:
This course will cover the practical aspects of computer network programming, with emphasis on the Internet. The goal of this course is to introduce the students to the basics of computer networks and Internet programming. We will also look at industry trends and discuss some innovative ideas that have recently been developed.

Course Objectives:
1. Understand the basics of network programming
2. Describe the socket API based programs.
3. Implement network services that communicate through the Internet.
4. Understand the elementary function and address conversion using Protocol suite.
5. Apply the client-server model in networking applications.

UNIT I INTRODUCTION **9 hours**

Introduction to Network Programming:
OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

Sockets :
Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

UNIT II TCP client server **9 hours**

TCP client server :
Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.

Elementary UDP sockets and I/O Multiplexing
Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP, I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server.

UNIT III Socket options 9 hours

Socket options:

getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options, Raw sockets.

Advanced I/O Functions-

Introduction, Socket Timeouts, recv and send Functions,readv and writev Functions, recvmsg and sendmsg Functions, Ancillary Data, How Much Data Is Queued, Sockets and Standard I/O, T/TCP: TCP for Transactions.

UNIT IV Elementary name and Address conversions 9 hours

Elementary name and Address conversions:

DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.

Daemon Processes and inetd Superserver :

Introduction, syslogd Daemon, syslog Function, daemon_init Function, inetd Daemon, daemon_inetd Function

UNIT V Broadcasting and Multicasting 9 hours

Broadcasting-

Introduction, Broadcast Addresses, Unicast versus Broadcast, dg_cli Function Using Broadcasting, Race Conditions

Multicasting-

Introduction, Multicast Addresses, Multicasting versus Broadcasting on A LAN, Multicasting on a WAN, Multicast Socket Options, mcast_join and Related Functions, dg_cli Function Using Multicasting, Receiving MBone Session Announcements, Sending and Receiving, SNTP: Simple Network Time Protocol, SNTP

Recent case studies- Internet protocol, Virtual Network and Debugging Techniques.

Course Outcomes:

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

To understand the basics network programming using TCP and UDP connections.

2. To describe socket API based programs.
3. To design and implement client-server applications using TCP and UDP sockets
4. To understand the elementary name functions and address conversion.
5. To analyze network programs.

Text Book(s)

1. W. Richard Stevens, "UNIX Network Programming Vol. I Sockets API", 3nd Edition, Pearson, 2015

2. W.Richard Stevens, "UNIX Network Programming", 2st Edition, PHI, 1998.

Reference Books

1. King abls, “UNIX for Programmers and Users”, 3rd Edition, Pearson, 2003

2. M.J.Rochkind, “Advanced UNIX Programming”, 2nd Edition, Pearson, 2000.

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

Professional Elective – IV

Professional Elective – IV

20CST411 IMAGE AND VIDEO PROCESSING

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

This course provides the basic understanding of the digital image formation and visualization, the visualization of relationships between spatial and frequency, the understanding of mapping the signal processing techniques to the digital image, an idea of multimedia data (image, video), and an exposure to various image and video compression standards.

Course Objectives:

This course enables the student to –

1. Understand the basic concepts in digital image formation and visualization.
2. Make to know the image restoration and color image-processing techniques.
3. Analyze the image compression methods.
4. Knowledge of image segmentation methods.
5. Understand coding systems and video compression standards.

UNIT I INTRODUCTION AND IMAGE ENHANCEMENT 9 hours

Digital image fundamentals, Concept of pixels and gray levels, Applications of image processing, Digital Image Representation- Elements of visual perception – Image acquisition – Image sampling and Quantization – Image geometry – Discrete Image Transforms-Introduction to image enhancement, spatial domain methods: point processing - intensity transformations, histogram processing, image averaging, image subtraction,

UNIT II IMAGE RESTORATION AND COLOR IMAGE PROCESSING 9 hours

Introduction to Image restoration, Degradation model, Restoration in the presence of Noise only-Spatial filtering- smoothing filters, sharpening filters, Frequency domain methods: low pass filtering, high pass filtering, Homomorphic filtering, Periodic Noise reduction by Frequency domain Filtering, Fundamentals of Color image processing: Color models - RGB, CMY, YIQ, HIS.

UNIT III IMAGE COMPRESSION 9 hours

Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standards, Wavelet-based image compression. Case Study-Satellite Image compression.

UNIT IV IMAGE SEGMENTATION 9 hours

Introduction to image segmentation, Detection of discontinuities - point, line and edge and combined detection; Edge linking and boundary description - local and global processing using Hough transform, Thresholding, Region oriented segmentation - basic formulation, region growing by pixel aggregation, region splitting and merging.

UNIT V DIGITAL VIDEO & CODING 9 hours

Basics of Video, Time-varying Image formation Models, Spatiotemporal Sampling, Optical flow, General methodologies, Overview of coding systems, Video Compression Standards. Applications of Image and Video Processing- Applications in measurements, manufacturing, medicine, agriculture and food industry – Case studies.

Course Outcomes:

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

1. Comprehend the image processing fundamentals and enhancement techniques in spatial and Frequency domain.
2. Describe the color image fundamentals, models and various restoration techniques.
3. Design and Analyze the image compression systems.
4. Outline the various image segmentation and morphology operations.
5. Comprehend the basics of video processing and video coding.

Text Book(s)

1. S Jayaraman, ”Digital Image Processing” Mc Graw hill, Second Edition, 2020.

2. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson, Education, Inc., Fourth Edition, 2018.
3. Thomas. B. Moeslund, “Introduction to Video and Image Processing”, Springer, 2012.

Reference Books

1. John W. Woods, “Multidimensional Signal, Image and Video Processing”, Elsevier, 2nd Edition 2011.
2. A. Murat Tekalp, “Digital Video Processing”, Prentice Hall, 2nd Edition, 2015.

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

Professional Elective – IV

20CST412 ADVANCED ALGORITHMS

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

This course helps the students to learn advanced methods of designing and analyzing algorithms. This course will help to classify the problems according to the type of classes. Students will have an insight of recent activities in the field of the advanced data structures.

Course Objectives:

1. The student should be able to choose appropriate algorithms and use it for a specific problem.
2. To familiarize students with basic paradigms and data structures used to solve advanced algorithmic problems.
3. Students should be able to understand different classes of problems concerning their computation difficulties.
4. Introduce the students to recent developments in the area of algorithmic design.

UNIT I INTRODUCTION 9 hours

Sorting: Review of Selection, Bubble, Insertion and Topological Sorting.

Graph: Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkasra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.

UNIT II MATROIDS & GRAPH MATCHING 9 hours

Matroids: Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set, Application to MST.

Graph Matching: Algorithm to compute maximum matching, Characterization of maximum matching by augmenting paths, Edmond's Blossom algorithm to compute augmenting path.

UNIT III FLOW-NETWORKS & MATRIX COMPUTATIONS 9 hours

Flow-Networks: Maxflow-mincut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp maximum-flow algorithm.

Matrix Computations: Strassen's algorithm and introduction to divide and conquer paradigm, inverse of a triangular matrix, relation between the time complexities of basic matrix operations, LUP-decomposition.

UNIT IV GRAPHS, MODULO REPRESENTATION OF INTEGERS/POLYNOMIALS 9 hours

Shortest Path in Graphs: Floyd-Warshall algorithm and introduction to dynamic programming paradigm, Applications of dynamic programming.

Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation, Extension to polynomials. Application: Interpolation problem.

UNIT V LINEAR PROGRAMMING AND NP-COMPLETENESS 9 hours

Linear Programming: Geometry of the feasibility region and Simplex algorithm.
NP-completeness: Examples, proof of NP-hardness and NP-completeness, Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm

Course Outcomes:

1. Understand and apply various sorting algorithms.
2. Analyze and design algorithms for graphs and matroids.
3. Apply flow-networks and matrix computation.
4. Analyze graphs and utilize modulo representation.
5. Understand linear programming and NP-completeness.

Text Book(s)

1. Introduction to Algorithms" by Cormen, Leiserson, Rivest, Stein, Second Edition 2001
2. The Design and Analysis of Computer Algorithms" by Aho, Hopcroft, Ullman fourth edition, 2009.

Reference Books

1. "Algorithm Design" by Kleinberg and Tardos, 2006

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

Professional Elective – IV

20CST413 FUNDAMENTALS OF FOG AND EDGE COMPUTING

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course introduces topics such as developing scalable architectures, moving from closed systems to open systems, and ethical issues rising from data sensing, addresses both the challenges and opportunities that Fog and Edge computing presents.

Course Objectives:

1. Students will learn about relevant technologies and explore the hierarchy of fog and edge computing.
2. Students will learn about network slicing, its implementation in software-defined clouds, and the management of network slicing in edge and fog environments.
3. Students will gain knowledge of the formal modeling framework for fog computing and understand the metrics and quality attributes associated with optimization.

Students will understand the need for fog and edge computing middleware, identify the design goals, and explore state-of-the-art middleware infrastructures.

4. Students will learn about fog data management, the fog data life cycle, and its application in domains such as e-health and smart buildings.

UNIT I Internet of Things (IoT) and New Computing Paradigms 9 hours

Introduction-Relevant Technologies-Fog and Edge Computing Completing the Cloud-Hierarchy of Fog and Edge Computing-Business Models-Opportunities and Challenges

UNIT II Management and Orchestration of Network Slices in 5G, Fog, Edge, and Clouds 9 hours

Introduction-Background-Network Slicing-Network Slicing in Software-Defined Clouds-Network Slicing Management in Edge and Fog- Internet of Vehicles : Architecture, Protocol and Security Seven layered model architecture for Internet of Vehicles- IoV: Network Models, Challenges and future aspects

UNIT III Optimization Problems in Fog and Edge Computing 9 hours

Preliminaries-The Case for Optimization in Fog Computing-Formal Modeling Framework for Fog Computing-Metrics-Further Quality Attributes-Optimization Opportunities along the Fog Architecture-Optimization Opportunities along the Service Life Cycle-Toward a Taxonomy of Optimization Problems in Fog Computing

UNIT IV Middleware for Fog and Edge Computing: Design Issues 9 hours

Need for Fog and Edge Computing Middleware-Design Goals-State-of-the-Art Middleware Infrastructures-System Model-Proposed Architecture-Case Study Example

UNIT V Technologies in Fog Computing 9 hours

Fog Data Management, Fog Data Life Cycle, e-Health Case Study. Predictive Analysis to Fog Application -Motivating Example: Smart Building-Predictive Analysis with Fog Torch. Machine Learning in Fog Computing-Data Analytics in the Fog-Data Analytics in the Fog Architecture-Configurations

Course Outcomes:

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

1. Understand the principles and architectures of new computing paradigms.
2. Acquire the skills to manage and orchestrate network slices in 5G, fog, edge, and clouds.
3. Analyze optimization problems in fog and edge computing.
4. Analyze system models, propose architectures, and middleware for fog and edge computing.
5. Apply the security and privacy issues of fog Applications.

Text Book(s)

1. Buyya, Rajkumar, and Satish Narayana Srirama, eds, Fog and edge computing: principles and paradigms, 1st edition, John Wiley & Sons, 2019.
2. John Mutumba Bilay , Peter Gutsche, Mandy Krimmel and Volker Stiehl ,SAP Cloud Platform Integration: The Comprehensive Guide, 2nd edition, Rheinwerg publishing, 2019

Reference Books

1. Bahga, Arshdeep, and Vijay Madisetti. Cloud computing: A hands-on approach, 1st edition, CreateSpace Independent Publishing Platform, 2013.
2. Ovidiu Vermesan, Peter Friess, Internet of Things –From Research and Innovation to Market Deployment, 1st edition,River Publishers, 2014
3. Michael Missbach, Thorsten Staerk, Cameron Gardiner, Joshua McCloud, Robert Madl, Mark Tempes, George Anderson, SAP on Cloud, 1st edition, Springer, 2016

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

Professional Elective – IV

20CST414 HUMAN COMPUTER INTERACTION

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:
Introduction to basic concepts in theory and practice of (HCI) Human Computer Interaction, a discipline concerned with design, implementation, and evaluation of interactive computing systems for human use. Emphasis is on the structure of communication between consumers and computers, capabilities of people to use computers, and concerns that arise in the process of designing and building interfaces between humans and computers.

Course Objectives:

1. Introduce concepts and history of (HCI) Human Computer Interaction
2. Explain importance of HCI for interactive computing system design
3. Summarize a variety of user research and evaluation techniques in HCI
4. Discuss principles of user centered design
5. Recognize role of human factors in system usability
6. Apply HCI principles to (UI) User Interface design.
7. Explain methods for cognitive model.

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 & WEB INTERFACE DESIGN 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

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

UNIT V COGNITIVE MODELS GOAL AND TASK HIERARCHIES DESIGN FOCUS **9 hours**

GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient Wood – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

Course Outcomes:

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

1. Understand the basic principles of interaction design.
2. Utilize universal useability for interactive designs adhering to HCI.
3. Interpret cognitive and socio-organizational models for communication.
4. Formulate support systems for implementing interactive systems.
5. Design the HCI using cognitive models.

Text Book(s)

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction‖, 3rd Edition, Pearson Education, 2004 .
2. Brian Fling, ―Mobile Design and Development‖, First Edition, O‘Reilly Media Inc., 2009
3. Bill Scott and Theresa Neil, ―Designing Web Interfaces‖, First Edition, O‘Reilly, 2009.

Reference Books

1. Human-Computer Interaction, Third Edition by Alan Dix et al, Prentice Hall (2004).
2. Debbie Stone, Caroline Jarrett, Mark Woodroffe, and Shailey Minocha , User Interface Design and Evaluation , 2005

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

Professional Elective – IV

20CST415 SENSORS AND ACTUATOR DEVICES

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

The IoT Sensor Systems course provides students with a comprehensive understanding of the networking components in IoT systems, specifically focusing on sensors. The course explores the evolution and advancements in IoT sensors across various generations. Students will gain the knowledge and skills necessary to analyze and design sensor and actuator systems for energy harvesting, smart cities, automotive vehicles, and security applications. Finally, the students will be equipped with the knowledge and skills to design, develop, and analyze IoT sensor systems for various applications.

Course Objectives:

1. To learn about the different components of an IoT network and their roles in connecting and communicating with sensors.
2. Explore the evolution of IoT sensors over different generations, from basic sensors to advanced smart sensors.
3. Students will analyze sensors and actuators specifically used for energy harvesting systems and smart city applications.
4. Students will study sensors and actuators utilized in automotive vehicle systems and security Applications.
5. Acquire practical skills in designing and developing IoT-based sensor systems.

UNIT I INTRODUCTION 9 hours

Internet of Things Promises–Definition– Scope–Sensors for IoT Applications–Structure of IoT–IoT Map Device. Introduction to Sensors and Actuator- Sensor and Actuator Characteristics- Primary factors driving the deployment of sensor technology

UNIT II SEVEN GENERATIONS OF IoT SENSORS 9 hours

Industrial sensors – Description & Characteristics–First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics–Sensors' Swarm – Description & Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap

UNIT III ENERGY HARVESTING & SMART CITIES 9 hours

Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module. Sensors in Home activity monitoring, human activity recognition, road traffic management

UNIT IV SENSORS FOR AUTOMOTIVE VEHICLE AND SECURITY APPLICATIONS 9 hours

Tyre pressure monitoring systems - Two-wheeler and Four wheeler security systems - Parking guide systems - Anti-lock braking system - Future safety technologies- Vehicle diagnostics and health monitoring.

UNIT V DEVELOPING AN IoT BASED APPLICATIONS 9 hours

Smart Energy Monitor Based on IoT, develop a Face Recognizing Robot, Build an IoT based Smart Home System, IoT Based Air Quality Index Monitoring, IoT Based Contactless Body Temperature Monitor.

Course Outcomes:

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

1. Identify the IoT networking components with respect to sensors.
2. Understand the various generations of IoT sensors.
3. Analyze the Sensor and Actuators for Energy Harvesting & Smart Cities.
4. Analyze the Sensor and Actuators for Automotive Vehicle and Security applications.
5. Design and develop IoT based sensor systems.

Text Book(s)

1. Timothy Chou,. Precision: Principles, Practices and Solutions for the Internet of Things, Cloudbook Inc., USA. April-13 2020.

2. Maggie Lin and Qiang Lin., Internet of Things Ecosystem: 2nd Edition,. January 19, 2021., independently published.

Reference Books

1. Patranabis, Sensors and Actuators, 2nd edition, PHI, 2013.

2. D. Patranabis, Sensors and Transducers, 1st edition, PHI Learning Private Limited,2013.

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

Professional Elective – V

20CST416 MULTI AGENT SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

This course introduces the principles and techniques of Multi-Agent Systems (MAS) and explores the design, analysis, and implementation of intelligent agents that can interact and collaborate in complex environments. The course focuses on various aspects of MAS, including agent architectures, communication protocols, coordination mechanisms, negotiation strategies, and learning processes. Students will gain practical experience through hands-on programming assignments and simulations.

Course Objectives:

The purpose of learning this course is to:

1. Understand the fundamental concepts and theories underlying Multi-Agent Systems.
2. Examine various agent architectures of Multi Agent Systems.
3. Explore various coordination mechanisms and negotiation strategies in Multi-Agent Systems.
4. Develop skills in designing and implementing intelligent agents in practical scenarios.
5. Analyze and evaluate the performance and efficiency of Multi-Agent Systems.

UNIT I INTRODUCTION TO GAME THEORY AND SWARM INTELLIGENCE 9 hours

Games in Normal Form – Some Example Games, Analyzing Games from Optimality to Equilibrium, Solution concepts for Normal-form Games, Swarm Intelligence: Optimization & Optimization algorithms, Nature inspired algorithms for Optimization, Algorithms and self-organization.

UNIT II MULTI AGENT SYSTEMS AND ARCHITECTURES OF INTELLIGENT AGENTS 9 hours

What are Agents - Examples of Agents, Intelligent Agents, Agents & Objects, Agents & Expert Systems, Agent Programming Languages

Abstract Architectures - Purely Reactive Agents, Perception, Agents with State, Concrete Architectures - Logic-based Architectures, Reactive Architectures, Belief-Desire-Intention Architectures, Layered Architectures.

UNIT III AGENT COMMUNICATION AND COORDINATION 9 hours

Agent Communications- Coordination, Dimensions of Meaning, Message Types, Communication Levels, Speech Acts, KQML, KIF, Agent Interaction Protocols- Coordination Protocols, Cooperation Protocols, Contract Net, Blackboard Systems, Negotiation

UNIT IV LEARNING IN MULTI AGENT SYSTEMS 9 hours

Learning and Activity Coordination - Reinforcement Learning, Isolated and Concurrent Reinforcement Learners, Interactive Reinforcement Learning of Coordination, Learning about and from Other Agents, Learning and Communication

UNIT V APPLICATIONS OF MULTI-AGENT SYSTEMS 9 hours

Agents for Workflow and Business Process Management, Agents for Information Retrieval and Management, Agents for Electronic Commerce, Agents for Human-Computer Interfaces

Course Outcomes:

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

1. Understand the fundamental concepts and theories underlying Multi-Agent Systems.
2. Articulate various agent architectures of Multi Agent Systems.
3. Explore various coordination mechanisms and negotiation strategies in Multi-Agent Systems.
4. Develop skills in designing and implementing intelligent agents in practical scenarios.
5. Analyze and evaluate the performance and efficiency of Multi-Agent Systems.

Text Book(s)

1. Weiss, Gerhard "Multiagent Systems: A Modern Approach to Distributed Artificial Intelligence", MIT press, 1999.

1. Shoham, Y., Leyton-Brown, K. "Essentials of Game Theory: A Concise Multidisciplinary Introduction" Switzerland: Springer International Publishing, 2009.

2. Yang, Xin-She, "Nature-inspired computation and swarm intelligence: Algorithms, theory and applications." 2020.

2. Wooldridge, Michael. "An introduction to multiagent systems", John wiley & sons, 2009.

3. Shoham, Yoav, and Kevin Leyton-Brown. "Multiagent systems: Algorithmic, game-theoretic, and logical foundations", Cambridge University Press, 2008.

Reference Books

1. Ferber, Jacques, and Gerhard Weiss. "Multi-agent systems: an introduction to distributed artificial intelligence", Vol. 1. Reading: Addison-wesley, 1999.
2. Sugumaran, Vijayan "Distributed artificial intelligence, agent technology, and collaborative applications", IGI Global, 2008.

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

Professional Elective – V

20CST417 DEEP LEARNING TECHNIQUES

L	T	P	C
3	0	0	3

Pre-requisite 20CST401

Course Description:
This course provides the content to make students comfortable with tools and techniques required in handling large amounts of datasets. It will also uncover various deep learning methods in NLP, Neural Networks etc. Several libraries and datasets publicly available will be used to illustrate the application of these algorithms. This will help students in developing skills required to gain experience of doing independent research and study

Course Objectives:
1. To give an overview of basics of neural networks and data representations.
2. To know the classification and regression tasks in deep learning.
3. To learn the CNN architecture and activation functions.
4. To construct the LSTM model and Deep Recurrent Neural Network.
5. To apply the deep learning concepts in Real time applications.

UNIT I BASICS OF NEURAL NETWORKS 9 hours

Anatomy of a neural network - Layers, Models, Loss function and optimizers. Data representations for neural networks - Tensor operations

UNIT II INTRODUCTION TO DEEP LEARNING 9 hours

Binary Classification, Logistic Regression, Gradient Descent, Derivatives, Computation graph, Vectorization, Vectorizing logistic regression – Shallow neural networks: Activation functions, non-linear activation functions, Back propagation – Forward and Backward Propagation - Parameters vs Hyper parameters

UNIT III CONVOLUTIONAL NEURAL NETWORK 9 hours

Introduction- Components of CNN Architecture- Rectified Linear Unit (ReLU) Layer- Exponential Linear Unit (ELU, or SELU)- Unique Properties of CNN- Architectures of CNN-Transfer Learning

UNIT IV RECURRENT NEURAL NETWORK 9 hours

Introduction - Simple Recurrent Neural Network - LSTM Implementation - Gated Recurrent Unit (GRU) - Deep Recurrent Neural Network - Auto encoder: Introduction - Features of Auto Encoder - Types of Auto encoder - Restricted Boltzmann Machine - Deep Reinforcement Learning

UNIT V APPLICATIONS OF DEEP LEARNING 9 hours

Image Classification Using CNN-Visual Speech Recognition Using 3D-CNN. Case Study: Stock Market Prediction, Soil Moisture Prediction Using Recurrent Neural Network- TensorFlow, Keras or MatConvNet for implementation, GANs.

Course Outcomes:

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

1. Understand the working principles neural networks.
2. Apply vectorized logistic regression and shallow neural networks.
3. Apply CNN architectures in transfer learning scenarios.
4. Implement the recurrent neural networks for data processing.
5. Apply the deep learning for real-time applications.

Text Book(s)

1. Ian J. Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2017.

2. Dr. S. Lovelyn Rose, Dr. L Ashok Kumar, Dr. D. Karthika Renuka, “Deep Learning using Python”, Wiley, First Edition, 2019

Reference Books

1. Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018

2. Adam Gibson and Josh Patterson, “Deep Learning, A practitioner’s approach”, O’Reilly, First Edition, 2017.
3. Yuxi (Hayden) Liu, Python Machine Learning by Example, Pact Publications, First Edition, 2017.

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

Professional Elective – V

20CST418 QUANTUM COMPUTING

L	T	P	C
3	0	0	3

Pre-requisite **20MAT112**

Course Description:
This course introduces the fundamental principles and concepts of quantum computing, highlighting the transformative nature of this field compared to conventional computing. Students will gain an understanding of the building blocks of quantum computers and the paradigm shift they represent. The course explores quantum state transformations, algorithms, and the mathematical foundations necessary for optimizing quantum computation.

Course Objectives:

1. To introduce the building blocks of Quantum computers and highlight the paradigm change between conventional computing and quantum computing.
2. To understand the Quantum state transformations and the algorithms
3. To provide the mathematical background for carrying out the optimization associated with quantum computation learning.
4. To understand entangled quantum subsystems and properties of entangled states
5. To explore the applications of quantum computing

UNIT I INTRODUCTION TO QUANTUM COMPUTATION AND PHYSICS 9 hours

Classical deterministic systems, classical probabilistic systems, quantum systems, basic quantum theory. Quantum bits, Bloch sphere representation of a qubit, multiple qubits. Background **Mathematics and Physics**: Hilbert space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis.

UNIT II QUANTUM CIRCUITS 9 hours

Quantum algorithms- Single qubit operation – multiple qubit gates – controlled qubit operations-universal quantum gates- design of quantum circuits

UNIT III QUANTUM INFORMATION AND CRYPTOGRAPHY 9 hours

Quantum operation-Example of quantum noise and quantum operation-Comparison between classical and quantum information theory – Bell states – Quantum teleportation – Quantum Cryptography – no cloning theorem.

UNIT IV QUANTUM ALGORITHMS 9 hours

Classical computation on quantum computers– Relationship between quantum and classical complexity classes– Deutsch's algorithm– Deutsch's-Jozsa algorithm– Shor factorization, Grover search..

UNIT V NOISE AND ERROR CORRECTION 9 hours

Graph states and codes – Shor code- Theory of Quantum error correction –constructing quantum codes- stabilizer code- fault-tolerant computation

Course Outcomes:

1. Understand the basic principles of quantum computing.
2. Understand the fundamental differences between conventional computing and quantum computing.
3. Analyze the basic quantum information and cryptography methods.
4. Implement the various quantum computing algorithm.
5. Simulate and analyze the characteristics of Quantum Computing Systems.

Text Book(s)

1. Nielsen M.A,Chuange I.L, ―Quantum Computation and Quantum Information, Cambridge University Press,2013.
2. Helmut Bez, Tony Croft, "Quantum Computation", CRC Press, 2023.

Reference Books

1. John Gribbin, Computing with Quantum Cats: From Colossus to Qubits, 2021
2. Benenti G., Casati G. and Strini G., ―Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II: Basic Tools and Special Topics ", World Scientific, 2014.

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

Professional Elective – V

20CST419 AUGMENTED REALITY AND VIRTUAL REALITY

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

The Augmented Reality and Virtual Reality course is designed to provide students with a comprehensive understanding of the concepts, principles, and applications of augmented reality (AR) and virtual reality (VR) technologies. The course explores the fundamental theories, techniques, and design considerations involved in creating immersive AR and VR experiences.

Course Objectives:

1. To learn the fundamentals of Augmented Reality and Virtual Reality, including their underlying principles, concepts, and technologies.
2. Explore VR interactions using environmental modeling techniques.
3. Explore AR interactions using environmental modeling techniques.
4. Students will learn various tool for Augmented Reality and Virtual Reality applications.
5. Learn human, legal and social considerations.

UNIT I INTRODUCTION 9 hours

Fundamental Concepts and Components of Virtual Reality. Primary Features and Present Development on Virtual Reality Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual / Auditory / Haptic Devices

UNIT II ENVIRONMENT MODELING - VIRTUAL REALITY 9 hours

Geometric Modeling; Behavior Simulation; Physically Based Simulation Concept of haptic interaction; Principles of touch feedback and force feedback. Typical structure and principles of touch/force feedback Facilities in applications

UNIT III ENVIRONMENT MODELING - AUGMENTED REALITY 9 hours

Introduction System Structure of Augmented Reality; Key Technology in AR, AR hardware, AR software, AR content. General solution for calculating geometric & illumination Consistency in the augmented environment. Tracking, Calibration and registration, Computer vision visual coherence, situated visualization, modeling and annotation Authoring AR, navigation, Mobile AR, Augmented Virtuality, Mixed Reality.

UNIT IV DEVELOPMENT TOOLS & APPLICATION DEVELOPMENT 9 hours

Frameworks of Software Development Tools in VR; Modeling Tools for VR, Planning, creating content for VR and AR projects Gaming and entertainment, Education, Science and Engineering.

UNIT V HUMAN FACTORS, LEGAL, & SOCIAL CONSIDERATIONS 9 hours

Human Factors Considerations- Physical Side Effects, Visual Side Effects. Legal and Social Considerations- Legal Considerations, Moral and Ethical Considerations.

Course Outcomes:

Upon successful completion of the course, students will be able to
1. Understand the Fundamentals of Augmented Reality and Virtual Reality.
2. Analyze VR Interaction using environmental modeling.
3. Analyze AR Interaction using environmental modeling.
4. Develop Augmented Reality and Virtual Reality Application
5. Explore human, legal and social considerations.

Text Book(s)

1. Virtual Reality by Steve Lavalle, Cambridge University Press, 2016.
2. Steve Aukstakalnis , Practical Augmented Reality, A guide to technologies applications and human factors for AR and VR (usability), Addison-Wesley Professional, 1st Edition, 2016.

Reference Books

1. Paul Mealy, Virtual and Augmented Reality for Dummies, For Dummies, 1st Edition, 2018.
2. Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
3. Schmalstieg/Hollerer, Augmented Reality: Principles & Practice, Pearson Education India, 1st Edition, 2016.

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

Professional Elective – V

20CST420 DATA ANALYTICS AND VISUALIZATION

L	T	P	C
3	0	0	3

Pre-requisite 20CST103

Course Description:

The course introduces the concepts of data visualization techniques to apply various types of data mostly available. The course will provide a better knowledge about visualization mechanism, tools, techniques and use cases for applying on real world data and enhance their experience in solving real world problems.

Course Objectives:

1. To determine the evaluation of Data Science and Stages of Data Science
2. To apply Data Preprocessing steps and Data Visualization with statistical analysis on data
3. To examine various measures in Exploratory Data Analytics
4. To estimate the performance of Numpy and Pandas in Data Wrangling
5. To illustrate the Data using Data Visualization techniques by plotting various components

UNIT I INTRODUCTION **9 hours**

Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.
Introduction to Data Analytics – Difference between Data Science and Data Analytics, Descriptive, Diagnostic, Predictive and Prescriptive Analytics

UNIT II PREPROCESSING **9 hours**

Data Collection and Data Pre-Processing, Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization. Descriptive Statistics Sampling Techniques – Data Classification – Tabulation – Frequency and graphic Representation – Measures of Central Tendency – Measures of Variation – Quartiles and Percentiles.

UNIT III EXPLORATORY DATA ANALYTICS **9 hours**

Exploratory Data Analytics Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.

UNIT IV DATA WRANGLING **9 hours**

Data Wrangling with Numpy & Pandas: Python list vs NumPy arrays – What's the Difference? Creating a NumPy Array, Shape and Reshaping of NumPy Array, Expanding and Squeezing a NumPy Array, Indexing and Slicing of NumPy Array, Stacking and Concatenating NumPy Arrays, Broadcasting in NumPy Arrays, Sorting in NumPy Arrays, Pandas Series, Data Frame, indexing, sorting, loading data from CSV, Aggregation, concatenation, groupby.

UNIT V VISUALIZATION 9 hours

Visualization and simple metrices: Data Analytics Communication Data Types for Plotting Data Types and Plotting, Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binning's, and Density, Customizing Plot Legends, Customizing Colour bars, Multiple Subplots, Text and Annotation, Customizing Ticks.

Course Outcomes:

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

1. Understand the evaluation measure of data analytics.
2. Illustrate Data Preprocessing and Data Visualization techniques.
3. Compute various measures in Exploratory Data Analytics.
4. Implement Numpy and Pandas in Data Wrangling.
5. Examine data visualizations using various plots and customization techniques.

Text Book(s)

1. Data science Handbook – Field cady- Publisher -John Wiley & Sons Inc., 2017
2. Statistical inference for data science - Brian Caffo, Publisher - LeanPub, 2015
3. Introducing Data science by Davy cielen, Arno D.B.Meysman, Mohamed Ali, Publisher – Manning, Shelter Island, 2016

Reference Books

1. Doing Data Science, Straight talk from the front line- Rachel Schutt & Cathy O'Neil, O'Reilly Media 1st Edition, Kindle Edition, 2013
2. Probability and Statistics for Data Science-Carlos Fernandez-Granda, 2017
3. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing, and Presenting Data 1st Edition, Publisher – Wiley, 2015
4. Hands-On Exploratory Data Analysis with Python, Suresh Kumar Mukhiya, Usman Ahmed, Packt Publishing Limited, 2020
5. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data EMC Education Services, Willey. 6. Hands-On Data Analysis with NumPy and pandas by Curtis Miller.

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

Skill Oriented Course

Skill Oriented Course – I

20ENG601 CORPORATE COMMUNICATION LABORATORY

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: Continuous Internal Evaluation, Practical Examination.

Skill Oriented Course – II

20CST601 WEB DEVELOPMENT USING FLASK FRAMEWORK

L	T	P	C
1	0	2	2

Pre-requisite **20CSE101**

Course Description:
The course introduces the FLASK framework for web programming and its applications in static and dynamic content development. The course will well prepare the students to handle forms using the flask-wtf module, database using the flask-SQL Alchemy and enrich their experience in model development and manipulate data.

Course Objectives:

1. Create complete Flask applications
2. Work with session data
3. Design Jinja templates using inheritance
4. Integrate an SQLite database
5. Test and debug Flask applications

UNIT I OVERVIEW OF FLASK FRAMEWORK 6 Hours

Getting started With Flask, Web Framework, Critical Elements of the Python Flask Framework, Installing Python Packages with Pip. Basic Application Structure – Initialization, Routes and View Functions, Server Startup, The Request-Response Cycle.

a) Installation and running of Flask Framework.
b) Develop a Hello World Application using Flask Framework.
c) Develop a flask application with a dynamic route.

UNIT II TEMPLATES 6 Hours

The Jinja 2 Template Engine – Rendering Templates, Variables, Control Structures, Twitter Bootstrap Integration with Flask-Bootstrap, Custom Error Pages, Links, Static Files, Localization of Dates and Times with Flask – Moments.

a) Develop a template that uses the elements of the flask-bootstrap
b) Develop a custom error page using flask bootstrap.
c) Develop a base web application template with navigation bar.
d) Develop a custom code 404 error page using template inheritance.
e) Write a program to add a datetime variable and timestamp rendering with flask-moment.

UNIT III WEB FORMS **6 Hours**

Cross-Site Request Forgery (CSRF) Protection, Form Classes, HTML Rendering of Forms, Form Handling in view functions, Redirect and User Sessions, Message Handling.

a) Create an application that utilize the WTForms standard HTML fields.
b) Develop a web application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
c) Create a Webpage that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button.
d) Develop a web application that redirects and user sessions and flashed messages.
e) Develop a sample web form using route methods.

UNIT IV DATABASES **6 Hours**

SQL Databases, NoSQL Databases, SQL or NoSQL? Python Database Frameworks, Database Management with Flask-SQLAlchemy, Model Definition, Relationships. Database Operations – Creating the Tables, Inserting Rows, Modifying Rows, Defining Rows, Deleting Rows, Querying Rows. Database Migrations with Flask-Migrate.

a) Installation and configure of flask-sqlalchemy database with pip
b) Implement a program that uses the role and user model definition and relationships.
c) Create a database, tables and insert, modify delete, query the rows
d) Develop a web application by integrating the database in flask environment.

UNIT V EMAIL AND LARGE APPLICATION STRUCTURE **6 Hours**

Email Support with Flask-Mail – Sending Email from the Python Shell, Integrating Emails with the applications, Sending Asynchronous Email. Large Application Structure – Project Structure, Configuration Options, Application Package, Using an Application Factory, Implementing Application Functionality in a Blueprint, Launch Script, Unit Tests, Database Setup.

a) Develop a web application that configures the flask-mail for gmail.
b) Develop a web application that sends an email from the python shell and integrate the emails with the application.
c) Develop an application that launches the unit testing.

Course Outcomes:

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

1. Able to create routes with flask.
2. Understand the way to serve static content and files using Flask.
3. Implement to serve dynamic content using the Jinja Templating Engine.
4. Able to handle forms using the flask-wtf module.
5. Able to work with a database using the flask-SQL Alchemy module.
6. Able to create Models and manipulate data using them.

Text Books:

1. Miguel Grinberg, “Flask Web Development – Developing Web Applications with Python”, O Reilly, First Edition, May 2014.

2. Daniel Gaspar and Jack Stouffer, “Mastering Flask Web Development”, Second Edition, Packt Publishing Ltd., 2018.

Reference Books:

1. Shalabh Aggarwal, “Flask Framework Cookbook”, Second Edition, Packt Publication Pvt. Ltd, 2019.
2. Shalabh Aggarwal, “Flask Framework Cookbook”, Second Edition, Packt Publication Pvt. Ltd, 2019.
3. Andrew Ngo, “Developing Web Applications with Flask Framework: Easy to follow with step-by-step tutorial and examples”, Kindle Edition, 2017.Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Skill Oriented Course – II

20CST602 DATA SCIENCE USING R

L	T	P	C
1	0	2	2

Pre-requisite **20CSE101, 20CSE102**

Course Description:
This course describes how to use R for effective data analysis. The course covers practical issues in statistical computing which includes programming in R, reading data into R, accessing R packages, writing R functions, debugging, profiling R code, and organizing and commenting R code. In addition to this, drawing Graph and Chart through R has also been included.etc.

Course Objectives:
1. Understand the R Programming Language.
2. Exposure on Solving of data science problems.
3. Understand the classification, Regression Model and get an idea to plot various types of Charts and Graphs for data analyses.

UNIT I INTRODUCTION **6 Hours**
Introduction to Data Science – What is Data Science? Current landscape of Perspectives, Skills Sets Needed, Role of Data Scientist, Data Pre-Processing. Introduction to R – What is R? Installation of R, Basic features of R, R Objects, Creating Vectors and Matrices.

a. Using with and without R objects on console
b. Using mathematical functions on console
c. Write an R script, to create R objects for calculator application and save in a specified location in disk

UNIT II DESCRIPTIVE STATISTICS USING R **6 Hours**
Getting Data in and out of R, Managing Data Frames and Functions, Discrete and continuous random variables, Densities and distribution.

a. Write an R script to find basic descriptive statistics using summary
b. Write an R script to find subset of dataset by using subset ()

UNIT III DATA SUMMARIZATION **6 Hours**
Data Summarization – Measures of Central Tendency, Measures of Dispersion (quartiles, five number summary, variance, standard deviation), Measures of shape (skewness, kurtosis), Measures of association (covariance, correlation), Outliers

a. Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.
b. Reading Excel data sheet in R.
c. Reading XML dataset in R.

UNIT IV PREDICTIVE ANALYSIS USING MACHINE LEARNING TECHNIQUES USING R **6 Hours**

Machine learning – what, how, where. Supervised, unsupervised and semi-supervised learning. Training, validation, testing, Validation, Generalization, over fitting.

a. Find the data distributions using box and scatter plot.
b. Find the outliers using plot.
c. Plot the histogram, bar chart and pie chart on sample data
d. Find the correlation matrix.
e. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data

UNIT V BUILDING A REGRESSION MODEL USING R **6 Hours**

Features and feature engineering, Using Decision trees, Linear Classifiers, Naïve Bayes, Nearest Neighbor methods in R packages.

Apply regression Model techniques to predict the data on any dataset and process the classification and clustering model

a) Classification Model –
   i. Install relevant package for classification,
   ii. choose classifier for classification problem,
   iii. Evaluate the performance of classifier

b) Clustering Model -
   i. Clustering algorithms for unsupervised classification.
   ii. Plot the cluster data using R visualizations.

Course Outcomes:

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

1. Understand R programming statistical analysis.
2. Implement descriptive analytics using R programming.
3. Implement data summarization techniques to diverse datasets using R programming.
4. Apply predictive analysis through machine learning for data exploration using R programming.
5. Implement regression techniques using R.

Text Books:

1. "The Art of R Programming, A Tour of Statistical Soft Ware Design", Norman Matloff
2. "Hands-On Programming with R", Garrett Grolemund, O'Reilly Media, Inc.,

Reference Books:

1. "Exploratory Data Analysis with R", Roger D Peng.
2. "Data Visualization: A practical introduction", by Kieran Healy.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Skill Oriented Course – III

20CST603	**COMPUTER GRAPHICS**	**L T P C**
		1 0 2 2

Pre-requisite NIL

Course Description:

This course introduces fundamental concepts of graphics programming. This also discusses creation of 3D graphical scenes using open graphics library suits and familiar with image manipulation, enhancement. To Learn to create animations and to create a multimedia presentation Project.

Course Objectives:

1. Understand graphics programming using graphics library.
2. Students will become proficient in various line-drawing algorithms.
3. Explore and comprehend different algorithms for drawing circles and ellipses.
4. Students will be able to design and create interactive menu-driven programs.
5. Students will develop the skills to handle complex graphical objects.

UNIT I Introduction to Computer Graphics 6 hours

Introduction to Computer Graphics, graphics.h library in C/C++, drawing basic shapes: point, line & circle, drawing complex shapes – ellipses & arcs, Introduction to keyboard and mouse input handling in graphics, Introduction to transformation functions: translation, rotation, and scaling.

1. Study of basic graphics functions defined in "graphics.h".
2. Write a program to draw a Hut or other geometrical figures.
3. Write a program to perform rotation and scaling.

UNIT II Introduction to Line Drawing Algorithms 6 hours

Introduction to Bresenham's algorithm for line drawing, Efficiency and advantages of Bresenham's algorithm, Implementing DDA Algorithm, Comparing DDA algorithm with Bresenham's algorithm, Error analysis in Bresenham's algorithm and DDA algorithm, Techniques to minimize error and improve line drawing accuracy.

1. Write a program to draw a line using Bresenhem's algorithm.
2. Write a program to draw a line using DDA algorithm.
3. Write a program to draw a line using Mid-Point algorithm

UNIT III Drawing Circles and Ellipses, and Circle Rotation 6 hours

Introduction to Mid-Point Algorithm, drawing a Circle & Ellipse using Mid-Point Algorithm, Analyzing the efficiency and advantages of the Mid-Point algorithm for circles and ellipses, Understanding the concept of rotation and transformation matrices, Rotating a Circle around the Boundary of Another Circle

1. Write a program to draw a circle using mid-point algorithm.

2. Write a program to draw an Ellipse using Mid-Point algorithm.
3. Write a program to rotate a Circle around any arbitrary point or around the boundary of another circle.

UNIT IV Geometric Transformations Menu-Driven Program 6 hours

Overview of geometric transformations: rotation, scaling, and translation, concept of origin and coordinate systems, rotation matrices and mathematical concepts behind rotation, scaling transformation and its mathematical representation

1. Write a program to translate a line about the origin.
2. Implement a program to scale a square about the origin.
3. Write a menu driven program to rotate, scale and translate a line point, square, triangle about the origin.

UNIT V Line Clipping Algorithms 6 hours

Introduction to Line Clipping, Cohen-Sutherland Line Clipping Algorithm, Liang-Barsky Line Clipping Algorithm, Sutherland-Hodgman Polygon Clipping Algorithm.

1. Write a program to clip a line using Cohen-Sutherland algorithm.
2. Write a program to clip a line using Liang-Barsky algorithm.
3. Write a program to clip a polygon using Sutherland-Hodgman algorithm

Course Outcomes:

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

1. Understanding of basics of graphics libraries.
2. Understand and implement various algorithms to draw lines efficiently.
3. Understand the various algorithms for drawing circles and ellipses.
4. Implement menu-driven programs to apply these transformations to various geometric objects.
5. Implement various algorithm and effectively work with complex graphical objects

Textbook(s)

1. John F. Hughes, Andries Van Dam, Morgan Mc Guire, David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley,"Computer Graphics: Principles and Practice", , 3rd Edition, AddisonWesley Professional,2013. (UNIT I, II, III, IV).

2. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007.

Reference Books

1. Donald Hearn and M. Pauline Baker, Warren Carithers, "Computer Graphics with Open GL", 4th Edition, Pearson Education, 2010.
2. Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers, 2006.

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

Skill Oriented Course – III

20CST604 **DATA MINING** **L T P C**
1 0 2 2

Pre-requisite **20CST202**

Course Description:

Data Mining studies algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data. Before starting a data-mining project, it is essential to determine the tasks to be performed and properly manage allocation of tasks among individuals involved in the data analysis. Hence, planning is important as it results in effective data analysis.

Course Objectives:

1. To familiarize student with the algorithms of data mining.
2. To be acquainted with the tools and techniques used for Knowledge Discovery in Databases.
3. To be exposed to web mining and text mining.
4. To acquire basic knowledge on Correlation Analysis of Data.
5. To gain knowledge on Classification techniques.

UNIT I DATA MINING AND DATA MODELS 6 hours

Introduction to basic concepts of data mining and different data models used to represent the data.

a) Explore various commands given in PL/SQL in Oracle8.0.
b) Execute multi-dimensional data model using SQL queries.
c) Perform SQL queries related data sets.

UNIT II DATA WARE HOUSING & ONLINE ANALYTICAL PROCESSING 6 hours

Introduction to Data warehousing concepts, data warehousing modelling and usage of data warehouse and information processing.

a) Implement various OLAP operations such as slice, dice, rollup, drill up, pivot etc.
b) Implementation of Text Mining on the data warehouse.

UNIT III CORRELATION ANALYSIS. 6 hours

Redundancy and Correlation Analysis, Correlation Test for Nominal Data, Correlation Coefficient for Numeric Data, Covariance of Numeric Data

a) Write a program to calculate Correlation for given Nominal data & Numeric data.

b) Explore the correlation-ship analysis between the dataset.

c) Evaluate attribute relevance analysis on a weather data warehouse.

UNIT IV BASIC CLASSIFICATION TECHNIQUES 6 hours

Introduction to basic concepts of classification, Attribute Selection Measures, Bayes Classification Methods.

a) Evaluate Information Gain of an attribute in the student database.

b) Implement Decision Tree Algorithm

c) Experiment to predict the class using the Bayesian classification.

UNIT V ADVANCED CLASSIFICATION METHODS AND MECHANISMS 6 hours

Introduction to advanced Concepts and Mechanisms, Training Bayesian Belief Networks, A Back Propagation Neural Network, and others classification methods and algorithms.

a) Find out a weight & bias updating using the Back Propagation Neural Network.

b) Implement SVM algorithm

c) To perform various data mining algorithms on the give database using WEKA.

Course Outcomes:

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

1. Illustrate the algorithms of data mining.
2. Analyze the performance of tools and techniques used for Knowledge Discovery in Databases.
3. Analyze various web mining and text mining Algorithms.
4. Apply the Classification Algorithms for data mining applications.
5. Use Weka tools to demonstrate data mining concepts.

Text Book(s)

1. Data Mining and Data Warehouse by Udit Agarwal
2. Data Mining Introductory & advanced topic by Margaret H. Dunham, Pearson Education

Reference Books

1. Data Warehousing, Data Mining & OLAP by Alex Berson Stephen J.Smith.

2. Data Mining: Next Generation Challenges and Future Direction by Kargupta, et al, PHI.

Online Material links:

1. https://jntukucen.ac.in/ebook_files/116.pdf

Mode of Evaluation: End Semester Examination

Skill Oriented Course - IV

20CST605 SOFTWARE TESTING

L	T	P	C
1	0	2	2

Pre-requisite 20CSE102, 20CST109

Course Description:
This course introduces fundamental concepts of different software testing tools and their features. It also discusses about testing with the intent of finding an error and to learn how to prepare software testing documents and communication with an Engineers in various forms. It also helps to gain the techniques and skills on how to use modern software testing tools to support software testing projects.

Course Objectives:
1. Understand different software testing tools and their features.
2. Manage the project from beginning to end.
3. Testing is a process of executing a program with the intent of finding error.
4. To learn how to write software testing documents, and communicate with engineers in various forms.
5. To gain the techniques and skills on how to use modern softwaretesting tools to support software testing projects.

UNIT I INTRODUCTION TO SOFTWARE TESTING 6 hours

Introduction to Testing, Importance of testing, Roles and Responsibilities, Principles of software testing, What is Quality?, How much testing is enough?, Basics of C Language.

a) Write programs in C- Language to demonstrate the working of the following constructs.

i) do-while ii) while….do iii) if…else iv) switch v) for

b) A program written in C- language for Matrix Multiplication fails´ Introspect the causes for its failure and write down the possible reasons for its failure.

c) Design and develop a program in C language to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all.

UNIT II TEST CASE DESIGN TECHNIQUES 6 hours

Introduction to Test Case Designing, Test Case Design Techniques: Static and Dynamic, Test Case Template, Type of Test Cases, Writing test cases, Reviewing Test Cases.

a) Take any system (e.g. ATM system) and study its system specifications and report the various bugs.
b) Write the test cases for any known application (e.g. Banking application).
c) Write the test cases for GMAIL.

UNIT III TEST PLANNING 6 hours

Objective of Test Plan, Scope of Testing, Testing Lifer Cycle, Assumptions, Roles and Responsibilities, Risks and Mitigations, Entry and Exit Criteria.

a) Create a test plan document for FACEBOOK.
b) Create a test plan document for TWITTER.
c) Create a test plan document for Library Management System Application

UNIT IV INTRODUCTION TO WEB TESTING TOOL 6 hours

Introduction to Selenium-Advantages and disadvantages of Selenium, Selenium-IDE, IDE Features, SELENSE Commands-Actions, Accessors, Assertions.

a) Study of any web testing tool (e.g. Selenium)
b) Create a simple Selenium IDE Script and run it.
c) Create a simple Selenium IDE Script and use "Execute this command" option.

UNIT V AUTOMATION TOOLS: WINRUNNER, TEST DIRECTOR 6 hours

Introduction to WinRunner, Features of Winrunner, Benefits of Automated Testing, Modes of Recording in Winrunner. **Introduction to Test Director, How to create tests, How to track the defects.**

a) Installation process of WinRunner tool.
b) Study of any test management tool (e.g. test director).
c) Study of testing tool (e.g.winrunner).

Course Outcomes:

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

1. Understand the history, cost of using and building CASE tools.
2. Design test cases using black box testing technique which includes decision tables domain testing and transition testing.
3. Construct test cases for a white box testing technique which includes path testing, data flow graphs and matrix representation for a given problem.
4. Execute how to run test script wizard and how to do performance testing using testing tools like Winrunner and JMeter respectively.
5. Demonstrate the importance of testing and its role in need of software development.

Text Book(s)

1 Software testing techniques – Boris Beizer, Dreamtech, second edition.

2. Software Testing- Yogesh Singh, Camebridge. 3. Introduction to Software Testing, Paul Ammann and Jeff Offutt, Cambridge University Press, 2nd edition, 2016.

3 Addison-Wesley, "Automated Software Testing: Introduction, Management, and performance", Elfriede Dustin, ‚Jeff RashkaJohn Paul · 1999

4 Rex Black,"Managing the Testing Process, Practical Tools and Techniques for Managing Hardware and Software Testing", Publisher: Wiley, 2003.

Reference Books

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing, 3rd Edition,P.C. Jorgensen, Aurbach Publications (Dist.by SPD).
3. Software Testing, N.Chauhan, Oxford University Press.

Online Material links:

1. https://www.youtube.com/watch?v=DKXkyzBV5Hw&list=PLQ7x7oTdExNIcM1lhKw1KdBeAq_VYD6fX
2. https://www.softwaretestingmaterial.com/manual-testing-tutorial/
3. https://www.javatpoint.com/manual-testing

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Skill Oriented Course – V

20CST606 PATTERN RECOGNITION

L	T	P	C
1	0	2	2

Pre-requisite 20CST109

Course Description:
Pattern recognition techniques are used to design automated systems that improve their own performance through experience. This course covers the methodologies, technologies, and algorithms of statistical pattern recognition from a variety of perspectives. Topics including Bayesian Decision Theory, Estimation Theory, Nonparametric Techniques, Neural Networks, Decision Trees, and Clustering Algorithms etc. will be presented.

Course Objectives:
1. Understand basic concepts in pattern recognition
2. Gain knowledge about state-of-the-art algorithms used in pattern recognition research
3. Understand pattern recognition theories, such as Bayes classifier, linear discriminant analysis.
4. Apply pattern recognition techniques in practical problems.
5. Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.

UNIT I BASIC IMAGE PROCESSING AND STATISTICS 6 hours

Introduction to image classification and analysis, Reading and loading images, Calculating basic statistics such as mean, mode, and standard deviation. Naïve Bayesian Classifier, Bayesian Networks.

d) Assuming a set of images that need to be classified, read the images and calculate basic statistics such as mean, mode, standard deviation etc.
e) 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.
f) Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients.

UNIT II BAYES THEOREM & K-NEAREST NEIGHBORS ALGORITHM 6 hours

Introduction to Bayes Theorem and its formula, Implementing Bayes Theorem in a program, Applying the formula to calculate probabilities. Introduction to KNN algorithm, Implementing KNN on an image dataset, Understanding the concept of distance metrics for image comparison.

c) Write a program to implement Bayes Theorem and its Formula.
d) Write a program to implement KNN on an image dataset.

UNIT III COCKE–YOUNGER–KASAMI PARSING ALGORITHM & PRINCIPLE COMPONENT ANALYSIS **6 hours**

Introduction to CYK parsing algorithm, Understanding syntactic pattern recognition, Implementing the CYK parsing algorithm in a program. Introduction to PCA and dimensionality reduction, Implementing PCA algorithm, Understanding eigenvalues, eigenvectors, and feature extraction.

a) Implement Cocke–Younger–Kasami (CYK) Parsing Algorithm using Syntactic Pattern Recognition
b) Write a program to implement PCA (Principle Component Analysis).

UNIT IV EXPECTATION-MAXIMIZATION (EM) AND K-MEANS CLUSTERING **6 hours**

Introduction to clustering algorithms: EM and k-Means, Applying EM algorithm for clustering on a CSV dataset, Applying k-Means algorithm for clustering on the same dataset, Comparing and evaluating the results of both algorithms.

d) Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means algorithm.
e) Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

UNIT V DECISION TREE WITH ID3 ALGORITHM & NEURAL NETWORK **6 hours**

Introduction to decision trees and ID3 algorithm, Building a decision tree using an appropriate dataset, Applying the decision tree to classify new samples. Introduction to neural networks and digit recognition, Building a neural network for handwritten digit recognition, Training the network using appropriate datasets, Evaluating the performance of the network on test data

d) 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.
e) Develop a system for Handwritten Digit Recognition using Neural Network

Course Outcomes:

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

1. Summarize the various techniques involved in pattern recognition
2. Design and develop the Bayesian classifier networks based on pattern recognition
3. Discuss the applications of pattern recognition in various applications
4. Develop the clustering techniques using K-means and EM algorithms
5. Demonstrate the working of the decision tree based ID3 algorithm

Text Book(s)

1. Richard O. Duda , Peter E. Hard , David G. Stork- "Pattern Recognition" 2nd edition 2021 Wiley India
2. Sankar K. Pal, Pabitra Mitra " Pattern Recognition Algorithms for Data Mining" Chapman and Hall/CRC; 1st edition 2019

Reference Books

1. Christopher M. Bishop "Pattern Recognition and Machine Learning" Springer 2016
2. Stuart Russell and Peter Norvig “Artificial intelligence: a modern approach”, Pearson Education; 4th edition 2022

Online Material links:

1. https://www.simplilearn.com/pattern-recognition-and-ml-article
2. https://www.geeksforgeeks.org/pattern-recognition-introduction/
3. https://www.mygreatlearning.com/blog/pattern-recognition-machine-learning/

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Skill Oriented Course – V

20CST607 STATISTICS WITH R PROGRAMMING

L	T	P	C
1	0	2	2

Pre-requisite 20CST602

Course Description:
This course provides a solid undergraduate foundation in both probability theory and mathematical statistics and at the same time provides an indication of the relevance and importance of the theory in solving practical problems in the real world.

Course Objectives:

1. Understand the Manipulation of data within R.
2. Be exposed to create graphs and charts used in introductory statistics.
3. Be familiar with different distribution using R.
4. Learn to carry out hypothesis testing and calculate confidence intervals.
5. Perform linear regression models for data analysis.

UNIT I INTRODUCTION 6 hours

R interpreter, Introduction to major R data structures like vectors, matrices, arrays, list and data frames, Control Structures, vectorized if and multiple selection, functions.

a) Write a program that creates a 3-dimensional array and calculates the sum of all its elements.
b) Write a program that takes a number as input and checks if it is positive, negative, or zero. Print the corresponding message based on the input.
c) Write a program that defines a function to calculate the factorial of a given number. Test the function by calculating the factorial of 5.

UNIT II DATA EXTRACTION AND NORMALIZING 6 hours

Read/write data from/in files, extracting data from web-sites, Clean data, Transform data by sorting, adding/removing new/existing columns, centring, scaling and normalizing the data values, converting types of values, using string in-built functions.

a) Write a program that extracts the title and description of articles from a given website and stores them in a data frame.
b) Write a program that removes missing values from a given data frame and saves the cleaned data frame as a new CSV file.
c) Write a program that takes a vector of numerical values and performs centering, scaling, and normalization operations on it, and then prints the transformed vector.
d) Write a program that reads a sentence from the user, counts the number of words in the sentence, and displays the result.

UNIT III STATISTICAL ANALYSIS AND VISUALIZATION 4 hours

Statistical analysis of data for summarizing and understanding data, Visualizing data using scatter plot, line plot, bar chart, histogram and box plot

a) Write a program that reads a CSV file containing numerical data and computes the mean, median, and standard deviation of a specific column.
b) Write a program that reads a CSV file containing two columns of numerical data and creates a scatter plot, a line plot, a bar chart, a histogram, and a box plot for the data.

UNIT IV BINOMIAL DISTRIBUTION & HYPOTHESES 8 hours

Binomial Distribution - Building Confidence in Confidence Intervals - Perform different Tests of Hypotheses

a) Write a program that generates random numbers from a binomial distribution with parameters n and p, and calculates the mean and variance of the distribution.
b) Given a dataset of observations, write a program that calculates a confidence interval for the population mean using the t-distribution.
c) Write a program that performs a hypothesis test for a binomial distribution, given a null hypothesis, alternative hypothesis, and significance level
d) Write a program to perform a chi-square test of independence for a contingency table.

UNIT V EXPLORATORY DATA ANALYSIS AND VISUALIZATION 6 hours

Correlation Spotting Problems in Data with Visualization: visually Checking Distributions for a single Variable - Estimating a Linear Relationship.

a) Write a program that reads a dataset with two numerical variables and creates a scatter plot to visualize their relationship. Add a linear regression line to the plot.
b) Develop a program that reads a dataset with a numerical variable and creates a histogram with a density curve to check for deviations from a normal distribution.

Course Outcomes:

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

1. Understand the fundamentals of R programming and major data structures.
2. Acquire skills in data extraction and normalization.
3. Perform statistical analysis and visualization of data.
4. Apply statistical concepts and hypotheses testing.
5. Perform exploratory data analysis and visualization.

Text Book(s)

1. Maria Dolores Ugarte , Ana F. Militino , Alan T. Arnholt "Probability and Statistics with R" 2nd Edition on, CRC Press, 2016.

2. P. Dalgaard. Introductory Statistics with R, 2nd Edition. (Springer 2008).

Reference Books

1. Michael Akritas, " Probability & Statistics with R for Engineers and Scientists", 2nd Edition on, CRC Press, 2016.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Skill Oriented Course – V

20CST608 MIDDLEWARE TECHNOLOGIES

L T P C
1 0 2 2

Pre-requisite 20CST105, 20CST106, 20CST112

Course Description:

This course provides students with practical knowledge and skills in designing, implementing, and managing middleware systems. Students will gain hands-on experience with various middleware technologies and tools commonly used in enterprise applications. The course focuses on the practical aspects of middleware, including configuration, integration, and troubleshooting.

Course Objectives:

1. Understand the basic concepts and configuration of a message queue system.
2. Design and implement a service-oriented architecture using web services.
3. Gain hands-on experience in building an enterprise service bus for message routing and transformation.
4. Explore security mechanisms and authentication in middleware systems.
5. Learn how to monitor and optimize the performance of middleware systems.

UNIT I Introduction To Message Queue Systems 6 hours

Introduction to Apache Kafka & RabbitMQ, architecture and components of Apache Kafka, Producers and Consumers Implementation.

Experiment 1: Setting up a Message Queue System

a. Set up a message queue system such as Apache Kafka or RabbitMQ.
b. Configure the necessary components, including producers and consumers.
c. Write a program that sends messages to the message queue.

UNIT II Introduction to Service-Oriented Architecture (SOA) 6 hours

Overview of SOA principles and concepts, benefits and challenges of SOA, service interfaces and operations using WSDL, Implementing SOAP-based web services

Experiment 2: Implementing a Service-Oriented Architecture (SOA)

a. Identify a specific scenario where a service-oriented architecture can be applied.
b. Design the service interfaces and define the operations and data formats using WSDL.
c. Implement the services using a programming language (e.g., Java, C#, or Python).

UNIT III Introduction to Enterprise Service Bus (ESB) 6 hours

Architecture, key features and capabilities of an ESB, Message trasformation and routing in ESB

Experiment 3: Building an Enterprise Service Bus (ESB)

a. Select an ESB platform such as Apache Camel, MuleSoft, or IBM Integration Bus.
b. Set up the ESB environment and configure the necessary components.
c. Define integration routes for different services using the ESB's routing capabilities.

UNIT IV Middleware Security and Authentication 6 hours

Potential security risks and vulnerabilities in distributed environments, authentication and authorization in middleware systems, Transport Layer Security (TLS) and Secure Communication.

Experiment 4: Middleware Security and Authentication

a. Implement secure communication between middleware components using SSL/TLS.
b. Configure authentication and authorization mechanisms in the middleware system.
c. Experiment with different authentication methods such as username/password, tokens, or certificates.

UNIT V Performance Monitoring and Management 6 hours

Performance measuring metrics, Performance monitoring tools for middleware systems, Load Testing and Stress Testing

Experiment 5: Middleware Performance Monitoring and Management

a. Set up a performance monitoring tool such as JMX or Prometheus.
b. Monitor the key performance metrics of the middleware components in real-time.
c. Generate a load on the middleware system and observe the impact on performance.

Course Outcomes:

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

1. Implement message passing system.
2. Design and implement service interfaces using WSDL
3. Develop an enterprise service bus for message routing and transformation.
4. Analyzes various security mechanisms and authentication in middleware systems.
5. Interpret various performance metrics of middleware systems.

Text Book(s)

1. Etzkorn Letha Hughes - " Introduction to Middleware " 1st Edition, CRC Press, 2017

2. Myerson Judith M " The Complete Book of Middleware" 1st Edition, CRC Press, 2017.

Reference Books

1. Shankarmani Radha " Middleware & Enterprise Integration Technologies” Wiley India Pvt. Ltd 2009
2. Serain Daniel “Middleware and Enterprise Application Integration”, Springer; 2nd edition 2002

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Skill Oriented Course–V

20CST609 SELENIUM WITH JAVA

L	T	P	C
1	0	2	2

Pre-requisite 20CST109

Course Description:

Selenium with Java is a free automation testing tool for web applications. It is able to work with different browsers like Chrome, Firefox, IE, Opera and simulate human like behavior. Selenium is able to interact with all the different elements in a webpage. It can click on them, input text, extract text and much more. By covering all the different functionalities on your website with Selenium tests, you will be able to quickly catch new and reappearing old bugs. This will save your time and money, we can run our test cases on various environments using selenium grid and we can integrate with project management tools for managing the projects.

Course Objectives:

1. Understand basic concepts in Selenium-IDE
2. Understand Selenium RCand Commands.
3. Understand Selenium Webdriver And Locators,Scripting using WebDriver.
4. Understand Interactions techniques, Keyboard Actions, Multi Select Action in practical problems.
5. Understand variety of Data Driven using Excel, Parameterization.

UNIT I INTRODUCTION TO SELENIUM AND SELENIUM IDE 6 hours

Introduction to Selenium-Advantages and disadvantages of Selenium, Selenium-IDE, Installing and opening the IDE, IDE Features, Script debugging.

1. Install and check the features of Selenium IDE.
2. Create a simple Selenium IDE Script and run it.
3. Create a simple Selenium IDE Script and use "Execute this command" option.
4. Create a simple Selenium IDE Script and use break point and starting point options.

UNIT II SELENIUM RC AND COMMANDS 6 hours

Introduction to Selenium RC, RC Architecture, RC-Scripting. SELENSE Commands-Actions, Accessors, Assertions.

5. Create a Selenium IDE script using actions commands.
6. Create a Selenium IDE script using accessors commands.
7. Create a Selenium IDE script using assertions commands.
8. Write a sample Selenium RC script for login page.

UNIT III SELENIUM WEBDRIVER AND LOCATORS 6 hours

Introduction to Selenium web-driver, webdriver Architecture, Selenium RC Vs WebDriver, Scripting using WebDriver, Most Used Commands, LOCATORS, Locators Usage-ID, Name, Class Name, Tag Name, Link Text , Partial Link Text.

9. Install Selenium webdriver and write java code to access google chrome browser.

10. Develop a java code with ID, Name and Class locators by using Selenium web-driver.
11. Develop a java code to locate web elements with LinkText, PartialLinkText and TagName locators by using Selenium web-driver.
12. Write a java code by using CssSelector and XPath locators.

UNIT IV INTERACTIONS AND SYNCHRONIZATION 6 hours

INTERACTIONS-Introduction ,User Interactions, Text Box Interaction, Radio Button Interaction, Check Box Interaction, Dropdown Interaction, Synchronization, Drag & Drop, Keyboard Actions, Multi Select Action.

13. Write a Java code to type in textbox using Selenium WebDriver.
14. Write a Java code to select Radio Button and Check Box using Selenium WebDriver.
15. Write a Java code to select Drop-Down and Multi Select using Selenium WebDriver.
16. Develop a Java code to implement Keyboard Actions by using Actions class in Selenium.

UNIT V TEST DESIGN TECHNIQUES 6 hours

TEST DESIGN TECHNIQUES- Introduction, Page Object Model, POM Flow Diagram, Data Driven using Excel, TestNG framework.

17. Write a java code to implement POM(Page Object Model).
18. Write a java code to read data from a Excel file.
19. Develop a java code to automate the testing process by using TestNG framework.

Course Outcomes:

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

1. Students able to identify difference between Manual and Automation Testing, features of Selenium IDE.
2. Utilize the Selenium IDE commands in testing.
3. Implement java script to identify and work with different WebElements.
4. Analyze different user interactions on a webpage.
5. Implement and analyze different test models and frameworks to automate the testing process.

Text Book(s)

1. Boni Garcia, “ Hands-On Selenium WebDriver with Java ” O’RE ILLY publications 2022.
2. Pallavi Sharma, “Selenium with Java – A Beginner’s Guide: Web Browser Automation for Testing using Selenium with Java” English Edition 2022

Reference Books

1. Navneesh Garg, “Test Automation using Selenium WebDriver with Java” 2014.
2. Unmesh Gundecha, Carl Cocchiaro, “ Learn Selenium ” by Packt Publishing 2019.

Online Material links

1. https://www.guru99.com/selenium-tutorial.html
2. https://www.tutorialspoint.com/selenium/selenium_webdriver.htm

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

MINOR

Minor

20MDCST101 DATA STRUCTURES AND ALGORITHMS
(Except EEE Branch)

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 linked lists, stacks, queues, various types of trees, graphs and their implementation.

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

UNIT I LIST AND STACK 9 hours

Introduction: Algorithm specification, growth of functions, Asymptotic notations.
List: Singly Linked List and Its Operations, Doubly Linked List and its operations, Circular Lists.
Stack: Array representations, operations on stack. Applications of Stack.

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

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

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

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:
At the end of the course, students will be able to:
1. Design algorithms to implement various linked lists.
2. Implement queues using arrays and linked lists.
3. Compare the complexity of various sorting techniques.
4. Create binary tree and implement different traversal techniques.
5. Develop solutions for problems based on graphs.

Text Books:

1. Data Structures and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffery D.Ulman.Pearson; 1st edition.
2. Data Structures and Algorithms Made Easy, Narasimha Karumanchi, CareerMonk Publications; 5th edition.

Reference Books

1. Robert L. Kruse, Alexander J. Ryba, Data Structures and Program Design in C++, Prentice Hall, 2ed.
2. Fundamentals of Data Structures using C++, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta,
3. Silicon Press, Second Edition. 2007.
4. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
5. Data Structures, Algorithms and Applications in C++ by Sartaj Sahni, McGraw Hill, NY, Second Edition.
6. URL: http://nptel.ac.in/courses/106102064/
7. URL: https://swayam.gov.in/nd2_cec19_cs04
8. URL: https://swayam.gov.in/nd1_noc19_cs40

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

Minor

20MDCST102 DESIGN AND ANALYSIS OF ALGORITHMS
(For EEE Branch)

L	T	P	C
3	0	0	3

Pre-requisite **Nil**

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 of different algorithms.
2. Identify optimal solution for different problems using greedy method and dynamic programming.
3. Implement various graph based algorithms.
4. Make use of backtracking and branch & Bound methods to solve real world problems.
5. Understand 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.

Minor

20MDCST103 DATABASE SYSTEMS

L T P C
3 0 0 3

Pre-requisite **NIL**

Course Description:

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

Course Objectives:

1. To understand the concept of DBMS and ER Modeling.
2. To explain the normalization, Query optimization and relational algebra.
3. To have an introductory knowledge about the storage and query processing techniques and the basic concepts of Information retrieval techniques
4. To learn about the internal storage structures using different file and indexing techniques which will help in physical DB design
5. To apply the concurrency control, recovery, security and indexing for the real time data.

UNIT I DATABASE SYSTEMS CONCEPTS AND DATA MODELING 9 hours

Introduction to Databases- File System Vs Database System - Data Models- Schemas and Instances - DBMS Architecture- Centralized - Client Server - Database Applications.

Entity Relationship Model: Types of Attributes, Relationship, Structural Constraints - Relational Model, Relational model Constraints - Mapping ER model to a relational schema - Integrity Constraints.

UNIT II SQL 9 hours

The Database Language SQL – Simple Queries in SQL – Queries Involving More than One Relation, Sub Queries, aggregate operators, null values, complex integrity constraints, triggers and active databases Embedded SQL, Dynamic SQL, Cursors, Introduction to JDBC, Stored Procedures.

UNIT III SCHEMA REFINEMENT 9 hours

Translating SQL Queries into Relational Algebra and Relational Calculus, Guidelines for Relational Schema – Functional dependency; Normalization, Boyce Codd Normal Form, Multi-valued dependency and Fourth Normal form; Join dependency and Fifth Normal form.

UNIT IV DATA STORAGE AND TRANSACTION MANAGEMENT 9 hours

Storage strategies: Indices, B-trees, B^+-trees, hashing. Two-Phase Locking Techniques for Concurrency Control -ACID Property– Concurrency Control based on timestamp – Recovery Concepts – Recovery based on deferred update – Recovery techniques – Buffer management.

UNIT V DATABASE SECURITY AND RECENT TRENDS 9 hours

Database Authentication, Authorization and access control, DAC, MAC and RBAC models, SQL injection. Introduction, Need of NoSQL, CAP Theorem and Recent trends.

Course Outcomes:

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

1. To understand basic concept and role of DBMS in an organization.
2. Illustrate the design principles for database design, ER model and normalization for real time applications.
3. Demonstrate Concurrency control and recovery mechanisms for the desirable database problem.
4. Analysis the basic database storage structure and access techniques including B Tree, B+ Trees and hashing.
5. Design and implement the database system with the fundamental concepts of DBMS.

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: Assignments, Mid Term Tests, End Semester Examination.

Minor

20MDCST104 BIG DATA ANALYTICS

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course introduces fundamental concepts and tools required to understand Data analytics. The also discusses big data applications in Data Science and covers the applications and technologies needed to process the large-scale data.

Course Objectives:

1. To learn data mining and big data basics
2. To learn the big data in technology perspective
3. To learn Hadoop framework for data analytics
4. Applying MapReduce paradigm to solve problems
5. To interpret the potential applications in big data scenario.

UNIT I INTRODUCTION TO DATA MINING AND BIG DATA — 9 hours

Introduction to Data mining, KDD process, Data Mining Techniques: Mining Frequent patterns, Association rule, Cluster analysis, Classification and Regression. Introduction to Big Data - What is Big Data? Explosion in Quantity of Data, Big Data Characteristics, Types of Data, Common Big data Customer Scenarios, BIG DATA vs. HADOOP, A Holistic View of a Big Data System, Limitations of Existing Data Analytics Architecture.

UNIT II DATA ANALYTICS LIFE CYCLE — 9 hours

Introduction to Big data Business Analytics - State of the practice in analytics role of data scientists- Key roles for successful analytic project - Main phases of life cycle - Developing core deliverables for stakeholders.

UNIT III INTRODUCTION TO HADOOP — 9 hours

Why DFS? What is Hadoop? Hadoop Distribution, Hadoop Key Characteristics, RDBMS vs. Hadoop, Hadoop 2.x Cluster Architecture, Hadoop Architecture, Hadoop Storage: HDFS, Common Hadoop Shell commands, Anatomy of File Write and Read, Name Node, Secondary Name Node, and Data Node, Hadoop 2.0 New Features – Name Node High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN Hadoop Distributed File System.

UNIT IV PROGRAMMING FOR DATA ANALYTICS — 9 hours

MapReduce program in Java – Map Reduce API – Programming Examples- Combiner Functions Streams and Files - Streams – Text Input and Output – Reading and Writing Binary Data.

UNIT V DATA SCIENCE AND APPLICATIONS — 9 hours

Data Loading Techniques & Data Analysis, Text Analytics for Large unstructured information, Analytic Stack, Big Data Applications - Fraud detection in Stock markets, Sentiment Analysis.

Course Outcomes:

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

1. Apply data mining algorithms for classification and clustering.
2. Understand Big data framework.
3. To understand the map reduce way of solving analytic problems.
4. Illustrate the problem and its solution.
5. Analyze big data applications.

Text Book(s)

1. Jiawei Han Micheline Kamber Jian Pei, Data Mining: Concepts and Techniques, Third Edition, Elsevier, Morgan Kaufmann, 2011.
2. Tom White, "Hadoop: The Definitive Guide", 3rd Edition, O'reilly, 2012.
3. Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014.
4. Eric Siegel, Thomas H. Davenport, "Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die", Wiley, 2013.

Reference Books

1. Chuck Lam, Hadoop in Action, Manning, Second Edition, 2016.
2. Mark Gardener, Beginning R: The Statistical Programming Language, Wiley, 2013.
3. Jiawei Han and Micheline Kamber, Data Mining, Second Edition, Elsevier, 2007. ISBN: 81-312-0535-5.

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

Minor

20MDCST105 DATA MINING AND DATA WAREHOUSING

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:
In this course we explore how this interdisciplinary field brings together techniques from databases, statistics, machine learning, and information retrieval. We will discuss the main data mining methods currently used, including data warehousing and data cleaning, clustering, classification, association rules mining, and web mining.

Course Objectives:
1. To understand the fundamentals of Data mining and Pre-processing techniques
2. To understand the concept of Data warehouses.
3. To understand the algorithms of supervised techniques.
4. To understand the algorithms of unsupervised techniques.
5. To know the applications of data mining in the real world.

UNIT I INTRODUCTION TO DATA MINING 9 hours

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation, role of Data warehousing in Data mining.

UNIT II MINING FREQUENT PATTERNS 9 hours

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining

UNIT III CLASSIFICATION AND PREDICTION 9 hours

Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation, Lazy Learners, Other

Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods.

UNIT IV CLUSTER ANALYSIS 9 hours

Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

UNIT V APPLICATIONS IN DATA MINING 9 hours

Social networks Analysis, Web mining, Text mining, Multimedia.

Course Outcomes:

1. Student is able to preprocess any real world dataset by using preprocessing techniques.
2. Able to distinguish the OLTP and OLAP.
3. Able to implement data mining techniques such as Associations, classification.
4. Able to implement clustering techniques and its applications.
5. Students can identify the applications where data mining techniques can be applied.

Text Books

1. Tan, Pang-Ning& others. “Introduction to Data Mining” Pearson Education, 2006.

Reference Books

1. Han J &Kamber M, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publishers, Second Edition, 2006

2. Dunhum M.H. & Sridhar S. “Data Mining-Introductory and Advanced Topics”, Pearson Education, 2006.

3. Grigoris Antoniou and Frank van Harmelen “A Semantic Web Primer”, The MIT Press Cambridge, Massachusetts London, England 2003.

4. S. Sumathi& S.N. Sivanandam “Introduction to Data mining and its applications”, Springer-verlag.

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

Minor

20MDCST201 BIG DATA MANAGEMENT AND DATA ANALYTICS LABORATORY

L	T	P	C
0	0	4	2

Pre-requisite -NIL-

Course Description:

Modern scientific, engineering, and business applications are increasingly dependent on data, existing traditional data storage technologies were not designed for the complexity of the modern world. Data Analytics has emerged as a new, exciting, and fast-paced discipline that explores novel statistical, algorithmic, and implementation challenges that emerge in processing, storing, and extracting knowledge from Big Data.

Course Objectives:

1. To optimize business decisions and create competitive advantage with Big Data Analytic.
2. Imparting the architectural concepts of Hadoop and introducing map reduce paradigm.
3. To introducing Java concepts required for developing map reduce programs
4. To derive business benefit from unstructured data
5. Introduce programming tools PIG & HIVE in Hadoop echo system.
6. Developing Big Data applications for streaming data using Apache Spark

List of Programs:

1. Perform setting up and Installing Hadoop in its two operating modes:
   - Pseudo distributed
   - Fully distributed.

2. Use web based tools to monitor your Hadoop setup.

3. a) Implement the following file management tasks in Hadoop:
   - Adding files and directories
   - Retrieving files
   - Deleting files

   b) Benchmark and stress test an Apache Hadoop cluster.
4. Stop word elimination problem:
   - Input:
     A large textual file containing one sentence per line
     A small file containing a set of stop words (One stop word per line)
   - Output:
     A textual file containing the same sentences of the large input file without the words appearing in the small file.
5. a) Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
   Data available at: https://github.com/tomwhite/hadoop-book/tree/master/input/ncdc/all.
   - Find average, max and min temperature for each year in NCDC data set?

- Filter the readings of a set based on value of the measurement, Output the line of input files associated with a temperature value greater than 30.0 and store it in a separate file.

6. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

7. Write a Pig Latin scripts for finding TF-IDF value for book dataset (A corpus of eBooks available at: Project Gutenberg).

8. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, Functions and indexes.

9. Install, Deploy & configure Apache Spark Cluster. Run apache spark applications using Scala.

10. Data analytics using Apache Spark on Amazon food dataset, find all the pairs of items frequently reviewed together. Write a single Spark application that:
    - Transposes the original Amazon food dataset, obtaining a PairRDD of the type:
    - <user_id> → <list of the product_ids reviewed by user_id>
    - Counts the frequencies of all the pairs of products reviewed together;
    - Writes on the output folder all the pairs of products that appear more than once and their frequencies. The pairs of products must be sorted by frequency.

Course Outcomes:

After completing this course the students should be able to

1. Preparing for data summarization, query, and analysis.

2. Applying data modelling techniques to large data sets.

3. Creating applications for Big Data analytics.

4. Building a complete business data analytic solution.

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

Minor

20MDCST106 DEEP LEARNING

L	T	P	C
3	0	0	3

Pre-requisite 20CST401

Course Description:
This course provides the content to make students comfortable with tools and techniques required in handling large amounts of datasets. It will also uncover various deep learning methods in NLP, Neural Networks etc. Several libraries and datasets publicly available will be used to illustrate the application of these algorithms. This will help students in developing skills required to gain experience of doing independent research and study

Course Objectives:
1. To give an overview of basics of neural networks and data representations.
2. To know the classification and regression tasks in deep learning.
3. To learn the CNN architecture and activation functions.
4. To construct the LSTM model and Deep Recurrent Neural Network.
5. To apply the deep learning concepts in Real time applications.

UNIT I BASICS OF NEURAL NETWORKS 9 hours

Anatomy of a neural network - Layers, Models, Loss function and optimizers. Data representations for neural networks - Tensor operations

UNIT II INTRODUCTION TO DEEP LEARNING 9 hours

Binary Classification, Logistic Regression, Gradient Descent, Derivatives, Computation graph, Vectorization, Vectorizing logistic regression – Shallow neural networks: Activation functions, non-linear activation functions, Back propagation – Forward and Backward Propagation - Parameters vs Hyper parameters

UNIT III CONVOLUTIONAL NEURAL NETWORK 9 hours

Introduction- Components of CNN Architecture- Rectified Linear Unit (ReLU) Layer- Exponential Linear Unit (ELU, or SELU)- Unique Properties of CNN- Architectures of CNN-Transfer Learning

UNIT IV RECURRENT NEURAL NETWORK 9 hours

Introduction - Simple Recurrent Neural Network - LSTM Implementation - Gated Recurrent Unit (GRU) - Deep Recurrent Neural Network - Auto encoder: Introduction - Features of Auto Encoder - Types of Auto encoder - Restricted Boltzmann Machine - Deep Reinforcement Learning

UNIT V APPLICATIONS OF DEEP LEARNING 9 hours

Image Classification Using CNN-Visual Speech Recognition Using 3D-CNN. Case Study: Stock Market Prediction, Soil Moisture Prediction Using Recurrent Neural Network- TensorFlow, Keras or MatConvNet for implementation, GANs.

Course Outcomes:

Upon successful completion of the course, students will be able to
1. Describe the anatomy of Neural Networks
2. Understand the mathematical blocks of neural networks
3. Design and implement convolutional neural networks
4. Implement the recurrent neural networks.
5. Apply the neural network architectures for real-time applications.

Text Book(s)

1. Ian J. Goodfellow, Yoshua Bengio, Aaron Courville, “Deep Learning”, MIT Press, 2017.
2. Dr. S. Lovelyn Rose, Dr. L Ashok Kumar, Dr. D. Karthika Renuka, “Deep Learning using Python”, Wiley, First Edition, 2019

Reference Books

1. Francois Chollet, “Deep Learning with Python”, Manning Publications, 2018
2. Adam Gibson and Josh Patterson, “Deep Learning, A practitioner’s approach”, O’Reilly, First Edition, 2017.
3. Yuxi (Hayden) Liu, Python Machine Learning by Example, Pact Publications, First Edition, 2017.

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

Minor

20MDCST107 DATA VISUALIZATION

L	T	P	C
3	0	0	3

Pre-requisite -

Course Description:

The course introduces the concepts of data visualization techniques to apply various types of data mostly available. The course will provide a better knowledge about visualization mechanism, tools, techniques and use cases for applying on real world data and enhance their experience in solving real world problems.

Course Objectives:

1. To determine the evaluation of Data Science and Stages of Data Science
2. To apply Data Preprocessing steps and Data Visualization with statistical analysis on data
3. To examine various measures in Exploratory Data Analytics
4. To estimate the performance of Numpy and Pandas in Data Wrangling
5. To illustrate the Data using Data Visualization techniques by plotting various components

UNIT I INTRODUCTION 9 hours

Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.
Introduction to Data Analytics – Difference between Data Science and Data Analytics, Descriptive, Diagnostic, Predictive and Prescriptive Analytics

UNIT II PREPROCESSING 9 hours

Data Collection and Data Pre-Processing, Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization. Descriptive Statistics Sampling Techniques – Data Classification – Tabulation – Frequency and graphic Representation – Measures of Central Tendency – Measures of Variation – Quartiles and Percentiles.

UNIT III EXPLORATORY DATA ANALYTICS 9 hours

Exploratory Data Analytics Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.

UNIT IV DATA WRANGLING 9 hours

Data Wrangling with Numpy & Pandas: Python list vs NumPy arrays – What's the Difference? Creating a NumPy Array, Shape and Reshaping of NumPy Array, Expanding and Squeezing a NumPy Array, Indexing and Slicing of NumPy Array, Stacking and Concatenating NumPy Arrays, Broadcasting in NumPy Arrays, Sorting in NumPy Arrays, Pandas Series, Data Frame, indexing, sorting, loading data from CSV, Aggregation, concatenation, groupby.

UNIT V VISUALIZATION 9 hours

Visualization and simple metrices: Data Analytics Communication Data Types for Plotting Data Types and Plotting, Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binning's, and Density, Customizing Plot Legends, Customizing Colour bars, Multiple Subplots, Text and Annotation, Customizing Ticks.

Course Outcomes:

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

1. Describe the evaluation of Data Science and Stages of Data Science
2. Illustrate Data Preprocessing steps and Data Visualization with statistical analysis
3. Compute various measures in Exploratory Data Analytics
4. Evaluate the performance of Numpy and Pandas in Data Wrangling
5. Organize the Data using Data Visualization techniques by plotting various components

Text Book(s)

1. Data science Handbook – Field cady- Publisher -John Wiley & Sons Inc., 2017
2. Statistical inference for data science - Brian Caffo, Publisher - LeanPub, 2015
3. Introducing Data science by Davy cielen, Arno D.B.Meysman, Mohamed Ali, Publisher – Manning, Shelter Island, 2016

Reference Books

1. Doing Data Science, Straight talk from the front line- Rachel Schutt & Cathy O'Neil, O'Reilly Media 1st Edition, Kindle Edition, 2013
2. Probability and Statistics for Data Science-Carlos Fernandez-Granda, 2017
3. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing, and Presenting Data 1st Edition, Publisher – Wiley, 2015

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

HONORS

Honors

20HDCST101 RESEARCH METHODS FOR THE STUDY OF EVOLUTION

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course deals with basics of research and explores multifaceted possibilities in the discipline of research and provide participants the opportunity to practically, theoretically, critically and creatively think through methodological issues in their research and the research of others.

Course Objectives:

1. To explore multifaceted possibilities and pathways of translation and dialogue across knowledge, discipline, community and social borders
2. To further multifaceted possibilities and pathways of translation and dialogue across knowledge, discipline, community and social borders.
3. To provide participants the opportunity to practically, theoretically, critically and creatively think through methodological issues in their research and the research of others.
4. To engage in participatory interdisciplinary learning and exchange.

UNIT I INTRODUCTION TO RESEACH METHOLOGIES 9 hours

Survey of Research Methodologies- Rationalism, Idealism, Positivism, Post Positivism, Introduction to major binaries, Subjectivity vs Objectivity, Realism vs Anti –realism, True vs False, Scientific evolution vs Scientific Revolutions, Continuity vs Discontinuity, Deterministic vs Probabilistic, Linearity vs Non –Linearity, Beyond the binaries

UNIT II TYPES OF RESEARCH METHODS 9 hours

T Methods: Epistemology, Ontology, Deduction, Induction, Hypothetical Deductive method, Explanation and Prediction, General and Particular, Cause and Effect.

UNIT III QUANTITATIVE TECHNIQUES 9 hours

Techniques-Quantitative Techniques, Techniques of generating data, Techniques of classification, Techniques of measures, Central Tendency and Dispersion, Measures of Correspondence/Correlation, Measures of Causal relations/Regression, Techniques of Explanation ANOVA, Time Series Analysis-ARMA Adaptive Estimation Procedures (Kalman Filters) Techniques of inference.

UNIT IV STATISTICAL METHODS 9 hours

Advanced Techniques- Advanced Statistical Methods for data Analysis, Structural, quantitative, statistical approaches for the analysis of data.

UNIT V CLASSIFICATION AND APPLICATION 9 hours

Advances in classification, clustering and pattern recognition methods, Strategies for modelling complex data and mining large data sets, Chaos analysis and its measurement, Methods for the extraction of knowledge from whatever type of data, and Application of advanced methods in specific domains of practice.

Course Outcomes:

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

1. Discuss the various research component and binaries.
2. Understand the guidelines for research methods.
3. Understand the various types of quantitative techniques and statistical methods.
4. Apply the various classification technique in advanced applications

Text Book(s)

1. Abraham Kaplan, 1964, Conduct of Inquiry, Chander Publishing Company, California.
2. Ann Majchrzak, 1984, Methods for Policy Research, Sage London
3. Thomas S Khun, 1970, The Structure of Scientific Revolution, University of Chicago Press, Chicago

Reference Books

1. Carl G Hempel "The Covering Law Analysis of Scientific Explanation" in Leonard I Krimerman (ed)
2. Catheriner Marsh, 1988, Exploring Data, Polity Press, Cambridge
3. Cohen and Ernest Nagel (ed) 1978, An Introduction to Logic and Scientific Method, Allied, New Delhi.

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

Honors

20HDCST102 NATURAL LANGUAGE PROCESSING

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course covers the basics of text processing including basic pre-processing, spelling correction, language modeling, Part-of Speech tagging, Constituency and Dependency Parsing, Lexical Semantics, distributional Semantics and topic models.

Course Objectives:

1. To learn the fundamentals of natural language processing.
2. To appreciate the use of CFG and PCFG in NLP.
3. To understand the role of semantics and pragmatics.

UNIT I INTRODUCTION 9 hours

Words - Regular Expressions and Automata - Words and Transducers - N-grams - Part-of-Speech – Tagging - Hidden Markov and Maximum Entropy Models.

UNIT II SPEECH 9 hours

Speech – Phonetics - Speech Synthesis - Automatic Speech Recognition - Speech Recognition: - Advanced Topics - Computational Phonology

UNIT III SYNTAX 9 hours

Formal Grammars of English - Syntactic Parsing - Statistical Parsing - Features and Unification - Language and Complexity.

UNIT IV SEMANTICS AND PRAGMATICS 9 hours

The Representation of Meaning - Computational Semantics - Lexical Semantics - Computational Lexical Semantics - Computational Discourse

UNIT V APPLICATIONS 9 hours

Information Extraction - Question Answering and Summarization - Dialogue and Conversational Agents - Machine Translation

Course Outcomes:

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

1. To tag a given text with basic Language features
2. To design an innovative application using NLP components
3. To implement a rule based system to tackle morphology/syntax of a language
4. To design a tag set to be used for statistical processing for real-time applications
5. To compare and contrast use of different statistical approaches for different types of NLP applications.

Text Book(s)

1. Daniel Jurafsky, ―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python, First Edition, O‘Reilly Media, 2009.

Reference Books

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook‖, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java‖, O‘Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing‖, Second Edition, Chapman and Hall/CRC Press, 2010.

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

Honors

20HDCST103 INTRODUCTION TO GAME THEORY

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course covers the basics of text processing including basic pre-processing, spelling correction, language modeling, Part-of Speech tagging, Constituency and Dependency Parsing, Lexical Semantics, distributional Semantics and topic models.

Course Objectives:

1. Provide an in-depth introduction to technologies and techniques used in the game Theory.
2. To familiarize with the process of game design and development
3. To learn the processes, mechanics, issues in game design
4. To understand the architecture of game programming
5. To know about game engine development, modeling, techniques and frameworks

UNIT I INTRODUCTION 9 hours

Elements of Game Play – Artificial Intelligence – Getting Input from the Player – Sprite Programming – Sprite Animation - Multithreading – Importance of Game Design – Game Loop

UNIT II 3D GRAPHICS FOR GAME PROGRAMMING 9 hours

Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces.

UNIT III GAME DESIGN PRINCIPLES 9 hours

Character Development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding, Case study: Tetris.

UNIT IV GAMING ENGINE DESIGN 9 hours

Renderers, Software Rendering, Hardware Rendering, and Controller Based Animation, Spatial Sorting, Level of Detail, Collision Detection, Standard Objects, and Physics, Case study : The Sims.

UNIT V GAME DEVELOPMENT 9 hours

Information Extraction - Question Answering and Summarization - Dialogue and Conversational Agents - Machine Translation

Course Outcomes:

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

1. Understand the basic working of gaming.
2. Design an innovative 3D model for gaming.
3. Apply the basic principles of designing in game development.
4. Create interactive game via game engine.
5. Develop the 2D/3D interactive game using openGL.

Text Book(s)

1. David H. Eberly, ―3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics‖, Second Edition, Morgan Kaufmann, 2010.
2. Jung Hyun Han, ―3D Graphics for Game Programming‖, First Edition, Chapman and Hall/CRC, 2011.

Reference Books

1. Ernest Adams and Andrew Rollings, ―Fundamentals of Game Design‖, Third Edition, Pearson Education, 2014.
2. Jim Thompson, Barnaby Berbank-Green, and Nic Cusworth, ―Game Design: Principles, Practice, and Techniques - The Ultimate Guide for the Aspiring Game Designer‖, First Edition, Wiley, 2008.

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

Honors

20HDCST104 HIGH PERFORMANCE COMPUTING

L	T	P	C
3	0	0	3

Pre-requisite 20CST108

Course Description:

The course aims to give an introductory overview of High Performance Computing (HPC) in general, and of the facilities of the High Performance Computing Service (HPCS) in particular. Practical examples of using the HPCS clusters will be used throughout, although it is hoped that much of the content will have applicability to systems elsewhere.

Course Objectives:

1. Provide systematic and comprehensive treatment of the hardware and the software high performance techniques involved in current day computing.
2. Introduce the fundamentals of high-performance computing with the graphics processing units and many integrated cores using their architectures and corresponding programming environments.
3. Introduce the learner to fundamental and advanced parallel algorithms through the GPU and MIC programming environments.
4. Provide systematic and comprehensive treatment of the components in the pipeline that extract instruction level parallelism.
5. Provide a strong foundation on memory hierarchy design and tradeoffs in both uniprocessor and multiprocessors.
6. Illustrate the cache coherence and consistency problems in multiprocessors, and their existing solutions.

UNIT I GRAPHICS PROCESSING UNITS 9 hours

Introduction to Heterogeneous Parallel Computing. GPU architecture. Thread hierarchy. GPU Memory Hierarchy.

UNIT II GPGPU PROGRAMMING 9 hours

Vector Addition, Matrix Multiplication algorithms. 1D, 2D, and 3D Stencil Operations. Image Processing algorithms – Image Blur, Grayscaling. Histogramming, Convolution, Scan, Reduction techniques.

UNIT III MANY INTEGRATED CORES 9 hours

Introduction to Many Integrated Cores. MIC, Xeon Phi architecture. Thread hierarchy. Memory Hierarchy. Memory Bandwidth and performance considerations

UNIT IV XEON PHI PROGRAMMING 9 hours

Vector Addition, Matrix Multiplication algorithms. 1D, 2D, and 3D Stencil Operations. Image Processing algorithms – Image Blur, Grayscaling. Histogramming, Convolution, Scan, Reduction techniques

UNIT V SHARED MEMORY PARALLEL PROGRAMMING & MESSAGE PASSING INTERFACE 9 hours

Symmetric and Distributed architectures. OpenMP Introduction. Thread creation, Parallel regions. Work sharing, Synchronization. MPI Introduction. Collective communication. Data grouping for communication.

Course Outcomes:

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

1. The learner will be able to design, formulate, solve and implement high performance versions of standard single threaded algorithms
2. The learner will know and will be able to demonstrate the architectural features in the GPU and MIC hardware accelarators.
3. The learner will be able to design programs to extract maximum performance in a multicore, shared memory execution environment processor.
4. The learner will be able to design and deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm.

Text Book(s)

1. Wen-Mei W Hwu, David B Kirk, Programming Massively Parallel Processors A Hands-on Approach, Morgann Kaufmann, 3e.

Reference Books

1. Rezaur Rahman, Intel Xeon Phi Coprocessor Architecture and Tools, Apress Open, 2013.
2. Barbara Chapman, Gabriele Jost, Ruud van der Pas, Using OpenMP, MIT Press, 2008.
3. Gropp, Lusk, Skjellum, Using MPI, Using MPI, 2014.

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

Homors

20HDCST105 ADVANCED COMPUTER NETWORKS AND COMMUNICATIONS

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course involves multiple players, including academia, research and development centers, service providers and industry, illustrating a clear trend toward services integration in a single communication platform, where the Internet Protocol is seen as the convergence technology layer. In this scenario, strong efforts have been made to adapt and improve TCP/IP networks with enhanced service models, protocols, control and management facilities, in order to accommodate the integration of applications and services with distinct quality requirements.

Course Objectives:

1. To study the problematic of service integration in TCP/IP networks focusing on protocol design, implementation and performance issues.
2. To debate the current trends and leading research in the computer networking area.

UNIT I INTRODUCTION AND IPV6 9 hours

Introduction: Course organization and objectives, Next generation networking: Motivation and Challenges. IPv6 Internetworking and Mobility, Internetworking with IPv6; IPv6 extensions and functionality. Routing advances. Mobile IP networking. Micro and macro mobility.

UNIT II IP CONVERGENCE AND QOS 9 hours

Service integration and Quality of Service (QoS) in IP networks. Service contracts. Services specification, configuration and management. Service-oriented architectures (SOA) - services in SOA-based networks; technologies for the support and development of services, technologies and APIs for SOA; Web Services and associated technologies.

UNIT III ADVANCED TRANSPORT ISSUES AND SIGNALLING 9 hours

Reliable and unreliable transport services for the support of QoS and real-time. Signalling for Multiconstrained Services and Applications. Case studies: Video over IP and VoIP.

UNIT IV MANAGING TCP/IP NETWORKS 9 hours

Management models and functions. Autonomic management. Internet measurement and monitoring.

UNIT V SELF-ORGANIZING NETWORKS 9 hours

Ad-hoc, sensors and mesh networks; applications; communication support: information dissemination, medium access mechanisms, routing mechanisms, transport protocols, quality of service and security; self-organizing concepts in infrastructure networks.

Course Outcomes:

1. To understand the principles and functionality of mobile IP, explaining its concretization in IPv6; to understand the needs of optimization of the mobility mechanisms and description of some extensions that aim to reduce handover latency and requirements from terminals.
2. To understand and explain the design issues in transport services in face of applications and services requirements;
3. To understand theoretical and practical concepts behind the design of multi-constrained applications and services;
4. To discuss relevant management issues and devise adequate network management solutions;
5. To identify and assess possible research opportunities and difficulties within the course scope.

Text Book(s)

1. Silvia Hagen, "IPv6 Essentials", OReilly, 2002.
2. Z. Wang, "Internet QoS: Architectures and Mechanisms for Quality of Service", The Morgan Kaufmann Series in Networking, 2001.

Reference Books

1. Michael Welzl, "Network Congestion Control: Managing Internet Traffic", John Wiley & Sons, 2005
2. Colin Perkins, "RTP: Audio and Video for the Internet", Addison-Wesley Professional, 2003.

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

Honors

20HDCST106 GAME DESIGN STUDIO

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

This course deals with basics of game design development, processes, mechanics and issues in Game Design and exposed to the Core architectures of Game Programming.

Course Objectives:

1. Understand the concepts of Game design and development.
2. Learn the processes, mechanics and issues in Game Design.
3. Be exposed to the Core architectures of Game Programming.
4. Know about Game programming platforms, frame works and engines. Learn to develop games.

UNIT I 3D GRAPHICS FOR GAME PROGRAMMING 9 hours

3D Transformations, Quaternions, 3D Modeling and Rendering, Ray Tracing, Shader Models, Lighting, Color, Texturing, Camera and Projections, Culling and Clipping, Character Animation, Physics-based Simulation, Scene Graphs.

UNIT II GAME ENGINE DESIGN 9 hours

Game engine architecture, Engine support systems, Resources and File systems, Game loop and real-time simulation, Human Interface devices, Collision and rigid body dynamics, Game profiling.

UNIT III GAME PROGRAMMING 9 hours

Application layer, Game logic, Game views, managing memory, controlling the main loop, loading and caching game data, User Interface management, Game event management.

UNIT IV GAMING PLATFORMS AND FRAMEWORKS 9 hours

2D and 3D Game development using Flash, DirectX, Java, Python, Game engines - Unity. DX Studio.

UNIT V GAME DEVELOPMENT 9 hours

Developing 2D and 3D interactive games using DirectX or Python – Isometric and Tile Based Games, Puzzle games, Single Player games and Multi-Player games.

Course Outcomes:

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

1. Understand the concepts of Game design and development.
2. Understand the processes, mechanics and issues in Game Design.
3. Understand exposed to the Core architectures of Game Programming.
4. Understand about Game programming platforms, frame works and engines and develop games.

Text Book(s)

1. Mike Mc Shaffrfy and David Graham, “Game Coding Complete”, Fourth Edition, Cengage Learning, PTR, 2012.
2. Jason Gregory, “Game Engine Architecture”, CRC Press / A K Peters, 2009.

Reference Books

1. Ernest Adams and Andrew Rollings, “Fundamentals of Game Design”, 2nd Edition Prentice Hall / New Riders, 2009.
2. Eric Lengyel, “Mathematics for 3D Game Programming and Computer Graphics”, 3rd Edition, Course Technology PTR, 2011.
3. Jesse Schell, The Art of Game Design: A book of lenses, 1 st Edition, CRC Press, 2008.

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

Honors

20HDCST107 EVOLUTIONARY COMPUTING

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:
This course introduces the field of evolutionary computing (EC) and surveys the major types of evolutionary algorithms (EAs), a class of stochastic, population-based algorithms inspired by natural evolution theory, genetics, and population dynamics, capable of solving complex optimization and modeling problems. This is a rigorous and programming intensive course in which students will implement course concepts to gain hands-on experience in solving complex problems with EAs. Some popular types of EAs that will be reviewed are Genetic Algorithms, Evolution Strategies, Genetic Programming, Differential Evolution, Learning Classifier Systems, and Hyper-heuristics. This course will follow a unified approach focusing on the general characteristics of all EA types.

Course Objectives:
1. The ability to analyze and explain EA behavior,
2. The skills necessary to write formal technical reports in the field of EC.

UNIT I INTRODUCTION **9 hours**

Complex adaptive systems (cas) as the motivation for genetic-algorithm (GA) research; classifier systems; overview of GA mechanisms and theory; quick run-through of EVOKE, the Evolutionary Computation Engine. Technical details of GA mechanisms; fitness landscapes; GA applications - prisoner's dilemma, sorting networks, task scheduling.

UNIT II GENETIC PROGRAMMING **9 hours**

Introduction to genetic programming (GP), Comparison of GA and GP. GA and GP applications to cellular automata, Advanced implementation details in EC. GP applications to control and classification problems.

UNIT III GENETIC ALGORITHM **9 hours**

Theoretical aspects of GAs: building blocks, schema theory, royal-roads functions. EC applications to neural nets. Introduction to Artificial Life. Modelling Learning and Evolution. Sampling of artificial life systems

UNIT IV PROBLEM REPRESENTATION **9 hours**

Derivative Methods in Genetic Programming, Learning Classifier Systems, Hybrid Methods. Introduction to Representations, Binary Strings, Real-Valued Vectors. Permutations, Finite-State Representations, Parse Trees

UNIT V GA OPERATORS 9 hours

Introduction to Selection, Proportional Selection and Sampling Algorithms. Tournament Selection, Rank-based Selection, Boltzmann Selection. Generation Gap Methods, A comparison of Selection Mechanisms. Introduction to Search Operators, Mutation Operators, Recombination.

Course Outcomes:

1. To understanding of core EC concepts and EA mechanisms,
2. Understand of how to identify (real-world) problems for which EC is appropriate,
3. To implement and configure EAs to solve appropriate problems,
4. To perform statistical analysis on stochastic algorithms such as EAs, and
5. Skills necessary to write basic technical reports on solving problems with EC.

Text Book(s)

1. Genetic Programming, an Introduction, Wolfgang Banzhaf, Peter Nordin, Robert E. Keller, and Frank D. Francone, Morgan Kaufmann Publishers, 1998.

Reference Books

1. An Introduction to Genetic Algorithms, Melanie Mitchell, MIT Press, 1996.
2. Genetic Programming, John Koza, MIT Press, 1992.
3. Evolutionary Computation, The Fossil Record, David Fogel, IEEE Press, 1998.

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

Honors

20HDCST108 ADVANCED SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:
The course aims to develop the broad understanding of the discipline of software engineering (gained in the earlier Software Engineering course) by considering the wider systems engineering context in which software plays a role. It aims to examine the concepts and techniques associated with a number of advanced and industrially relevant topics, relating to both the product and processes of software engineering. It seeks to complement this with an account of the associated practical and professional issues in software engineering.

Course Objectives:

1. To understand Software Engineering Lifecycle Models.
2. To do project management and cost estimation.
3. To gain knowledge of the System Analysis and Design concepts.
4. To understand software testing approaches.
5. To be familiar with DevOps practices.

UNIT I INTRODUCTION 9 hours

Software engineering concepts –Development activities –Software lifecycle models -Classical waterfall -Iterative waterfall –Prototyping –Evolutionary -Spiral –Software project management –Project planning –Estimation –Scheduling –Risk management –Software configuration management.

UNIT II SOFTWARE REQUIREMENT SPECIFICATION 9 hours

Requirement analysis and specification –Requirements gathering and analysis –Software Requirement Specification –Formal system specification –Finite State Machines –Petrinets –Object modelling using UML –Use case Model –Class diagrams –Interaction diagrams –Activity diagrams –State chart diagrams –Functional modelling –Data Flow Diagram.

UNIT III ARCHITECTURE AND DESIGN 9 hours

Software design –Design process –Design concepts –Coupling –Cohesion –Functional independence –Design patterns –Model-view-controller –Publish-subscribe –Adapter –Command –Strategy –Observer –Proxy –Facade –Architectural styles –Layered -Client-server -Tiered -Pipe and filter.-User interface design

UNIT IV TESTING 9 hours

Testing –Unit testing –Black box testing–White box testing –Integration and System testing–Regression testing –Debugging -Program analysis –Symbolic execution –Model Checking.

UNIT V DEVOPS **9 hours**

DevOps: Motivation-Cloud as a platform-Operations-Deployment Pipeline: Overall Architecture-Building and Testing-Deployment-Case study: Migrating to Micro services.

Course Outcomes:

1. Understand the advantages of various Software Development Lifecycle Models
2. Gain knowledge on project management approaches as well as cost and schedule estimation strategies
3. Perform formal analysis on specifications
4. Use UML diagrams for analysis and design
5. Understand software testing advantages of DevOps practices

Text Book(s)

1. Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2ndedition, Pearson Education, 2004.
2. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd., 2010.

Reference Books

1. Craig Larman, Applying UML and Patterns, 3rd ed, Pearson Education, 2005.
2. Len Bass, Ingo Weberand Liming Zhu, ―DevOps: A Software Architect‘s Perspective‖, Pearson Education, 2016
3. Rajib Mall, Fundamentals of Software Engineering, 3rdedition, PHI Learning Pvt. Ltd., 2009.
4. Stephen Schach, Software Engineering 7th ed, McGraw-Hill, 2007.

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

Honors

20HDCST109 EXPERIENTIAL LEARNING IN DATA SCIENCE

L	T	P	C
3	0	0	3

Pre-requisite Nil

Course Description:

As an introduction to the emerging interdisciplinary field of data science, this course surveys the main concepts, tools, and techniques used to obtain, explore, and analyze data to extract information, gain insight, and solve problems in applied contexts – with emphasis on practical application using real-world data from many disciplines. Students will learn and practice techniques for acquiring/integrating data, tidying/cleaning data, and wrangling/munging data into useful form. Data analysis techniques include exploratory data analysis, data visualization, descriptive/predictive statistical modeling and inference, and machine learning algorithms.

Course Objectives:

1. Students will develop relevant **programming** abilities.
2. Students will demonstrate proficiency with statistical **analysis of data**.
3. Students will develop the ability to build and assess data-based **models**.
4. Students will execute statistical analyses with professional statistical **software**.
5. Students will demonstrate skill in **data management**.

UNIT I INTRODUCTION 9 hours

Introduction to core concepts and technologies: Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.

UNIT II DATA COLLECTION 9 hours

Data collection and management: Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, using multiple data sources.

UNIT III DATA ANALYSIS 9 hours

Data analysis: Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.

UNIT IV DATA VISUALISATION 9 hours

Data visualization: Introduction, Types of data visualization, Data for visualization: Datatypes, Data encodings, Retinal variables, mapping variables to encodings, Visual encodings.

UNIT V APPLICATIONS OF DATA SCIENCE 9 hours

Applications of Data Science, Technologies for visualization, Bokeh (Python), recent trends in various data collection and analysis techniques, various visualization techniques, application development methods of used in data science.

Course Outcomes:

1. Ability to identify the characteristics of datasets and compare the trivial data and data science for various applications
2. Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.

Text Book(s)

1. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from The Frontline. O'Reilly, 2013.

Reference Books

1. Jure Leskovek, Anand Rajaraman, Jeffrey Ullman, Mining of Massive Datasets. v2.1,CambridgeUniversity Press, 2014.

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

Honors

20HDCST601 SOFT COMPUTING USING PYTHON

L	T	P	C
1	0	2	2

Pre-requisite

Course Description:
The objective of the course covering the subjects mentioned above is to provide students with a comprehensive understanding of various techniques and algorithms used in the field of artificial intelligence and machine learning. The course aims to familiarize students with fundamental concepts such as perceptrons, neural networks, fuzzy sets, genetic algorithms, correlation analysis, regression, classification, and logic gates.

Course Objectives:
1. Develop a comprehensive understanding of various techniques and algorithms used in artificial intelligence and machine learning.
2. Familiarize students with fundamental concepts and principles in AI and machine learning, enabling them to apply these concepts to solve real-world problems effectively.
3. Gain practical skills in data analysis, pattern recognition, optimization, and decision making through hands-on implementation of AI and machine learning techniques.
4. Enhance critical thinking abilities by evaluating and analyzing different approaches and algorithms
5. Equip students with the ability to apply AI and machine learning techniques to various domains.

UNIT I PERCEPTRON AND ARTIFICIAL NEURAL NETWORKS 6 hours

Introduction to perceptrons and their components (inputs, weights, activation function), Perceptron learning algorithm and fixed increment learning, Training a perceptron until convergence, Outputting the final weights of a trained perceptron, Introduction to artificial neural networks (ANNs) and their applications.
Implement a perceptron with appropriate number of inputs and outputs.

1. Implement a feedforward neural network with one or more hidden layers.

UNIT II BACKPROPAGATION AND TRAINING NEURAL NETWORKS 6 hours

Introduction to backpropagation algorithm for training neural networks, Forward propagation and backward propagation in backpropagation, Calculating the gradient and updating weights using backpropagation, Training a neural network with backpropagation algorithm, Implementing a neural network with backpropagation from scratch.

2. Implement the backpropagation algorithm for a feedforward neural network
3. Implement a neural network class with functions for forward propagation, backward propagation, and weight updates

UNIT III FUZZY SETS AND OPERATIONS 6 hours

Introduction to fuzzy sets and their properties, Union, Intersection, Complement, and Difference operations on fuzzy sets, Cartesian product of fuzzy sets and creating fuzzy relations, Max-min composition of fuzzy relations, Application of fuzzy sets and relations in decision making and pattern recognition.

4. Implement functions for union, intersection, complement, and difference operations on fuzzy sets.
5. Implement functions for Cartesian product of fuzzy sets and creation of fuzzy relations.

UNIT IV GENETIC ALGORITHMS AND TRAVELING SALESPERSON PROBLEM (TSP) 6 hours

Introduction to genetic algorithms (GA) and their principles, Representation, selection, crossover, and mutation in genetic algorithms, Applying genetic algorithms to solve the traveling salesperson problem (TSP), Implementing TSP using genetic algorithms in a programming language, Performance analysis and optimization of genetic algorithms for TSP

6. Implement a graphical user interface (GUI) to visualize the TSP problem and genetic algorithm process.

UNIT V DATA ANALYSIS AND MACHINE LEARNING TECHNIQUES 6 hours

Correlation plot and visualization for analyzing relationships in datasets, Overview of Analysis of Covariance (ANCOVA) and its applications, Handling categorical variables in ANCOVA using one-way or two-way ANOVA, Implementing linear regression and multi-regression for data analysis.

7. Correlation Plot and Visualization
    - Read a dataset from a file or using a library (e.g., pandas)
    - Calculate the correlation matrix for the variables in the dataset
    - Plot the correlation matrix as a heatmap or scatterplot matrix to visualize the relationships among the variables.

8. Linear Regression and Multi-Regression
    - Implement functions for linear regression and multi-regression models
    - Load a dataset and split it into training and test sets
    - Train the regression model using the training data and evaluate its performance on the test data.
    - Output the regression coefficients and interpret their significance

Course Outcomes:

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

1. Gain a comprehensive understanding of fundamental concepts and techniques in artificial intelligence and machine learning.
2. Develop practical skills in implementing and applying various AI and machine learning techniques.
3. Enhance critical thinking abilities by evaluating and analyzing different approaches within the field of artificial intelligence and machine learning.
4. Acquire proficiency in data analysis, enabling students to effectively process and interpret large datasets, extract meaningful insights, and make data-driven decisions.
5. Foster a strong foundation for further exploration and research in artificial intelligence and machine learning.

Text Book(s)

1. Nielsen, Michael A. Neural networks and deep learning. Vol. 25. San Francisco, CA, USA: Determination press, 2015.

2. Ross, Timothy J. Fuzzy logic with engineering applications. John Wiley & Sons, 2009.

Reference Books

1. Goldberg, David E., and Chie Hsiung Kuo. "Genetic algorithms in pipeline optimization." Journal of Computing in Civil Engineering 1, no. 2 (1987): 128-141.
2. Stuart Russell and Peter Norvig “Artificial intelligence: a modern approach”, Pearson Education; 4th edition 2022

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination