MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE

MADANAPALLE

(UGC-AUTONOMOUS)

www.mits.ac.in

COMPUTER SCIENCE & ENGINEERING (ARTIFICIAL INTELLIGENCE)

Course Structure

For the students admitted to

B. Tech. Regular Four Year Degree Programme from the academic year 2020-21

and

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

B.TECH. COMPUTER SCIENCE & ENGINEERING (ARTIFICIAL INTELLIGENCE)

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

B. Tech Four Year Curriculum Structure

Branch: COMPUTER SCIENCE & ENGINEERING

(ARTIFICIAL INTELLIGENCE)

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

R20 - Curriculum Structure

I Year I Semester

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

I Year II Semester

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

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

II Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	BSC	20MAT111	Probability and Statistics for Computer Science	3	0	0	3	3
2	PCC	20CAI103	Computer System Architecture	3	0	0	3	3
3	PCC	20CAI104	Data Structures using Python	3	0	0	3	3
4	PCC	20CAI105	Object Oriented Programming - JAVA	2	1	0	3	3
5	PCC	20CAI106	Fundamentals of Artificial Intelligence	3	0	0	3	3
6	PCC	20CAI203	Data Structures using Python Laboratory	0	0	3	3	1.5
7	PCC	20CAI204	Object Oriented Programming - JAVA Laboratory	0	0	3	3	1.5
8	PCC	20CAI205	Fundamentals of Artificial Intelligence Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course – I (Refer ANNEXURE-IV)	1	0	2	3	2
10	MC	20CHE901	Environmental Science	2	0	0	2	0
Total				**17**	**1**	**11**	**29**	**21.5**

II Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	HSMC	20HUM101	Economics and Financial Accounting for Engineers	3	0	0	3	3
2	BSC	20MAT112	Discrete Mathematical Structures	3	0	0	3	3
3	ESC	20CAI107	Operating Systems Fundamentals	3	0	0	3	3
4	PCC	20CAI108	AI Tools, Techniques and Applications	3	0	0	3	3
5	PCC	20CAI109	Design and Analysis of Algorithms	2	1	0	3	3
6	PCC	20CAI206	Operating Systems Fundamentals Laboratory	0	0	3	3	1.5
7	PCC	20CAI207	AI Tools, Techniques and Applications Laboratory	0	0	3	3	1.5
8	PCC	20CAI208	Design and Analysis of Algorithms Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course - II (Refer ANNEXURE-IV)	1	0	2	3	2
10	MC	20HUM901	Indian Constitution	2	0	0	2	0
Total				**17**	**1**	**11**	**29**	**21.5**

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

III Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PCC	20CAI110	Computer Networks	3	0	0	3	3
2	PCC	20CAI111	Database Management Systems	3	0	0	3	3
3	PCC	20CAI112	Machine Learning	3	0	0	3	3
4	OE		Open Elective-I	3	0	0	3	3
5	PE		Professional Elective-I	3	0	0	3	3
6	PCC	20CAI209	Database Management Systems Laboratory	0	0	3	3	1.5
7	PCC	20CAI210	Machine Learning Laboratory	0	0	3	3	1.5
8	SC		Skill Oriented Course – III (Refer ANNEXURE-IV)	1	0	2	3	2
9	MC	20CE901	Disaster Management	2	0	0	2	0
10	PROJ	20CAI701	Summer Internship-1*	0	0	3	3	1.5
Total				**18**	**0**	**11**	**29**	**21.5**

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

III Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PCC	20CAI113	Big Data Analytics	3	0	0	3	3
2	PCC	20CAI114	Deep Learning	3	0	0	3	3
3	PCC	20CAI115	Data Science	3	0	0	3	3
4	OE		Open Elective-II	3	0	0	3	3
5	PE		Professional Elective-II	3	0	0	3	3
6	PCC	20CAI211	Big Data Analytics Laboratory	0	0	3	3	1.5
7	PCC	20CAI212	Deep Learning Laboratory	0	0	3	3	1.5
8	PCC	20CAI213	Data Science Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course – IV (Refer ANNEXURE-IV)	1	0	2	3	2
10	MC	20HUM902**/ 20HUM102#	Universal Human Values	2/3	0	0	2/3	0/3
Total				**18/19**	**0**	**11**	**29/30**	**21.5/24.5**

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

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

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

Tentative Curriculum Structure from IV Year Onwards

IV Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PE		Professional Elective-III	3	0	0	3	3
2	PE		Professional Elective-IV	3	0	0	3	3
3	PE		Professional Elective-V	3	0	0	3	3
4	OE		Open Elective-III	3	0	0	3	3
5	OE		Open Elective-IV	3	0	0	3	3
6	OE-HSMC		Open Elective-V (Taken from Humanities & Social Science)	3	0	0	3	3
7	SC		Skill Oriented Course – V (Refer ANNEXURE-IV)	1	0	2	3	2
8	PROJ	20CAI702	Summer Internship-2*	0	0	6	6	3
Total				**19**	**0**	**8**	**27**	**23**

* 2 Months internship during 3nd 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	20CAI703	Project Work, Seminar and Internship in Industry (6 months)	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	20CE3M01	Integrated Waste Management for Smart City	Civil
4	20CE3M02	Soil and Water Conservation Engineering	Civil
5	20CE3M03	Plastic Waste Management	Civil
6	20ME3M01	Introduction to Industry 4.0 and Industrial Internet of Things	Mechanical
7	20ME3M02	Operations Management	Mechanical
8	20ME3M03	Design Thinking and Innovation	Mechanical
9	20EEE3M01	Non-Conventional Energy Sources	EEE
10	20EEE3M02	Design of Photovoltaic Systems	EEE
11	20ECE3M01	Microprocessors and Interfacing	ECE
12	20ECE3M02	Microprocessors and Microcontrollers	ECE
13	20IE3M01	Intellectual Property Rights and Competition Law	Multidisciplinary
14	20IE3M02	Introduction to Research	Multidisciplinary
Any new Interdisciplinary Course offered by SWAYAM NPTEL can be appended in future.			

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OPEN ELECTIVE – II (To be offered under Conventional Mode)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	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	Materials 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.			

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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	20CE3M04	Remote Sensing and GIS	Civil
2	20CE3M05	Wastewater Treatment and Recycling	Civil
3	20ME3M04	Power Plant Engineering	Mechanical
4	20ME3M05	Mechatronics and Manufacturing Automation	Mechanical
5	20EEE3M03	Introduction to Smart Grid	EEE
6	20ECE3M05	Introduction to Embedded Systems	ECE
7	20ECE3M06	Embedded System Design with ARM	ECE
Any new Interdisciplinary Course offered by SMAYAM 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	20MAT303	Graph Theory	Mathematics
2	20MAT304	Mathematical Modelling and Numerical Simulation	Mathematics
3	20PHY303	Thin Film Technology and its Applications	Physics
4	20CHE303	Introduction to Nano Science and Technology	Chemistry
5	20CHE304	Computational Methods in Materials Science and Engineering	Chemistry
6	20CE304	Green Building and Energy Conservation	Civil
7	20CE305	Environmental Engineering	Civil
8	20ME303	Internet of Manufacturing Things	Mechanical
9	20ME304	Total Quality Management	Mechanical
10	20ME305	Entrepreneurship	Mechanical
11	20EEE303	Robotics	EEE
12	20EEE304	Electrical Safety	EEE
13	20ECE303	Nano Electronics	ECE
Any advanced courses can be appended in future.			

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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

ANNEXURE – III

List of Professional Electives

Professional Elective – I		
Sl. No.	**Course Code**	**Course Title**
1.	20CAI401	Distributed Systems
2.	20CAI402	Software Engineering
3.	20CAI403	Web Technologies
4.	20CAI404	Digital Image Processing
5.	20CAI405	Multimedia Technologies
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.	20CAI4M01	Cryptography and Network Security
2.	20CAI4M02	Soft Computing
3.	20CAI4M03	Theory of Computation and Compiler Design
4.	20CAI4M04	Social Media Analytics
5.	20CAI4M05	Mobile Computing
6.	20CAI4M06	Reinforcement Learning
7.	20CAI4M07	Privacy and Security in Online Social Media
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.	20CAI406	Blockchain Architecture Design and Use Case
2.	20CAI407	Data Visualization Techniques
3.	20CAI408	Expert System
4.	20CAI409	Wireless Sensor Networks
5.	20CAI410	Service Oriented Architecture
6.	20CAI411	Natural Language Processing
Any advanced courses can be appended in future.		

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Professional Elective – IV		
Sl. No.	**Course Code**	**Course Title**
1.	20CAI412	Robotics Process Automation
2.	20CAI413	Information Security
3.	20CAI414	Ethics and AI
4.	20CAI415	Internet of Things
5.	20CAI416	Advanced Python Programming
6.	20CAI417	Design Patterns
Any advanced courses can be appended in future.		

Professional Elective – V		
Sl. No.	**Course Code**	**Course Title**
1.	20CAI418	GPU Programming using CUDA
2.	20CAI419	Edge and Fog Computing
3.	20CAI420	Video Analytics
4.	20CAI421	Cognitive System
5.	20CAI422	Medical Image Data Analysis
6.	20CAI423	Human Computer Interaction
Any advanced courses can be appended in future.		

ANNEXURE – IV

SKILL ORIENTED COURSES

Skill Oriented Course - I		
Sl. No	**Course Code**	**Course Title**
1	20CAI601	Web Scripting
2	20CAI602	Android Application Development
Any advanced courses can be appended in future		

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

Skill Oriented Course - III		
Sl. No	**Course Code**	**Course Title**
1	20CAI603	Multimedia Computing
2	20CAI604	Python for Data Science
Any advanced courses can be appended in future		

Skill Oriented Course - IV		
Sl. No	**Course Code**	**Course Title**
1	20CAI605	Full Stack Development
2	20CAI606	UML Design
3	20CAI607	Image Processing
Any advanced courses can be appended in future		

Skill Oriented Course - V		
Sl. No	**Course Code**	**Course Title**
1	20CAI608	Data Warehousing and Data Mining
2	20CAI609	Blockchain Development
3	20CAI610	Cryptography Algorithms
Any advanced courses can be appended in future		

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ANNEXURE - V

Honors in Computer Science & Engineering (Artificial Intelligence)

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)**	20HDCAI101	R Programming	3	0	0	3	3
2		20HDCAI102	Business Intelligence	3	0	0	3	3
3		20HDCAI103	Advanced Algorithms	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)**	20HDCAI104	NoSQL	3	0	0	3	3
5		20HDCAI105	Intelligent Agents	3	0	0	3	3
6		20HDCAI106	Information Theory and Coding	3	0	0	3	3
	Sub Total			**6**	**0**	**0**	**6**	**6**
IV Year I Semester								
7	**Professional Elective Course (Choose any one from three courses)**	20HDCAI107	Information Retrieval Systems	3	0	0	3	3
8		20HDCAI108	Machine Translation	3	0	0	3	3
9		20HDCAI109	Federated Machine Learning	3	0	0	3	3
10	**SOC**	20HDCAI601	Web Application Development	1	0	2	3	2
	Sub Total			**7**	**0**	**2**	**9**	**8**
	Total			**19**	**0**	**2**	**21**	**20**

COMPUTER SCIENCE & ENGINEERING

(Artificial Intelligence)

B. Tech I Year I Semester

B. Tech I Year I Semester

20MAT101 ENGINEERING CALCULUS

L	T	P	C
3	1	0	4

Pre-requisite: Mathematics at Intermediate or Equivalent Level

Course Description:

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

Course Objectives: This course enables the student to –

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

UNIT I INTEGRAL CALCULUS 12 hours

Definite integrals; Applications of definite integrals to evaluate area and length of curves, surface areas and volumes of revolutions; Beta and Gamma functions and their properties.

UNIT II DIFFERENTIAL CALCULUS 12 hours

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

UNIT III SEQUENCE AND SERIES 12 hours

Sequence and Series, their Convergence and tests for convergence; Power series, Taylor's series, Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT IV MULTIVARIABLE DIFFERENTIAL CALCULUS 12 hours

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

UNIT V MULTIVARIABLE INTEGRAL CALCULUS 12 hours

Multiple Integration: double integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes (double integration), triple integrals, gradient, curl and divergence, Green's, Stokes and Gauss divergence theorems (without proofs).

Course Outcomes:

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

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

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42th Edition, 2012.

2. G. B. Thomas, Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas' Calculus Pearson education 11th Edition, 2004.

Reference Books:

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

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

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B. Tech I Year I Semester

20PHY102 APPLIED PHYSICS

L	T	P	C
3	1	0	4

Pre-requisite: Plus two level physics course

Course Description:

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

Course Objectives:

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

UNIT I WAVES AND OSCILLATIONS 11 hours

Simple harmonic motion, damped harmonic oscillations, forced harmonic oscillations, resonance, and quality factor. Superposition of vibrations along same direction (equal frequency) and in perpendicular directions, Lissajous figures.

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

UNIT II OPTICS 13 hours

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

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

Polarization, Types of polarization, Polarization by reflection, refraction and double refraction, Nicol's prism. Half wave and Quarter wave plates.

UNIT III QUANTUM MECHANICS 12 hours

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

UNIT IV FREE ELECTRON THEORY & SEMICONDUCTORS 12 hours

Free electron theory of metals (drift velocity and electrical conductivity), Fermi energy level, density of states, Kronig-Penney model (Qualitative only) and origin of energy bands, band structure of metals, semiconductors, and insulators. Direct and indirect bandgap semiconductors, Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier concentration and temperature (equilibrium carrier statistics), Drift and Diffusion Current, Hall effect.

UNIT V LASERS & FIBER OPTICS 12 hours

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

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

Course Outcomes:

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

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

Text Books:

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

Reference Books:

1. H. J. Pain, "The physics of vibrations and waves", Wiley, 2006.
2. Physics Vol I & II, Halliday/Resnick/Krane 5th Edition, John Wiley, 2003.
3. B.G. Streetman, "Solid State Electronic Devices", Prentice Hall of India, 1995.
4. Concepts of Modern Physics by Arthur Beiser, 7th Edition, 2017.

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

B. Tech I Year I Semester

20EEE101 BASIC ELECTRICAL ENGINEERING

L	T	P	C
3	1	0	4

Pre-requisite Intermediate Physics

Course Description:

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

Course Objectives:

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

UNIT I DC CIRCUIT ANALYSIS 12 hours

Electrical circuit elements, voltage and current sources, Series and parallel resistive circuits, Kirchhoff's current and voltage laws, Nodal and Mesh analysis of simple circuits with dc excitation. Source Transformation, Star-Delta Transformation, Superposition Theorem.

UNIT II AC CIRCUIT ANALYSIS 12 hours

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

UNIT III MAGNETIC MATERIALS AND TRANSFORMERS 12 hours

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

UNIT IV DC AND AC MACHINES 12 hours

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

UNIT V RECTIFIERS AND ELECTRICAL INSTALLATIONS 12 hours

PN junction diode, half wave, full wave and bridge rectifiers. Components of LT Switchgear: switch fuse unit (SFU), MCB, ELCB, MCCB, types of wires and cables – Current carrying capability, Insulation Strength; Earthing.

Course Outcomes:

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

1. To understand and analyze basic DC electric circuits.
2. To measure and analyze various electrical quantities of single phase and three AC electric circuits.
3. To understand magnetic materials and to analyze the transformers.
4. To study the working principles of electrical machines.
5. To create power converters for domestic applications with LT switchgear.

Text Books:

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

Reference Books:

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

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

B. Tech I Year I Semester

20CSE101 PROGRAMMING FOR PROBLEM SOLVING (PYTHON)

L	T	P	C
2	0	3	3.5

Pre-requisite: None

Course Description:

Python is a language with a simple syntax, and a powerful set of libraries. It is an interpreted language, with a rich programming environment. While it is easy for beginners to learn, it is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience.

This course provides knowledge on how to implement programs in python language and to solve computational problems using the various programming constructs including data structures, functions, string handling mechanisms and file handling concepts

Course Objectives:

This course enables students to

1. Learn Python programming constructs.
2. Implement Python programs with conditional structures and loops.
3. Use functions for structuring Python programs.
4. Handle compound data using Python lists, tuples, and dictionaries.
5. Manipulate data using files handling in Python.
6. Getting exposed to the basics of Object Oriented Programming using Python

UNIT I: INTRODUCTION 12 hours

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

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

UNIT II: OPERATORS AND EXPRESSIONS 12 hours

Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations. Control Flow - if, if-elif else, for, while, break, continue, pass.

a) Swapping of two number with and without using temporary variable.
b) If the age of Ram, Sam, and Khan are input through the keyboard, write a python program to determine the eldest and youngest of the three.
c) Develop a program that performs arithmetic operations (Addition, Subtraction, Multiplication, and Division) on integers. Input the two integer values and operator for performing arithmetic operation through keyboard. The operator codes are as follows:

- For code '+', perform addition.
- For code '-', perform subtraction.
- For code '*', perform multiplication.
- For code '/', perform division.

d) Implement the python program to generate the multiplication table.
e) Implement Python program to find sum of natural numbers
f) If the first name of a student is input through the keyboard, write a program to display the vowels and consonants present in his/her name.
g) The marks obtained by a student in 5 different subjects are input through the keyboard. Find the average and print the student grade as per the MITS examination policy as shown below.

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

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

UNIT-III: DATA STRUCTURES 12 hours

Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions. Functions - Defining Functions, Calling Functions, Passing Arguments, variable in python-Global and Local Variables.

a) Write a Python script to
- create a list
- access elements from a list
- slice lists
- change or add elements to a list
- delete or remove elements from a list

b) Write a Python script to read the values from a list and to display largest and smallest numbers from list.
c) Write a Python script to compute the similarity between two lists.
d) Write a Python script to read set of values from a Tuple to perform various operations.
e) Write a Python script to perform basic dictionary operations like insert, delete and display.
f) Write a Python program to count the occurrence of each word in a given sentence.
g) Define a dictionary named population that contains the following data.

Keys	Values
Shanghai	17.8
Istanbul	13.3
Karachi	13.0
Mumbai	12.5

h) Write a Python script to create Telephone Directory using dictionary and list to perform basic functions such as Add entry, Search, Delete entry, Update entry, View and Exit.
i) Implement Python script to display power of given numbers using function.
j) Implement a Python program that takes a list of words and returns the length of the longest one using function.

UNIT-IV:

String Handling -Modules: Creating modules, import statement, from import statement, name spacing

Files and Directories:

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

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

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

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

e) Write a Python script to display file contents.

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

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

h) Write a Python commands to perform the following directory operations.

- List Directories and Files
- Making a New Directory
- Renaming a Directory or a File
- Removing Directory or File

UNIT-V:

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

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

Brief Tour of the Standard Library: Turtle

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

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

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

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

Course Outcomes:

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

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

Text Books:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
(http://greenteapress.com/wp/thinkpython/)

2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

References:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.

2. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013.

3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.

4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers,LLC,2013.

5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year I Semester

20ENG201 ENGLISH FOR PROFESSIONAL PURPOSES LABORATORY

(Common to all branches)

L	T	P	C
0	0	2	1

Pre-requisite None

Course Description:

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

Course Objectives:

This course enables the student to –

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

Course contents:

Greeting and Introductions (L & S)

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

Describing: (L, S, R & W)

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

Narrating (L, S, R & W)

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

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

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

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

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

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

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

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

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

Course Outcomes:

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

Text Books:

1. Leo Jones; Functions of English, Published by: Cambridge University Press.
2. Leo Jones; Let's Talk Level 1, 2, 3, Published by: Cambridge University Press.
3. Adrian Doff, Craig Thaine, Herbert Puchta, et al; *Empower: Intermediate (B1+)*; Published by: Cambridge University Press.

References:

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

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech I Year I Semester

20PHY201 PHYSICS LABORATORY

L	T	P	C
0	0	3	1.5

Course Description:

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

Course Objectives:

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

LIST OF EXPERIMENTS:

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

1. Spring constant - Coupled Pendulums.
2. Study of resonance effect in series and parallel LCR circuit.
3. Determination of radius of curvature of a curved surface - Newton's Rings.
4. Wavelength of a laser - Diffraction Grating
5. Wavelength of the spectral lines - Diffraction Grating.
6. Magnetic field along the axis of a current carrying coil - Stewart Gees' Apparatus
7. Thickness of a given wire - Wedge Method.
8. Dispersive power of prism – Spectrometer.
9. Frequency of the tuning fork - Melde's apparatus.
10. Determination of particle size using Laser.
11. Width of single slit - Diffraction due to Single Slit.
12. Torsional Pendulum.
13. Determination of the numerical aperture of a given optical fiber and hence to find its acceptance angle.
14. Measurement of *e/m* of electron (Thomson's method)
15. Energy gap of a material of p-n junction.
16. Determination of Planck's constant.
17. Ferroelectric hysteresis (B-H Curve).

Course Outcomes:

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

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

Reference Books:

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

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year I Semester

20EEE201 ELECTRICAL ENGINEERING LABORATORY

L	T	P	C
0	0	3	1.5

Prerequisite: None

Course Description:

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

Course Objectives:

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

LIST OF LABORATORY EXPERIMENTS/DEMONSTRATIONS:

DEMONSTRATIONS:

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

EXPERIMENTS:

1. Wiring of a simple circuit for controlling (1) a lamp/fan point, (2) Staircase or Corridor Winding.
2. Wiring of a power circuit for controlling an electrical appliance (16A Socket).
3. Verification of Kirchhoff's current and voltage laws (KCL & KVL).
4. Verification of superposition theorem
5. Sinusoidal steady state response of R-L, and R-C circuits (impedance calculation and verification).
6. Measurement of voltage, current and power in a single-phase circuit using voltmeter, ammeter and wattmeter. Also, calculate the power factor of the circuit.
7. Measurement of voltage, current and power in a single-phase circuit using voltmeter, ammeter and wattmeter. Also, calculate the power factor of the circuit.
8. Open-circuit and short-circuit test on a single-phase transformer.
9. Speed control of separately excited DC motor.
10. Wiring of a power distribution arrangement using single-phase MCB distribution board with ELCB, main switch and energy meter (or residential house wiring).
11. Regulated power supply for generating a constant DC Voltage.
12. Fabrication of a given electronic circuit on a PCB and test the same.

Course Outcomes:

Upon successful completion of the course, the students are expected to

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.
5. Get an exposure to the working of various power electronic converters.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

COMPUTER SCIENCE & ENGINEERING

(Artificial Intelligence)

B. Tech I Year II Semester

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech I Year II Semester

20ENG101 PROFESSIONAL ENGLISH

L	T	P	C
3	0	0	3

Pre-requisite None

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

Course Objectives: This course enables the student to –

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

UNIT I GRAMMAR & VOCABULARY 9 hours

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

UNIT II READING SKILLS & WRITTEN COMMUNICATION 9 hours

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

UNIT III VERBAL & NON-VERBAL ASPECTS 9 hours

Verbal - Introducing oneself, exchanging personal information, Using 'Wh'- Questions, asking and answering, yes or no questions- asking about routine actions and expressing opinions; Non-Verbal – Use of body language, combating nervousness.

UNIT IV CONVERSATIONS 9 hours

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

UNIT V BUSINESS ENVIRONMENT & ETIQUETTES 9 hours

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

Course Outcomes:

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

1. Read articles and understand professional communication
2. Participate effectively in informal conversations
3. Introduce themselves and their friends and express opinions in English
4. Comprehend conversations and short talks delivered in English
5. Write short essays of a general kind and personal letters and emails in English.

Text Books:

1. Guy Brook Hart & Norman Whitby; Cambridge English-Business Benchmark: Pre-Intermediate to Intermediate; Published by: Cambridge University Press.

2. Adrian Doff, Craig Thaine, Herbert Puchta, et al; Empower: Intermediate (B1+); Published by: Cambridge University Press.

Reference Books

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

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

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech I Year II Semester

20MAT110 LINEAR ALGEBRA

L	T	P	C
3	0	0	3

Pre-requisite **20MAT101**

Course Description:

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

Course Objectives:

1. Understanding basic concepts of linear algebra (systems of linear equations, matrix calculus, vectors and basic vector operations).
2. Learn about vector spaces and subspaces.
3. To become proficient in solving computational problems of linear algebra.
4. To understand the axiomatic structure of modern mathematics and learn to construct simple proof.
5. To gain basic knowledge of search engine operations and optimization path.

UNIT I LINEAR EQUATIONS AND MATRICES 9 hours

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

UNIT II VECTOR SPACE 9 hours

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

UNIT III LINEAR TRANSFORMATIONS 9 hours

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

UNIT IV VECTOR SPACE OF LINEAR TRANSFORMATIONS 9 hours

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

UNIT V INNER PRODUCT SPACES 9 hours

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

Course Outcomes:

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

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

Text Books:

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

Reference Books:

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

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

B. Tech I Year II Semester

20CHE101 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

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

Course Description:

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

Course Objectives:

Students will

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

UNIT I IMPURITIES PRESENT IN WATER AND WATER TREATMENT **9 hours**

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

UNIT II PERIODIC PROPERTIES AND ORGANIC REACTIONS **7 hours**

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

UNIT III SPECTROSCOPY **8 hours**

Basic Principle and Applications of UV-Visible, FT-IR, Raman, Microwave and Nuclear Magnetic Resonance (NMR) Spectroscopy

UNIT IV THERMODYNAMICS AND ELECTROCHEMISTRY **11 hours**

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

UNIT V ENGINEERING MATERIALS, NANOSCIENCE & NANOTECHNOLOGY **10 hours**

Engineering Materials: Cement Materials and Manufacturing Process. Reactions in setting and hardening of Cement. Lubricants – definition, Properties of lubricants – Viscosity, Viscosity Index, Flash Point and Pour Point. Nanomaterials: Introduction, Classes/Types, Chemical synthesis of Nanomaterials: Chemical Vapor Deposition method (Carbon Nanotubes), Characterization by powder XRD (Scherrer's equation). Applications of Nanomaterials: Solar Energy and Photocatalytic Dye Degradation (TiO_2).

Course Outcomes:

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

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

Text Books:

1. P. W. Atkins & Julio de Paula, 'The Elements of Physical Chemistry', Ninth edition (Oxford University Press, Oxford 2010)
2. C. N. Banwell, Fundamentals of Molecular Spectroscopy, Fourth Edition, (Tata McGraw Hill, 2008).
3. C. N. Banwell, Fundamentals of Molecular Spectroscopy, Fourth Edition, (Tata McGraw Hill, 2008).
4. Dr. S. S. Dara and Dr. S. S. Umare, A Textbook of Engineering Chemistry,1 st Edition., (S. Chand & Company Ltd, 2000).
5. T. Pradeep, Nano: The Essentials, 1 st Edition, (Tata McGraw-Hill Publishing Company Limited, 2017).

Reference Books

1. 'Physical Chemistry', D. W. Ball, First Edition, India Edition (Thomson, 2007).
2. Perry's Chemical Engineers' Handbook, Don W. Green and Marylee Z. Southard, 9th Edition (McGraw Hill, 2018).
3. Engineering Chemistry, Dr. Suba Ramesh and others, 1st Edition (Wiley India, 2011).
4. Jain and Jain, Engineering Chemistry,16th Edition (Dhanpat Rai Publishing Company (P) Ltd, 2016).
5. Amretashis Sengupta, Chandan Kumar Sarkar (eds.), Introduction to Nano Basics to Nanoscience and Nanotechnology (Springer-Verlag, Berlin, Heidelberg, 2015)

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

B. Tech I Year II Semester

20CSE102 C PROGRAMMING AND DATA STRUCTURES

L	T	P	C
3	0	0	3

Pre-requisite: 20CSE101

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

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

UNIT I INTRODUCTION TO C PROGRAMMING 9 hours

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

UNIT II FUNCTIONS & ARRAY 9 hours

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

UNIT III STRINGS & POINTERS 9 hours

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

UNIT IV STRUCTURES & FILES 9 hours

Structures: Defining a structure, processing a structure, Pointer to Structure, Unions.
Files: Opening and closing a data file, Reading and Writing a data file, File I/O Functions.

UNIT V DATA STRUCTURES 12 hours

Stack: stack operations, stack implementations using arrays.
Queue: queue operations, queue implementations using array, Applications of stack and queue.
Linked List: Single linked list operations.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. 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

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

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech I Year II Semester

20CHE201 CHEMISTRY LABORATORY

L	T	P	C
0	0	3	1.5

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

Course Description:

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

Course Objectives:

This Engineering Chemistry Laboratory is common to all branches of I Year B Tech. At the end of the course the student is expected to Students will

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

LIST OF EXPERIMENTS

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

Course Outcomes:

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

1. Develop and perform analytical chemistry techniques to address the water related problems (for e.g., hardness, alkalinity present in water) technically.
2. Handle electro-analytical instruments like digital conductivity meter and potentiometer to perform neutralization, precipitation, and redox titrations, respectively.
3. Acquire practical skills to handle spectro-photochemical methods to verify Beer Lambert's Law.
4. Operate various instruments for the analysis of materials and produce accurate results in a given time frame.
5. Think innovatively and improve the creative skills that are essential for solving engineering problems.

Textbook:

1. Engineering Chemistry Lab Manual (2017-18), Dept. of Chemistry, Madanapalle Institute of Technology and Science, Madanapalle – 517325, Chittoor Dist., Andhra Pradesh, India.
2. "Vogel's Textbook of Qualitative Chemical Analysis", Arthur Israel Vogel, Prentice Hall, 2000.
3. Laboratory Manual on Engineering Chemistry, by Dr Sudha Rani, Dhanpat Rai Publishing house, 2009.

4. A Textbook on Experiments and calculations in Engineering Chemistry, by SS Dara, S Chand publications, 2015.
5. Laboratory Manual of Organic Chemistry, by Raj K Bansal, Wiley Eastern Limited, New age international limited, 2009.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech I Year II Semester

20CSE201 C PROGRAMMING AND DATA STRUCTURES LABORATORY

L	T	P	C
0	0	3	1.5

Prerequisite: 20CSE101

Course Description:

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

Course Objectives:

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

LIST OF EXPERIMENTS

1. a) Write a C program to swap the two numbers.
b) Write a C Program to find the eligibility of admission for a Professional course based on the following criteria:

i. Marks in Maths >=65
ii. Marks in Physics >=55
iii. Marks in Chemistry>=50
OR
iv. Total in all three subject >=180

2. a) Write a C program to compute the factorial of a given number.
b) Write a program that reads numbers which are in the range 0 to 100, till it encounters -1. Print the sum of all the integers that you have read before you encountered -1.

3. a) Write a C program to accept a coordinate point in a XY coordinate system and determine in which quadrant the coordinate point lies.
b) The digital root (also called repeated digital sum) of a number is a single digit value obtained by an iterative process of summing digits. Digital sum of 65536 is 7, because 6+5+5+3+6=25 and 2+5 = 7.Write a program that takes an integer as input and prints its digital root.

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

5. a) Write a C program to find sum of digits, Decimal to Binary conversion, reversal of numbers using functions.
b) Write a C program to find Factorial, Greatest Common Divisor, and Fibonacci using recursion.

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

7. Implement the following sorting techniques.
a) Bubble sort b) Insertion sort c) Selection sort.

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

9. a) Write a program in C to find the frequency of characters in a string.
b) Write a C program to implement all string operations (string length, string copy, string compare, string concatenation and string reverse) without using string library functions.

10. a) Write a C program to get *N* elements in an array and sort it using Pointer.
b) Write a C program to swap two integers using pass by reference.
c) Write a C program to find the largest element using Dynamic Memory Allocation.

11. a) Write a program in C to count the number of vowels, consonants, digits, special symbols, words in a string using a pointer.
b) Write a C program to print all permutations of a given string using pointers.
12. a) Write a C program to add two distances in the inch-feet system using structures.
b) Write a C program to calculate difference between Two Time Periods (in *Hours*, *Minutes*, *Seconds* format) using structures.
13. Develop an application to match parenthesis of a given expression using Stack.
14. Develop an application to identify Palindrome string using Stack and Queue.
15. Develop an application to add two Polynomial equations using Linked List.

Course Outcomes:

Upon successful completion of the course, students will be able to
1. 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

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech I Year II Semester

20CSE202 ENGINEERING AND IT WORKSHOP

L	T	P	C
0	0	3	1.5

Prerequisite: None

Course Description:

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

Course Objectives:

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

LIST OF EXPERIMENTS

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

Course Outcomes:

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

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

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

COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE)
B. Tech II Year I Semester

B. Tech II Year I Semester

20MAT111 PROBABILITY AND STATISTICS FOR COMPUTER SCIENCE

L	T	P	C
3	0	0	3

Pre-requisite **20MAT101**

Course Description:

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

Course Objectives:

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.

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech II Year I Semester

20CAI103 COMPUTER SYSTEM ARCHITECTURE

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

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

Course Objectives:

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

UNIT I DIGITAL LOGIC CIRCUITS AND COMPONENTS 9 hours

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

UNIT II DATA REPRESENTATION AND COMPUTER ARITHMETIC 9 hours

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

UNIT III CPU AND CONTROL UNIT 9 hours

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

UNIT IV PIPELINE AND PARALLEL PROCESSING 9 hours

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

UNIT V MEMORY AND I/O ORGANIZATIONS 9 hours

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

Course Outcomes:

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

1. Design digital circuits for computer components.
2. Implement fixed-point and floating point arithmetic unit.
3. Understand the basics structure of computers, operations and instructions.
4. Understand pipelined execution and parallel processing architectures.
5. Analyze the various memory systems and I/O communication.

Text Books:

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

Reference Books:

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

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

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech II Year I Semester

20CAI104 DATA STRUCTURES USING PYTHON

L	T	P	C
3	0	0	3

Pre-requisite **20CSE102**

Course Description:

The typical data structures course, which introduces a collection of fundamental data structures. The basic concepts related to abstract data types, data structures, and algorithms. Arrays, Sets and Maps, Searching and Sorting, Linked Structures, Stacks, Queues, Advanced Linked Lists, Recursion, Hash Tables, Advanced Sorting, Binary Trees, Search Trees.

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.
4. To develop skill in advanced linked list.
5. To develop skill in advanced sorting.

UNIT I ABSTRACT DATA TYPES, ARRAYS, SETS AND MAPS 9 hours

Abstract Data Types: Introduction, The Date Abstract Data Type, Bags, Iterators. **Arrays:** The Array Structure, The Python List, Two-Dimensional Arrays, The Matrix Abstract Data Type. **Sets and Maps:** Sets, Maps, Multi-Dimensional Arrays.

UNIT II ALGORITHM ANALYSIS, SEARCHING AND SORTING 9 hours

Algorithm Analysis: Complexity Analysis, Evaluating the Python List, Amortized Cost, Evaluating the Set ADT. **Searching and Sorting:** Searching, Sorting, Working with Sorted Lists, The Set ADT Revisited.

UNIT III LINKED STRUCTURES, QUEUES 9 hours

Linked Structures: The Singly Linked List, The Bag ADT Revisited, The Sparse Matrix Revisited. **Stacks:** The Stack ADT, Implementing the Stack, Stack Applications. **Queues:** The Queue ADT, Implementing the Queue, Priority Queues.

UNIT IV ADVANCED LINKED LISTS, RECURSION, HASH TABLES 9 hours

Advanced Linked Lists: The Doubly Linked List, The Circular Linked List, Multi-Linked Lists, Complex Iterators. **Recursion:** Recursive Functions, Properties of Recursion, How Recursion Works, Recursive Applications. **Hash Tables:** Hashing, Separate Chaining, Hash Functions, The HashMap Abstract Data Type.

UNIT V ADVANCED SORTING, BINARY TREES, SEARCH TREES 9 hours

Advanced Sorting: Merge Sort**,** Quick Sort, Radix Sort, Sorting Linked Lists. **Binary Trees:** The Tree Structure, The Binary Tree, Expression Trees, Heaps, Heapsort. **Search Trees:** The Binary Search Tree, Search Tree Iterators, AVL Trees, The 2-3 Tree.

Course Outcomes:

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

1. Describes the Abstract Data Types, Arrays, Sets and Maps
2. Explains the Algorithm Analysis, Searching and Sorting
3. Understand the Linked Structures, Stacks, and Queues
4. Examine the Advanced Linked Lists, Recursion, and Hash Tables
5. Construct of Advanced Sorting, Binary Trees, and Search Trees

Text Books:

1. Data Structures and Algorithms Using Python, Rance D. Necaise

Reference Books:

1. Fundamentals of Data Structures, Ellis Horowitz, SartajSahni, Dinesh Mehta, Silicon Press, Second Edition. 2007.

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

B. Tech II Year I Semester

20CAI105 OBJECT ORIENTED PROGRAMMING – JAVA

L	T	P	C
2	1	0	3

Pre-requisite 20CSE102

Course Description:

This course is designed to provide basics of Object-Oriented Programming - objects, classes, polymorphism, inheritance, static and dynamic binding. Object Oriented Programming using Java- classes, interfaces, inheritance, polymorphism, method dispatch, features for encapsulation and modularity.

Course Objectives:

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

UNIT I INTRODUCTION TO OOPS CONCEPTS AND CLASSES 9 hours

Introduction to Object Oriented Programming, Java buzzwords, Java Programming Basics, Sample programs, Data types and operators, Control statements. **Classes:** Classes, Objects, Methods, Constructors, this and static keywords, Method and Constructor Overloading, Access modifiers, Polymorphism **Arrays**: One Dimensional and multi-dimensional arrays.

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

Strings: Strings, String Handling **Inheritance:** Basics, Usage of Super, Multi-level hierarchy, Method overriding, Abstract class and Final keyword. **Packages:** Defining, Finding and Importing packages, Member Access. **Interfaces:** Creating, Implementing, Using, Extending, and Nesting of interfaces.

UNIT III EXCEPTION HANDLING &MULTI-THREADING 9 hours

Exception Handling: Fundamentals, Types, Multiple catch clauses, Nested try blocks, Thrown Class, Using Finally and Throws, Built-in exceptions, User-defined exceptions.

Multi-threading: Thread Class, Runnable interface, creating multiple threads, life cycle of thread, thread properties, synchronization, thread communication, suspending, resuming and stopping threads.

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

I/O Streams: Byte Stream Classes and Character Stream Classes. **Collection Frame work :** Hierarchy of collection framework, Array List, Linked List, Vector, Stack, Queue, Priority Queue, Hash Set, Linked Hash Set, Tree Set.

UNIT V SWINGS **9 hours**

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

Course Outcomes:

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

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

Text Books:

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

Reference Books

1. "Java Fundamentals - A Comprehensive Introduction", Herbert Schildt and Dale Skrien, Special Indian Edition, McGrawHill, 2013.

2. "Java – How to Program", Paul Deitel, Harvey Deitel, PHI.

3. "Thinking in Java", Bruce Eckel, Pearson Education.

4. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.

5. A Programmers Guide to Java SCJP", Third Edition, Mughal, Rasmussen, Pearson.

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

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech II Year I Semester

20CAI106 FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

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

Course Objectives:

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

UNIT I FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE 9 hours

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

UNIT II UNINFORMED SEARCH STRATEGIES 9 hours

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

UNIT III INFORMED SEARCH STRATEGIES 9 hours

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

UNIT IV KNOWLEDGE REPRESENTATION 9 hours

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

UNIT V PLANNING AND UNCERTAINTY 9 hours

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

Course Outcomes:

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

1. Formulate a problem and build intelligent agents.
2. Apply appropriate searching techniques to solve a real world problem.
3. Evaluation of different uninformed search algorithms on well formulate problems along with stating valid conclusions that the evaluation supports.
4. Analyze the problem and infer new knowledge using suitable knowledge representation schemes.
5. Formulate and solve given problem using Propositional and first order logic.
6. Apply reasoning for non-monotonic AI problems.

Text Books:

1. Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGraw Hill, 2008.
2. Stuart Russell and Peter Norvig. Artificial Intelligence – A Modern Approach, Pearson

Reference Books:

1. George F. Luger, "AI-Structures and Strategies for Complex Problem Solving", 4/e, 2002, Pearson Education.
2. Robert J. Schalkolf, Artificial Intelligence: An Engineering approach, McGraw Hill, 1990.
3. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson.
4. Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication.
5. Dan W. Patterson, Introduction to Artificial Intelligence and Expert System, PHI.
6. Elaine Rich, Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 1999.
7. George F. Luger, Artificial Intelligence, Pearson Education, 2001.
8. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman, 2002.David E Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Pearson Education, 2013.

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

B. Tech II Year I Semester

20CAI203 DATA STRUCTURES USING PYTHON LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CSE201

Course Description:

The typical data structures course, which introduces a collection of fundamental data structures. The basic concepts related to abstract data types, data structures, and algorithms. Arrays, Sets and Maps, Searching and Sorting, Linked Structures, Stacks, Queues, Advanced Linked Lists, Recursion, Hash Tables, Advanced Sorting, Binary Trees, Search Trees.

Course Objectives:

1. To develop skills to design and analyze linear and nonlinear data structures.
2. To develop algorithms for manipulating linked lists, stacks, queues, trees and graphs.
3. To develop recursive algorithms as they apply to trees and graphs.
4. To develop skill in advanced linked list.
5. To develop skill in advanced sorting.

List of Programs:

1. Write a Python program that uses functions to perform the following:
   a) Create a singly linked list of integers.
   b) Delete a given integer from the above linked list.
   c) Display the contents of the above list after deletion.

2. Write a Python program that uses functions to perform the following:
   a) Create a doubly linked list of integers.
   b) Delete a given integer from the above doubly linked list.
   c) Display the contents of the above list after deletion.

3. Write a Python program that uses stack operations to convert a given infix expression into its postfix Equivalent, Implement the stack using an array.

4. Write Python programs to implement a double ended queue ADT using i) array and ii) doubly linked list respectively.

5. Write a Python program that uses functions to perform the following:
   a) Create a binary search tree of characters.
   b) Traverse the above Binary search tree recursively in Postorder.

6. Write a Python program that uses functions to perform the following:
   a) Create a binary search tree of integers.
   b) Traverse the above Binary search tree non recursively in inorder.

7. Write Python programs for implementing the following sorting methods to arrange alist of integers in ascending order:
   a) Insertion sort b) Merge sort

8. Write Python programs for implementing the following sorting methods to arrange alist of integers in ascending order:
   a) Quick sort b) Selection sort

9. i) Write a Python program to perform the following operation:
   A) Insertion into a B-tree
   ii) Write a Python program for implementing Heap sort algorithm for sorting a given list of integers in ascending order.
10. Write a Python program to implement all the functions of a dictionary (ADT) using hashing.

11. Write a Python program for implementing Knuth-Morris- Pratt pattern matching algorithm.

12. Write Python programs for implementing the following graph traversal algorithms:
    a)Depth first traversal b)Breadth first traversal

Course Outcomes:

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

1. Describes the Abstract Data Types, Arrays, Sets and Maps
2. Explains the Algorithm Analysis, Searching and Sorting
3. Understand the Linked Structures, Stacks, and Queues
4. Examine the Advanced Linked Lists, Recursion, and Hash Tables
5. Construct of Advanced Sorting, Binary Trees, and Search Trees

Text Books:

1. Data Structures and Algorithms Using Python, Rance D. Necaise

Reference Books

1. Fundamentals of Data Structures, Ellis Horowitz, SartajSahni, Dinesh Mehta, Silicon Press, Second Edition. 2007.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech II Year I Semester

20CAI204 OBJECT ORIENTED PROGRAMMING - JAVA LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CSE201

Course Description:

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

Course Objectives:

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

List of Programs:

1. .a) Write a Java program that prints all real solutions to the quadratic equation ax2 + bx + c =0. Read in a, b, c and use the quadratic formula. If the discriminant b2-4ac is negative, display a message stating that there are no real solutions.
   b) Write a Java program that find prime numbers between 1 to n.
   c) Write a Java Program that find the factorial of a number.
2. a) The Fibonacci sequence is defined by the following rule: The fist two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that print the nth value in the Fibonacci sequence.
   b) Write a Java program that checks whether a given string is a palindrome or not. Ex: MADAM is a Palindrome.
   c) Write a Java program for sorting a given list of names in ascending order.
3. a) Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by .part<n> where n is the sequence number of the part file
   b) Write a java program to convert an ArrayList to an Array.
   c) Write a Java program to make frequency count of vowels, consonants, special symbols, digits, words in a given text..
4. a) Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
   b) Write a Java program that reads a file and displays the file on the screen, with a line number before each line.
   c) Implement Stack using queues.
5. a) Write a java program to make rolling a pair of dice 10,000 times and counts the number of times doubles of are rolled for each different pair of doubles. Hint: Math.random()
   b) Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it‘s not a duplicate of any number already read display the complete set of unique values input after the user enters each new value.
   c) Write a java program to read the time intervals (HH:MM) and to compare system time if the system time between your time intervals print correct time and exit else try again to repute the same thing. By using StringToknizer class.

6. a) Write java program to create a super class called Figure that receives the dimensions of two dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub class overridden area() so that it returns the area of a rectangle and a triangle respectively.
   b) Write a Java program that creates three threads. First thread displays ―Good Morning‖ every one second, the second thread displays ―Hello‖ every two seconds and the third thread displays ―Welcome‖ every three seconds

7. a) Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
   b) Use inheritance to create an exception super class called EexceptionA and exception sub class ExceptionB and ExceptionC, where ExceptionB inherits from ExceptionA and ExceptionC inherits from ExceptionB. Write a java program to demonstrate that the catch block for type ExceptionA catches exception of type ExceptionB and ExceptionC
8. Write a Java Program to design login window using AWT components.
9. Develop an application for simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.
10. Design & Develop an application that creates a user interface to perform integer divisions. The user enters two numbers in the JtextFields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an ArithmeticException Display the exception in a message dialog box.
11. Design a GUI application that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.
12. Design a GUI application for Cafeteria bill generation.
    Project Based Learning : Design and Develop a mini project using OOPS concepts

Course Outcomes:

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

1. Solve real world problems using OOP techniques.
2. Implement string handling and file handling methods.
3. Design multithreaded applications with synchronization.
4. Develop web applications using AWT components.
5. Create GUI based applications

Text Books:

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

Reference Books:

1. "Java Fundamentals - A Comprehensive Introduction", Herbert Schildt and Dale Skrien, Special Indian Edition, McGrawHill, 2013.
2. "Java – How to Program", Paul Deitel, Harvey Deitel, PHI.
3. "Thinking in Java", Bruce Eckel, Pearson Education.
4. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech II Year I Semester

20CAI205 FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CSE101

Course Description:

The course aims at equipping students to be able to use python programming for solving Artificial Intelligence problems.

Course Objectives:

1. To train the students in solving computational problems
2. To elucidate solving mathematical problems using Python programming language
3. To understand the fundamentals of Python programming concepts and its applications.
4. Practical understanding of building different types of models and their evaluation

List of Programs:

1. Study of Numpy and Pandas basic programs.
2. Write a program to implement Breadth First Search using Python.
3. Write a program to implement Depth First Search using Python.
4. Write a program to implement Tic-Tac-Toe game using Python.
5. Write a program to implement 8-Puzzle problem using Python.
6. Write a program to implement Water-Jug problem using Python.
7. Write a program to implement Travelling Salesman Problem using Python.
8. Write a program to implement Tower of Hanoi using Python.
9. Write a program to implement Monkey Banana Problem using Python.
10. Write a program to implement Missionaries-Cannibals Problems using Python.
11. Write a program to implement 8-Queens Problem using Python.

Course Outcomes:

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

1. Formulate a problem and build intelligent agents.
2. Apply appropriate searching techniques to solve a real world problem.
3. Evaluation of different uninformed search algorithms on well formulate problems along with stating valid conclusions that the evaluation supports.

Text Books:

1. Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGraw Hill, 2008.
2. Stuart Russell and Peter Norvig. Artificial Intelligence – A Modern Approach, Pearson

Reference Books:

1. George F. Luger, "AI-Structures and Strategies for Complex Problem Solving", 4/e, 2002, Pearson Education.
2. Robert J. Schalkolf, Artificial Intelligence: An Engineering approach, McGraw Hill, 1990.
3. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson.
4. Nils J. Nilsson, Principles of Artificial Intelligence, Narosa Publication.

5. Dan W. Patterson, Introduction to Artificial Intelligence and Expert System, PHI.

6. Elaine Rich, Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 1999.

7. George F. Luger, Artificial Intelligence, Pearson Education, 2001.

8. Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman, 2002.David E Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Pearson Education, 2013.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Mandatory Course

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.

COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE)
B. Tech II Year II Semester

B. Tech II Year II Semester

20HUM101 ECONOMICS AND FINANCIAL ACCOUNTING FOR ENGINEERS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

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

Course Objectives:

1. Describe the nature of engineering economics in dealing with the issues of scarcity;

2. Know the supply, demand, production and cost analysis to analyze the impact of economic events on markets;

3. Explain the performance of firms under different market structures and Price determination in various market conditions.

4. Explain the accounting principles, types of accounting and preparation of final accounts; and

5. Describe the financial statement analysis and investment evaluation through ratios and capital budgeting techniques.

UNIT I DEMAND ANALYSIS 9 hours

Scope and Significance of Economics- Understanding the problem of scarcity and choice - Elements of market Economy: Demand, Supply and Market Equilibrium- Theory of Demand, Elasticity of Demand, Supply and Law of Supply.

UNIT II PRODUCTION AND COST ANALYSIS 9 hours

Production Function – Short-run and long- run production – Cost Analysis: Cost concepts - Cost Structure of Firms and output decision- Break-Even Analysis (BEA) – Managerial significance and limitations of BEA - Determination of Break Even Point (Simple Problems).

UNIT III MARKET STRUCTURE AND PRICING 9 hours

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

UNIT IV BASICS OF ACCOUNTING 9 hours

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

UNIT V FINANCIAL RATIO ANALYSIS AND CAPITAL BUDGETING 9 hours

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

Course Outcomes:

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

1. Understand Engineering economics basic concepts,

2. Analyze the concepts of demand, elasticity, supply, Production, Cost Analysis and its essence in floating of an organization,

3. Compare different market structures and identify suitable market,

4. Demonstrate an understanding and analyzing the accounting statements, and

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

Text Books:

1. Case E. Karl & Ray C. Fair, "Principles of Economics", Pearson Education, 8th Edition, 2007

2. Financial Accounting, S. N. Maheshwari, Sultan Chand, 2009

3 Financial Statement Analysis, Khan and Jain, PHI, 2009

4 Financial Management, Prasanna Chandra, T.M.H, 2009

Reference Books:

1. Lipsey, R. G. & K. A. Chrystal , "Economics", Oxford University Press, 11th Edition, 2007

2 Samuelson P. A. & Nordhaus W. D. "Economics", Tata McGraw-Hill 18th Edition, 2007

3 Financial Management and Policy, Van Horne, James, C., Pearson, 2009.

4. Financial Management, I. M. Pandey, Vikas Publications

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

Dept. of. Computer Science & Engineering (Artificial Intelligence)

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 Book(s)

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.

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech II Year II Semester

20CAI107 OPERATING SYSTEMS FUNDAMENTALS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

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

Course Objectives:

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

UNIT I INTRODUCTION 9 hours

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

UNIT II PROCESS CONCEPTS 9 hours

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

UNIT III PROCESS SYNCHRONIZATION AND DEADLOCKS 9 hours

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

UNIT IV MEMORY MANAGEMENT STRATEGIES 9 hours

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

UNIT V FILE SYSTEM 9 hours

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

Course Outcomes:

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

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

Text Books:

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

Reference Books:

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

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

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech II Year II Semester

20CAI108 AI TOOLS, TECHNIQUES AND APPLICATIONS

L	T	P	C
3	0	0	3

Pre-requisite **20CAI106**

Course Description:

To understand the importance of AI and its applications, Machine learning and Deep Learning algorithms and smart solutions for various domains. This course aims to introduce the students to the theoretical foundation for the process of computation and to impart an understanding of Automata, Regular Languages, Context Free Languages, Push down Automata and Turing Machine.

Course Objectives:

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

UNIT I FUNDAMENTALS OF AI 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 the basic concepts and applications of Artificial Intelligence.
2. Design Chatbots based on the user requirements
3. Identify the features of digital images for analysis.
4. Implement the deep learning techniques using software tools.
5. Develop smart applications for various domains

Text Books:

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

Reference Books:

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

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

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech II Year II Semester

20CAI109 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
2	1	0	3

Pre-requisite 20CAI104

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.

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech II Year II Semester

20CAI206 OPERATING SYSTEMS FUNDAMENTALS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite NIL

Course Description:

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

Course Objectives:

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

List of Programs:

1. To Study basic concepts in OS with the help of Linux commands.
2. a) Write a shell script that accepts two integers as its arguments and computers the value of first number raised to the power of the second number.
   b) Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.
3. a) Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
   b) Write a shell script that computes the gross salary of a employee according to the following rules:

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

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

   The basic salary is entered interactively through the key board.
4. a) Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
   b) Develop an interactive script that ask for a word and a file name and then tells how many times that word occurred in the file.
5. Simulate the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority
6. Program on process creation and Execution
   a. To display Environment variables.
   b. To implement Different types of exec functions.
7. a)Write a program to create a chain of Processes.
   b) Demonstration of Zombie and Orphan process.
8. Write a program for Producer Consumer Problem.

9. Write a program to create pipes.

10. Write a Program to find whether a file is having read, write, execute permissions and also check whether a given name is file or directory.

11. Simulate MVT and MFT.

12. Simulate all page replacement algorithms

13. Simulate all file allocation strategies
    a) Sequential b) Indexed c) Linked

Course Outcomes:

At the end of the course the student will be able to

1. Understand the use of Linux commands
2. Compare the performance of processor scheduling algorithms
3. Design algorithmic solutions for process synchronization problems
4. Analyze the performance of various file management schemes
5. Implement different page replacement algorithms.

Text Books:

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

References:

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

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

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech II Year II Semester

20CAI207 AI TOOLS, TECHNIQUES AND APPLICATIONS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite 20CAI205

Course Description:

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

Course Objectives:

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

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. Create convolution neural network model for image classification

Text Books:

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
3. Building Machine Learning systems with Python, WilliRichart Luis Pedro Coelho

4. Python Machine Learning by Example, Liu, Yuxi(Hayden),Packt Publishers

5. Stuart J. Russell and Peter Norvig,Artificial Intelligence A Modern Approach

Reference Books:

1. AurélienGéron,Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media,2017
2. Machine Learning with Python, AbhishekVijayvargia, BPB publications

3. Python Machine Learning, Sebastian Raschka, packt publishers

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech II Year II Semester

20CAI208 DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite **20CAI203**

Course Description:

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

Course Objectives:

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

List of Programs:

1. Sort a given set of elements using the Quick sort method and determine the time required to sort the elements.
2. Implement Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements.
3. Implement Fractional Knapsack problem using Greedy Method
4. Implement Job Scheduling with Deadlines using Greedy Method
5. Implement 0/1 Knapsack problem using Dynamic Programming
6. Implement Traveling Salesperson problem to find the optimal tour using Dynamic Programming
7. Find Minimum Cost Spanning Tree of a given undirected graph using
   (a) Prim's algorithm.
   (b) Kruskal's algorithm
8. Implement the algorithm for Topological ordering of vertices in a DAG.
9. From a given vertex in a weighted connected graph, find shortest paths to all other vertices using Dijkstra's algorithm
10. Implement All-Pairs Shortest Paths Problem using Floyd-Warshall's algorithm
11. Find a subset of a given set $S = \{S_1, S_2, ...S_n\}$ of n positive integers whose sum is equal to a given positive integer d. For example, if S= {2, 3, 5, 7, 8} and d = 10 there are three solutions {2,3,5}, {3,7}. and {2,8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.
12. Implement N Queen's problem using Back Tracking

Course Outcomes:

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

1. Analyse the performance of different algorithms.
2. Apply various problem solving approaches
3. Identify optimal solution for different problems using greedy method and dynamic programming.
4. Implement various graph based algorithms.
5. Make use of backtracking method to solve real world problems.

Text Books:

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

Reference Books:

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

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Mandatory Course

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.

COMPUTER SCIENCE & ENGINEERING

(Artificial Intelligence)

B. Tech III Year I Semester

B. Tech III Year I Semester

20CAI110 COMPUTER NETWORKS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

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

Course Objectives:

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

UNIT I INTRODUCTION 9 hours

NETWORK FUNDAMENTALS:

Introduction, Advantages and Applications, Network Types, Topologies, Internet History, Standards and Administration. Protocols and Standards Network Models: Protocol Layering, The ISO Model, Layers in the OSI Model, TCP/IP Protocol Suite, Cross-layering, Addressing.

THE PHYSICAL LAYER

Data and Signals, Transmission impairment, Data rate limits, Performance. Transmission media: Introduction, Guided Media, Unguided Media. switching: Structure of Circuit Switched Networks, Packet switched networks.

UNIT II THE DATA LINK LAYER 9 hours

Introduction, Link layer addressing. Error detection and Correction: Cyclic codes, Checksum, Forward error correction. Data link control: DLC Services, Data link layer protocols, Frames, Flow & Error Control, Protocols, HDLC, Point to Point Protocol. Media Access control: Random Access, Controlled Access, Channelization, and connecting devices.

UNIT III THE NETWORK LAYER 9 hours

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

UNIT IV THE TRANSPORT LAYER 9 hours

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

UNIT V THE APPLICATION LAYER 9 hours

Introduction, Client Server Programming, WWW and HTTP, FTP, e-mail, TELNET, Secure Shell, Domain Name System, SNMP. DNS, TELNET, e-mail, File Transfer, WWW and HTTP, SNMP, Streaming Audio & Video, Content delivery.Case study- Computer Networks in health care.

Course Outcomes:

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

1. Understand and choose the transmission media and topologies depending on the requirements.
2. Apply error detection and error correction wherever required.
3. Analyze the concepts of routing, and congestion control
4. Evaluate the computer network logically, by enumerating the layers of the TCP/IP.
5. Create and make use of application-level protocols for file communication, and file transfer.

Text Book(s)

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

Reference Books

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

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

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech III Year I Semester

20CAI111 DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

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

Course Objectives:

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

UNIT I INTRODUCTION 9 hours

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

UNIT II RELATIONAL MODEL 9 hours

Relational Data Model: Concept of relations, schema-instance distinction, keys, referential integrity, foreign keys, relational algebra operators, SQL - Introduction, data definition in SQL, table, key, and foreign key definitions. Querying in SQL, notion of aggregation, Integrity constraints, aggregation functions group by and having clauses.

PL/SQL concepts: Embedded SQL, Dynamic SQL, triggers and active databases, Cursors, Introduction to JDBC, Stored Procedures.

Relational Algebra and Calculus: Preliminaries, Relational algebra- Selection and Projection, Set Operations, Renaming, Joins, Division. Relational Calculus

UNIT III DATABASE DESIGN & SCHEMA REFINEMENT 9 hours

Database Design: Dependencies and Normal forms, dependency theory - functional dependencies, Armstrong's axioms for FD's, closure of a set of FDs.

Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, and 5NF decompositions and desirable properties

UNIT IV TRANSACTION PROCESSING & INDEXING 9 hours

Transaction processing - Concepts of transaction processing, ACID properties, concurrency control, Time-stamp based and lock-based protocols for concurrency control. Serializability of scheduling Index Structures – Indexes on Sequential Files – Secondary Indexes – B-Trees – Hash Tables

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

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

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

Course Outcomes:

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

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

Text Book(s)

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

Reference Books

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

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

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech III Year I Semester

20CAI112 MACHINE LEARNING

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

This course aims to gives a basic knowledge on machine learning, classification techniques and the various algorithms in machine learning. It helps the students to explores Scikit-learn, Tensorflow and the various datasets used for machine learning. It enlightens the students with the knowledge of need for cloud computing in machine learning and GPU computing using CUDA.

Course Objectives:

1. To understand the principles and concepts of machine learning
2. To learn the clustering techniques and their utilization in machine learning
3. To study the neural network systems for machine learning
4. To understand the role of cloud computing and GPU computing in machine learning
5. To learn methodology and tools to apply machine learning algorithms to real data and evaluate their performance

UNIT I INTRODUCTION 9 hours

Introduction to Machine Learning, Need for Machine Learning, Types of Machine learning systems - Challenges in Machine learning system. End-to-End Machine learning project - Practice a python code for training and running a linear model using Scikit-learn in California Housing Dataset.

UNIT II CLASSIFICATION 9 hours

Binary Classification, Multiclass classification, Multilabel classification, Multioutput classification, SVM classification

Compute the Performance Metrics Precision and Recall for MNIST dataset using Scikit-learn.

Train a linear SVM model using Scikit-learn to detect Iris-Virginica flowers in Iris Dataset

UNIT III ALGORITHMS 9 hours

Decision Tress, CART algorithm, Ensemble Algorithm and Regression Trees, Unsupervised learning: clustering. Introduction to Artificial Neural Networks.

Use Adult income dataset to predict income level based on the individual's personal information.

UNIT IV INTELLIGENT CLOUD 9 hours

Tensor Flow: Introduction, Installation, Architecture, Functions and graphs. Intelligent cloud: introduction, need for cloud computing in machine learning, key characteristics of cloud computing, various stakeholders, Examples of Cloud based Machine Learning, Case studies on Healthcare in the cloud using machine learning.

Explore Salesforce IoT cloud, Azure cognitive services.

UNIT V AN INTRODUCTION TO GPU COMPUTING WITH CUDA 9 hours

Introduction: Parallel Processing, Rise of GPU computing, CUDA – Architecture, Applications, CUDA development environment, Parallel programming with CUDA, CUDA C on multiple GPUs, CUDA tools.

Explore tensorflow-gpu to classify MNIST dataset using GPU.

Course Outcomes:

1. Upon successful completion of the course, students will be able to
2. Appreciate the underlying mathematical relationships within and across machine learning algorithms and the paradigms of supervised and un-supervised learning
3. Appreciate machine learning challenges and suggest solutions for the same
4. Design and implement various machine learning algorithms in a range of real-world applications
5. Have an understanding of how cloud computing helps machine learning.
6. Design parallel programming with CUDA.

Text Book(s)

1. Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Geron Aurelien
2. CUDA by example: an introduction to general-purpose gpu programming, Edward Kandrot and Jason Sanders

Reference Books

1. Introduction to Machine Learning in the Cloud with Python, Pramod Gupta • Naresh K. Sehgal, Springer
2. Machine Learning: A multistrategy approach, Tom M. Mitchell
3. E. Alpaydin, "Introduction to Machine Learning", Second Edition, Prentice-Hall of India, 2010.
4. Simon Haykin, "Neural Networks and Learning Machines", Pearson, 2008.

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

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech III Year I Semester

20CAI209 DATABASE MANAGEMENT SYSTEMS LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite NIL

Course Description:

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

Course Objectives:

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

LIST OF PROGRAMS:

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

A) Draw an ER diagram for Library Management System

B) Draw an ER diagram for Hospital Management System

2. Students should be allowed to choose appropriate DBMS software, install it, configure it and start working on it. Create sample tables, and insert the data into them, and perform the following using DDL and DML commands

a. Insert the data given above in employee, department, and project tables.
b. Retrieve all the employees' information for a particular department number
c. Get Employee name along with his SSN and Supervisor SSN.
d. Retrieve the employee names whose bdate is' 29-MAR-1959.'
e. Get salaries of the employees without duplications.
f. Retrieve the MgrSSN, MgrStartDate of the manager of 'Research' department.
g. Change the department number of an employee having fname as 'Joyce' to 3
h. Alter Table department add column ContactNo of NUMBER data type and insert values into this column only.
i. Change table department by modifying the size of field ContactNo.
j. Modify the field name ContactNo of departments table to MobileNo.
k. Change the name of Table Department to DEPT.

3. Perform following queries
    a. Retrieve all data from employee, jobs, and deposit.
    b. Give details of account no. and deposited rupees of customers having an accountopened between dates 01-01-06 and 25-07-06.

c. Display all jobs with a minimum salary is greater than 4000.
d. Display name and salary of the employee whose department no is 20. Give alias nameto name of the employee.
e. Display employee no, name, and department details of those employees whosedepartment lies in(10,20)

4. To study various options of LIKE predicate
   a. Display all employees whose name starts with 'V' and the third character is 'v.'
   b. Display name, number, and salary of those employees whose name is 5 characterslong and the first three characters are 'Vic.'
   c. Display the non-null values of employees and employee name second charactershould be 'n,' and the string should be 5 characters long.
   d. Display the null values of an employee, and also employee name's third charactershould be 'a'.
   e. What will be output if you are giving LIKE predicate as '%_%' ESCAPE '\'
5. To perform various data manipulation commands, aggregate functions, and sorting conceptson all created tables.
   a. List total deposit from the deposit.
   b. List total loan from karolbagh branch
   c. Give maximum loan from branch vice.
   d. Count the total number of customers
   e. Count total number of customer's cities.
   f. Create table supplier from the employee with all the columns.
   g. Create table sup1 from the employee with the first two columns.
   h. Create table sup2 from the employee with no data
   i. Insert the data into sup2 from an employee whose second character should be 'n' andstring should be 5 characters long in the employee's name field.
   j. Delete all the rows from sup1.
   k. Delete the detail of the supplier whose sup_no is 103.
   l. Rename the table sup2.
   m. Destroy table sup1 with all the data.
   n. Update the value dept_no to 10 where second character of emp. name is 'm'.
   o. Update the value of employee name, whose employee number is 103.
6. To know how the constraints are used to make a table contain valid data.
   Execute the following Queries on the Database to note the violations integrity constraints byany of the following operations
   a. Insert ('Robert', 'F', 'Scott', '987987987 ', '21-JUN-42', '2365 Newcastle Rd, Bellaire,TX', M, 58000, '888665555', 1) into EMPLOYEE.
   b. Insert ('Ramez', 'F', 'Scott', ' ', '21-JUN-42', '2365 Newcastle Rd, Bellaire, TX', M,58000, '888665555', 1) into EMPLOYEE.
   c. Insert ('677678989', null, '40.0') into WORKS_ON.
   d. Insert ('453453453', 'John', M, '12-DEC-60', 'SPOUSE') into DEPENDENT
   e. Insert ('343453453', 'Varun','', '12-DEC-60', 'SON') into DEPENDENT
   f. Delete WORKS_ON tuples with ESSN= '333445555'.
   g. Modify MGRSSN and MGRSTARTDATE of the DEPARTMENT tuple with DNUMBER=5 to '123456789' and '01-OCT-88', respectively.
7. To study Single-row functions.
   a. Write a query to display the current date.

b. For each employee, display the employee number, job, salary, and salary increased by15% and expressed as a whole number. Label the column New Salary
c. Modify your query no 2 to add a column that subtracts the old salary from the newsalary. Label the column Increase
d. Write a query that displays the employee's names with the first letter capitalized and all other letters lowercase, and the length of the names, for all employees whose namestarts with J, A, or M. Give each column an appropriate label. Sort the results by the employees' last names.
e. Write a query that produces the following for each employee: <employee last name>earns <salary> monthly
f. Write a query to calculate the annual compensation of all employees (sal+comm)

8. Displaying Data from Multiple Tables (join)
   a. Give details of customers Vivek
   b. Give the names of the customers who are borrowers and depositors and having living cityMadanapalle
   c. Give city as their city name of customers having the same living branch.
   d. Write a query to display the last name, department number, and department name for allemployees.
   e. Create a unique listing of all jobs that are in department 30. Include the location of thedepartment in the output
   f. Write a query to display the employee name, department number, and department namefor all employees who work in NEW YORK.
   g. Display the employee's last name and employee number along with their manager's lastname and manager number. Label the columns Employee, Emp#, Manager, and Mgr#, respectively.
   h. Create a query to display the name and hire date of any employee hired after employeeSCOTT.
9. To apply the concept of Aggregating Data using Group functions.
   a. List total deposit of customer having account date after 1-Jan-96.
   b. List total deposit of customers living in city Nagpur.
   c. List maximum deposit of customers living in Bombay.
   d. Display the highest, lowest, sum, and average salary of all employees. Label the columns Maximum, Minimum, Sum, and Average, respectively. Round your results to the nearest whole number.
   e. Write a query that displays the difference between the highest and lowest salaries. Label the column DIFFERENCE
   f. Create a query that will display the total number of employees and, of that total, thenumber of employees hired in 1995, 1996, 1997, and 1998
   g. Find the average salaries for each department without displaying the respectivedepartment numbers.
   h. Write a query to display the total salary being paid to each job title within eachdepartment.
   i. Find the average salaries > 2000 for each department without displaying the respectivedepartment numbers.
   j. Display the job and total salary for each job with a total salary exceeding 3000, whichexcludes the present and sorts the list by the total salary.
   k. List the branches having the sum of deposit more than 5000 and located in city

Bombay.

10. To solve queries using the concept of the subquery.
    a. Write a query to display the last name and hire date of any employee in the samedepartment as SCOTT. Exclude SCOTT
    b. Give the name of customers who are depositors having same branch city of Mr. Arul.
    c. Give deposit details and loan details of the customer in the same city where Pramod isliving.
    d. Create a query to display the employee numbers and last names of all employees whoearn more than the average salary. Sort the results in ascending order of salary.
    e. Give names of depositors having the same living city as Mr. Hari and having depositamount greater than 2000
    f. Display the last name and salary of every employee who reports to ford.
    g. Display the department number, name, and job for every employee in the accountingdepartment.
    h. List the name of the branch having the highest number of depositors.
    i. Give the name of cities wherein the maximum number of branches are located.
    j. Give the name of customers living in the same city where maximum depositors arelocated.
11. . Write a PL/SQL block to change the address of a particular employee by taking theiremployee number interactively.
    b. Write a cursor program to display manager details for each department
12. a. Create a trigger which checks whether an employee with Emp_no is present in theEmployee table before inserting it into EMP.
    b. Write a procedure to insert a record into the ORDER table by validating the qty limit ofthe item and also check whether that item exists

Project-Based Learning:

Design and implementation of Student Information System

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

- Draw ER Diagram
- Tables Creation
- Establish the relationship between relevant tables Apply Normalization (if necessary)
- Create GUI
- Establish Connection between front end and back end as Oracle
- Prepare Project Report

Course Outcomes:

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

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

Text Book(s)

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.

Dept. of. Computer Science & Engineering (Artificial Intelligence)

B. Tech III Year I Semester

20CAI210 MACHINE LEARNING LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite

Course Description:
This course helps the students to learn various machine learning algorithms. It makes the students to explore the machine learning algorithms using various dataset. It also helps the students to analyse the data and find interesting patterns.

Course Objectives:

1. Make use of Data sets in implementing the machine learning algorithms
2. Implement the machine learning concepts and algorithms in any suitable language of choice
3. To apply various supervised learning methods to different problems.
4. To evaluate the performance of the machine learning algorithms.
5. To skill in various languages to analyse the machine learning algorithms.

List of Programs:

1. Implement Linear Regression
2. Implement Logistic Regression
3. Implement Decision Tress
4. Implement SVM algorithm
5. Implement Naïve Bayes Algorithm
6. Implement KNN algorithm
7. Implement K-Means algorithm
8. Implement Random forest algorithm
9. Implement Gradient boosting and Adaboosting algorithm
10. Implement Neural Networks
11. Implement DBSCAN Clustering
12. Implement Hierarchical clustering
13. Implement Grid search algorithm
14. Implement Voting classifier

Course Outcomes:

1. Design and implement various machine learning algorithms in a range of real-world applications
2. Appreciate the underlying mathematical relationships within and across machine learning algorithms
3. Analyse the paradigms of supervised and un-supervised learning
4. Apply suitable machine learning techniques for data handling
5. Evaluate the performance of algorithms.

Text Book(s)

1. Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Geron Aurelien
2. Machine Learning: A multi strategy approach, Tom M. Mitchell

Reference Books

1. Introduction to Machine Learning in the Cloud with Python, Pramod Gupta • Naresh K. Sehgal, Springer.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Mandatory Course

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

COMPUTER SCIENCE & ENGINEERING

(Artificial Intelligence)

B. Tech III Year II Semester

B. Tech III Year II Semester

20CAI113 BIG DATA ANALYTICS

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

This course introduces the students the concept of big data, characteristics, and its importance. It helps the students to explore Hadoop, how to set up a Hadoop cluster, spark, and its applications. It also discusses the MapReduce functions and NoSQL database.

Course Objectives:

1. To understand the Big Data Platform and its Use cases
2. To Provide an overview of Apache Hadoop
3. To understand the various MapReduce functions
4. To Provide HDFS Concepts and Interfacing with HDFS
5. To understand NoSQL database

UNIT I INTRODUCTION **9 hours**

Introduction: Big Data - Characteristics of Big Data - Big data management architecture - Examining Big Data Types - Big Data Technology Components - Big data analytics - Big data analytics examples - Web Data Overview - Web Data in Action.

UNIT II HADOOP **9 hours**

Introduction: History of Hadoop - Hadoop Ecosystem - Analyzing data with Hadoop - Hadoop Distributed File System - Design - HDFS concepts - Hadoop filesystem - Data flow - Hadoop I / O - Data integrity - Serialization - Setting up a Hadoop cluster - Cluster specification - cluster setup and installation - YARN.

UNIT III MAPREDUCE **9 hours**

Introduction: Understanding MapReduce functions - Scaling out - Anatomy of a MapReduce Job Run - Failures - Shuffle and sort - MapReduce types and formats - features - counters - sorting - MapReduce Applications –Configuring and setting the environment - Unit test with MR unit - local test.

UNIT IV SPARK **9 hours**

Installing spark - Spark applications - Jobs - Stages and Tasks - Resilient Distributed databases - Anatomy of a Spark Job Run - Spark on YARN - SCALA: Introduction - Classes and objects - Basic types and operators - built-in control structures - functions and closures - inheritance.

UNIT V NoSQL DATABASE **9 hours**

Introduction to NoSQL - MongoDB: Introduction - Data types - Creating - Updating and deleing documents - Querying - Introduction to indexing - Capped collections - Hbase: Concepts - Hbase Vs RDBMS - Creating records - Accessing data - Updating and deleting data - Modifying data - exporting and importing data. USE CASES: Call detail log analysis - Credit fraud alert - Weather forecast.

Course Outcomes:

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

1. Understand the characteristics of big data and concepts of Hadoop ecosystem
2. Understand the concepts of Scala programming
3. Apply Mapreduce programming model to process big data
4. Analyze Spark and its uses for big data processing
5. Design programs for big data applications using Hadoop components

Text Book(s)

1. EMC Education Services, “Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, Wiley Publishers, 2015.
2. Simon Walkowiak, “Big Data Analytics with R”, PackT Publishers, 2016.

Reference Books

1. David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, No SQL, and Graph”, Morgan Kaufmann/Elsevier Publishers, 2013.
2. Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley Publishers, 2015.
3. Kim H. Pries, Robert Dunnigan, “Big Data Analytics: A Practical Guide for Managers”, CRC Press, 2015.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech III Year II Semester

20CAI114 DEEP LEARNING

L	T	P	C
3	0	0	3

Pre-requisite: Probability and Statistics, Introduction to Machine Learning

Course Description:
This course is designed to present the core fundamentals behind the much talked about field of Deep Learning. We will delve into selected topics of Deep Learning, from discussing basics of neural networks, to understanding how CNN and NN works with common examples and publicly available datasets. Special highlight of the course is the lecture on Interpretability of Neural Networks which will help students to understand how to trust a neural network's recommendation.

Course Objectives:

To introduce the fundamentals of deep learning and the main research activities in this field.

To learn architectures and optimization methods for deep neural network training

UNIT 1 LINEAR ALGEBRA REVIEW AND OPTIMIZATION 9 hours

Brief review of concepts from Linear Algebra, Types of errors, bias-variance trade-off, overfitting-under fitting, brief review of concepts from Vector Calculus and optimization, variants of gradient descent, momentum.

UNIT 2 LOGISTIC REGRESSION 9 hours

Basic concepts of regression and classification problems, linear models addressing regression and classification, maximum likelihood, logistic regression classifiers.

UNIT 3 NEURAL NETWORKS 9 hours

Basic concepts of artificial neurons, single and multi-layer perceptron, perceptron learning algorithm, its convergence proof, different activation functions, SoftMax cross entropy loss function.

UNIT 4 CONVNETS 9 hours

Basic concepts of Convolutional Neural Networks starting from filtering. Convolution and pooling operation and arithmetic of these, Discussions on famous convent architectures - AlexNet, ZFNet, VGG, GoogLeNet, ResNet, MobileNet-v1

REGULARIZATION, BATCHNORM

Discussion on regularization, Dropout, Batchnorm, Discussion on detection as classification, region proposals, RCNN architectures

UNIT 5 RECURRENT NEURAL NETWORKS 9 hours

Basic concepts of Recurrent Neural Networks (RNNs), backpropagation through time, Long-Short Term Memory (LSTM) architectures, the problem of exploding and vanishing gradients, and basics of word embedding.

AUTOENCODERS

Autoencoders, Denoising autoencoders, sparse autoencoders, contractive Autoencoders

Course Outcomes:

After completion of course, students would be able to:

1. Understand the fundamentals of deep learning
2. Compare various deep neural network architectures
3. Apply various deep learning algorithms based on real-world applications.

Text Book(s)

1. Ian Goodfellow, YoshuaBengio, Aaron Courville. Deep Learning, the MIT press, 2016
2. Bengio, Yoshua. " Learning deep architectures for AI." Foundations and trends in Machine Learning 2.1, Now Publishers, 2009.

Reference Books

1. B. Vegnanarayana, Artificial Neural Networks, Prentice Hall of India, 2005.
2. Simon Haykin, Neural Networks a Comprehensive Foundations, PHI Edition, 2005.
3. Chao Pan, Deep Learning Fundamentals: An Introduction for Beginners, AI Sciences Publisher.

Online Resources:

1. https://www.coursera.org/learn/neural-networks-deep-learning
2. https://www.deeplearning.ai/program/deep-learning-specialization/

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

B. Tech III Year II Semester

20CAI115 DATA SCIENCE **L T P C**

3 0 0 3

Pre-requisite: Introduction to Python

Course Description:

This course is designed to provide strong foundation for data science and application area related to it and understand the underlying core concepts and emerging technologies in data science.

Course Objectives:

1. To describe the life cycle of Data Science and computational environments for data scientists using Python.
2. To describe the fundamentals for exploring and managing data with Python.
3. To examine the various data analytics techniques for labeled/columnar data using Python.
4. To demonstrate a flexible range of data visualizations techniques in Python.
5. To describe the various Machine learning algorithms for data modeling with Python.

UNIT I INTRODUCTION TO DATA SCIENCE **9 hours**

Introduction to Data Science and its importance - Data Science and Big data-, The life cycle of Data Science- The Art of Data Science - Work with data – data Cleaning, data Managing, data manipulation. Establishing computational environments for data scientists using Python with IPython and Jupyter.

UNIT-II VISUALIZING DATA **9 hours**

Visualizing Data: matplotlib, Bar Charts, Line Charts, Scatterplots. Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Some Other Correlational Caveats, Correlation and Causation.

UNIT-III GETTING DATA **9 hours**

Getting Data: stdin and stdout, Reading Files, Scraping the Web, Using APIs. Working with Data: Exploring Your DataUsing NamedTuples, Dataclasses, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction. Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem.

UNIT-IV MACHINE LEARNING **9 hours**

Machine Learning: Modeling, Overfitting and Underfitting, Correctness, The Bias-Variance. Categories of Machine Learning algorithms, Dimensionality reduction-Introducing ScikitApplication: Exploring Hand-written Digits. Feature Engineering, Naive Bayes Classification - Linear Regression - kMeans Clustering

UNIT-V CLUSTERING **9 hours**

Clustering: The Idea, The Model, Choosing k, Bottom-Up Hierarchical Clustering. Recommender Systems: Manual Curation, Recommending What's Popular, User-Based Collaborative Filtering, Item-Based Collaborative Filtering, Matrix Factorization Data Ethics, Building Bad Data Products, Trading Off Accuracy and Fairness, Collaboration

Course Outcomes:

Upon successful completion of the course, students will be able to
1. Identify phases involved in the life cycle of Data Science.
2. Pre-process and manage the data for efficient storage and manipulation in Python.
3. Realize the various data analytics techniques for labeled / columnar Data using Python Pandas.
4. Explore a flexible range of data visualizations approaches in Python.
5. Analyze various Machine learning algorithms for data modeling with Python.

Text Books

1. Joel Grus, "Data Science From Scratch", OReilly. 2) Allen B.Downey, "Think Stats", OReilly.
2. Doing Data Science: Straight Talk From The Frontline, 1st Edition, Cathy O'Neil and Rachel Schutt, O'Reilly, 2013

Reference Books

1. Mining of Massive Datasets, 2nd Edition, Jure Leskovek, Anand Rajaraman and Jeffrey Ullman, v2.1, Cambridge University Press, 2014
2. "The Art of Data Science", 1st Edition, Roger D. Peng and Elizabeth matsui, Lean Publications, 2015
3. "Algorithms for Data Science", 1st Edition, Steele, Brian, Chandler, John, Reddy, Swarna, springers Publications, 2016

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

B. Tech III Year II Semester

20CAI211 BIG DATA ANALYTICS LABORATORY

L T P C

0 0 3 1.5

Pre-requisite: Data Structure & Algorithms, Computer Architecture, Operating System, Database Management Systems

Course Description:
This course is designed an in-depth understanding of terminologies and the core concepts behind big data problems, applications, systems and the techniques that underlie today's big data computing technologies. It provides an introduction to some of the most common frameworks such as Apache Spark, Hadoop, MapReduce, Large scale data storage technologies such as in-memory key/value storage systems, NoSQL distributed databases

Course Objectives:

1. Optimize business decisions and create competitive advantage with Big Data analytics
2. Imparting the architectural concepts of Hadoop and introducing map reduce paradigm
3. Introducing Java concepts required for developing map reduce programs
4. Derive business benefit from unstructured data
5. Introduce programming tools PIG & HIVE in Hadoop echo system.

List of Programs:

1. (i)Perform Setting Up And Installing Hadoop In Its Two Operating Modes:

Pseudo Distributed, And Fully Distributed.

(ii) Use Web Based Tools To Monitor Your Hadoop Setup.

2. (i) Implement the following file management tasks in Hadoop:

    1. Adding files and directories

    2. Retrieving files

    3. Deleting files

ii) Benchmark and stress test an Apache Hadoop cluster

3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.

    1. Find the number of occurrence of each word appearing in the input file(s)

    2. Performing a MapReduce Job for word search count (look for specific keywords in a file)

4. Stop word elimination problem:

a. Input:

    i. A large textual file containing one sentence per line

    ii. A small file containing a set of stop words (One stop word per line)

b. Output:

i. A textual file containing the same sentences of the large input file without thewords appearing in the small file.

5. 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.

1. Find average, max and min temperature for each year in NCDC data set?

2. 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. Purchases.txt Dataset

a. Instead of breaking the sales down by store, give us a sales breakdown by product category across all of our stores

i. What is the value of total sales for the following categories?

1. Toys

2. Consumer Electronics

b. Find the monetary value for the highest individual sale for each separate store

7. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

8. Write a Pig Latin scripts for finding TF-IDF value for book dataset (A corpus of eBooks available at: Project Gutenberg)

9. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes

10. Install, Deploy & configure Apache Spark Cluster. Run apache spark applications using Scala.

Course Outcomes:

Upon successful completion of the course, students will 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

Text Book(s)

1. Arshdeep Bahga, Vijay Madisetti, “Big Data Science & Analytics: A Hands-On Approach “,VPT, 2016
2. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge DataStreams with Advanced Analytics”, John Wiley& sons, 2012

Reference Books

1. Paul Zikopoulos, Dirkde Roos, Krishnan Parasuraman, Thomas Deutsch, James Giles , David Corrigan, “Harness the Power of Big Data The IBM Big Data Platform”, Tata McGraw Hill Publications, 2012
2. Bart Baesens “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)”, John Wiley & Sons,2014

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

B. Tech III Year II Semester

20CAI212 DEEP LEARNING LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite: Data Structures using Python Programming Lab

Course Description

This course is designed to provide a basic understanding of working principle of perceptron model. Expert knowledge in solving real world problems using state of art deep learning techniques the course covers all basic and advanced concepts to solve real world problems by using neural network and deep learning techniques.

Course Objectives

Understand the working principle of perceptron model.

1. Learn different activation functions and optimization techniques used in neural networks.
2. Know the applications of deep learning models for binary and multiclass classification.
3. Understand the architectures of CNN, RNN, LSTM and GRU.
4. Explore various types of Categorical Data Encoding Schemes

List of Programs:

1. Basic image processing operations: Histogram equalization, thresholding, edge detection, data augmentation, morphological operations
2. Implement Perceptron training algorithm to classify flowers in IRIS dataset.
3. Implement Activation Functions in Neural Networks and analyse their usage.
4. Build a three-layer Artificial Neural Network by implementing the Back propagation algorithm.
5. Design a GRU-based deep learning model for IMDB dataset. Compare the performance of GRU based model with LSTM based model
6. Build a Deep Neural Network for multi class text classification using Reuters dataset
7. Design a model for MNIST handwritten digit classification using Deep Convolution Neural networks.
8. Train a simple Recurrent Neural Network using an Embedding layer and a Simple RNN layer for movie review classification problem.
9. Build a Deep learning model using LSTM layer in Keras for IMDB dataset.
10. Design a Neural network with various optimization algorithms and analyse their performance using Keras.

11. Design a Deep Learning Model to classify the movie reviews as Positive or Negative based on the text content of reviews using IMDB dataset.
12. Apply One Hot Encoding for categorical sequence data.
13. Design a Deep Learning framework for Object Detection.
14. Image segmentation using Mask RCNN,SegNet
15. Familiarisation of cloud based computing like Google colab

COURSE OUTCOMES:

1. Illustrate Perceptron training algorithm and apply various activation functions.
2. Design multi-layer neural network with Back propagation algorithm and evaluate the performance of various optimization techniques.
3. Build Deep Learning models for binary and multiclass classification problems.
4. Compare the application of Deep learning models CNN, RNN, LSTM and GRU
5. Use data encoding schemes and develop Deep learning models for real world applications.

TEXTBOOKS:

1. Deep Learning with Python, Francois Chollet, Manning Publications Co.
2. Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms with contributions by Nikhil Buduma , O'Reilly publications
3. Francois Chollet, "Deep learning with Python" – Manning Publications.

REFERENCE BOOKS:

1. Deep Learning, Ian Good fellow,Yoshua Bengio and Aaron Courville, MIT Press, London, England
2. Deep Learning: A Practitioner's Approach by Josh Patterson, Adam Gibs, O'Reilly publications

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

B. Tech II Year II Semester

20CAI213 DATA SCIENCE LABORATORY

L	T	P	C
0	0	3	1.5

Pre-requisite: 20CSE101, Basic Programming Knowledge

Course Description:

This course is designed to equipping students to be able to use python programming for solving real-time data science problems.

Course Objectives:

1. To train the students in solving computational problems
2. To elucidate solving mathematical problems using Python programming language
3. To understand the fundamentals of Python programming concepts and its applications.
4. Practical understanding of building different types of models and their evaluation

List of Programs:

1. Create NumPy arrays from Python Data Structures, Intrinsic NumPy objects and Random Functions.
2. Manipulation of NumPy arrays- Indexing, Slicing, Reshaping, Joining and Splitting.
3. Computation on NumPy arrays using Universal Functions and Mathematical methods.
4. Import a CSV file and perform various Statistical and Comparison operations on rows/columns.
5. Load an image file and do crop and flip operation using NumPy Indexing.
6. Write a program to compute summary statistics such as mean, median, mode, standard deviation and variance of the given different types of data.
7. Create Pandas Series and Data Frame from various inputs.
8. Import any CSV file to Pandas Data Frame and perform the following:
    (a) Visualize the first and last 10 records
    (b) Get the shape, index and column details.
    (c) Select/Delete the records(rows)/columns based on conditions.
    (d) Perform ranking and sorting operations.
    (e) Do required statistical operations on the given columns.

(f) Find the count and uniqueness of the given categorical values.

(g) Rename single/multiple columns.

9. Import any CSV file to Pandas DataFrame and perform the following:

(a) Handle missing data by detecting and dropping/ filling missing values.

(b) Transform data using apply() and map() method.

(c) Detect and filter outliers.

(d) Perform Vectorized String operations on Pandas Series.

(e) Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and Scatter Plots.

10. Write a program to demonstrate Linear Regression analysis with residual plots on a given data set

11. 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.

12. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions using Python ML library classes.

13. Write a program to implement k-Means clustering algorithm to cluster the set of data stored in .CSV file. Compare the results of various "k" values for the quality of clustering.

Course Outcomes:

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

1. Illustrate the use of various data structures.

2. Analyze and manipulate Data using Numpy and Pandas.

3. Creating static, animated, and interactive visualizations using Matplotlib.

4. Understand the implementation procedures for the machine learning algorithms.

5. Identify and apply Machine Learning algorithms to solve real-world problems using appropriate data sets.

Text Book(s)

1. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, 2nd Edition,2018.

2. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2017.

Reference Books

1. Y. Daniel Liang, “Introduction to Programming using Python”, Pearson, 2012.
2. Francois Chollet, Deep Learning with Python, 1/e, Manning Publications Company, 2017.
3. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, “How to Think Like a Computer Scientist: Learning with Python 3”, 3rd edition, Available at https://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
4. Paul Barry, “Head First Python a Brain Friendly Guide” 2nd Edition, O’Reilly, 2016 4.

Dainel Y.Chen “Pandas for Everyone Python Data Analysis” Pearson Education, 2019

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Mandatory Course

20HUM902 /20HUM102* UNIVERSAL HUMAN VALUES

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

****Pre-requisite** None.

Course Description:

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

Course Objectives:

This course enables students to

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

L12: Programs to ensure Self-regulation and Health.

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

UNIT III Understanding Harmony in the Family and Society 7 hours

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

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

L15: Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
L16: Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
L17: Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
T5 & T6: Reflection on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT IV Understanding Harmony in the Nature and Existence 6 hours

L18: Understanding the harmony in the Nature
L19: Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self- regulation in nature
L20: Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
L21: Holistic perception of harmony at all levels of existence.
T7 & T8: Discussion on human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

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

L22: Natural acceptance of human values
L23: Definitiveness of Ethical Human Conduct
L24: Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
L25; Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
L26: Case studies of typical holistic technologies, management models and production systems
L27: Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
L28: Sum up.
T9-T14: Exercises and Case Studies For e.g. Individual discussion on the conduct as an engineer or scientist etc.

Course Outcomes:

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

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

Text Book(s)

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

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

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

Open Elective - II

Open Elective - II

20MAT301 ADVANCED NUMERICAL METHODS

L	T	P	C
3	0	0	3

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

Course Description:

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

Course Objectives:

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", 2nd edition, Tata McGraw - Hill, New Delhi, 2005
3. LeslieCromwell,"BiomedicalInstrumentationandMeasurement",Prentice-Hall, New Delhi, 2011.

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

Open Elective – II

20ECE302 VLSI DESIGN

L	T	P	C
3	0	0	3

Pre-requisite: None

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

Course Objectives:
This course enables students to

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

UNIT I INTRODUCTION TO MOS TRANSISTOR 9 hours

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

UNIT II COMBINATIONAL MOS LOGIC CIRCUITS 9 hours

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

UNIT III SEQUENTIAL CIRCUIT DESIGN 9 hours

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

UNIT IV DESIGN OF ARITHMETIC BUILDING BLOCKS AND SUBSYSTEM 9 hours

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

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

UNIT V IMPLEMENTATION STRATEGIES AND TESTING 9 hours

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

Course Outcomes:

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

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

Text Books:

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

Reference Books

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

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

Professional Elective – I

Professional Elective I

20CAI401 DISTRIBUTED SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite: Nil

Course Description:
This course helps the students to understand the importance of distributed systems, various procedures and methods used for communication in distributed systems and how the transaction takes place in distributed systems.

Course Objectives:

1. To understand fundamentals of Distributed Systems
2. To explore the issues in communications in distributed systems
3. To understand the various issues in process and thread management
4. To understand CORBA architecture and processes in the distributed file system
5. To recognize the Distributed System and shared memory architecture

UNIT I INTRODUCTION 9 hours

Characteristics - Design Goals -Types of Distributed Systems-Case Study: The World Wide Web. Distributed system models, Design issues in DS.

UNIT II COMMUNICATION IN DISTRIBUTED SYSTEM 9 hours

Inter process communication: Message passing model, Remote procedure call and implementation issues, Point to point and Group communication , Client Server model & its implementation, Socket programming, Case Studies: SUN RPC, DEC RPC

UNIT III SYNCHRONIZATION IN DISTRIBUTED SYSTEMS 9 hours

Introduction, Temporal ordering of events, Clock synchronization, mutual exclusion, Deadlock in distributed systems, Election algorithms. **Remote Method Invocation** -Introduction, Java RMI Architecture, API for Java RMI, Client Call-back, Stub downloading

UNIT IV COMMON OBJECT REQUEST BROKER ARCHITECTURE 9 hours

Introduction, Interface, Inter-ORB Protocol, Object server and object client, Naming service, Object service. **Processes and processors in distributed systems.** Threads, system model, processor allocation, scheduling in distributed systems: Load balancing and sharing approach, fault tolerance, Real time distributed systems, Process migration and related issues.

UNIT V DISTRIBUTED FILE SYSTEMS 9 hours

Introduction, features & goal of distributed file system, file models, file accessing models, file sharing semantics, file caching scheme, file replication, fault tolerance, trends in distributed file system, case study- HDFS. Distributed Shared Memory-general architecture of DSM systems, design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing.

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

1. Explore the fundamentals of Distributed Systems
2. Get insight the issues in communications in distributed systems
3. Get awareness on various issues in process and thread management
4. Understand CORBA architecture and processes in the distributed file system
5. Recognize the Distributed System and shared memory architecture

Text Book(s)

1. Andrew S. Tanenbaum, Maartenvan Steen, "Distributed Systems Principles and Paradigms", 2nd ed., Pearson Education, 2006.
2. George Coulouris, Jean Dollimore, and Tim Kindberg, " Distributed Systems Concepts and Design", 5th ed., Pearson Education, 2011

Reference Books

1. Nancy A. Lynch, "Distributed Algorithms", Hardcourt Asia Pvt. Ltd., Morgan Kaufmann, 2000.
2. Kshemkalyani, Ajay D., Mukesh Singhal, "Distributed Computing: Principles, Algorithms, and Systems", Cambridge University Press, 2011.
3. Singhal, Shivaratri, "Advanced Concepts in Operating Systems", TMH.
4. P K Sinha, "Distibuted Operating System", PHI, IEEE Press.

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

Professional Elective I

20CAI402 SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite: Nil

Course Objectives:

1. To Describe and compare various software development methods.
2. To understand the requirements and to develop various design models.
3. To describe the processes and metrics involving in a software product.
4. To recognize various testing strategies in software development process
5. To identify the risk involved and to maintain the quality product.

UNIT I AN OVERVIEW OF SOFTWARE ENGINEERING 9 hours

Nature of Software, Software Engineering, Software Process, Software Engineering Practice, Software Process Models: Linear, RAD, Incremental, Spiral Component-based development, Fourth Gen Techniques.

UNIT II MODELING (REQUIREMENTS AND DESIGN) 9 hours

Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Requirements Model, Negotiating Requirements, Validating Requirements. Design within the context of Software Engineering, Design Process, Design Concepts, Design Model-Software Architecture.

UNIT III PROCESS & PRODUCT METRICS 9 hours

Product Metrics, Metrics for the Requirements Model, Metrics for the Design Model - Architectural Design Metrics, Object-Oriented Design, Software Measurement, Metrics for Software Quality.

UNIT IV SOFTWARE TESTING 9 hours

Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Software Testing Fundamentals, Black box Testing, White box testing.

UNIT V RISK MANAGEMENT AND SOFTWARE MAINTENANCE 9 hours

Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Monitoring and Management, RMMM Plan, Software Maintenance, Software Supportability, Reengineering.

Course Outcomes:

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

1. Describe and compare various software development methods.
2. Understand the requirements and to develop various design models.
3. Describe the processes and metrics involving in a software product.
4. Recognize various testing strategies in software development process
5. Identify the risk involved and to maintain the quality product.

Text Book(s)

1. Roger Pressman, Software Engineering: A Practitioner's Approach, 7th Edition, McGrawHill, 2010.

Reference Books

1. Ian Sommerville, Software Engineering, 9th Edition, Addison-Wesley, 2010
2. Pankaj Jalote, A Concise Introduction to Software Engineering, Springer,2008
3. William E. Lewis , ―Software Testing and Continuous Quality Improvement‖, Third Edition, Auerbach Publications, 2008.

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

Professional Elective I

20CAI403 WEB TECHNOLOGIES

L	T	P	C
3	0	0	3

Pre-requisite: Nil

Course Description:

This course will expose students to the techniques used in programming web pages for interactive content. The course begins by reviewing basic web technologies (HTML5, CSS3 style sheets) and exploring the use of event-driven programming in JavaScript to add interactive elements such as buttons and text fields to web pages. Next, students will use AJAX tools to build web pages that connect to servers like Google to dynamically access data (maps, search results, videos, images, etc.). Finally, the course will show students how to write their own xml code to provide access to a custom database.

Course Objectives:

1. To introduce Markup Languages for client side scripting
2. To introduce JavaScript and DOM and Java Servlets with Java
3. To introduce XML and processing of XML Data with Java
4. To introduce Server side programming with Java Servlets and JSP
5. To introduce various java web services and SOAP

UNIT I WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0 9 hours

Web Essentials: Clients, Servers, and Communication – The Internet – Basic Internet protocols – World wide web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Tables – Lists – Image – HTML5 control elements – Semantic elements – Drag and Drop – Audio – Video controls - CSS3 – Inline, Embedded, and External style sheets – Rule cascading – Inheritance – Backgrounds – Border Images – Colors – Shadows – Text – Transformations – Transitions – Animations.

UNIT II CLIENT-SIDE PROGRAMMING 9 hours

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects, - Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript- JSON introduction – Syntax – Function Files – Http Request – SQL.

UNIT III SERVER-SIDE PROGRAMMING 9 hours

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example — JSP: Understanding Java Server Pages-JSP Standard Tag Library (JSTL)-Creating HTML forms by embedding JSP code.

UNIT IV PHP and XML 9 hours

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions- Form Validation- Regular Expressions — File handling — Cookies — Connecting to Database. XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

UNIT V INTRODUCTION TO AJAX and WEB SERVICES 9 hours

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics — Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application –SOAP.

Course Outcomes:

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

1. Gain knowledge of client-side scripting, validation of forms and AJAX programming
2. Understand server-side scripting with JSP language
3. Understand what XML is and how to parse and use XML Data with Java
4. To introduce Server-side programming with Java Servlets and JSP
5. Design and implement the various Web services concepts of JAX-RPC

Text Book(s)

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

Reference Books

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

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

Professional Elective I

20CAI404 DIGITAL IMAGE PROCESSING

L	T	P	C
3	0	0	3

Pre-requisite: Nil

Course Description:

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

Course Objectives:

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

UNIT I DIGITAL IMAGE FUNDAMENTALS 9 hours

Image Processing Fundamentals -- Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures

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

Image Enhancements and Filtering - Gray level transformations, histogram equalization, smoothing filters – sharpening filters – two dimensional DFT and its inverse - frequency domain filters – low pass and high pass - Color Image Processing - Color models–RGB, YUV, HIS - color complements, color slicing, tone and color corrections – Color image smoothing and sharpening - Color Segmentation.

UNIT III IMAGE CODING AND SEGMENTATION 9 hours

Image Coding : Fundamentals of image compression, image data redundancies, Image Compression Model, Huffman Coding, Arithmetic Coding, Run Length Coding, Bit Plane Coding, Block Transform Coding, JPEG compression standard – DCT based image compression
Image Segmentation: Detection of discontinuities, edge linking and boundary detection – global and adaptive thresholding, region-based segmentation.

UNIT IV IMAGE TRANSFORMS 9 hours

A) Coding, inter pixel and image redundancy, 2-D Discrete Fourier Transform and frequency domain filters, Discrete Cosine Transform – its application in Baseline JPEG, Walsh Hadamard Transform, Fast Walsh Transform, Introduction to Gabor Transform. B) Hough Transform

UNIT V IMAGE RESTORATION 9 hours

Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering - Inverse Filtering -Wiener filtering.

Course Outcomes:

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

1. Apply mathematics to represent the connectivity and neighborhood relationship between pixels and frames.
2. Understand application-based image enhancement and color image processing.
3. Develop algorithms for image segmentation and coding in image processing.
4. Use various image transforms to analyze and modify image.
5. Understand the restoration concepts and filtering techniques.

Text Book(s)

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

Reference Books

1. Murat Tekalp, Digital Video Processing, Prentice Hall, 2ndedition, 2015
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, Digital Image Processing using MATLAB, Pearson Education, Inc., 2011.

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

Professional Elective I

20CAI405 MULTIMEDIA TECHNOLOGIES

L	T	P	C
3	0	0	3

Pre-requisite: Nil

Course Description:

This course aims to introduce the students to Multimedia technologies and their usage in real world applications. This course covers introduction to multimedia, different image, video and audio formats, image coding and compression techniques, I/O technologies, Multimedia network and Multimedia Security and Forensics.

Course Objectives:

1. To provide the foundation knowledge of multimedia computing.
2. To provide the knowledge about media characteristics, compression standards, multimedia representation, data formats, multimedia technology development.
3. To understand Multimedia security and forensics.
4. To understand multimedia components efficiently
5. To develop integrated, collaborative multimedia systems

UNIT I INTRODUCTION 9 hours

Introduction to Multimedia: Multimedia Elements – Multimedia applications – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases, Multimedia Architecture – Multimedia Documents

UNIT II COMPRESSION, ANIMATION , FILE FORMATS 9 hours

Compression , Decompression, Binary Image Compression Schemes, Types of Compression, Image Compression , Video Compression , Audio Compression. principles of animation,2D, 3D animation. file formats: Rich Text Format – TIFF File Format – Resource Interface File Format – MIDI File Format - JPEG DIB File Format – AVI Indeo File Format .

UNIT III MULTIMEDIA TECHNOLOGIES 9 hours

Multimedia I/O Technologies: Image Scanners – Digital Voice and Audio – Digital Camera – Video Images – Full Motion Video -Video Motion Analysis.

UNIT IV MULTIMEDIA PROTOCOLS 9 hours

Protocol - QOS Issues - RTP, RTCP, RTSP, SIP - Media on demand –ITV - STB Broadcast Schemes for VoD Buffer Management- Multimedia over wireless networks.

UNIT V SECURITY ATTACKS 9 hours

Multimedia encryption - Digital Watermarking. Security Attacks- Digital Forensics taxonomy, goals/requirements - Forensic Data Acquisition -Forensics Analysis and Validation.

Course Outcomes:

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

1. Understand the characteristics of different media and the representations of different multimedia data formats.
2. Understand the characteristics of Image, Audio and Video systems and takes into considerations in multimedia techniques design and implementation.
3. Describe different coding and compression principles and compare different compression techniques.
4. Design multimedia components efficiently
5. Develop integrated, collaborative multimedia system

Text Book(s)

1. Li, Ze-Nian and Mark S. Drew, “Fundamentals of Multimedia”, Prentice Hall of India, 2004.

2. Steinmetz Ralf and K. Nahrstedt “Multimedia: Computing, Communications & Applications”,Pearson Education, 1995.

Reference Books

1. Ralf Steinmetz and Klara, “Multimedia Computing, Communications and Applications”, Pearson Education, 2009
2. Chun-Shien Lu, “Multimedia Security : Steganography and Digital Watermarking techniques for Protection of Intellectual Property”, Springer Inc 2007

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

Skill Oriented Courses

Skill Oriented Course – I

20CAI601 WEB SCRIPTING

L	T	P	C
1	0	2	2

Pre-requisite NIL

Course Description:

This course will expose students to the techniques used in programming web pages for interactive content. The course begins by reviewing basic web technologies (HTML, CSS style sheets, XML, JavaScript (Node and Angular) and jQuery and exploring the use of event-driven programming in JavaScript to add interactive elements such as buttons and text fields to web pages.

This course provides the knowledge necessary to design and develop dynamic, database-driven web pages using PHP. Students also learn how to configure PHP and Web Servers like Apache, IIS, WAMP and XAMPP.

Course Objectives:

1. To build web applications using HTML, CSS and PHP with client side validations.
2. To build XML documents with DTD, Schemas and style sheets.
3. To maintain session management tracking using cookies & HTTP Sessions.
4. To develop a web application with database interaction using Node JavaScript and Angular JavaScript
5. To build jQuery enabled web applications.

UNIT – I: HTML & CSS **6 Hours**

Introduction to HTML, HTML5 New Features, Structural, Content, Application-focused tags. History of CSS, The Power of CSS, Selectors and Pseudo Classes, Fonts and Text Effects, Colors.

a. Creation College Website using HTML.
b. Design a website using style sheets so that the pages have uniform style.

UNIT – II: INTRODUCTION TO JAVASCRIPT **6 Hours**

Introduction to JavaScript, Comments, Variables, Exploring JavaScript Data Types, Popup Boxes, Objects, Functions, Conditions, Loops, Form Validation.

a. Design a form and validate all the controls placed on the form using Java Script.
b. Write a JavaScript program to measure the time taken by a function to execute.

UNIT – III: JQUERY WITH HTML **6 Hours**

Introduction to jQuery, Installation, Selectors, Events, Effects, Callbacks, jQuery and HTML, jQuery

a. Working on Blink text using jQuery.
b. Using jQuery right click to toggle background color.

UNIT – IV: INTRODUCTION TO XML AND PHP DATABASE **6 Hours**

Introduction to XML, Creating XML Documents, XSL, PHP Concepts: Sessions, authenticating users Database Access: Database Concepts, MYSQL database connectivity and operations.

a. Display Library information using XML.
b. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page,
c. Write a PHP program to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.

UNIT – V: NODEJS AND ANGULAR JS **6 Hours**

Introduction to Node JS, Advantage of Node JS, File System: Using file operation. Data base Connectivity: Connecting strings and configuring. Database operations on create table data -Angular JS forms.

a. Working on file write, read and delete using Node.js
b. Write a Node JavaScript program to connect to that database and extract data from the tables and display them.
c. Using AngularJS to read input value from text box and will be displayed it.
d. Using AngularJS to demonstrate Arithmetic operations of two numbers.

Course Outcomes:

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

1. Design pages with HTML and CSS attributes.
2. Design and develop web applications with the support of client side validations.
3. Use well-formed XML documents and develop PHP scripts with may support of object oriented features.
4. Manage the session in web browser through Cookies & Sessions and able to communicate with other web pages through form GET and POST methods.
5. Design and develop web applications with the database interactions (thorough SQL queries) and apply Node JavaScript and Angular JavaScript for faster performance.

Text Books:

1. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens.
2. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Leeand B.Ware(Addison Wesley) Pearson Education.
3. Professional Angular JS, Valeri Karpov and Diego Netto, John Willey Edition.
4. Beginning Node.JS by Basarat Syed, 2014.

Reference Books:

1. HTML & CSS:The Complete Reference ,Thomas.A Powel “Fifth Edition”Kindle Edition,2017
2. Marty Hall and Larry Brown,”Core Web Programming” Second Edition, Volume I andII, Pearson Education, 2001. Learning jQuery, Jonathan Chaffer, Karl Swedberg, Third Edition, Packt Publishing Ltd
3. HTML & CSS:The Complete Reference ,Thomas.A Powel “Fifth Edition”Kindle Edition,2017
4. Marty Hall and Larry Brown,”Core Web Programming” Second Edition, Volume I andII, Pearson Education, 2001. Learning jQuery, Jonathan Chaffer, Karl Swedberg, Third Edition, Packt Publishing Ltd

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

Skill Oriented Course – I

20CAI602 ANDROID APPLICATION DEVELOPMENT

L	T	P	C
1	0	2	2

Pre-requisite NIL

Course Description:

This course is concerned with the development of applications on Android platform. Android is used as a basis for the development of mobile applications. This course starts with the basic concepts of Java, history of android and architecture. It also covers the development of applications using widgets, events, networking. It provides ideas on sensors, their types and writing programs based on sensor classes for application development. They will design and develop Mobile applications with the use of J2ME, like SMS, MMS, Gaming, Multimedia, JavaFX & Android.

Course Objectives:

While studying this course student will be able to

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

UNIT- I INTRODUCTION AND INSTALLATION OF ANDROID TOOLS 6 Hours

Installation and Use of Android Tools: Installing the Android SDK - Anatomy of an Android Project Drawable Resources – XML Introduction - Creating user interface using XML – Overview of Android Building Blocks.

a) Develop an android application to display a simple text in the emulator

b) Develop an android application to display the internal keyboard in the emulator

UNIT- II USER INTERACTION 6 Hours

Input Components – Text View – Image View – List View and Alert Dialogues – Menus: Popup, Options and Context Menus – Screen Navigation through App Bar – Recycler View – Material Design – Testing the User Interface

a) Write an android program to display a message in the toast

b) Write an android program to input a text through a text and the same must be displayed in the toast when a button is clicked on the screen

c) Develop an application to perform 5 arithmetic operations: Addition, Subtraction, Multiplication, Division and Modulo operation with necessary user interface creation

d) Develop an android application to process a student mark list by creating proper UI using the necessary controls

UNIT-III THREADS, LOADERS AND ASYNCTASK LOADER, SERVICES 6 Hours

Threading in Android – AsyncTask – Loaders – AsyncTask Loader -Alarms and system services – Examples on alarms and services – Services: Services Life Cycle – Intent Service – Implementing Intent Service – Notifications.

1. Write an android application to create a calculator

2. Create an android UI that consists of Different Departments of a company namely Production, Finance, Marketing and HR. If the user clicks on any department it should show details of that department. Use indents.

UNIT IV: SAVING, RETRIEVING AND LOADING DATA **6 Hours**

Android File systems and Files, Databases on Android - SQLite - Status Contract Class, Update Refresh Service – Cursors – Backups - Content Providers: Overview – Role of Content Providers, Content Resolver.

a) Design an android application to display a list of items on the android screen. If the user clicks any one of the list items a dialogue box should show that the user has clicked that particular item (Use array adopters)
b) Develop an android application to show some categories such as education, entertainment, health, provisions etc., If the user clicks on any one of the items it should show the sub categories of the category and if is again clicked it should the details of those items. (Use indents and lists)
c) i. Design an android application to create a service that shows the service is running in the background in the form of a toast

UNIT-V APPLICATIONS WIDGETS, INTERACTION AND SENSORS **6 Hours**

App Widgets: Creation of Application Widgets - Interaction and Animation- Sensors: Sensor API in Android - Motion Sensor, Position Sensor, Sensor Values, Sensor Manager Class, Sensor Event class, Sensor Event Listener.

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

Course Outcomes:

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

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

Text Books:

1. Android Programming-The Big Nerd Ranch Guide, Bill Philips, Christ Stewart, Kristin Mariscano, Big Nerd Ranch publishers, 3rd Edition,2017
2. Android Programming for Beginners, John Horton, PACKT publishers,2018
3 Learning Android, By Marko Gargenta& Masumi Nakamura, O'Reilly, II Edition,2014
4 Android Application Development All in One for Dummies, Barry Burd, Wiley, 2nd Edition,2015

Reference Books:

1. Android application Development-Black Book, Pradeep Kothari, dreamtech,2014

2. Android Programming - Unleashed, B.M.Harwani, Pearson Education, 2013

3 Head First Android Development: A Brain-Friendly Guide, Dawn Griffiths and David Griffiths, O'Reilly, 2nd Edition,2017

4 Android System Programming, Roger Ye, PACKT publishers,2017

5 Programming Android,ByZigurdMednieks,LairdDornin,G.BlakeMeike& Masumi Nakamura,O'Reilly,2011

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

Skill Oriented Course – II

20ENG601 CORPORATE COMMUNICATION

L	T	P	C
1	0	2	2

Pre-requisite: **20ENG201**

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 – III

20CAI603 MULTIMEDIA COMPUTING

L	T	P	C
1	0	2	2

Pre-requisite:

Course Description:

This course provides interactive, computer-based applications that allow students to communicate ideas and information with digital and print elements. It helps to develop and manage online graphics and content. It provides an interaction between users and digital information.

Course Objectives:

This course enables the students to –

1. This course aims to develop student's competency in producing dynamic and creative graphicsolutions for multimedia productions.
2. It introduces students with the advanced scripting skills necessary for implementing highlyinteractive, rich internet applications using multimedia technologies and authoring tools.
3. Students will develop aesthetic value and competencies in multimedia authoring.
4. Artistic visual style and layout design are stressed, as well as the editing and integration ofgraphic video, audio, images and animation, files.
5. The course allows students to master industry-wide software and technologies to createhighly interactive, rich internet applications.

UNIT I LISTENING SKILLS **8 hours**

1. Video editing,
2. Audio editing
3. Image editing
4. 2D Animation
5. 3D Animation
6. Write a program to create an animated e-card using adobe Flash.
7. Write a Program to create an animation to represent the Growing Moon.
8. Write a Program to create an animation to indicate a ball bouncing on Steps
9. Write a Program to simulate a ball hitting another ball
10. Write a Program to change a circle into a square using Flash.
11. Write a Program to perform motion twinning operation using flash
12. Write a Program to change and object shape using a shape twinning concept.
13. Write a Program to create a 24 spokes on a wheel using flash.

Course Outcomes:

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

1. Describe different realizations of multimedia tools and the way in which they are used.
2. Compare various data compression schemes.
3. Analyze user interface for a given application
4. Ability to apply different multimedia development tools to produce web based and standaloneuser interfaces

Text Books:

1. Fundamentals of Multimedia by Ze-Nian Li and Mark S. Drew PHI Learning, 2004.
2. AJAX, Rich Internet Applications, and Web Development for Programmers, Paul J Deitel andHarvey M Deitel, Deitel Developer Series, Pearson Education, 2008. (UNITS 4,5)

Reference:

1. Professional Adobe Flex 3, Joseph Balderson, Peter Ent, et al, Wrox Publications,Wiley India, 2009
2. Multimedia Communications: Applications, Networks, Protocols and Standards, FredHalsall,Pearson Education, 2001, RP 2005

Mode of Evaluation: Continuous Internal Evaluation, Practical Examination.

Skill Oriented Course – III

20CAI604 PYTHON FOR DATA SCIENCE

L	T	P	C
1	0	2	2

Pre-requisite: Basic Programming Knowledge

Course Description:

This course is designed to equipping students to be able to use python programming for solving data science problems.

Course Objectives:

This course enables the students to –

1. To train the students in solving computational problems
2. To elucidate solving mathematical problems using Python programming language
3. To understand the fundamentals of Python programming concepts and its applications.
4. Practical understanding of building different types of models and their evaluation

LIST OF PROGRAMS

1. Create NumPy arrays from Python Data Structures, Intrinsic NumPy objects and RandomFunctions.
2. Manipulation of NumPy arrays- Indexing, Slicing, Reshaping, Joining and Splitting.
3. Computation on NumPy arrays using Universal Functions and Mathematical methods.
4. Import a CSV file and perform various Statistical and Comparison operations on rows/columns.
5. Load an image file and do crop and flip operation using NumPy Indexing.
6. Write a program to compute summary statistics such as mean, median, mode, standard deviation and variance of the given different types of data.
7. Create Pandas Series and Data Frame from various inputs.
8. Import any CSV file to Pandas Data Frame and perform the following:
   (a) Visualize the first and last 10 records
   (b) Get the shape, index and column details.
   (c) Select/Delete the records(rows)/columns based on conditions.
   (d) Perform ranking and sorting operations.
   (e) Do required statistical operations on the given columns.
   (f) Find the count and uniqueness of the given categorical values.
   (g) Rename single/multiple columns.
9. Import any CSV file to Pandas Data Frame and perform the following:
   (a) Handle missing data by detecting and dropping/ filling missing values.
   (b) Transform data using apply() and map() method.
   (c) Detect and filter outliers.
   (d) Perform Vectorized String operations on Pandas Series.
   (e) Visualize data using Line Plots, Bar Plots, Histograms, Density Plots and ScatterPlots.

10. Write a program to demonstrate Linear Regression analysis with residual plots on a givendata set.
11. Write a program to implement the Naïve Bayesian classifier for a sample training data setstored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
12. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set.Print both correct and wrong predictions using Python ML library classes.
13. Write a program to implement k-Means clustering algorithm to cluster the set of data storedin .CSV file. Compare the results of various "k" values for the quality of clustering.

Course Outcomes:

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

1. Illustrate the use of various data structures.
2. Analyze and manipulate Data using Numpy and Pandas.
3. Creating static, animated, and interactive visualizations using Matplotlib.
4. Understand the implementation procedures for the machine learning algorithms.
5. Identify and apply Machine Learning algorithms to solve real-world problems using appropriate data sets.

Text Books:

1. Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly, 2nd Edition,2018.
2. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", O'Reilly, 2017.

Reference:

1. Y. Daniel Liang, "Introduction to Programming using Python", Pearson,2012.
2. Francois Chollet, Deep Learning with Python, 1/e, Manning Publications Company, 2017.
3. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers, "How to Think Like a Computer Scientist: Learning with Python 3", 3rd edition, Available at https://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
4. Paul Barry, "Head First Python a Brain Friendly Guide" 2nd Edition, O'Reilly, 2016 4. Dainel Y.Chen "Pandas for Everyone Python Data Analysis" Pearson Education, 2019

Mode of Evaluation: Continuous Internal Evaluation, Practical Examination.

Skill Oriented Course – IV

20CAI605 FULL STACK DEVELOPMENT

L	T	P	C
1	0	2	2

Pre-requisite

Course Description:
Full Stack Web Development course will make students to become master in front-end technology. It provides basic information and experiments to grow to be a Full-Stack web developer. With fast growing technologies, the students can update their knowledge on technologies. This will help the students to learn the complete set of process like designing development and deployment.

Course Objectives:

1. To build web applications using HTML, Javascript, CSS and PHP with client-side validations.
2. To create and integrating Plug-ins with JQuery (Events, Animation).
3. To build XML documents with DTD, Schemas and style sheets.
4. To develop a web application with database interaction using Node JavaScript and Angular JavaScript.
5. To implement MongoDB Models.
6. To learn all about SQL and Mongo databases

List of Programs:

1. Develop static pages (using only HTML) of an online ticket reservation.
2. Develop static pages (using only HTML) of an online Book store. The pages should resemble www.amazon.com. The website should consist of the following pages.

- Home page
- Registration and user Login
- User profile page
- Books catalog
- Shopping cart
- Payment by credit card Order Conformation

3. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient
4. Design a form and validate all the controls placed on the form using Java Script.
5. Write a JavaScript code that displays text “TEXT-GROWING” with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays “TEXTSHRINKING” in BLUE color. Then the font size decreases to 5pt.
6. Develop and demonstrate PHP Script for the following problems:
   a) Write a PHP Script to find out the Sum of the Individual Digits.

   b) Write a PHP Script to check whether the given number is Palindrome or not
7. Write a PHP program to store page views count in SESSION, to increment the count on each refresh, and to show the count on web page.

8. Design a website using style sheets so that the pages have uniform style.
9. Create animation using JQuery
   (a) Working on Blink text using jQuery.
   (b) Using jQuery right click to toggle background color.
10. Design an XML document to store information about a student. The information must include Rollno, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document.
11. Working on file write, read and delete using Node.js
12. Develop a Form and validate using Angular JS
13. Design Webpage for Data collection, store, retrieve and manipulate data using SQL database.
14. Implement MongoDB data models.
15. Implement the following in Angular JS
    a) Angular Js data binding.
    b) Angular JS directives and Events.
    c) Using angular Js fetching data from MySQL.
16. Create an Online fee payment form using JSCript and MangoDB

Course Outcomes:

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

1. Design pages with HTML and CSS attributes.

2. Design and develop web applications with the support of client side validations.

3. Use well-formed XML documents and develop PHP scripts with may support of object oriented features.

4. Manage the session in web browser through Sessions and able to communicate with other web pages through form GET and POST methods.

5. Design and develop web applications with the database interactions (thorough MongoDB) and apply Node JavaScript and Angular JavaScript for faster performance.

Text book(s)

1. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann andJon Stephens.
2. HTML & CSS:The Complete Reference ,Thomas.A Powel “Fifth Edition”Kindle Edition,2017.
3. Professional Angular JS, Valeri Karpov and Diego Netto, John Willey Edition.
4. Beginning Node.JS by Basarat Syed, 2014.
5. MongoDB Basics 1st ed. Edition by Peter Membrey (Author), David Hows (Author), Eelco Plugge (Author)

Reference Books

1. Web Coding Bible, An Accelerated Course, Chong Lip Phang, 2015
2. Java Script for ProgrammersPaul J. Deitel, Deitel & Associates, Inc.Harvey M. Deitel, Deitel& Associates, Inc.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

Skill Oriented Course – IV

20CAI606 UML DESIGN

L	T	P	C
1	0	2	2

Pre-requisite: None

Course Description:

This course will give an overview of UML and how to use UML diagrams and views to support requirements, architectural and systems design. The main contents are use case diagram, class diagram, sequence diagram, state diagram, activity diagram, component diagram and deployment diagram of UML. CASE tool of UML is used to analyze and design the course project systems.

Course Objectives:

1. To analyze and design solutions to problems using object-oriented approach.
2. To make the student to learn and apply the process of object-oriented analysis and design to solve complex problems with the different applications.

List of Programs:

To develop a mini project the following 12 exercises listed below

1.To develop a problem statement.

2.Develop an IEEE standard SRS document. Also develop risk management and project plan (Gantt chart).

3. Identify Use Cases and develop the Use Case model.
4. Identify the business activities and develop an UML Activity diagram.
5. Identity the conceptual classes and develop a domain model with UML Class diagram.
6. Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
7. Draw the State Chart diagram.
8. Identify the User Interface, Domain objects, and technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
9. Implement the Technical services layer.
10. Implement the Domain objects layer.
11. Implement the User Interface layer.
12. Draw Component and Deployment diagrams.

Suggested domains for Mini project

1. Passport automation system
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. Online course reservation system
6. E-ticketing
7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference Management System
13. BPO Management System

Course Outcomes:

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

1. Analyse problems using object-oriented approach.
2. Design structural and behavioral diagrams.
3. Apply forward engineering to the given problems.
4. Design object-oriented models using UML.
5. Develop real time applications using object oriented concepts.

Textbook(s)

1. Grady Booch, James Rumbaugh, Ivar Jacobson, The Unified Modeling Language User Guide, Pearson Education, 2nd Edition.

Reference Books

1. Erich Gamma, Richard Belm, Ralph Johnson, John Vlissides, Design Patterns: Elements of Reusable Object Oriented Software, Addison-Wesley, 1994.
2. Meilir Page-Jones, Fundamentals of Object Oriented Design in UML, Pearson Education, 2000.
3. Atul Kahate, Object Oriented Analysis & Design, McGraw-Hill, 2004.

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

Skill Oriented Course – IV

	L	T	P	C
20CAI607 IMAGE PROCESSING	**1**	**0**	**2**	**2**

Pre-requisite Nil

Course Description:

This laboratory course completely deals with basics of image processing and their experimental observations. Here the students are exposed to design the image processing blocks and do image filtering, image enhancement, edge detection etc. To start with this laboratory session, initially all students are trained to use the MATLAB software. Thorough understanding of MATLAB software is mandatory for proceeding with the course wear. Instructions to the students are given in the start of this document which they are advised to read before they start conducting experiments.

Course Objectives:

1. To become familiar with digital image fundamentals
2. To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
3. To learn concepts of degradation function and restoration techniques.
4. To study the image segmentation and representation techniques.
5. To become familiar with image compression and recognition methods

List of Experiments

1. To write a program to display grayscale image using read and write operation.
2. To write a program to implementation of relationships between pixels
3. To write a program to find histogram value and display histograph of a grayscale and color image.
4. To write a program to implementation of transformations of an image.
5. To write a program for image smoothening and sharpening.
6. To create a program for Non-Linear Filtering technique using edge detection.
7. To create a program to determine the edge detection of an image using different operators.
8. To write a program for image compression by DCT, DPCM, HUFFMAN coding
9. To write a program Implementation of image restoring techniques.
10. To write a program implementation of image intensity slicing technique for image enhancement.
11. To create a program to discretize an image using Fourier transformation.
12. To create a program to eliminate the high frequency components of an image.
13. To create a program for segmentation of an image using watershed transforms.

TEXT BOOKS

1. Rafael.C,Gonzalez, Richard E Woods, “Digital Image Processing”,3rdEdition, Pearson India, 2013.
2. Jain A.K, “Fundamentals of Digital Image Processing”, 4th Edition, Prentice hall of India, 2004.

REFERENCE BOOKS

1. B.Chanda, D. DuttaMajumder, “Digital Image Processing and Analysis”, 2ndEdition, Phi learning, 2011.
2. William K Pratt, “Digital Image Processing”, 4th Edition, Wiley, 2012.

HONORS

Honors

20HDCAI101 R PROGRAMMING

L	T	P	C
3	0	0	3

Pre-requisite: Nil

Course Description:

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. Topics in statistical data analysis will provide working examples.

Course Objectives:

1. To understand and able to use basic programming concepts
2. To automate data analysis, working collaboratively and openly on code
3. To know how to generate dynamic documents
4. Able to use a continuous test-driven development approach

UNIT I INTRODUCTION 9 hours

Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations

UNIT II CONTROL STRUCTURES AND VECTORS 9 hours

Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes Vectors: Generating sequences, Vectors and subscripts, extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations.

UNIT III LISTS 9 hours

Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations.

UNIT IV FACTORS AND TABLES 9 hours

Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables, extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions

UNIT V OBJECT-ORIENTED PROGRAMMING 9 hours

S Classes, S Generic Functions, Writing S Classes, Using Inheritance, S Classes, Writing S Classes, Implementing a Generic Function on an S Class, visualization, Simulation, code profiling, Statistical Analysis with R, data manipulation

Course Outcomes:

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

1. Study and use fundamental concepts to solve the real-world problem using R programming language.
2. Design and implement the solution using scalar, vectors, matrices and statistical problems in R program.
3. Design and implement the program using data frame, list to provide the solution for various problem.
4. Study about factors and tables and to solve statistical problems.
5. Minimize and maximize functions, simulation and visualization and statistical analysis using R.

Text Book(s)

1. Roger D. Peng," R Programming for Data Science ", 2012

2. Norman Matloff,"The Art of R Programming- A Tour of Statistical Software

Reference Books

1. Garrett Grolemund, Hadley Wickham,"Hands-On Programming with R: Write Your Own Functions and Simulations" , 1st Edition, 2014
2. Venables , W.N.,and Ripley,"S programming", Springer, 2000.

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

Honors

20HDCAI102 BUSINESS INTELLIGENCE

L	T	P	C
3	0	0	3

Pre-requisite: Nil

Course Description:

This course introduces the concepts of business intelligence (BI) as components and functionality of information systems. It explores how business problems can be solved effectively by using operational data to create data warehouses, and then applying data mining tools and analytics to gain new insights into organizational operations. Detailed discussion of the analysis, design and implementation of systems for BI, including: the differences between types of reporting and analytics, enterprise data warehousing, data management systems, decision support systems, knowledge management systems, big data and data/text mining. Case studies are used to explore the use of application software, web tools, success, and limitations of BI as well as technical and social issues.

Course Objectives:

1. Introduce the concepts and components of Business Intelligence (BI)
2. Evaluate the technologies that make up BI (data warehousing, OLAP)
3. Define how BI will help an organization and whether it will help yours
4. Identify the technological architecture that makes up BI systems
5. Plan the implementation of a BI system

UNIT I INTRODUCTION 9 hours

Introduction - History and Evolution: Effective and Timely decisions, Data Information and Knowledge, Architectural Representation, Role of mathematical Models, Real Time Business Intelligent System.

UNIT II BI – DATA MINING & WAREHOUSING 9 hours

Data Mining - Introduction to Data Mining, Architecture of Data Mining and How Data mining works (Process) , Functionalities & Classifications of Data Mining, Representation of Input Data, Analysis Methodologies.

Data Warehousing - Introduction to Data Warehousing, Data Mart, Online Analytical Processing (OLAP) – Tools, Data Modelling, Difference between OLAP and OLTP, Schema – Star and Snowflake Schemas, ETL Process – Role of ETL

UNIT III BI – DATA PREPARTTION 9 hours

Data Validation - Introduction to Data Validation, Data Transformation – Standardization and Feature Extraction, Data Reduction – Sampling, Selection, PCA, Data Discretization.

UNIT IV BI – DATA ANALYTICS PROCESS 9 hours

Analytics Process - Introduction to analytics process, Types of Analytical Techniques in BI – Descriptive, Predictive, Perspective, Social Media Analytics, Behavioral, Iris Datasets

UNIT V IMPLEMENTATION OF BI – ANALYTICS PROCESS 9 hours

Operational Intelligence: Technological – Business Activity Monitoring, Complex Event Processing, Business Process Management, Metadata, Root Cause Analysis.

Course Outcomes:

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

1. Understand the essentials of BI & data analytics and the corresponding terminologies
2. Analyze the steps involved in the BI - Analytics process.
3. Illustrate competently on the topic of analytics.
4. Understand & Implement the K-Means Clustering with Iris Dataset.
5. Demonstrate the real time scenario (Case study) by using BI & Analytics techniques

Text Book(s)

1. Carlo-Vercellis, “Business Intelligence Data Mining and Optimization for Decision-Making”, First Edition.
2. Drew Bentely, “Business Intelligence and Analytics” ,@2017 Library Pres., ISBN: 978-1-9789- 2136-8.

Reference Books

1. Larissa T. Moss & Shaku Atre, “Business Intelligence Roadmap: The Complete Project Lifecycle For Decision-Support Applications”, First Edition, Addison-Wesley Professional,2003

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

Honors

20HDCAI103 ADVANCED ALGORITHMS

L	T	P	C
3	0	0	3

Pre-requisite: Computer Programming and Data Structure

Course Description:
Advanced algorithms build upon basic ones and use new ideas. We will start with networks flows which are used in more typical applications such as optimal matchings, finding disjoint paths and flight scheduling as well as more surprising ones like image segmentation in computer vision.

Course Objectives:

1. Introduces the recurrence relations for analyzing the algorithms.
2. Introduces the graphs and their traversals.
3. Describes major algorithmic techniques (divide-and-conquer, greedy, dynamic programming, Brute Force, Transform and Conquer approaches) and mention problems for which each technique is appropriate.
4. Describes how to evaluate and compare different algorithms using worst-case, average-case and best-case analysis.
5. Introduces string matching algorithms.
6. Introduces linear programming.

UNIT I **9 hours**

Introduction: Role of Algorithms in computing, Order Notation, Recurrences, Probabilistic Analysis and Randomized Algorithms. Sorting and Order Statistics: Heap sort, Quick sort and Sorting in Linear Time.
Advanced Design and Analysis Techniques: Dynamic Programming- Matrix chain Multiplication, Longest common Subsequence and optimal binary Search trees.

UNIT II **9 hours**

Greedy Algorithms - Huffman Codes, Activity Selection Problem. Amortized Analysis.
Graph Algorithms: Topological Sorting, Minimum Spanning trees, Single Source Shortest Paths, Maximum Flow algorithms.

UNIT III **9 hours**

Sorting Networks: Comparison Networks, Zero-one principle, bitonic Sorting Networks, Merging Network, Sorting Network.
Matrix Operations- Strassen's Matrix Multiplication, inverting matrices, Solving system of linear Equations

UNIT IV **9 hours**
String Matching: Naive String Matching, Rabin-Karp algorithm, matching with finite Automata, Knuth- Morris - Pratt algorithm.

UNIT V **9 hours**

NP-Completeness and Approximation Algorithms: Polynomial time, polynomial time verification, NP-Completeness and reducibility, NP-Complete problems. Approximation Algorithms- Vertex cover Problem, Travelling Salesperson problem

Course Outcomes:

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

1. Ability to analyze the performance of algorithms.
2. Ability to choose appropriate data structures and algorithm design methods for a specified application.
3. Ability to understand how the choice of data structures and the algorithm design methods impact the performance of programs.

Text Book(s)

1. Introduction to Algorithms," T. H. Cormen, C.E. Leiserson, R. L. Rivest, and C. Stein, Third Edition, PHI.

Reference Books

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia publications pvt. Ltd.
2. Design and Analysis Algorithms - Parag Himanshu Dave, Himanshu Bhalchandra Dave Publisher: Pearson
3. Algorithm Design: Foundations, Analysis and Internet examples, M.T. Goodrich and R. Tomassia, John Wiley and sons.

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

Honors

20HDCAI104 NoSQL

L	T	P	C
3	0	0	3

Pre-requisite: Basic Knowledge about DBMS

Course Description:

Introduction to non-relational (NoSQL) data models, such as Key-Value, Document, Column, Graph and Object-Oriented database models. Advantages and disadvantages of the different data architecture patterns will be discussed. Hands-on experience with a representative sample of open-source NoSQL databases will be provided. The rapid and efficient processing of data sets with a focus on performance, reliability, and agility will be covered. Big Data distributed and cloud computing concepts will be introduced. Intended for students with previous programming experience.

Course Objectives:

1. Explain and compare different types of NoSQL Databases
2. Compare and contrast RDBMS with different NoSQL databases.
3. Demonstrate the detailed architecture and performance tune of Document-oriented NoSQL databases.
4. Explain performance tune of Key-Value Pair NoSQL databases.
5. Apply Nosql development tools on different types of NoSQL Databases

UNIT I **9 hours**

Overview and History of NoSQL Databases. Definition of the Four Types of NoSQL Database, The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL, Key Points

UNIT II **9 hours**

Comparison of relational databases to new NoSQL stores, MongoDB, Cassandra, HBASE, Neo4j use and deployment, Application, RDBMS approach, Challenges NoSQL approach, Key-Value and Document Data Models, Column-Family Stores, Aggregate-Oriented Databases. Replication and sharding, MapReduce on databases. Distribution Models, Single Server, Sharding, Master-Slave Replication, Peer-to-Peer Replication, Combining Sharding and Replication.

UNIT III **9 hours**

NoSQL Key/Value databases using MongoDB, Document Databases, Document oriented Database Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Web Analytics or Real-Time Analytics, E-Commerce Applications, Complex Transactions Spanning Different Operations, Queries against Varying Aggregate Structure.

UNIT IV **9 hours**

Column- oriented NoSQL databases using Apache HBASE, Column-oriented NoSQL databases using Apache Cassandra, Architecture of HBASE, Column-Family Data Store Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases, Event Logging, Content Management Systems, Blogging Platforms, Counters, Expiring Usage.

UNIT V **9 hours**

NoSQL Key/Value databases using Riak, Key-Value Databases, Key-Value Store, Key-Value Store Features, Consistency, Transactions, Query Features, Structure of Data, Scaling, Suitable Use Cases, Storing Session Information, User Profiles, Preferences, Shopping Cart Data, Relationships among Data, Multi operation Transactions, Query by Data, Operations by Sets. Graph NoSQL databases using Neo4, NoSQL database development tools and programming languages, Graph Databases, Graph Database. Features, Consistency, Transactions, Availability, Query Features, Scaling, Suitable Use Cases

Course Outcomes:

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

1. Define NoSQL, its characteristics and history, and the primary benefits for using NoSQL databases
2. Define the major types of NoSQL databases including a primary use case and advantages/disadvantages of each type
3. Create wide-column, document, key-value, graph and object-oriented databases, add content, and run queries
4. Describe the NoSQL data architecture patterns
5. Use NoSQL to manage Big Data.
6. Develop NoSQL desktop and cloud database solutions.

Text Book(s)

1. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Wiley Publications,1st Edition ,2019.

WEB REFERENCES:

1. https://www.ibm.com/cloud/learn/nosql-databases
2. https://www.coursera.org/lecture/nosql-databases/introduction-to-nosql-VdRNp
3. https://www.geeksforgeeks.org/introduction-to-nosql/
4. https://www.javatpoint.com/nosql-datab

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

Honors

20HDCAI105 INTELLIGENT AGENTS

L	T	P	C
3	0	0	3

Pre-requisite: NIL

Course Description:

Intelligent agents are software programs that can sense their environment, choose rational actions based on their percepts, and execute these actions. If an agent does all of this without the aid of a human, then it is generally considered autonomous. Often, agents interact with other agents, either by cooperating or competing; such environments are called multiagent systems. Agents can be embedded in completely electronic environments such as the Web or a simulation or may actually be robots "living" in the real world. The potential applications of agents are numerous -- including web search assistants, travel advisors, electronic secretaries, bidders in on-line auctions, tutoring systems, and actors in games or simulations. The course will cover the underlying theory of agents, the common agent architectures, methods of cooperation, and the potential applications for agents. In order to gain a better understanding of the concepts, students will construct their own agents for solving different types of problems.

Course Objectives:

1. Determine the fundamental concepts, depictions, and processes for Designing.
2. Improve reinforcement learning model for real world problems.
3. Get to use of language models for various NLP tasks.
4. Model Agent’s contributions awareness and preprocessing practices.
5. Create and execute machine hardware and software.

UNIT I INTELLIGENT AGENTS 9 hours

Agents and environments, good behavior: The concept of rationality, The nature of environments, The structure of agents.

UNIT II CLASSICAL PLANNING 9 hours

Definitions, Algorithms, Planning graphs, Classical planning approaches, Analysis. PLANNING AND ACTING IN THE REAL WORLD – Time, schedule and resources, Hierarchical planning, Planning, and acting in nondeterministic domains, Multiagent planning.

UNIT III KNOWLEDGE REPRESENTATION 9 hours

Ontological engineering, Categories and objects, Events, Mental events and mental objects, Reasoning systems for categories, Reasoning with default information, The Internet shopping world.

UNIT IV REINFORCEMENT LEARNING AND NPL 8 hours

Introduction, Passive and active reinforcement learning, Generalization in reinforcement learning, Policy search, Applications of reinforcement learning. **NPL:** Language models, Text classification, Information retrieval, Information extraction.

UNIT V NATURAL LANGUAGE FOR COMMUNICATION, PERCEPTION, ROBOTICS **10 hours**

Phrase structure grammars, syntactic analysis, Augmented grammars and semantic interpretation, Machine translation, Speech recognition.

PERCEPTION – Image formation, Early image processing operations, Object recognition by appearance, Reconstructing the 3D world, Object recognition from structural information, Using vision.

ROBOTICS – Introduction, Robot hardware, Robotic perception, planning to move, Planning uncertain movements, Moving, Robotic software architectures, Application domains.

Course Outcomes:

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

1. Demonstrate the basic concepts, representations, and algorithms for Planning.
2. Develop reinforcement learning model for real world problems.
3. Make use of language models for various NLP tasks.
4. Model Agent's inputs perception and preprocessing techniques.
5. Design and implement robot hardware and software.

Text Book(s)

1. Stuart Russell, Peter Norvig, "Artificial Intelligence -A Modern Approach", 2/e, Pearson, 2003.
2. Nils J Nilsson, "Artificial Intelligence: A New Synthesis", Morgan Kaufmann Publications, 2000.

Reference Books

1. An Introduction to Multiagent Systems (first edition) by Michael Wooldridge. ISBN 0-471-49691-X
2. A Modern Approach, Second Edition by Stuart Russell and Peter Norvig. ISBN 0-13-790395-2 (especially recommended for students who have not taken CSE 327 at Lehigh)

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

Honors

20HDCAI106 INFORMATION THEORY AND CODING

L	T	P	C
3	0	0	3

Pre-requisite: NIL

Course Description:

This course is meant to serve as an introduction to some basic concepts in information theory and error-correcting codes, and some of their applications in computer science and statistics. We plan to cover the following topics: Introduction to entropy and source coding.

Course Objectives:

1. Understand the basics of information theory and coding theories.
2. Introduce the concept of amount of information, entropy, channel capacity, error, detection and error-correction codes, block coding, convolution coding, and Viterbi decoding algorithm.
3. Understand and explain the basic concepts of information theory, source coding, channel and channel capacity, channel coding and relation among them.
4. Describe the real life applications based on the fundamental theory.
5. Calculate entropy, channel capacity, bit error rate, code rate, and steady-state probability and so on.
6. Implement the encoder and decoder of one block code or convolution code using any program language.

UNIT I CODING FOR RELIABLE DIGITAL TRANSMISSION AND STORAGE — 9 hours

Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

UNIT II LINEAR BLOCK CODES — 9 hours

Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT III CYCLIC CODES — 9 hours

Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding, Cyclic Hamming Codes, shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT IV CONVOLUTIONAL CODES — 9 hours

Encoding of Convolutional Codes- Structural and Distance Properties, state, tree, trellis diagrams, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes.

Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT V BCH CODES 9 hours

Minimum distance and BCH bounds, Decoding procedure for BCH codes, Syndrome computation and iterative algorithms, Error locations polynomials for single and double error correction.

Course Outcomes:

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

1. Learn measurement of information and errors.
2. Obtain knowledge in designing various source codes and channel codes
3. Design encoders and decoders for block and cyclic codes
4. Understand the significance of codes in various applications

Text Book(s)

1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc 2014.
2. Error Correcting Coding Theory-Man Young Rhee, McGraw – Hill Publishing 1989

Reference Books

1. Digital Communications- John G. Proakis, 5th ed., , TMH 2008.
2. Introduction to Error Control Codes-Salvatore Gravano-oxford
3. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006, Wiley India.

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