Jawaharlal Nehru Technological University Anantapur

(Established by Govt. of A.P., Act. No. 30 of 2008)

Ananthapuramu–515 002 (A.P) India

Four Year B.Tech.

Course Structure and Syllabi under R20 Regulations

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
(Established by Govt. of A.P., ACT No.30 of 2008)
ANANTAPUR – 515 002 (A.P) INDIA
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Semester-0

Induction Program: 3 weeks
(Common for All Branches of Engineering)

S.No	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counselling	MC	2-0-2-0
3	Orientation to all branches -- career options, tools, etc.	MC	3-0-0-0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

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CSE (Artificial Intelligence and Machine Learning)
Course Structure (R20)

S.No	Course No	Course Name	Category	L-T-P	Credits
	Semester - 1 (Theory - 5, Lab - 4)				
1.	20A54101	Linear Algebra and Calculus	BS	3-0-0	3
2.	20A51101T	Chemistry	BS	3-0-0	3
3.	20A05201T	C-Programming & Data Structures	ES	3-0-0	3
4.	20A02101T	Basic Electrical & Electronics Engineering	ES	3-0-0	3
5.	20A03202	Engineering Workshop	LC	0-0-3	1.5
6.	20A05202	IT Workshop	LC	0-0-3	1.5
7.	20A51101P	Chemistry Lab	BS	0-0-3	1.5
8.	20A05201P	C-Programming & Data Structures Lab	ES	0-0-3	1.5
9.	20A02101P	Basic Electrical & Electronics Engineering Lab	ES	0-0-2	1.5
				Total	**19.5**

S.No	Course No	Course Name	Category	L-T-P/D	Credits
	Semester – 2 (Theory – 5, Lab – 5)				
1.	20A54202	Probability & Statistics	BS	3-0-0	3
2.	20A56201T	Applied Physics	BS	3-0-0	3
3.	20A52101T	Communicative English	HS	3-0-0	3
4.	20A05101T	Python Programming & Data Science	ES	3-0-0	3
5.	20A03101T	Engineering Drawing	ES	1-0-0/2	2
6.	20A03101P	Engineering Graphics Lab	ES	0-0-2	1
7.	20A52101P	Communicative English Lab	HS	0-0-3	1.5
8.	20A56201P	Applied Physics Lab	BS	0-0-3	1.5
9.	20A05101P	Python Programming & Data Science Lab	ES	0-0-3	1.5
				Total	**19.5**

		Semester-III					
S.No	**Course Code**	**Course Name**	**Category**	**Hours per week**			**Credits**
				L	**T**	**P**	
1.	20A54304	Discrete Mathematics & Graph Theory	BS	3	0	0	3
2.	20A04304T	Digital Electronics& Microprocessors	ES	3	0	0	3
3.	20A05301T	Advanced Data Structures & Algorithms	PC	3	0	0	3
4.	20A05302T	Object Oriented Programming Through Java	PC	3	0	0	3
5.	20A05303	Computer Organization	PC	3	0	0	3
6.	20A04304P	Digital Electronics& Microprocessors Lab	ES	0	0	3	1.5
7.	20A05301P	Advanced Data Structures and Algorithms Lab	PC	0	0	3	1.5
8.	20A05302P	Object Oriented Programming Through Java Lab	PC	0	0	3	1.5
9.	20A52201	Universal Human Values	MC	3	0	0	3
10.	20A05304	**Skill Oriented Course – I** Web application Development	SC	1	0	2	2
				Total			**24.5**

		Semester-IV					
S.No	**Course Code**	**Course Name**	**Category**	**Hours per week**			**Credits**
				L	**T**	**P**	
1.	20A54404	Deterministic & Stochastic Statistical Methods	BS	3	0	0	3
2.	20A05401T	Database Management Systems	PC	3	0	0	3
3.	20A05402T	Operating Systems	PC	3	0	0	3
4.	20A30401T	Artificial Intelligence	PC	3	0	0	3
5.	20A52301 20A52302 20A52303	**Humanities Elective– I** Managerial Economics & Financial Analysis Organizational Behaviour Business Environment	HS	3	0	0	3
6.	20A05401P	Database Management SystemsLab	PC	0	0	3	1.5
7.	20A05402P	Operating SystemsLab	PC	0	0	3	1.5
8.	20A30401P	Artificial Intelligence Lab	PC	0	0	3	1.5
9.	20A05404	**Skill Oriented Course– II** Exploratory Data Analysis with R	SC	1	0	2	2
10.	20A99401	**Mandatory noncrdit course** Design Thinking for Innovation	MC	2	1	0	0
11.	20A99301	NSS/NCC/NSO Activities	MC	0	0	2	0
				Total			**21.5**
		Community Service Internship/Project(Mandatory) for 6 weeks duration during summer vacation					

Note:
1. Eligible and interested students can register either for Honors or for a Minor in IV Semester as per the guidelines issued by the University
2. Students shall register for NCC/NSS/NSO activities and will be required to participate in an activity for two hours in a week during fourth semester.
3. Lateral entry students shall undergo a bridge course in Mathematics during third semester

		Semester–V				
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20A30502a	Software Engineering for AI	3	0	0	3
2.	20A05602T	Machine Learning	3	0	0	3
3.	20A05703c	Deep Learning	3	0	0	3
4.		**Professional Elective Course – I**	3	0	0	3
	20A05504c	Big Data Technologies				
	20A05501T	Computer Networks				
	20A31501a	Robotic Process Automation				
5.		**Open Elective Course – I**	3	0	0	3
6.	20A05602P	Machine Learning Lab	0	0	3	1.5
7.	20A31502	Deep Learning Lab	0	0	3	1.5
8.	20A30503	**Skill oriented course – III** Web Application Design	1	0	2	2
9.	20A33501	Evaluation of Community Service Project				1.5
10.	20A99201	**Mandatory noncredit course** Environmental Science	3	0	0	0
		Total				**21.5**

Open Elective-I

S.No	Course Code	Course Name	Offered by the Dept.
1	20A01505	Building Technology	CE
2	20A02505	Electric Vehicles	EEE
3	20A03505	3D Printing Technology	ME
4	20A04507	MATLAB Programming for Engineers	ECE/EEE
5	20A04508	Introduction to Control Systems	ECE/EEE
6	20A27505	Computer Applications in Food Processing	FT
7	20A54501	Optimization Techniques	Mathematics
8	20A56501	Materials Characterization Techniques	Physics
9	20A51501	Chemistry of Energy Materials	Chemistry

Note:
1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.
2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.
3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline

S.No	Course Code	Course Name	L	T	P	Credits
		Semester–VI				
1.	20A05702c	Natural Language Processing	3	0	0	3
2.	20A33601T	Advanced Machine Learning	3	0	0	3
3.	20A05701a	Cloud Computing	3	0	0	3
4.	20A31601a 20A33602a 20A05604c	**Professional Elective Course– II** Robotics Automation of Model Building Computer Vision	3	0	0	3
5.		**Open Elective Course – II**	3	0	0	3
6.	20A30603	Natural Language Processing Lab	0	0	3	1.5
7.	20A33601P	Advanced Machine Learning Lab	0	0	3	1.5
8.	20A12604	Cloud Computing Lab	0	0	3	1.5
9.	20A52401	**Skill oriented course - IV** Soft Skills	1	0	2	2
10.	20A99601	**Mandatory Non-credit Course** Intellectual Property Rights & Patents	2	0	0	0
		Total				**21.5**
		Industry Internship (Mandatory) for 6 - 8 weeks duration during summer vacation				

Open Elective-II

S.No	Course Code	Course Name	Offered by the Dept.
1	20A01605	Environmental Economics	CE
2	20A02605	Smart Electric Grid	EEE
3	20A04605	Signal Processing	ECE
4	20A04606	Basic VLSI Design	ECE
5	20A27605	Food Refrigeration and Cold Chain Management	FT
6	20A54701	Wavelet Transforms & its applications	Mathematics
7	20A56701	Physics Of Electronic Materials and Devices	Physics
8	20A51701	Chemistry of Polymers and its Applications	Chemistry

		Semester-VII				
S.No.	**Course Code**	**Course Name**	**L**	**T**	**P**	**Credits**
1.	20A31701a 20A30701b 20A30701c	**Professional Elective Course– III** Recommender Systems Intelligent Information Retrieval Systems Knowledge Representation and Reasoning	3	0	0	3
2.	20A31702a 20A30702b 20A33701a	**Professional Elective Course– IV** Optimization Techniques In AI AI for Image Analysis Machine Learning for Unstructured data	3	0	0	3
3.	20A30703a 20A05703b 20A30703b	**Professional Elective Course– V** Dev Ops Block Chain Technology and Applications Reinforcement Learning	3	0	0	3
4.	20A52701a 20A52701b 20A52701c	**Humanities Elective – II** Entrepreneurship and Incubation Management Science Enterprise Resource Planning	3	0	0	3
5.		**Open Elective Course – III**	3	0	0	3
6.		**Open Elective Course – IV**	3	0	0	3
7.	20A30704	**Skill oriented course – V** Conversational AI	1	0	2	2
8.	20A33702	Evaluation of Industry Internship				3
			Total			**23**

Open Elective-III

S.No	Course Code	Course Name	Offered by the Dept.
1	20A01704	Cost Effective Housing Techniques	CE
2	20A02704	IOT Applications in Electrical Engineering	EEE
3	20A03704	Product Design & Development	ME
4	20A04704	Electronic Sensors	ECE
5	20A04506	Principles of Communication Systems	ECE
6	20A27704	Human Nutrition	FT
7	20A54702	Numerical Methods for Engineers	Mathematics
8	20A56702	Sensors And Actuators for Engineering Applications	Physics
9	20A51702	Chemistry of Nanomaterials and Applications	Chemistry

Open Elective-IV

S.No	Course Code	Course Name	Offered by the Dept.
1	20A01705	Health, Safety & Environmental management	CE
2	20A02705	Renewable Energy Systems	EEE
3	20A03705	Introduction to Composite Materials	ME
4	20A04705	Microcontrollers and Applications	ECE
5	20A04706	Principles of Cellular & Mobile Communications	ECE
6	20A27705	Waste and Effluent Management	FT
7	20A54703	Number theory & its applications	Mathematics
8	20A56703	Smart Materials and Devices	Physics
9	20A51703	Green Chemistry and Catalysis for Sustainable	Chemistry

S.No.	Course Code	Course Name	Category	L	T	P	Credits
Semester-VIII							
1.	20A33801	Full Internship & Project work	PR				12
						Total	12

COURSES OFFERED FOR HONOURS DEGREE IN CSE (AI & ML)

S.No.	Code	Course Name	Contact Hours per week		Credits
			L	T	
1	20A30H01	Virtual and Augmented reality	3	1	4
2	20A33H01	Software Project Management using Agile	3	1	4
3	20A30H03	Ethics and Privacy in AI	3	1	4
4	20A30H04	Medical Image Data Processing	3	1	4
5	20A33H02	MOOC - I			2
6	20A33H03	MOOC - II			2

MOOC Courses for a Total of 2 credits	AI Chatbots without Programming	2 weeks	https://www.edx.org/course/AI-chatbots-without-programming
	Robot Development	6 weeks	https://www.edx.org/course/developmental-robotics
MOOC Course for 2 credits	Introduction to Watson AI	8 weeks	https://www.edx.org/course/intro-to-watson-AI
MOOC Course for 2 credits	Artificial Intelligence A-Z: Learn How to Build an AI (Paid Course)	Equivalent to 8 Weeks	https://www.udemy.com/course/artificial-intelligence-az/
MOOC Course for 2 credits	Introduction to Haskell Programming	8 weeks	https://onlinecourses.nptel.ac.in/noc22_cs69/preview
MOOC Course for 2 credits	Applied Accelerated Artificial Intelligence	12 weeks (To be considered only for 8 weeks)	https://onlinecourses.nptel.ac.in/noc22_cs83/preview

LIST OF MINORS OFFERED TO CSE (AI & ML)

S.No.	Minor Title	Department offering the Minor
1.	Construction Technology	Civil Engineering
2.	Environmental Geotechnology	Civil Engineering
3.	Energy Systems	EEE
4.	3D Printing	ME
5.	Industrial Engineering	ME
6.	Food Science	Food Technology

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech -CSE -(AI &ML)– I Sem   **L T P C**

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(20A54101) LINEAR ALGEBRA & CALCULUS
(Common to All Branches of Engineering)

Course Objectives:

- This course will illuminate the students in the concepts of calculus and linear algebra.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

UNIT -1

Matrices

Rank of a matrix by echelon form, normal form. Solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigenvectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix.

Learning Outcomes:

At the end of this unit, the student will be able to

- Solving systems of linear equations, using technology to facilitate row reduction determine the rank, eigen values and eigenvectors (L3).
- Identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics; (L3)

UNIT -2

Mean Value Theorems

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof) related problems.

Learning Outcomes:

At the end of this unit, the student will be able to
- Translate the given function as series of Taylor's and Maclaurin's with remainders (L3)
- Analyze the behaviour of functions by using mean value theorems (L3)

UNIT -3

Multivariable Calculus

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes:

At the end of this unit, the student will be able to
- Find partial derivatives numerically and symbolically and use them to analyze and interpret the way a function varies. (L3)
- Acquire the Knowledge maxima and minima of functions of several variable (L1)
- Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables (L3)

UNIT -4

Multiple Integrals

Double integrals, change of order of integration, change of variables. Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates. Finding areas and volumes using double and triple integrals.

Learning Outcomes:

At the end of this unit, the student will be able to
- Evaluate double integrals of functions of several variables in two dimensions using Cartesian and polar coordinates (L5)
- Apply double integration techniques in evaluating areas bounded by region (L4)
- Evaluate multiple integrals in Cartesian, cylindrical and spherical geometries (L5)

UNIT -5

Beta and Gamma functions

Beta and Gamma functions and their properties, relation between beta and gamma functions, evaluation of definite integrals using beta and gamma functions.

Learning Outcomes:

At the end of this unit, the student will be able to
- Understand beta and gamma functions and its relations (L2)
- Conclude the use of special function in evaluating definite integrals (L4)

Text Books:
1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

Reference Books:
1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.
4. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
5. Dean G. Duffy, Advanced Engineering Mathematics with MATLAB, CRC Press
6. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
7. R.L. Garg Nishu Gupta, Engineering Mathematics Volumes-I &II, Pearson Education
8. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill Education

9. H. k Das, Er. RajnishVerma, Higher Engineering Mathematics, S. Chand.
10. N. Bali, M. Goyal, C. Watkins, Advanced Engineering Mathematics, Infinity Science Press.

Course Outcomes:

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

- Develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
- Utilize mean value theorems to real life problems (L3)
- Familiarize with functions of several variables which is useful in optimization (L3)
- Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems (L5)
- Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions

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B.Tech- CSE -(AI &ML) – I Sem   L   T   P   C
                                            3   0   0   3

(20A51101T) CHEMISTRY
(CSE, AI & DS,CSE (AI), CSE(IoT), CSE (Data Science), CSE(AI & ML), IT, ECE, EEE and IT)

Course Objectives:

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches

Unit 1: Structure and Bonding Models:

Planck's quantum theory, dual nature of matter, Schrodinger equation, significance of Ψ and Ψ^2, applications to hydrogen, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O_2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation ofbond order.

Learning Outcomes:

At the end of this unit, the students will be able to
- Apply Schrodinger wave equation to hydrogen atom (L3)
- Illustrate the molecular orbital energy level diagram of different molecular species (L2)
- Explain the calculation of bond order of O_2 and Co molecules (L2)
- Discuss the basic concept of molecular orbital theory (L3)

Unit 2: Modern Engineering materials:

Coordination compounds: Crystal field theory – salient features – splitting in octahedral and tetrahedral geometry. Properties of coordination compounds-Oxidation state, coordination, magnetic and colour.
Semiconductor materials, super conductors- basic concept, band diagrams for conductors, semiconductors and insulators, Effect of doping on band structures.
Supercapacitors: Introduction, Basic concept-Classification – Applications.
Nanochemistry: Introduction, classification of nanometerials, properties and applications of Fullerenes, carbonnano tubes and Graphines nanoparticles.

Learning Outcomes:

At the end of this unit, the students will be able to
- Explain splitting in octahedral and tetrahedral geometryof complexes (L2).
- Discuss the magnetic behaviour and colour of coordination compounds (L3).
- Explain the band theory of solids for conductors, semiconductors and insulators (L2)
- Demonstrate the application of Fullerenes, carbon nano tubes and Graphines nanoparticles (L2).

Unit 3: Electrochemistry and Applications:

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode); Electrochemical cell, Nernst equation, cell potential calculations and numerical problems,

potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad),and lithium ion batteries-working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

Learning Outcomes:

At the end of this unit, the students will be able to
- Apply Nernst equation for calculating electrode and cell potentials (L3)
- Differentiate between ph metry, potentiometric and conductometric titrations (L2)
- Explain the theory of construction of battery and fuel cells (L2)
- Solve problems based on cell potential (L3)

Unit 4: Polymer Chemistry:

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.

Plastics - Thermoplastics and Thermosettings, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, polypyrroles – mechanism of conduction and applications.

Learning Outcomes:

At the end of this unit, the students will be able to
- Explain the different types of polymers and their applications (L2)
- Explain the preparation, properties and applications of Bakelite, Nylon-6,6, and carbon fibres (L2)
- Describe the mechanism of conduction in conducting polymers (L2)
- Discuss Buna-S and Buna-N elastomers and their applications (L2)

Unit 5: Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. Principle and applications of pH metry, UV-Visible**,**IR Spectroscopies. Solid-Liquid Chromatography–TLC, retention time.

Learning outcomes:

After completion of Unit IV, students will be able to:
- Explain the different types of spectral series in electromagnetic spectrum (L2)
- Understand the principles of different analytical instruments (L2)
- Explain the different applications of analytical instruments (L2)

Text Books:
1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:
1. G.V.Subba Reddy, K.N.Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020.
2. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
3. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
4. J.M.Lehn, Supra Molecular Chemistry, VCH Publications

Course Outcomes:

At the end of the course, the students will be able to:
- Compare the materials of construction for battery and electrochemical sensors (l2)
- Explain the preparation, properties, and applications of thermoplastics &thermosetting, elastomers& conducting polymers. (l2)
- Explain the principles of spectrometry, slc in separation of solid and liquid mixtures (l2)
- Apply the principle of Band diagrams in application of conductors and semiconductors (L3)

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	L	T	P	C
B.Tech - CSE -(AI &ML) – I Sem	**3**	**0**	**0**	**3**

(20A05201T) C-PROGRAMMING & DATA STRUCTURES
(Common to All Branches of Engineering)

Course Objectives:

- To illustrate the basic concepts of C programming language.
- To discuss the concepts of Functions, Arrays, Pointers and Structures.
- To familiarize with Stack, Queue and Linked lists data structures.
- To explain the concepts of non-linear data structures like graphs and trees.
- To learn different types of searching and sorting techniques.

UNIT-1

Introduction to C Language - C language elements, variable declarations and data types, operators and expressions, decision statements - If and switch statements, loop control statements - while, for, do-while statements, arrays.

Learning outcomes:

At the end of this unit, the students will be able to
- Use C basic concepts to write simple C programs. (L3)
- Use iterative statements for writing the C programs (L3)
- Use arrays to process multiple homogeneous data. (L3)
- Test and execute the programs and correct syntax and logical errors. (L4)
- Translate algorithms into programs. (L4)
- Implement conditional branching, iteration and recursion. (L2)

UNIT – 2

Functions, types of functions, Recursion and argument passing, pointers, storage allocation, pointers to functions, expressions involving pointers, Storage classes – auto, register, static, extern, Structures, Unions, Strings, string handling functions, and Command line arguments.

Learning outcomes:

At the end of this unit, the students will be able to
- Writing structured programs using C Functions. (L5)
- Writing C programs using various storage classes to control variable access. (L5)
- Apply String handling functions and pointers. (L3)
- Use arrays, pointers and structures to formulate algorithms and write programs.(L3)

UNIT-3

Data Structures, Overview of data structures, stacks and queues, representation of a stack, stack related terms, operations on a stack, implementation of a stack, evaluation of arithmetic expressions, infix, prefix, and postfix notations, evaluation of postfix expression, conversion of expression from infix to postfix, recursion, queues - various positions of queue, representation of queue, insertion, deletion, searching operations.

Learning outcomes:

At the end of this unit, the students will be able to
- Describe the operations of Stack. (L2)
- Explain the different notations of arithmetic expression. (L5)
- Develop various operations on Queues. (L6)

UNIT – 4

Linked Lists – Singly linked list, dynamically linked stacks and queues, polynomials using singly linked lists, using circularly linked lists, insertion, deletion and searching operations, doubly linked lists and its operations, circular linked lists and its operations.

Learning outcomes:

At the end of this unit, the students will be able to
- Analyze various operations on singly linked list. (L4)
- Interpret operations of doubly linked lists. (L2)
- Apply various operations on Circular linked lists. (L6)

UNIT-5

Trees - Tree terminology, representation, Binary trees, representation, binary tree traversals. binary tree operations, **Graphs** - graph terminology, graph representation, elementary graph operations, Breadth First Search (BFS) and Depth First Search (DFS), connected components, spanning trees. **Searching and Sorting** – sequential search, binary search, exchange (bubble) sort, selection sort, insertion sort.

Learning outcomes:

At the end of this unit, the students will be able to
- Develop the representation of Tress. (L3)
- Identify the various Binary tree traversals. (L3)
- Illustrate different Graph traversals like BFS and DFS. (L2)
- Design the different sorting techniques (L6)
- Apply programming to solve searching and sorting problems. (L3)

Text Books:

1. The C Programming Language, Brian W Kernighan and Dennis M Ritchie, Second Edition, Prentice Hall Publication.
2. Fundamentals of Data Structures in C, Ellis Horowitz, SartajSahni, Susan Anderson-Freed, Computer Science Press.
3. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. AnandaRao, Pearson Education.
4. B.A. Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016.
5. Richard F. Gilberg & Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, CENGAGE Learning, 2011.

Reference Books:

1. Pradip Dey and Manas Ghosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2. E. Balaguruswamy, "C and Data Structures", 4th Edition, Tata Mc Graw Hill.
3. A.K. Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.
4. M.T. Somashekara, "Problem Solving Using C", PHI, 2nd Edition 2009.

Course Outcomes:

1. Analyse the basicconcepts of C Programming language. (L4)
2. Design applications in C, using functions, arrays, pointers and structures. (L6)
3. Apply the concepts of Stacks and Queues in solving the problems. (L3)
4. Explore various operations on Linked lists. (L5)
5. Demonstrate various tree traversals and graph traversal techniques. (L2)
6. Design searching and sorting methods (L3)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech - CSE -(AI &ML) – I Sem	L T P C
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(20A02101T) BASIC ELECTRICAL & ELECTRONICS ENGINEERING
(Civil, Mechanical, CSE, AI & DS,CSE (AI), CSE(IoT), CSE (Data Science), CSE(AI & ML), IT and Food Technology)

Part A: Basic Electrical Engineering

Course Objectives:

- To introduce basics of electric circuits.
- To teach DC and AC electrical circuit analysis.
- To explain working principles of transformers and electrical machines.
- To impart knowledge on Power system generation, transmission and distribution

UNIT -1

DC & AC Circuits:
Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Superposition Theorem - 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 RL - RC - RLC series circuits, Resonance.

Learning Outcomes

At the end of this unit, the student will be able to

- Recall Kirchoff laws
- Analyze simple electric circuits with DC excitation
- Apply network theorems to simple circuits
- Analyze single phase AC circuits consisting of series RL - RC - RLC combinations

UNIT -2

DC & AC Machines:
Principle and operation of DC Generator - EMF equations - OCC characteristics of DC generator – principle and operation of DC Motor – Performance Characteristics of DC Motor - Speed control of DC Motor – Principle and operation of Single Phase Transformer - OC and SC tests on transformer - Principle and operation of 3-phase AC machines [Elementary treatment only]

Learning Outcomes

At the end of this unit, the student will be able to
● Explain principle and operation of DC Generator & Motor.
● Perform speed control of DC Motor
● Explain operation of transformer and induction motor.
● Explain construction & working of induction motor - DC motor

UNIT -3

Basics of Power Systems:
Layout & operation of Hydro, Thermal, Nuclear Stations - Solar & wind generating stations – Typical AC Power Supply scheme – Elements of Transmission line – Types of Distribution systems: Primary & Secondary distribution systems.

Learning Outcomes

At the end of this unit, the student will be able to
  ● Understand working operation of various generating stations
  ● Explain the types of Transmission and Distribution systems

Text Books:
  1. D. P. Kothari and I. J. Nagrath - "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
  2. V.K. Mehta & Rohit Mehta, "Principles of Power System" – S.Chand – 2018.

References:
  1. L. S. Bobrow - "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
  2. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.
  3. C.L. Wadhwa – "Generation Distribution and Utilization of Electrical Energy", 3rd Edition, New Age International Publications.

Course Outcomes:

The student should be able to
  ● Apply concepts of KVL/KCL in solving DC circuits
  ● Understand and choose correct rating of a transformer for a specific application
  ● Illustrate working principles of DC Motor
  ● Identify type of electrical machine based on their operation
  ● Understand the basics of Power generation, Transmission and Distribution

Part 'B'- Electronics Engineering

COURSE OBJECTIVES

  ● Understand principles and terminology of electronics.
  ● Familiar with the theory, construction, and operation of electronic devices.
  ● Learn about biasing of BJTs and FETs.
  ● Design and construct amplifiers.
  ● Understand the concept & principles of logic devices.

Unit-1:

Diodes and Applications: Semiconductor Diode,Diode as a Switch& Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Operation and Applications ofZener Diode, LED, Photo Diode.

Transistor Characteristics: Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Biasing of Transistor Configuration; Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Concepts of Small Signal Amplifiers –CE & CC Amplifiers.

Learning outcomes:

At the end of this unit, the student will be able to
- Remember and understand the basic characteristics of semiconductor diode. (L1)
- Understand principle of operation of Zener diode and other special semiconductor diodes. (L1)
- Analyze BJT based biasing circuits. (L3)
- Design an amplifier using BJT based on the given specifications. (L4)

Unit-2:

Operational Amplifiers and Applications: Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op-Amp, Concept of Virtual Ground; Op-Amp Applications - Inverting, Non-Inverting, Summing and Difference Amplifiers, Voltage Follower, Comparator, Differentiator, Integrator.

Learning outcomes:

At the end of this unit, the student will be able to
- Describe operation of Op-Amp based linear application circuits, converters, amplifiers and non-linear circuits. (L2)
- Analyze Op-Amp based comparator, differentiator and integrator circuits. (L3)

Unit-3:

Digital Electronics: Logic Gates,Simple combinational circuits–Half and Full Adders, BCD Adder.Latches and Flip-Flops (S-R, JK andD), Shift Registers and Counters.Introduction to Microcontrollers and their applications (Block diagram approach only).

Learning outcomes:

At the end of this unit, the student will be able to
- Explain the functionality of logic gates. (L2)
- Apply basic laws and De Morgan's theorems to simplify Boolean expressions. (L3)
- Analyze standard combinational and sequential circuits. (L4)
- Distinguish between 8085 & 8086 microprocessors also summarize features of a microprocessor. (L5)

Text Books:

1. R.L.Boylestad& Louis Nashlesky, Electronic Devices &Circuit Theory, Pearson Education,2007.
2. Ramakanth A. Gayakwad, Op-Amps & Linear ICs, 4th Edition, Pearson, 2017.

3. R. P. Jain, Modern Digital Electronics,3rd Edition, Tata Mcgraw Hill,2003.
4. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd Edition, Pearson, 2012.

Reference Books:

1. SantiramKal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India,2002.
2. R. S. Sedha, A Text Book of Electronic Devices and Circuits, S.Chand& Co,2010.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

COURSE OUTCOMES:

After the completion of the course students will able to

- Explain the theory, construction, and operation of electronic devices.

- Apply the concept of science and mathematics to explain the working of diodes and its applications, working of transistor and to solve the simple problems based on the applications

- Analyze small signal amplifier circuits to find the amplifier parameters

- Design small signal amplifiers using proper biasing circuits to fix up proper Q point.

- Distinguish features of different active devices including Microprocessors.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech- CSE -(AI &ML)– I Sem   **L   T   P   C**

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(20A03202) ENGINEERING WORKSHOP

(Common to All Branches of Engineering)

Course Objective:

To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

List of Topics

Wood Working:

Familiarity with different types of woods and tools used in wood working and make following joints
   a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint

Sheet Metal Working:

Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets
   a) Tapered tray   b) Conical funnel   c) Elbow pipe   d) Brazing

Fitting:

Familiarity with different types of tools used in fitting and do the following fitting exercises
  a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two wheeler tyre

Electrical Wiring:

Familiarities with different types of basic electrical circuits and make the following connections
   a) Parallel and series b) Two way switch   c) Godown lighting
   d) Tube light   e) Three phase motor f) Soldering of wires

Course Outcomes:

After completion of this lab the student will be able to
   • Apply wood working skills in real world applications. (l3)
   • Build different objects with metal sheets in real world applications. (l3)
   • Apply fitting operations in various applications. (l3)
   • Apply different types of basic electric circuit connections. (l3)
   • Use soldering and brazing techniques. (l2)

Note: In each section a minimum of three exercises are to be carried out.

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B.Tech - CSE -(AI &ML) – I Sem   L   T   P   C
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(20A05202) IT WORKSHOP
(Common to All Branches of Engineering)

Course Objectives:

- To make the students know about the internal parts of a computer, assembling and dissembling a computer from the parts, preparing a computer for use by installing the operating system
- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations and LAteX
- To learn about Networking of computers and use Internet facility for Browsing and Searching

Preparing your Computer

Task 1:
Learn about Computer: Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

Task 2:
Assembling a Computer: Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods

Task 3:
Install Operating system: Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

Task 4:
Operating system features: Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.
Networking and Internet

Task 5:
Networking: Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimpling activity, logical configuration etc. should be done by the student. The entire process has to be documented.

Task 6:

Browsing Internet: Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc. If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

Task 7:

Antivirus: Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

Productivity tools

Task 8:

Word Processor: Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered, Image Manipulation tools.

Task 9:

Presentations: creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show.

Task 10:

Spreadsheet: Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet

Task 11:

LateX: Introduction to Latex and its installation and different IDEs. Creating first document using Latex, using content into sections using article and book class of LaTeX. Styling Pages: reviewing and customizing different paper sizes and formats. Formatting text (styles, size, alignment, colors and adding bullets and numbered items, inserting mathematical symbols, and images, etc.). Creating basic

tables, adding simple and dashed borders, merging rows and columns. Referencing and Indexing: cross-referencing (refer to sections, table, images), bibliography (references).

References:
1. Introduction to Computers, Peter Norton, McGraw Hill
2. MOS study guide for word, Excel, Powerpoint& Outlook Exams, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs, Bigelows, TMH
6. Lamport L. LATEX: a document preparation system: user's guide and reference manual. Addison-wesley; 1994.

Course Outcomes:

- Disassemble and Assemble a Personal Computer and prepare the computer ready to use.
- Prepare the Documents using Word processors and Prepare spread sheets for calculations .using excel and also the documents using LAteX.
- Prepare Slide presentations using the presentation tool.
- Interconnect two or more computers for information sharing.
- Access the Internet and Browse it to obtain the required information.

Note: Use open source tools for implementation of the above exercises.

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B.Tech- CSE -(AI &ML) – I Sem	0	0	3	1.5

(20A51101P)   CHEMISTRY LAB

(CSE, AI & DS,CSE (AI), CSE(IoT), CSE (Data Science), CSE(AI & ML), IT**, ECE, EEE and IT)**

Course Objectives:

- Verify the fundamental concepts with experiments

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method
2. Models of potential energy surfaces
3. Conductometrictitration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite and measurement of its mechanical properties (strength.).
8. Verify Lambert-Beer's law
9. Thin layer chromatography
10. Identification of simple organic compounds by IR.
11. Preparation of nanomaterial's by precipitation
12. Estimation of Ferrous Iron by Dichrometry.

Course Outcomes:

At the end of the course, the students will be able to
- Determine the cell constant and conductance of solutions (L3)
- Prepare advanced polymer Bakelite materials (L2)
- Measure the strength of an acid present in secondary batteries (L3)
- Analysethe IR of some organic compounds (L3)

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B.Tech- CSE -(AI &ML)-I Sem	L	T	P	C
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(20A05201P) C-PROGRAMMING & DATA STRUCTURES LAB
(Common to All Branches of Engineering)

Course Objectives:

- To get familiar with the basic concepts of C programming.
- To design programs using arrays, strings, pointers and structures.
- To illustrate the use of Stacks and Queues
- To apply different operations on linked lists.
- To demonstrate Binary search tree traversal techniques.
- To design searching and sorting techniques.

Week l

Write C programs that use both recursive and non-recursive functions

  i)   To find the factorial of a given integer.
  ii) To find the GCD (greatest common divisor) of two given integers.
  iii) To solve Towers of Hanoi problem.

Week 2

  a) Write a C program to find both the largest and smallest number in a list of integers.
  b) Write a C program that uses functions to perform the following:
      i) Addition of Two Matrices   ii) Multiplication of Two Matrices

Week 3
  a) Write a C program that uses functions to perform the following operations:
      i) To insert a sub-string in to a given main string from a given position.
      ii) To delete n characters from a given position in a given string.

Week 4
  a) Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.

  b) Write a C program to count the lines, words and characters in a given text.

Week 5

  a) Write a C Program to perform various arithmetic operations on pointer variables.
  b) Write a C Program to demonstrate the following parameter passing mechanisms:
      i) call-by-value   ii) call-by-reference

Week 6

Write a C program that uses functions to perform the following operations:

  i) Reading a complex number
  ii) Writing a complex number
  iii) Addition of two complex numbers
  iv) Multiplication of two complex numbers

 (Note: represent complex number using a structure.)

Week 7

Write C programs that implement stack (its operations) using

  i) Arrays
  ii) Pointers

Week 8

Write C programs that implement Queue (its operations) using
  i) Arrays
  ii) Pointers

Week 9

Write a C program that uses Stack operations to perform the following:

  i) Converting infix expression into postfix expression
  ii) Evaluating the postfix expression

Week 10

Write a C program that uses functions to perform the following operations on singly linked list.

  i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 11

Write a C program that uses functions to perform the following operations on Doubly linkedlist.

  i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 12

Write a C program that uses functions to perform the following operations on circular linkedlist.

  i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 13

Write a C program that uses functions to perform the following:

   i) Creating a Binary Tree of integers

   ii) Traversing the above binary tree in preorder, inorder and postorder.

Week 14

Write C programs that use both recursive and non-recursive functions to perform the following searching operations for a key value in a given list of integers:

   i)   Linear search
   ii) Binary search

Week 15

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

   i)   Bubble sort
   ii)   Selection sort
   iii) Insertion sort

Text Books:
   1. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A. Ananda Rao, Pearson Education.
   2. B.A. Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016.
   3. Richard F. Gilberg & Behrouz A. Forouzan, "Data Structures: A Pseudocode Approach with C", Second Edition, CENGAGE Learning, 2011.

Reference Books:

   1. PradipDey and ManasGhosh, Programming in C, Oxford University Press, 2nd Edition 2011.

   2. E.Balaguruswamy, "C and Data Structures", 4th Edition, Tata Mc Graw Hill.

   3. A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press.

   4. M.T.Somashekara, "Problem Solving Using C", PHI, 2nd Edition 2009.

Course Outcomes

   • Demonstrate basic concepts of C programming language. (L2)
   • Develop C programs using functions, arrays, structures and pointers. (L6)
   • Illustrate the concepts Stacks and Queues. (L2)
   • Design operations on Linked lists. (L6)
   • Apply various Binary tree traversal techniques. (L3)
   • Develop searching and sorting methods. (L6)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech- CSE -(AI &ML) – I Sem   L T P C
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(20A02101P) BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB
(Civil, Mechanical, CSE, AI & DS,CSE (AI), CSE(IoT), CSE (Data Science), CSE(AI & ML), IT and
Food Technology)

Part A: Electrical Engineering Lab

Course Objectives:

- To Verify Kirchoff's laws and Superposition theorem
- To learn performance characteristics of DC Machines.
- To perform various tests on 1- Phase Transformer.
- To Study the I – V Characteristics of Solar PV Cell

List of experiments: -

1. Verification of Kirchhoff laws.
2. Verification of Superposition Theorem.
3. Magnetization characteristics of a DC Shunt Generator.
4. Speed control of DC Shunt Motor.
5. OC & SC test of 1 – Phase Transformer.
6. Load test on 1-Phase Transformer.
7. I – V Characteristics of Solar PV cell
8. Brake test on DC Shunt Motor.

Course Outcomes:

After completing the course, the student will be able to

- Understand Kirchoff's Laws & Superposition theorem.
- Analyze the various characteristics on DC Machines by conducting various tests.
- Analyze I – V Characteristics of PV Cell
- Apply the knowledge to perform various tests on 1-phase transformer

Part B: Electronics Engineering Lab

Course Objectives:

- To verify the theoretical concepts practically from all the experiments.
- To analyze the characteristics of Diodes, BJT, MOSFET, UJT.
- To design the amplifier circuits from the given specifications.
- Exposed to linear and digital integrated circuits.

List Of Experiments:

1. PN Junction diode characteristics A) Forward bias B) Reverse bias.

2. Zener diode characteristics and Zener as voltage Regulator.

3. Full Wave Rectifier with & without filter.

4. Wave Shaping Circuits. (Clippers & Clampers)

5. Input & Output characteristics of Transistor in CB / CE configuration.

6. Frequency response of CE amplifier.

7. Inverting and Non-inverting amplifiers using Op-AMPs.

8. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.

9. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

Course outcomes:

- Learn the characteristics of basic electronic devices like PN junction diode, Zener diode & BJT.
- Construct the given circuit in the lab
- Analyze the application of diode as rectifiers, clippers and clampers and other circuits.
- Design simple electronic circuits and verify its functioning.

Note: Minimum Six Experiments to be performed in each section.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech- CSE -(AI &ML) – II Sem   **L   T   P   C**
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(20A54202) PROBABILITY AND STATISTICS
(Common to CSE, AI & DS,CSE (AI), CSE(IoT), CSE (Data Science), CSE(AI & ML) and IT)

Course Objectives:

- To familiarize the students with the foundations of probability and statistical methods
- To impart probability concepts and statistical methods in various applications Engineering

Unit 1:

Descriptive statistics
Statistics Introduction, Measures of Variability (dispersion) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, principle of least squares, method of least squares, regression lines, regression coefficients and their properties.

Learning Outcomes:

At the end of this unit, the student will be able to
- summarize the basic concepts of data science and its importance in engineering (L2)
- analyze the data quantitatively or categorically , measure of averages, variability (L4)
- adopt   correlation methods and principle of least squares, regression analysis (L5)

UNIT 2: Probability

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties.

Learning Outcomes:

At the end of this unit, the student will be able to
- Define the terms trial, events, sample space, probability, and laws of probability (L1)
- Make use of probabilities of events in finite sample spaces from experiments (L3)
- Apply Baye's theorem to real time problems (L3)
- Explain the notion of random variable, distribution functions and expected value(L2)

UNIT 3:

Probability distributions
Discrete distribution - Binomial, Poisson approximation to the binomial distribution and their properties. Continuous distribution: normal distribution and their properties.

Learning Outcomes:

At the end of this unit, the student will be able to
- Apply Binomial and Poisson distributions for real data to compute probabilities, theoretical frequencies (L3)
- Interpret the properties of normal distribution and its applications (L2)

Unit4:

Estimation and Testing of hypothesis, large sample tests
Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

Learning Outcomes:

At the end of this unit, the student will be able to
● Explain the concept of estimation, interval estimation and confidence intervals (L2)
● Apply the concept of hypothesis testing for large samples (L4)

Unit 5:

Small sample tests
Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi2$ - test for goodness of fit, $\chi2$ - test for independence of attributes.

Learning Outcomes:

At the end of this unit, the student will be able to
● Apply the concept of testing hypothesis for small samples to draw the inferences (L3)
● Estimate the goodness of fit (L5)

Text Books:
1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.

Reference Books:
1. S. Ross, a First Course in Probability, Pearson Education India, 2002.
2. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.
3. Peyton Z. Peebles ,Probability, Random Variables & Random Signal Principles -, McGraw Hill Education, 4th Edition, 2001.

Course Outcomes:

Upon successful completion of this course, the student should be able to
● Make use of the concepts of probability and their applications (L3)
● Apply discrete and continuous probability distributions (L3)
● Classify the concepts of data science and its importance (L4)
● Interpret the association of characteristics and through correlation and regression tools (L4)
● Design the components of a classical hypothesis test   (L6)
● Infer the statistical inferential methods based on small and large sampling tests   (L6)

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B.Tech- CSE -(AI &ML) – II Sem   **L   T   P   C**
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20A56201T   APPLIED PHYSICS
(ECE, EEE, CSE, AI & DS,CSE (AI), CSE(IoT), CSE (Data Science), CSE(AI & ML), IT)

Course Objectives

- To make a bridge between the physics in school and engineering courses.

- To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications

- To understand the mechanisms of emission of light, the use of lasers as light sources for low and high energy applications, study of propagation of light wave through optical fibres along with engineering applications.

- To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.

- To enlighten the concepts of Quantum Mechanics and to provide fundamentals of de'Broglie waves, quantum mechanical wave equation and its applications, the importance of free electron theory and band theory of solids.

- Evolution of band theory to distinguish materials, basic concepts and transport phenomenon of charge carriers in semiconductors. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.

Unit-I:

Wave Optics
Interference- Principle of superposition – Interference of light – Conditions for sustained interference - Interference in thin films (Reflection Geometry) – Colors in thin films – Newton's Rings – Determination of wavelength and refractive index.
Diffraction- Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Grating spectrum.

Polarization- Introduction – Types of polarization – Polarization by reflection, refraction and double refraction - Nicol's Prism - Half wave and Quarter wave plates with applications.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain the need of coherent sources and the conditions for sustained interference (L2)
- Identify engineering applications of interference (L3)
- Analyze the differences between interference and diffraction with applications (L4)
- Illustrate the concept of polarization of light and its applications (L2)
- Classify ordinary polarized light and extraordinary polarized light (L2)

Unit-II:

Lasers and Fiber optics
Lasers- Introduction – Characteristics of laser – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Lasing action – Pumping mechanisms – Nd-YAG laser – He-Ne laser – Applications of lasers.

Fiber optics- Introduction – Principle of optical fiber – Acceptance Angle – Numerical Aperture – Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers – Propagation Losses (qualitative) – Applications.

Learning Outcomes:

At the end of this unit, the student will be able to
- Understand the basic concepts of LASER light Sources (L2)
- Apply the concepts to learn the types of lasers (L3)
- Identifies the Engineering applications of lasers (L2)
- Explain the working principle of optical fibers (L2)
- Classify optical fibers based on refractive index profile and mode of propagation (L2)
- Identify the applications of optical fibers in various fields (L2)

Unit-III:

Dielectric and Magnetic Materials

Dielectric Materials- Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations: Electronic, Ionic and Orientation polarizations (Qualitative) – Lorentz internal field – Clausius-Mossotti equation.

Magnetic Materials- Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and Permeability – Origin of permanent magnetic moment – Classification of magnetic materials: Dia, para & Ferro-Domain concept of Ferromagnetism (Qualitative) – Hysteresis – Soft and Hard magnetic materials.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain the concept of dielectric constant and polarization in dielectric materials (L2)
- Summarize various types of polarization of dielectrics (L2)
- Interpret Lorentz field and Claussius- Mosotti relation in dielectrics(L2)
- Classify the magnetic materials based on susceptibility and their temperature dependence (L2)
- Explain the applications of dielectric and magnetic materials (L2)
- Apply the concept of magnetism to magnetic devices (L3)

Unit IV:

Quantum Mechanics, Free Electron Theory and   Band theory of Solids
Quantum Mechanics- Dual nature of matter – Schrodinger's time independent and dependent wave equation – Significance of wave function – Particle in a one-dimensional infinite potential well.

Free Electron Theory- Classical free electron theory (Merits and demerits only) – Quantum free electron theory – Equation for electrical conductivity based on quantum free electron theory – Fermi-Dirac distribution – Density of states – Fermi energy.

Band theory of Solids- Bloch's Theorem (Qualitative) – Kronig-Penney model (Qualitative) – E vs K diagram – Classification of crystalline solids – Effective mass of electron – m^* vs K diagram – Concept of hole.

Learning Outcomes:

At the end of this unit, the student will be able to
- Explain the concept of dual nature of matter (L2)
- Understand the significance of wave function (L2)
- Interpret the concepts of classical and quantum free electron theories (L2)
- Explain the importance of K-P model
- Classify the materials based on band theory (L2)
- Apply the concept of effective mass of electron (L3)

Unit – V:

Semiconductors and Superconductors
Semiconductors- Introduction – Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors – Density of charge carriers – Dependence of Fermi energy on carrier concentration and temperature – Drift and diffusion currents – Einstein's equation – Direct and indirect band gap semiconductors – Hall effect – Hall coefficient – Applications of Hall effect.
Superconductors- Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory – Josephson effects (AC and DC) – High T_c superconductors – Applications of superconductors.

Learning Outcomes:

At the end of this unit, the student will be able to
- Classify the energy bands of semiconductors (L2)
- Interpret the direct and indirect band gap semiconductors (L2)
- Identify the type of semiconductor using Hall effect (L2)
- Identify applications of semiconductors in electronic devices (L2)
- Explain how electrical resistivity of solids changes with temperature (L2)
- Classify superconductors based on Meissner's effect (L2)
- Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2)

Text books:
1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, S. Chand and Company
2. Engineering Physics – B.K. Pandey and S. Chaturvedi, Cengage Learning.

Reference Books:
1. Engineering Physics – Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018
2. Engineering Physics – K. Thyagarajan, McGraw Hill Publishers
3. Engineering Physics - Sanjay D. Jain, D. Sahasrambudhe and Girish, University Press
4. Semiconductor physics and devices- Basic principle – Donald A, Neamen, Mc Graw Hill

Course Outcomes

- Study the different realms of physics and their applications in both scientific and technological systems through physical optics. (L2)
- Identify the wave properties of light and the interaction of energy with the matter (L3).
- Asses the electromagnetic wave propagation and its power in different media (L5).
- Understands the response of dielectric and magnetic materials to the applied electric and magnetic fields. (L3)
- Study the quantum mechanical picture of subatomic world along with the discrepancies between the classical estimates and laboratory observations of electron transportation phenomena by free electron theory and band theory. (L2)
- Elaborate the physical properties exhibited by materials through the understanding of properties of semiconductors and superconductors. (L5)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech- CSE -(AI &ML) – II Sem   **L   T   P   C**
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(20A52101T) COMMUNICATIVE ENGLISH
(Common to All Branches of Engineering)

Course Objectives

- Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
- Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
- Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
- Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
- Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

UNIT -1

Lesson: On the Conduct of Life: William Hazlitt
Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Reading for Writing : Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. **Grammar and Vocabulary:** Parts of Speech, Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Learning Outcomes

At the end of the module, the learners will be able to
- Understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
- Ask and answer general questions on familiar topics and introduce oneself/others
- Employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
- Recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- Form sentences using proper grammatical structures and correct word forms

UNIT -2

Lesson: The Brook: Alfred Tennyson
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts. **Speaking:** Discussion in pairs/small groups on specific topics followed by short structured talks. **Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas

in a paragraph together. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters. **Grammar and Vocabulary:** Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.

Learning Outcomes

At the end of the module, the learners will be able to
- Comprehend short talks on general topics
- Participate in informal discussions and speak clearly on a specific topic using suitable discourse markers
- Understand the use of cohesive devices for better reading comprehension
- Write well structured paragraphs on specific topics
- Identify basic errors of grammar/ usage and make necessary corrections in short texts

UNIT -3

Lesson: The Death Trap: Saki
Listening: Listening for global comprehension and summarizing what is listened to. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed **Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing, Paragraph Writing **Grammar and Vocabulary:** Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Learning Outcomes

At the end of the module, the learners will be able to
- Comprehend short talks and summarize the content with clarity and precision
- Participate in informal discussions and report what is discussed
- Infer meanings of unfamiliar words using contextual clues
- Write summaries based on global comprehension of reading/listening texts
- Use correct tense forms, appropriate structures and a range of reporting verbs in speech and writing

UNIT-4

Lesson: Innovation: Muhammad Yunus
Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Letter Writing: Official Letters/Report Writing **Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; Voice - Active & Passive Voice

Learning Outcomes

At the end of the module, the learners will be able to
- Infer and predict about content of spoken discourse
- Understand verbal and non-verbal features of communication and hold formal/informal conversations
- Interpret graphic elements used in academic texts
- Produce a coherent paragraph interpreting a figure/graph/chart/table
- Use language appropriate for description and interpretation of graphical elements

UNIT -5

Lesson: Politics and the English Language: George Orwell
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension. Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Reading: Reading for comprehension. Writing: Writing structured essays on specific topics using suitable claims and evidences. Grammar and Vocabulary: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Learning Outcomes

At the end of the module, the learners will be able to
- Take notes while listening to a talk/lecture and make use of them to answer questions
- Make formal oral presentations using effective strategies
- Comprehend, discuss and respond to academic texts orally and in writing
- Produce a well-organized essay with adequate support and detail
- Edit short texts by correcting common errors

Text Book:

1. Language and Life: A Skills Approach- I Edition 2019, Orient Black Swan

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Raymond Murphy's English Grammar in Use Fourth Edition (2012) E-book
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. Oxford Learners Dictionary, 12th Edition, 2011
6. Norman Lewis Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary (2014)
7. Speed Reading with the Right Brain: Learn to Read Ideas Instead of Just Words by David Butler

Course Outcomes

- Retrieve the knowledge of basic grammatical concepts
- Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
- Apply grammatical structures to formulate sentences and correct word forms
- Analyze discourse markers to speak clearly on a specific topic in informal discussions
- Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
- Create a coherent paragraph interpreting a figure/graph/chart/table

Web links

www.englishclub.com
www.easyworldofenglish.com
www.languageguide.org/english/
www.bbc.co.uk/learningenglish
www.eslpod.com/index.html
www.myenglishpages.com

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech- CSE -(AI &ML) - II Sem   **L   T   P   C**
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(20A05101T) PYTHON PROGRAMMING & DATA SCIENCE
(CSE, AI & DS,CSE (AI), CSE(IoT), CSE (Data Science), CSE(AI & ML), IT)

Course Objectives

- To learn the fundamentals of Python.

- To discuss the concepts of Functions and Exceptions.

- To familiarize with Python libraries for Data Analysis and Data Visualization.

- To introduce preliminary concepts in Pattern Recognition and Machine learning.

- To provide an overview of Deep Learning and Data Science models.

Unit-I

Introduction to Python: Features of Python, Data types, Operators, Input and output, Control Statements.
Strings: Creating strings and basic operations on strings, string testing methods. Lists, Dictionaries, Tuples.

Learning outcomes:

At the end of this unit, the students will be able to
- List the basic constructs of Python. (L1)
- Apply the conditional execution of the program (L3)
- Design programs for manipulating strings (L6)
- Use the data structure lists, Dictionaries and Tuples (L3)

Unit-II

Functions: Defining a function, Calling a function, returning multiple values from a function, functions are first class objects, formal and actual arguments, positional arguments, recursive functions.
Exceptions: Errors in a Python program, exceptions, exception handling, types of exceptions, the except block, the assert statement, user-defined exceptions.

Learning outcomes:

At the end of this unit, the students will be able to
- Solve the problems by applying the modularity principle. (L3)
- Classify exceptions and explain the ways of handling them. (L4)

Unit-III

Introduction to NumPy, Pandas, Matplotlib.

Exploratory Data Analysis (EDA), Data Science life cycle, Descriptive Statistics, Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA. Data Visualization: Scatter plot, bar chart, histogram, boxplot, heat maps, etc.

Learning outcomes:

At the end of this unit, the students will be able to
- Demonstrate various mathematical operations on arrays using NumPy (L2)
- Analyze and manipulate Data using Pandas (L4)
- Creating static, animated, and interactive visualizations using Matplotlib. (L6)

Unit-IV

Introduction to Pattern Recognition and Machine Learning: Patterns, features, pattern representation, the curse of dimensionality, dimensionality reduction. Classification—linear and non-linear. Bayesian, Perceptron, Nearest neighbor classifier, Logistic regression, Naïve-Bayes, decision trees and random forests; boosting and bagging.Clustering---partitional and hierarchical; k-means clustering. Regression.

Cost functions, training and testing a classifier. Cross-validation, Class-imbalance – ways of handling, Confusion matrix, evaluation metrics.

Learning outcomes:

At the end of this unit, the students will be able to
- Define Patterns and their representation (L1)
- Describe the Classification and Clustering (L2)
- illustrate cost functions and class imbalance (L3)

Unit-V

Introduction to Deep Learning: Multilayer perceptron. Backpropagation. Loss functions. Hyperparameter tuning, Overview of RNN, CNN and LSTM.

Overview of Data Science Models: Applications to text, images, videos, recommender systems, image classification, Social network graphs.

At the end of this unit, the students will be able to
- Describe RNN, CNN and (L2)
- Explain the applications of Data Science (L2)

Textbooks:

1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.
2. Cathy O'Neil, Rachel Schutt, Doing Data Science, Straight Talk from the Frontline. O'Reilly, 2013.

3. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

References:

1. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.
2. Francois Chollet, Deep Learning with Python, 1/e, Manning Publications Company, 2017
3. EMC2: Data Science and Big Data Analytics, EMC Education Services, EMC 2 , Wiley Publication, 2015.
4. V. Susheela Devi and M. Narasimha Murty. Pattern Recognition – An Introduction. Universities Press (Indian Edition; there is an expensive Springer version of the same)
5. Goodfellow and YoshuaBengio and Aaron Courville. Deep Learning. MIT Press. Book available online at https://www.deeplearningbook.org/.
6. J. Leskovec, A. Rajaraman, J.D. Ullman. Mining of Massive Datasets. Cambridge University Press. (Indian Edition; Online pdf is available for download)

Course Outcomes:

1. Apply the features of Python language in various real applications. (L3)
2. Identify the appropriate data structure of Python for solving a problem (L2)
3. Demonstrate data analysis, manipulation and visualization of data using Python libraries (L5)
4. Enumerate machine learning algorithms. (L1)
5. Analyze the various applications of Data Science. (L4)
6. Design solutions for real-world problems using Python. (L6)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech- CSE -(AI &ML) – II Sem　　　　　　　　　　　　**L　T　P/D　C**
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(20A03101T) ENGINEERING DRAWING
(Common to All Branches of Engineering)

Course Objectives:

- Bring awareness that Engineering Drawing is the Language of Engineers.
- Familiarize how industry communicates technical information.
- Teach the practices for accuracy and clarity in presenting the technical information.
- Develop the engineering imagination essential for successful design.

Unit: I

Introduction to Engineering Drawing: Principles of Engineering Drawing and its significance-Conventions in drawing-lettering - BIS conventions.
　　a)Conic sections including the rectangular hyperbola- general method only,
　　b) Cycloid, epicycloids and hypocycloid c) Involutes

Learning Outcomes:

At the end of this unit the student will be able to
- Understand the significance of engineering drawing
- Know the conventions used in the engineering drawing
- Identify the curves obtained in different conic sections
- Draw different curves such as cycloid, involute and hyperbola

Unit: II

Projection of points, lines and planes: Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

Learning Outcomes:

At the end of this unit the student will be able to
- Understand the meaning of projection
- Know how to draw the projections of points, lines
- Differentiate between projected length and true length
- Find the true length of the lines

Unit: III

Projections of solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.

Learning Outcomes:

At the end of this unit the student will be able to
- Understand the procedure to draw projection of solids
- Differentiate between rotational method and auxillary view method.
- Draw the projection of solid inclined to one plain
- Draw the projection of solids inclined to both the plains

Unit: IV

Sections of solids: Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

Learning Outcomes:

At the end of this unit the student will be able to
- Understand different sectional views of regular solids
- Obtain the true shapes of the sections of prism
- Draw the sectional views of prism, cylinder, pyramid and cone

Unit: V

Development of surfaces: Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

Learning Outcomes:

At the end of this unit the student will be able to
- Understand the meaning of development of surfaces
- Draw the development of regular solids such as prism, cylinder, pyramid and cone
- Obtain the development of sectional parts of regular shapes

Text Books:
1. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.

Reference Books:
1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
3. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Course Outcomes:
  After completing the course, the student will be able to
- Draw various curves applied in engineering. (l2)
- Show projections of solids and sections graphically. (l2)
- Draw the development of surfaces of solids. (l3)

Additional Sources
Youtube: http-sewor,Carleton.cag,kardos/88403/drawings.html conic sections-online, red woods.edu

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B.Tech- CSE -(AI &ML) – II Sem	L	T	P	C
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(20A03101P) ENGINEERING GRAPHICS LAB
(Common to All Branches of Engineering)

Course Objectives:

- Instruct the utility of drafting & modeling packages in orthographic and isometric drawings.
- Train the usage of 2D and 3D modeling.
- Instruct graphical representation of machine components.

Computer Aided Drafting:

Introduction to AutoCAD: Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions.

Dimensioning principles and conventional representations.

Orthographic Projections: Systems of projections, conventions and application to orthographic projections - simple objects.

Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views:
lines, planes, simple solids.

Text Books:
1. K. Venugopal, V.Prabhu Raja, Engineering Drawing + Auto Cad, New Age International Publishers.
2. Kulkarni D.M, AP Rastogi and AK Sarkar, Engineering Graphics with Auto Cad, PHI Learning, Eastern Economy editions.

Reference Books:
1. T. Jayapoovan, Engineering Graphics using Auto Cad, Vikas Publishing House
2. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
3. Linkan Sagar, BPB Publications, Auto Cad 2018 Training Guide.
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Course Outcomes:
After completing the course, the student will be able to

- Use computers as a drafting tool. (L2)
- Draw isometric and orthographic drawings using CAD packages. (L3)

Additional Sources

1. Youtube: http-sewor,Carleton.cag, kardos/88403/drawings.html conic sections-online, red woods.edu

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B.Tech- CSE -(AI &ML) – II Sem	L	T	P	C
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(20A52101P) COMMUNICATIVE ENGLISH LAB
(Common to All Branches of Engineering)

Course Objectives

- students will be exposed to a variety of self instructional, learner friendly modes of language learning
- students will learn better pronunciation through stress, intonation and rhythm
- students will be trained to use language effectively to face interviews, group discussions, public speaking
- students will be initiated into greater use of the computer in resume preparation, report writing, format making etc

List of Topics

1. Phonetics
2. Reading comprehension
3. Describing objects/places/persons
4. Role Play or Conversational Practice
5. JAM
6. Etiquettes of Telephonic Communication
7. Information Transfer
8. Note Making and Note Taking
9. E-mail Writing
10. Group Discussions-1
11. Resume Writing
12. Debates
13. Oral Presentations
14. Poster Presentation
15. Interviews Skills-1

Suggested Software

Orel, Walden Infotech, Young India Films

Reference Books
1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.
5. A Textbook of English Phonetics for Indian Students by T.Balasubramanyam

Web Links
www.esl-lab.com
www.englishmedialab.com
www.englishinteractive.net

Course Outcomes

After completing the course, the student will be able to

- Listening and repeating the sounds of English Language
- Understand the different aspects of the English language
- proficiency with emphasis on LSRW skills
- Apply communication skills through various language learning activities
- Analyze the English speech sounds, stress, rhythm, intonation and syllable
- Division for better listening and speaking comprehension.
- Evaluate and exhibit acceptable etiquette essential in social and professional settings
- Create awareness on mother tongue influence and neutralize it in order to
- Improve fluency in spoken English.

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B.Tech- CSE -(AI &ML) – II Sem

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(20A56201P) APPLIED PHYSICS LAB

(ECE, EEE, CSE, AI & DS,CSE (AI), CSE(IoT), CSE (Data Science), CSE(AI & ML), IT)

Course Objectives:

- Understands the concepts of interference, diffraction and their applications.
- Understand the role of optical fiber parameters in communication.
- Recognize the importance of energy gap in the study of conductivity and Hall Effect in a semiconductor.
- Illustrates the magnetic and dielectric materials applications.
- Apply the principles of semiconductors in various electronic devices.

Note: In the following list, out of 15 experiments, any 12 experiments (minimum 10) must be performed in a semester

<u>List of Applied Physics Experiments</u>

1. Determine the thickness of the wire using wedge shape method
2. Determination of the radius of curvature of the lens by Newton's ring method
3. Determination of wavelength by plane diffraction grating method
4. Determination of dispersive power of prism.
5. Determination of wavelength of LASER light using diffraction grating.
6. Determination of particle size using LASER.
7. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
8. Determination of dielectric constant by charging and discharging method.
9. Magnetic field along the axis of a circular coil carrying current –Stewart Gee's method.
10. Measurement of magnetic susceptibility by Gouy's method
11. Study the variation of B versus H by magnetizing the magnetic material (B-H curve)
12. To determine the resistivity of semiconductor by Four probe method
13. To determine the energy gap of a semiconductor
14. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.
15. Measurement of resistance with varying temperature.

Course Outcomes:

At the end of the course, the student will be able to
- Operate optical instruments like microscope and spectrometer (L2)
- Determine thickness of a hair/paper with the concept of interference (L2)
- Estimate the wavelength of different colors using diffraction grating and resolving power (L2)
- Plot the intensity of the magnetic field of circular coil carrying current with distance (L3)
- Evaluate the acceptance angle of an optical fiber and numerical aperture (L3)
- Determine the resistivity of the given semiconductor using four probe method (L3)
- Identify the type of semiconductor i.e., n-type or p-type using hall effect (L3)
- Calculate the band gap of a given semiconductor (L3)

References

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

AWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech- CSE -(AI &ML) – II Sem   L   T   P   C
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(20A05101P) PYTHON PROGRAMMING & DATA SCIENCE LAB
(CSE, AI & DS,CSE (AI), CSE(IoT), CSE (Data Science), CSE(AI & ML), IT)

Course Objectives:

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

List of Topics

1. Write a program to demonstrate a) Different numeric data types and b) To perform different Arithmetic Operations on numbers in Python.
2. Write a program to create, append, and remove lists in Python.
3. Write a program to demonstrate working with tuples in Python.
4. Write a program to demonstrate working with dictionaries in Python.
5. Write a program to demonstrate a) arrays b) array indexing such as slicing, integer array indexing and Boolean array indexing along with their basic operations in NumPy.
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. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be the input that to be written to the second file.
8. Write a program to demonstrate Regression analysis with residual plots on a given data set.
9. Write a program to demonstrate the working of the decision tree-based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
10. 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.
11. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions using Java/Python ML library classes.
12. 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.
13. Write a program to build Artificial Neural Network and test the same using appropriate data sets.

Textbooks:

1. Francois Chollet, Deep Learning with Python, 1/e, Manning Publications Company, 2017
2. 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 http://www.ict.ru.ac.za/Resources/cspw/thinkcspy/thinkcspy3.pdf

3. 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

Course Outcomes:

At the end of the course, the student will be able to
- Illustrate the use of various data structures. (L3)
- Analyze and manipulate Data using Pandas (L4)
- Creating static, animated, and interactive visualizations using Matplotlib. (L6)
- Understand the implementation procedures for the machine learning algorithms. (L2)
- Apply appropriate data sets to the Machine Learning algorithms (L3)
- Identify and apply Machine Learning algorithms to solve real-world problems (L1)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech- CSE -(AI &ML) II-I Sem

L	T	P	C
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20A54304Discrete Mathematics & Graph theory

(Common to CSE, IT, CSE(DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS)

Pre-requisite   Basic Mathematics

Course Objectives:

Introduce the concepts of mathematical logic and gain knowledge in sets, relations and functions and Solve problems using counting techniques and combinatorics and to introduce generating functions and recurrence relations. Use Graph Theory for solving real world problems

Course Outcomes (CO):

After completion of the course, students will be able to

- Apply mathematical logic to solve problems.
- Understand the concepts and perform the operations related to sets, relations and functions.
- Gain the conceptual background needed and identify structures of algebraic nature.
- Apply basic counting techniques to solve combinatorial problems.
- Formulate problems and solve recurrence relations.
- Apply Graph Theory in solving computer science problems

UNIT - I	**Mathematical Logic**	8 Hrs

Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference Theory of Statement Calculus, Predicate Calculus, Inference theory of Predicate Calculus.

UNIT - II	**Set theory**	9 Hrs

Basic Concepts of Set Theory, Relations and Ordering, The Principle of Inclusion- Exclusion, Pigeon hole principle and its application,Functions composition of functions, Inverse Functions, Recursive Functions, Lattices and its properties. Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.

UNIT - III	**Elementary Combinatorics**	8 Hrs

Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.

UNIT - IV	**Recurrence Relations**	9 Hrs

Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generating functions, The Method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations.

UNIT - V   **Graphs**   9 Hrs

Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four Color Problem

Textbooks:

1. Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.
2. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.
2. Graph Theory with Applications to Engineering and Computer Science byNarsinghDeo.

Online Learning Resources:

http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech- CSE -(AI &ML) II-I Sem   **L   T   P   C**
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20A04304T DIGITAL ELECTRONICS & MICROPROCESSORS

Pre-requisite   **Basic Electronics**

Course Objectives:

- To understand all the concepts of Logic Gates and Boolean Functions.
- To learn about Combinational Logic and Sequential Logic Circuits.
- To design logic circuits using Programmable Logic Devices.
- To understand basics of 8086 Microprocessor and 8051 Microcontroller.
- To understand architecture of 8086 Microprocessor and 8051 Microcontroller.
- To learn Assembly Language Programming of 8086 and 8051.

Course Outcomes (CO):

After Completion of this course, the student will be able to:

- Design any Logic circuit using basic concepts of Boolean Algebra.
- Design any Logic circuit using basic concepts of PLDs.
- Design and develop any application using 8086 Microprocessor.
- Design and develop any application using 8051 Microcontroller.

UNIT - I   Number Systems & Code Conversion

Number Systems & Code conversion, Boolean Algebra & Logic Gates, Truth Tables, Universal Gates, Simplification of Boolean functions, SOP and POS methods – Simplification of Boolean functions using K-maps,Signed and Unsigned Binary Numbers.

UNIT - II   Combinational Circuits

Combinational Logic Circuits: Adders &Subtractors, Multiplexers, Demultiplexers, Encoders, Decoders, Programmable Logic Devices.

UNIT - III   Sequential Circuits

Sequential Logic Circuits: RS, Clocked RS, D, JK, Master Slave JK, T Flip-Flops, Shift Registers, Types of Shift Registers, Counters, Ripple Counter, Synchronous Counters, Asynchronous Counters, Up-Down Counter.

UNIT - IV   Microprocessors - I

8085 microprocessor Review (brief details only), 8086 microprocessor, Functional Diagram, register organization 8086, Flag register of 8086 and its functions, Addressing modes of 8086, Pin diagram of 8086, Minimum mode & Maximum mode operation of 8086, Interrupts in 8086.

UNIT – V   Microprocessors - II
Instruction set of 8086, Assembler directives, Procedures and Macros, Simple programs involving arithmetic, logical, branch instructions, Ascending, Descending and Block move programs, String Manipulation Instructions. Overview of 8051 microcontroller, Architecture, I/O ports and Memory organization, addressing modes and instruction set of 8051(Brief details only), Simple Programs.

Text Books:

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

2. Anil K. Maini, Digital Electronics: Principles, Devices and Applications, John Wiley & Sons, Ltd., 2007.
3. N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Microprocessor and

Microcontrollers,Oxford Publishers, 2010.

4. Advanced microprocessors and peripherals-A.K Ray and K.M.Bhurchandani, TMH, 2nd edition, 2006.

Reference Books:

1. Thomas L. Floyd, Digital Fundamentals – A Systems Approach, Pearson, 2013.
2. Charles H. Roth, Fundamentals of Logic Design, Cengage Learning, 5th, Edition, 2004.
3. D.V.Hall, Microprocessors and Interfacing. TMGH, 2nd edition, 2006.
4. Kenneth.J.Ayala, The 8051 microcontroller, 3rd edition, Cengage Learning,2010.

Online Learning Resources:

NPTEL, SWAYAM

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech- CSE -(AI &ML) II-I Sem   L   T   P   C
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20A05301T Advanced Data Structures & Algorithms

(Common to CSE, IT, CSE(DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS)

Pre-requisite   **Data Structures**

Course Objectives:

- Learn asymptotic notations, and analyze the performance of different algorithms.

- Understand and implement various data structures.

- Learn and implement greedy, divide and conquer, dynamic programming and backtracking algorithms using relevant data structures.

- Understand non-deterministic algorithms, polynomial and non-polynomial problems.

Course Outcomes (CO):

After completion of the course, students will be able to

- Analyze the complexity of algorithms and apply asymptotic notations.
- Apply non-linear data structures and their operations.
- Understand and apply greedy, divide and conquer algorithms.
- Develop dynamic programming algorithms for various real-time applications.
- Illustrate Backtracking algorithms for various applications.

| UNIT - I | **Introduction to Algorithms** | 9 Hrs |

Introduction to Algorithms:

Algorithms, Pseudocode for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh, Omega, Theta notation and Little oh notation, Polynomial Vs Exponential Algorithms, Average, Best and Worst Case Complexities, Analysing Recursive Programs.

| UNIT - II | **Trees Part-I** | 8 Hrs |

Trees Part-I

Binary Search Trees: Definition and Operations, AVL Trees: Definition and Operations, Applications.

B Trees: Definition and Operations.

| UNIT - III | **Trees Part-II** | 8 Hrs |

Trees Part-II

Red-Black Trees, Splay Trees, Applications.

Hash Tables: Introduction, Hash Structure, Hash functions, Linear Open Addressing, Chaining and Applications.

UNIT - IV　　　　**Divide and conquer, Greedy method**　　　9 Hrs

Divide and conquer: General method, applications-Binary search, Finding Maximum and minimum, Quick sort, Merge sort, Strassen's matrix multiplication.

Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT - V　　　　**Dynamic Programming & Backtracking**　　　9 Hrs

Dynamic Programming: General method, applications- 0/1 knapsack problem, All pairs shortest path problem, Travelling salesperson problem, Reliability design.

Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

Introduction to NP-Hard and NP-Complete problems: Basic Concepts.

Textbooks:

1.　Data Structures and algorithms: Concepts, Techniques and Applications, G A V Pai.

2.　Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni and Rajasekharam, Galgotia publications Pvt. Ltd.

Reference Books:

1. Classic Data Structures by D. Samanta, 2005, PHI

2. Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman 1998, PEA.

3. Introduction to the Design and Analysis of Algorithms by Goodman, Hedetniemi, TMG.

Online Learning Resources:

https://www.tutorialspoint.com/advanced_data_structures/index.asp

http://peterindia.net/Algorithms.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech- CSE -(AI &ML) II-I Sem	L	T	P	C
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20A05302T Object Oriented Programming Through Java

(Common to CSE, IT, CSE (AI), CSE (AI & ML) and AI& DS)

Fundamental Programming

Course Objectives:

- To understand object oriented concepts and problem solving techniques

- To obtain knowledge about the principles of inheritance and polymorphism

- To implement the concept of packages, interfaces, exception handling and concurrency mechanism.

- To design the GUIs using applets and swing controls.

- To understand the Java Database Connectivity Architecture

Course Outcomes (CO):

After completion of the course, students will be able to

- Solve real-world problems using OOP techniques.

- Apply code reusability through inheritance, packages and interfaces

- Solve problems using java collection framework and I/O classes.

- Develop applications by using parallel streams for better performance.

- Develop applets for web applications.

- Build GUIs and handle events generated by user interactions.

- Use the JDBC API to access the database

UNIT - I   **Introduction**   8Hrs

Introduction: Introduction to Object Oriented Programming, The History and Evolution of Java, Introduction to Classes, Objects, Methods, Constructors, this keyword, Garbage Collection, Data Types, Variables, Type Conversion and Casting, Arrays, Operators, Control Statements, Method Overloading, Constructor Overloading, Parameter Passing, Recursion, String Class and String handling methods.

UNIT - II   **Inheritance, Packages, Interfaces**   9Hrs

Inheritance: Basics, Using Super, Creating Multilevel hierarchy, Method overriding, Dynamic Method Dispatch, Using Abstract classes, Using final with inheritance, Object class,

Packages: Basics, Finding packages and CLASSPATH, Access Protection, Importing packages.

Interfaces: Definition, Implementing Interfaces, Extending Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces.

UNIT - III   **Exception handling, Stream based I/O** (java.io)   9Hrs

Exception handling - Fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built-in exceptions, creating own exception

subclasses.

Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and Writing Files, Random access file operations, The Console class, Serialization, Enumerations, Autoboxing, Generics.

UNIT - IV   **Multithreading, The Collections Framework** (java.util)   8Hrs

Multithreading: The Java thread model, Creating threads, Thread priorities, Synchronizing threads, Interthread communication.

The Collections Framework (java.util): Collections overview, Collection Interfaces, The Collectionclasses- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Hashtable, Properties, Stack, Vector, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner.

UNIT - V   **Applet, GUI Programming with Swings, Accessing Databases**   8Hrs
                 with JDBC

Applet: Basics, Architecture, Applet Skeleton, requesting repainting, using the status window, passing parameters to applets

GUI Programming with Swings – The origin and design philosophy of swing, components and containers, layout managers, event handling, using a push button, jtextfield, jlabel and image icon, the swing buttons, jtext field, jscrollpane, jlist, jcombobox, trees, jtable, An overview of jmenubar, jmenu and jmenuitem, creating a main menu, showmessagedialog, showconfirmdialog, showinputdialog, showoptiondialog, jdialog, create a modeless dialog.

Accessing Databases with JDBC:

Types of Drivers, JDBC Architecture, JDBC classes and Interfaces, Basic steps in developing JDBC applications, Creating a new database and table with JDBC.

Textbooks:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.

2. Java How to Program, 10th Edition, Paul Dietel, Harvey Dietel, Pearson Education.

Reference Books:

1. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

2. Core Java Volume – 1 Fundamentals, Cay S. Horstmann, Pearson Education.

3. Java Programming for core and advanced learners, Sagayaraj, Dennis, Karthik andGajalakshmi, University Press

4. Introduction to Java programming, Y. Daniel Liang, Pearson Education.

5. Object Oriented Programming through Java, P. Radha Krishna, University Press.

6. Programming in Java, S. Malhotra, S. Chaudhary, 2nd edition, Oxford Univ. Press.

7. Java Programming and Object-oriented Application Development, R.A. Johnson,

Cengage Learning.

Online Learning Resources:

https://www.w3schools.com/java/java_oop.asp

http://peterindia.net/JavaFiles.html

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B.Tech- CSE -(AI &ML) II-I Sem

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20A05303   Computer Organization

(Common to CSE, IT, CSE(DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS)

Pre-requisite   **Digital Electronics**

Course Objectives:

- To learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design
- To understand the structure and behavior of various functional modules of a computer.
- To learn the techniques that computers use to communicate with I/O devices
- To acquire the concept of pipelining and exploitation of processing speed.
- To learn the basic characteristics of multiprocessors

Course Outcomes (CO):

After completion of the course, students will be able to

- Understand computer architecture concepts related to the design of modern processors, memories and I/Os
- Identify the hardware requirements for cache memory and virtual memory
- Design algorithms to exploit pipelining and multiprocessors
- Understand the importance and trade-offs of different types of memories.
- Identify pipeline hazards and possible solutions to those hazards

UNIT - I	**Basic Structure of Computer, Machine Instructions and Programs**	8Hrs

Basic Structure of Computer: Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multicomputer.
Machine Instructions and Programs: Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations, Stacks and Queues, Subroutines, Additional Instructions.

UNIT - II	**Arithmetic, Basic Processing Unit**	9Hrs

Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.
Basic Processing Unit: Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, and Multi programmed Control.

UNIT - III	**The Memory System**	8Hrs

The Memory System: Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

UNIT - IV **Input/Output Organization** 8Hrs

Input/Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces.

UNIT - V **Pipelining, Large Computer Systems** 9 Hrs

Pipelining: Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets.
Large Computer Systems: Forms of Parallel Processing, Array Processors, The Structure of General-Purpose multiprocessors, Interconnection Networks.

Textbooks:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, "Computer Organization", 5th Edition, McGraw Hill Education, 2013.

Reference Books:

1. M.Morris Mano, "Computer System Architecture", 3rd Edition, Pearson Education.
2. Themes and Variations, Alan Clements, "Computer Organization and Architecture", CENGAGE Learning.
3. SmrutiRanjanSarangi, "Computer Organization and Architecture", McGraw Hill Education.
4. John P.Hayes, "Computer Architecture and Organization", McGraw Hill Education

Online Learning Resources:

https://nptel.ac.in/courses/106/103/106103068/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech- CSE -(AI &ML) II-I Sem   **L   T   P   C**
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20A04304P DIGITAL ELECTRONICS & MICROPROCESSORS LAB

Basic Electronics Engineering,

Course Objectives:

- To understand all the concepts of Logic Gates and Boolean Functions.
- To learn about Combinational Logic and Sequential Logic Circuits.
- To design logic circuits using Programmable Logic Devices.
- To understand basics of 8086 Microprocessor and 8051 Microcontroller.
- To understand architecture of 8086 Microprocessor and 8051 Microcontroller.
- To learn Assembly Language Programming of 8086 and 8051.

Course Outcomes (CO):

After Completion of this course, the student will be able to:

- Design any Logic circuit using basic concepts of Boolean Algebra.
- Design any Logic circuit using basic concepts of PLDs.
- Design and develop any application using 8086 Microprocessor.
- Design and develop any application using 8051 Microcontroller.

List of Experiments:

Note: Minimum of 12 (6+6) experiments shall be conducted from both the sections

given below:

DIGITAL ELECTRONICS:

1. Verification of Truth Table for AND, OR, NOT, NAND, NOR
and EX-OR gates.
2. Realisation of NOT, AND, OR, EX-OR gates with only NAND
and only NOR gates.
3. Karnaughmap Reduction and Logic Circuit Implementation.

4. Verification of DeMorgan's Laws.

5. Implementation of Half-Adder and Half-Subtractor.

6. Implementation of Full-Adder and Full-Subtractor.

7. Four Bit Binary Adder

8. Four Bit Binary Subtractor using 1's and 2's Complement.

MICROPROCESSORS (8086 Assembly Language Programming)

1. 8 Bit Addition and Subtraction.

2. 16 Bit Addition.

3. BCD Addition .

4. BCD Subtraction.

5. 8 Bit Multiplication.

6. 8 Bit Division.

7. Searching for an Element in an Array.

8. Sorting in Ascending and Descending Orders.

9. Finding Largest and Smallest Elements from an Array.

10. Block Move

Text Books:

1.M. Morris Mano, Michael D. Ciletti, Digital Design, Pearson Education, 5th Edition,

2013.

2. Anil K. Maini, Digital Electronics: Principles, Devices and Applications, John Wiley & Sons, Ltd., 2007.
3. N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Microprocessor and

Microcontrollers,Oxford Publishers, 2010.

4. Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH, 2nd edition, 2006.

Reference Books:

1. Thomas L. Floyd, Digital Fundamentals – A Systems Approach, Pearson, 2013.
2. Charles H. Roth, Fundamentals of Logic Design, Cengage Learning, 5th, Edition, 2004.
3. D.V.Hall, Microprocessors and Interfacing. TMGH, 2nd edition, 2006.
4. Kenneth. J. Ayala, The 8051 microcontroller, 3rd edition, Cengage Learning, 2010.

Online Learning Resources/Virtual Labs:

https://www.vlab.co.in/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
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20A05301P Advanced Data Structures and Algorithms Lab

(Common to CSE, IT, CSE(DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS)

Pre-requisite   Basics of Data Structures

Course Objectives:

- Learn data structures for various applications.

- Implement different operations of data structures by optimizing the performance.

- Develop applications using Greedy, Divide and Conquer, dynamic programming.

- Implement applications for backtracking algorithms using relevant data structures.

Course Outcomes (CO):

After completion of the course, students will be able to

- Understand and apply data structure operations.

- Understand and apply non-linear data structure operations.

- Apply Greedy, divide and conquer algorithms.

- Develop dynamic programming algorithms for various real-time applications.

- Illustrate and apply backtracking algorithms, further able to understand non-deterministic algorithms.

List of Experiments:

1.   Write a program to implement the following operations on Binary Search Tree:

a) Insert   b) Delete   c) Search   d) Display

2.   Write a program to perform a Binary Search for a given set of integer values.
3.   Write a program to implement Splay trees.
4.   Write a program to implement Merge sort for the given list of integer values.
5.   Write a program to implement Quicksort for the given list of integer values.
6.   Write a program to find the solution for the knapsack problem using the greedy method.
7.   Write a program to find minimum cost spanning tree using Prim's algorithm
8.   Write a program to find minimum cost spanning tree using Kruskal's algorithm

9.   Write a program to find a single source shortest path for a given graph.

10. Write a program to find the solution for job sequencing with deadlines problems.

11. Write a program to find the solution for a 0-1 knapsack problem using dynamic programming.

12. Write a program to solve Sum of subsets problem for a given set of distinct numbers using backtracking.

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

References:

1. Y Daniel Liang, "Introduction to Programming using Python", Pearson.

2. Benjamin Baka, David Julian, "Python Data Structures and Algorithms", Packt Publishers,2017.

3. Rance D. Necaise, "Data Structures and Algorithms using Python", Wiley Student Edition.

Online Learning Resources/Virtual Labs:

http://cse01-iiith.vlabs.ac.in/

http://peterindia.net/Algorithms.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech- CSE -(AI &ML) II-I Sem	**L**	**T P C**	

B.Tech- CSE -(AI &ML) II-I Sem   **L T P C**
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20A05302P Object Oriented Programming Through Java Lab

(Common to CSE, IT, CSE (AI), CSE (AI & ML) and AI& DS)

Pre-requisite   **Fundamental Programming**

Course Objectives:

- To introduce the concepts of Java.
- To Practice object-oriented programs and build java applications.
- To implement java programs for establishing interfaces.
- To implement sample programs for developing reusable software components.
- To establish database connectivity in java and implement GUI applications.

Course Outcomes (CO):

After completion of the course, students will be able to

- Recognize the Java programming environment.
- Develop efficient programs using multithreading.
- Design reliable programs using Java exception handling features.
- Extend the programming functionality supported by Java.
- Select appropriate programming constructs to solve a problem.

List of Experiments:

Week-1

a. Installation of Java software, study of any Integrated development environment, Use Eclipse or Netbeans platform and acquaint with the various menus. Create a test project, add a test class and run it.

   See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods and classes. Try debug step by step with java program to find prime numbers between 1 to n.

b. Write a Java program that prints all real solutions to the quadratic equation $ax^2+bx+c=0$. Read in a, b, c and use the quadratic formula.

c. Develop a Java application to generate Electricity bills. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Commute the bill amount using the following tariff.

 If the type of the EB connection is domestic, calculate the amount to be paid as follows:

-         First 100 units   - Rs. 1 per unit
-         101-200 units   - Rs. 2.50 per unit
-         201 -500 units - Rs. 4   per unit
-         > 501 units   - Rs. 6 per unit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:

-         First 100 units   - Rs. 2 per unit
-         101-200 units   - Rs. 4.50 per unit
-         201 -500 units - Rs. 6 per unit

-      > 501 units   - Rs. 7 per unit

d. Write a Java program to multiply two given matrices.

Week-2

a. Write Java program on use of inheritance, preventing inheritance using final, abstract classes.

b. Write Java program on dynamic binding, differentiating method overloading and overriding.

c. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen) using

  Interfaces.

Week-3

 a. 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.

  b. Write a Java Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

  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.

Week-4

  a. Write a Java program to implement user defined exception handling.

  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.

Week-5

  a. Write a Java program that creates a user interface to perform integer division. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 and Num2 were not integers, the program would throw a Number Format Exception. If Num2 were zero, the program would throw an Arithmetic Exception Display the exception in a message dialog box.

  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.

Week-6

  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 where n is the sequence number of the part file.

  b. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file

  in bytes.

Week-7

 a. Write a java program that displays the number of characters, lines and words in a text file.

b. Write a java program that reads a file and displays the file on the screen with line number before each line.

Week-8

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

b. Develop a Java application for stack operation using Buttons and JOptionPane input and Message dialog box.

c. Develop a Java application to perform Addition, Division, Multiplication and subtraction using the JOptionPane dialog Box and Textfields.

Week-9

a. Develop a Java application for the blinking eyes and mouth should open while blinking.

b. Develop a Java application that simulates a traffic light. The program lets the user select one of the three lights: Red, Yellow or Green with radio buttons. On selecting a button an appropriate message with ―STOP‖ or ―READY‖ or ‖GO‖ should appear above the buttons in the selected color. Initially, there is no message shown.

Week-10

a. Develop a Java application to implement the opening of a door while opening man should present before hut and closing man should disappear.

b. Develop a Java application by using JtextField to read decimal values and converting a decimal number into a binary number then print the binary value in another JtextField.

Week-11

a. Develop a Java application that handles all mouse events and shows the event name at the center of the window when a mouse event is fired. Use adapter classes.

b. Develop a Java application to demonstrate the key event handlers.

Week-12

a. Develop a Java application to find the maximum value from the given type of elements using a generic function.

b. Develop a Java application that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result.

c . Develop a Java application for handling mouse events.

Week-13

a. Develop a Java application to establish a JDBC connection, create a table student with properties name, register number, mark1, mark2, mark3. Insert the values into the table by using java and display the information of the students at front end.

References:

1. P. J. Deitel, H. M. Deitel, "Java for Programmers", Pearson Education, PHI, 4th Edition, 2007.

2. P. Radha Krishna, "Object Oriented Programming through Java", Universities Press, 2nd Edition, 2007

3. Bruce Eckel, "Thinking in Java", Pearson Education, 4th Edition, 2006.

4. Sachin Malhotra, Saurabh Chaudhary, "Programming in Java", Oxford University Press, 5th

Edition, 2010.

Online Learning Resources/Virtual Labs:

https://java-iitd.vlabs.ac.in/

http://peterindia.net/JavaFiles.html

B.Tech CSE (AI & ML) – II-I Sem   **L T P C**
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(20A52201) UNIVERSAL HUMAN VALUES
(Common to all branches)

Course Objective:

The objective of the course is four fold:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

COURSE TOPICS:

The course has 28 lectures and 14 practice sessions in 5 modules:

Unit 1:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss 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 2:

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

- Programs to ensure Sanyam and Health.

  Include practice sessions to discuss 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 3:

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect 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 4:

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature

- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Unit 5:

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values

- Definitiveness of Ethical Human Conduct

- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

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

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Book

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

MOE OF CONDUCT (L-T-P-C 2-1-0-2)

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

OUTCOME OF THECOURSE:

By the end of the course,

- Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
- They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability.
- They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

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20A05304Web Application Development

(Common to CSE, CSE (AI), CSE (AI & ML) and AI& DS)

Course Objectives:

- Learn website development using HTML, CSS, JavaScript.
- Understand the concepts of responsive web development using the bootstrap framework
- Make use of the JQueryjavascript library to provide interactiveness to the websites.
- Discover how to use Google Charts to provide a better way to visualize data on a website
- 5. Learn Content Management Systems to speed the development process

Course Outcomes (CO):

After completion of the course, students will be able to

- Construct web sites with valid HTML, CSS, JavaScript
- Create responsive Web designs that work on phones, tablets, or traditional laptops and wide-screen monitors.
- Develop websites using jQuery to provide interactivity and engaging user experiences
- Embed Google chart tools in a website for better visualization of data.
- Design and develop web applications using Content Management Systems like WordPress

Activities:

Module - 1:

HTML: What is a browser?, What is HTML?, Elements and Tags, Basic HTML5 structure, Metadata, <title>, Adding favicon, Comments, headings

Task: Create a Basic HTML document

Module - 2:

HTML (continued): Block-Level Elements & Inline Elements, Links (Understand Absolute vs Relative paths), Lists, Images, iframe (embed youtube video)

Task: Create your Profile Page

Module - 3:

HTML (continued): Tables: <table>, <tr>, <th>, <td>, Attributes for each Table element

Task: Create a Class Timetable (to merge rows/columns, use rowspan/colspan)

Module - 4:

HTML (continued): Form Elements: <input>, <select>, <textarea>, <button>, Attributes for each Form element

Task: Create a Student Hostel Application Form

Module - 5:

Cascading Style Sheets (CSS): CSS Properties, Types of CSS, Selectors, box model, Pseudo-elements, z-index

Task: Make the Hostel Application Form designed in Module -4 beautiful using CSS (add colors, backgrounds, change font properties, borders, etc.)

Module - 6:

Bootstrap - CSS Framework: Layouts (Containers, Grid system), Forms, Other Components

Task: Style the Hostel Application Form designed in Module-5still more beautiful using Bootstrap CSS (Re-size browser and check how the webpage displays in mobile resolution)

Module - 7:

HTTP & Browser Developer Tools: Understand HTTP Headers (Request & Response Headers), URL & its Anatomy, Developer Tools: Elements/Inspector, Console, Network, Sources, performance, Application Storage.

Task:Analyse various HTTP requests (initiators, timing diagrams, responses) and identify problems if any.

Module - 8:

Javascript: Variables, Data Types, Operators, Statements, Objects, Functions, Events & Event Listeners, DOM.

Task: Design a simple calculator using JavaScript to perform sum, product, difference, and quotient operations:

Module - 9:

Dynamic HTML with JavaScript: Manipulate DOM, Error Handling, Promises, async/await, Modules.

Task:Design& develop a Shopping Cart Application with features including Add Products, Update Quantity, Display Price(Sub-Total & Total), Remove items/products from the cart.

Module - 10:

JQuery - A Javascript Library: Interactions, Widgets, Effects, Utilities, Ajax using JQuery.

Task: Validate all Fields and Submit the Hostel Application Form designed in Module-6 using JQuery

Module - 11:

Google Charts: Understand the Usage of Pie chart, Bar Chart, Histogram, Area & Line Charts, Gantt Charts.

Task: Develop an HTML document to illustrate each chart with real-time examples.

Module - 12:

Open Source CMS (Content Management System): What is a CMS?, Install CMS, Themes, Plugins.

Task: Develop an E-learning website using any CMS(for example WordPress)

References:

1. Deitel and Deitel and Nieto, ―Internet and World Wide Web - How to Program‖, Prentice Hall, 5th Edition, 2011.
2. Web Technologies, Uttam K. Roy, Oxford Higher Education., 1st edition, 10th impression, 2015.
3. Stephen Wynkoop and John Burke ―Running a Perfect Website‖, QUE, 2nd Edition,1999.
4. Jeffrey C and Jackson, ―Web Technologies A Computer Science PerspectivePearsonEducation, 2011.
5. Gopalan N.P. and Akilandeswari J., ―Web Technology, Prentice Hall of India, 2011.

Online Learning Resources/Virtual Labs:

a. HTML: https://html.spec.whatwg.org/multipage/
b. HTML: https://developer.mozilla.org/en-US/docs/Glossary/HTML5
c. CSS: https://www.w3.org/Style/CSS/
d. Bootstrap - CSS Framework: https://getbootstrap.com/
e. Browser Developer Tools: https://developer.mozilla.org/en-US/docs/Learn/Common_questions/What_are_browser_developer_tools
f. Javascript: https://developer.mozilla.org/en-US/docs/Web/JavaScript
g. JQuery: https://jquery.com
h. Google Charts: https://developers.google.com/chart
i. Wordpress: https://wordpress.com

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20A54404 Deterministic & Stochastic Statistical Methods

(Common to CSE, IT,CSE (AI), CSE (AI & ML) and AI & DS)

Pre-requisite　　　　　　　**Basic Mathematics**

Course Objectives:

This course provides a study of various Mathematical Methods and Statistical Methods which is needed for Artificial Intelligence, Machine Learning, and Data Science and also for Computer Science and engineering problems.

Course Outcomes (CO):

After completion of the course, students will be able to

- Apply logical thinking to problem-solving in context.
- Employ methods related to these concepts in a variety of data science applications.
- Use appropriate technology to aid problem-solving and data analysis.
- The Bayesian process of inference in probabilistic reasoning system.
- Demonstrate skills in unconstrained optimization.

UNIT - I	**Data Representation**	**9 Hrs**

Distance measures, Projections, Notion of hyper planes, half-planes. Principal Component Analysis-Population Principal Components, sample principal coefficients, covariance, matrix of data set, Dimensionality reduction, Singular value decomposition, Gram Schmidt process.

UNIT - II	**Single Variable Distribution**	**9 Hrs**

Random variables (discrete and continuous), probability density functions, properties, mathematical expectation- Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties-Uniform distribution-exponential distribution.

UNIT - III	**Stochastic Processes And Markov Chains:**	**9 Hrs**

Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, step transition probabilities, Markov chain, Steady state condition, Markov analysis.

UNIT - IV	**Multivariate Distribution Theory**	**10 Hrs**

Multivariate Normal distribution – Properties, Distributions of linear combinations, independence, marginal distributions, conditional distributions, Partial and Multiple correlation coefficient. Moment generating function.

BAYESIAN INFERENCE AND ITS APPLICATIONS: Statistical tests and Bayesian model comparison, Bit, Surprisal,Entropy, Source coding theorem, Joint entropy, Conditional entropy, Kullback-Leibler divergence.

UNIT - V	**Optimization**	**9 Hrs**

Unconstrained optimization, Necessary and sufficiency conditions for optima, Gradient descent methods, Constrained optimization, KKT conditions, Introduction to non-gradient techniques, Introduction to least squares optimization, Optimization view of machine learning. Data Science Methods: Linear regression as an exemplar function approximation problem, linear classification problems.

Textbooks:

1. Mathematics for Machine Learning by A. Aldo Faisal, Cheng Soon Ong, and Marc Peter Deisenroth
2. Dr.B.S Grewal, Higher Engineering Mathematics, 45th Edition, Khanna Publishers.
3. Operations Research, S.D. Sharma

Reference Books:

1. Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.
2. A Probabilistic Theory of Pattern Recognition by Luc Devroye,. Laszlo Gyorfi, Gabor Lugosi.

Online Learning Resources:

https://www.math.brown.edu/swatson2/classes/data1010/pdf/data1010.pdf

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20A05401T DATABASE MANAGEMENT SYSTEMS

(Common to CSE, IT, CSE(DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS)

Course Objectives:

This course is designed to:

- Train in the fundamental concepts of database management systems, database modeling and design, SQL, PL/SQL and system implementation techniques.

- Enable students to model ER diagrams for any customized application

- Inducting appropriate strategies for optimization of queries.

- Provide knowledge on concurrency techniques

- Demonstrate the organization of Databases

Course Outcomes (CO):

After completion of the course, students will be able to

- Design a database for a real-world information system

- Define transactions that preserve the integrity of the database

- Generate tables for a database

- Organize the data to prevent redundancy

- Pose queries to retrieve the information from the database.

UNIT - I	**Introduction, Introduction to Relational Model**	9Hrs

Introduction: Database systems applications, Purpose of Database Systems, view of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database users and Administrators,

Introduction to Relational Model: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Operations

UNIT - II	**Introduction to SQL, Advanced SQL**	9 Hrs

Introduction to SQL: Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub-queries, Modification of the Database. Intermediate SQL**:** Joint Expressions, Views, Transactions, Integrity Constraints, SQL Data types and schemas, Authorization.

Advanced SQL: Accessing SQL from a Programming Language, Functions and Procedures, Triggers, Recursive Queries, OLAP, Formal relational query languages.

UNIT - III	**Database Design and the E-R Model, Relational Database Design**	8Hrs

Database Design and the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes in Entity Sets, Entity-Relationship Diagrams, Reduction to Relational Schemas, Entity-Relationship Design Issues.

Relational Database Design:

Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition Using Functional Dependencies, Functional-Dependency Theory, Algorithms for Decomposition, Decomposition Using Multivalued Dependencies, More Normal Forms.

UNIT - IV   **Query Processing, Query optimization**   8 Hrs

Query Processing: Overview, Measures of Query cost, Selection operation, sorting, Join Operation, other operations, Evaluation of Expressions.

Query optimization: Overview, Transformation of Relational Expressions, Estimating statistics of Expression results, Choice of Evaluation Plans, Materialized views, Advanced Topics in Query Optimization.

UNIT - V   **Transaction Management, Concurrency Control, Recovery** 10Hrs
                   System

Transaction Management:

Transactions: Concept, A Simple Transactional Model, Storage Structures, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Isolation and Atomicity, Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements.

Concurrency Control: Lock-based Protocols, Deadlock Handling, Multiple granularity, Timestamp-based Protocols, and Validation-based Protocols.

Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Nonvolatile Storage, Early Lock Release and Logical Undo Operations.

Textbooks:

1. A.Silberschatz, H.F.Korth, S.Sudarshan, "Database System Concepts",6/e, TMH 2019

Reference Books:

1. Database Management System, 6/e RamezElmasri, Shamkant B. Navathe, PEA

2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

3.Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke,TMH

Online Learning Resources:

https://onlinecourses.nptel.ac.in/noc21_cs04/preview

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B.Tech- CSE -(AI &ML) II-II Sem   L   T   P   C
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20A05402T OPERATING SYSTEMS

(Common to CSE, IT, CSE(DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS)

Pre-requisite   **Basics of CO and DBMS**

Course Objectives:

The course is designed to

- Understand basic concepts and functions of operating systems

- Understand the processes, threads and scheduling algorithms.

- Provide good insight on various memory management techniques

- Expose the students with different techniques of handling deadlocks

- Explore the concept of file-system and its implementation issues

- Familiarize with the basics of the Linux operating system

- Implement various schemes for achieving system protection and security

Course Outcomes (CO):

After completion of the course, students will be able to

- Realize how applications interact with the operating system
- Analyze the functioning of a kernel in an Operating system.
- Summarize resource management in operating systems
- Analyze various scheduling algorithms
- Examine concurrency mechanism in Operating Systems
- Apply memory management techniques in the design of operating systems
- Understand the functionality of the file system
- Compare and contrast memory management techniques.
- Understand deadlock prevention and avoidance.
- Perform administrative tasks on Linux based systems.

 UNIT - I   **Operating Systems Overview, System Structures**   8Hrs

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, Computing environments, Open-Source Operating Systems

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, Operating system Design and Implementation, Operating system structure, Operating system debugging, System Boot.

UNIT - II   **Process Concept, Multithreaded Programming,Process** 10Hrs
                         Scheduling, Inter-process Communication

Process Concept: Process scheduling, Operations on processes, Inter-process communication,

Communication in client server systems.

Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples.

Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples.

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

UNIT - III	**Memory-Management Strategies, Virtual Memory Management**	Lecture 8Hrs

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples.

Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples.

UNIT - IV	**Deadlocks, File Systems**	Lecture 9Hrs

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention.

File Systems: Files, Directories, File system implementation, management and optimization.

Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

UNIT - V	**System Protection, System Security**	Lecture 8Hrs

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification.

Case Studies: Linux, Microsoft Windows.

Textbooks:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.

2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008.

   (Topics: Inter-process Communication and File systems.)

Reference Books:

1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.

2. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.

3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education,

2009

4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004

Online Learning Resources:

https://nptel.ac.in/courses/106/106/106106144/

http://peterindia.net/OperatingSystems.html

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20A30401T ARTIFICIAL INTELLIGENCE

(Common to CSE (AI), CSE (AI & ML) and AI & DS)

Pre-requisite   **Mathematics and Programming**

Course Objectives:

- To introduce Artificial Intelligence
- To Teach about the machine learning environment
- To Present the searching Technique for Problem Solving
- To Introduce Natural Language Processing and Robotics

Course Outcomes (CO):

After completion of the course, students will be able to

- Apply searching techniques for solving a problem
- Design Intelligent Agents
- Develop Natural Language Interface for Machines
- Design mini robots
- Summarize past, present and future of Artificial Intelligence

UNIT - I	**Introduction**	Lecture 8Hrs

Introduction: What is AI, Foundations of AI, History of AI, The State of Art.

Intelligent Agents: Agents and Environments, Good Behaviour: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT - II	**Solving Problems by searching**	Lecture 8Hrs

Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Functions, Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continues Spaces, Searching with Nondeterministic Actions, Searching with partial observations, online search agents and unknown environments.

UNIT - III	**Reinforcement Learning & Natural Language Processing**	Lecture 9Hrs

Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning, Policy Search, applications of RL

Natural Language Processing: Language Models, Text Classification, Information Retrieval, Information Extraction.

UNIT - IV	**Natural Language for Communication**	Lecture 9Hrs

Natural Language for Communication: 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.

| UNIT - V | **Robotics** | Lecture 8 Hrs |

Robotics: Introduction, Robot Hardware, Robotic Perception, Planning to move, Planning uncertain movements, Moving, Robotic software architectures, application domains

Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI, Agent Components, Agent Architectures, Are we going in the right direction, What if AI does succeed.

Textbooks:

1. Stuart J.Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd Edition, Pearson Education, 2019.

Reference Books:

1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.
2. Johnson, Benny G., Fred Phillips, and Linda G. Chase. "An intelligent tutoring system for the accounting cycle: Enhancing textbook homework with artificial intelligence." Journal of Accounting Education 27.1 (2009): 30-39.

Online Learning Resources:

http://peterindia.net/AILinks.html

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20A52301 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

(Common to All branches of Engineering)

Course Objectives:

- To inculcate the basic knowledge of micro economics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements

Course Outcomes (CO):

- Define the concepts related to Managerial Economics, financial accounting and management.
- Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets
- Apply the Concept of Production cost and revenues for effective Business decision
- Analyze how to invest their capital and maximize returns
- Evaluate the capital budgeting techniques
- Develop the accounting statements and evaluate the financial performance of business entity.

UNIT - I **Managerial Economics**

Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT - II **Production and Cost Analysis**

Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination– Short run and Long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost & Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

UNIT - III **Business Organizations and Markets**

Introduction – Nature, meaning, significance, functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly-

Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT - IV   **Capital Budgeting**

Introduction – Nature, meaning, significance, functions and advantages. Types of Working Capital, Components, Sources of Short-term and Long-term   Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT - V   **Financial Accounting and Analysis**

Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions-Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). *Financial Analysis -* Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.

2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019

Reference Books:

1.   Ahuja Hl Managerial economics Schand,3/e,2013

2.   S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.

3.   Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.

4.   Domnick Salvatore: Managerial Economics in a Global Economy, Cengage,

   2013.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt

https://www.slideshare.net/rossanz/production-and-cost-45827016

https://www.slideshare.net/darkyla/business-organizations-19917607

https://www.slideshare.net/balarajbl/market-and-classification-of-market

https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396

https://www.slideshare.net/ashu1983/financial-accounting

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech- CSE -(AI &ML) II-II Sem

L	T	P	C
3	0	0	3

20A52302ORGANISATIONAL BEHAVIOUR

(Common to All branches of Engineering)

Course Objectives:

- To enable student's comprehension of organizational behavior

- To offer knowledge to students on self-motivation, leadership and management

- To facilitate them to become powerful leaders

- To Impart knowledge about group dynamics

- To make them understand the importance of change and development

Course Outcomes (CO):

- Define the Organizational Behaviour, its nature and scope.
- Understand the nature and concept of Organizational behaviour
- Apply theories of motivation to analyse the performance problems
- Analyse the different theories of leadership
- Evaluate group dynamics
- Develop as powerful leader

 UNIT - I   **Introduction to Organizational Behavior**

Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective -Understanding Individual   Behaviour –Attitude -Perception - Learning – Personality.

UNIT - II   **Motivation and Leading**

Theories of Motivation- Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theory of expectancy – Mc Cleland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory – Locke's goal setting theory– Alderfer's ERG theory .

UNIT - III   **Organizational Culture**

Introduction – Meaning, scope, definition, Nature - Organizational Climate - Leadership - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership - Qualities of good Leader - Conflict Management -Evaluating Leader- Women and Corporate leadership.

UNIT - IV   **Group Dynamics**

Introduction – Meaning, scope, definition, Nature- Types of groups - Determinants of group behavior - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decision making - Team building - Conflict in the organization– Conflict resolution

UNIT - V   **Organizational Change and Development**

Introduction –Nature, Meaning, scope, definition and functions- Organizational Culture - Changing the Culture – Change Management – Work Stress Management - Organizational management – Managerial implications of organization's change and development

Textbooks:

1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12 Th edition 2011

2. P Subba Ran, Organisational Behaviour, Himalya Publishing House 2017

Reference Books:

- ▪ McShane, Organizational Behaviour, TMH 2009

- ▪ Nelson, Organisational Behaviour, Thomson, 2009.

- ▪ Robbins, P. Stephen, Timothy A. Judge, Organisational Behaviour, Pearson 2009.

- ▪ Aswathappa, Organisational Behaviour, Himalaya, 2009

Online Learning Resources:

httphttps://www.slideshare.net/Knight1040/organizational-culture-9608857s://www.slideshare.net/AbhayRajpoot3/motivation-165556714

https://www.slideshare.net/harshrastogi1/group-dynamics-159412405

https://www.slideshare.net/vanyasingla1/organizational-change-development-26565951

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B.Tech- CSE -(AI &ML) II-II Sem	L	T	P	C
	3	0	0	3

20A52303 Business Environment

(Common to All branches of Engineering)

Course Objectives:

- To make the student to understand about the business environment
- To enable them in knowing the importance of fiscal and monitory policy
- To facilitate them in understanding the export policy of the country
- To Impart knowledge about the functioning and role of WTO
- To Encourage the student in knowing the structure of stock markets

Course Outcomes (CO):

- Define Business Environment and its Importance.
- Understand various types of business environment.
- Apply the knowledge of Money markets in future investment
- Analyse India's Trade Policy
- Evaluate fiscal and monitory policy
- Develop a personal synthesis and approach for identifying business opportunities

UNIT - I   **Overview of Business Environment**

Introduction – meaning Nature, Scope, significance, functions and advantages. Types-Internal &External, Micro and Macro. Competitive structure of industries -Environmental analysis-advantages & limitations of environmental analysis& Characteristics of business.

UNIT - II   **Fiscal & Monetary Policy**

Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget- Monetary Policy - Demand and Supply of Money –RBI -Objectives of monetary and credit policy - Recent trends- Role of Finance Commission.

UNIT - III   **India's Trade Policy**

Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank -Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

UNIT - IV   **World Trade Organization**

Introduction – Nature, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - GATT -Agreements in the Uruguay Round –TRIPS, TRIMS - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

UNIT - V   **Money Markets and Capital Markets**

Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI – Stock Exchanges - Investor protection and role of SEBI, Introduction to international finance.

Textbooks:

1. Francis Cherunilam (2009), International Business: Text and Cases, Prentice Hall of India.

2. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH2016

Reference Books:

1.K. V. Sivayya, V. B. M Das (2009), Indian Industrial Economy, Sultan Chand Publishers,

New Delhi, India.

2. Sundaram, Black (2009), International Business Environment Text and Cases, Prentice Hall of

India, New Delhi, India.

3. Chari. S. N (2009), International Business, Wiley India.

4.E. Bhattacharya (2009), International Business, Excel Publications, New Delhi.

Online Learning Resources:

https://www.slideshare.net/ShompaDhali/business-environment-53111245

https://www.slideshare.net/rbalsells/fiscal-policy-ppt

https://www.slideshare.net/aguness/monetary-policy-presentationppt

https://www.slideshare.net/DaudRizwan/monetary-policy-of-india-69561982

https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt

https://www.slideshare.net/viking2690/wto-ppt-60260883

https://www.slideshare.net/prateeknepal3/ppt-mo

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B.Tech- CSE -(AI &ML) II-II Sem   **L   T   P   C**
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20A05401P Database Management Systems Laboratory

(Common to CSE, IT, CSE(DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS)

Course Objectives:

- To implement the basic knowledge of SQL queries and relational algebra.
- To construct database models for different database applications.
- To apply normalization techniques for refining of databases.
- To practice various triggers, procedures, and cursors usingPL/SQL.
- To design and implementation of a database for an organization

Course Outcomes (CO):

After completion of the course, students will be able to

- Design database for any real world problem
- Implement PL/SQL programs
- Define SQL queries
- Decide the constraints
- Investigate for data inconsistency

List of Experiments:

 Week-1: CREATION OF TABLES

1. Create a table called Employee with the following structure.

Name	Type
Empno	Number
Ename	Varchar2(20)
Job	Varchar2(20)
Mgr	Number
Sal	Number

   a. Add a column commission with domain to the Employee table.
   b. Insert any five records into the table.
   c. Update the column details of job
   d. Rename the column of Employ table using alter command.
   e. Delete the employee whose empno is19.

2. Create department table with the following structure.

Name	Type
Deptno	Number
Deptname	Varchar2(20)
location	Varchar2(20)

   a. Add column designation to the department table.
   b. Insert values into thetable.
   c. List the records of emp table grouped bydeptno.
   d. Update the record where deptno is9.
   e. Delete any column data from thetable

3. Create a table called Customertable

Name	Type
Cust name	Varchar2(20)
Cust street	Varchar2(20)
Cust city	Varchar2(20)

a. Insert records into thetable.

b. Add salary column to thetable.

c. Alter the table columndomain.

d. Drop salary column of the customertable.

e. Delete the rows of customer table whose ust_city is 'hyd'.

f. Create a table called branchtable.

Name	Type
Branch name	Varchar2(20)
Branch city	Varchar2(20)
asserts	Number

4. Increase the size of data type for asserts to the branch.

    a. Add and drop a column to the branch table.

    b. Insert values to the table.

    c. Update the branch name column

    d. Delete any two columns from the table

5. Create a table called sailor table

Name	Type
Sid	Number
Sname	Varchar2(20)
rating	Varchar2(20)

a. Add column age to the sailor table.

b. Insert values into the sailor table.

c. Delete the row with rating>8.

d. Update the column details of sailor.

e. Insert null values into the table.

6. Create a table called reserves table

Name	Type
Boat id	Integer
sid	Integer
day	Integer

a. Insert values into the reservestable.

      b.   Add column time to the reservestable.

      c.   Alter the column day data type todate.

      d.   Drop the column time in thetable.

      e.   Delete the row of the table with somecondition.

Week-2: QUERIES USING DDL AND DML

1. a. Create a user and grant all permissions to theuser.
   b. Insert the any three records in the employee table and use rollback. Check theresult.
   c. Add primary key constraint and not null constraint to the employeetable.
   d. Insert null values to the employee table and verify theresult.
2. a. Create a user and grant all permissions to theuser.
   b. Insert values in the department table and usecommit.
   c. Add constraints like unique and not null to the departmenttable.
   d. Insert repeated values and null values into thetable.
3. a. Create a user and grant all permissions to theuser.
   b. Insert values into the table and use commit.
   c. Delete any three records in the department table and use rollback.
   d. Add constraint primary key and foreign key to thetable.
4. a. Create a user and grant all permissions to theuser.
   b. Insert records in the sailor table and usecommit.
   c. Add save point after insertion of records and verify save point.
   d. Add constraints not null and primary key to the sailortable.
5. a. Create a user and grant all permissions to theuser.
   b. Use revoke command to remove userpermissions.
   c. Change password of the usercreated.
   d. Add constraint foreign key and notnull.
6. a. Create a user and grant all permissions to theuser.
   b. Update the table reserves and use savepointandrollback.
   c. Add constraint primary key , foreign key and not null to the reserves table
   d. Delete constraint not null to the tablecolumn

Week-3:QUERIES USING AGGREGATE FUNCTIONS

1. a. By using the group by clause, display the enames who belongs to deptno 10 alongwithaveragesalary.
   b. Display lowest paid employee details under eachdepartment.
   c. Display number of employees working in each department and their departmentnumber.
   d. Using built in functions, display number of employees working in each department and their department name from dept table. Insert deptname to dept table and insert deptname for each row, do the required thing specified above.
   e. List all employees which start with either B or C.
   f. Display only these ename of employees where the maximum salary is greater than or equalto 5000.
2. a. Calculate the average salary for each differentjob.
   b. Show the average salary of each job excludingmanager.
   c. Show the average salary for all departments employing more than threepeople.
   d. Display employees who earn more than thelowest salary in department 30
   e. Show that value returned by sign (n)function.
   f. How many days between day of birth to currentdate
3. a. Show that two substring as singlestring.

b. List all employee names, salary and 15% rise insalary.

c. Display lowest paid emp details under eachmanager

d. Display the average monthly salary bill for eachdeptno.

e. Show the average salary for all departments employing more than twopeople.

f. By using the group by clause, display the eid who belongs to deptno 05 along withaverage salary.

4. a. Count the number of employees in department20

   b. Find the minimum salary earned byclerk.

   c. Find minimum, maximum, average salary of allemployees.

   d. List the minimum and maximum salaries for each jobtype.

   e. List the employee names in descendingorder.

   f. List the employee id, names in ascending order byempid.

5. a. Find the sids ,names of sailors who have reserved all boats called"INTERLAKE

   Find the age of youngest sailor who is eligible to vote for each rating level with at least two such sailors.

   b. Find the sname , bid and reservation date for eachreservation.

   c. Find the ages of sailors whose name begin and end with B and has at least 3characters.

   d. List in alphabetic order all sailors who have reserved redboat.

   e. Find the age of youngest sailor for each ratinglevel.

6. a. List the Vendors who have delivered products within 6 months from orderdate.

   b. Display the Vendor details who have supplied both Assembled and Subparts.

   c. Display the Sub parts by grouping the Vendor type (Local or NonLocal).

   d. Display the Vendor details in ascendingorder.

   e. Display the Sub part which costs more than any of the Assembledparts.

   f. Display the second maximum cost Assembledpart

Week-4: PROGRAMS ON PL/SQL

1. a. Write a PL/SQL program to swaptwonumbers.

   b. Write a PL/SQL program to find the largest of threenumbers.

2. a. Write a PL/SQL program to find the total and average of 6 subjects and display thegrade.

   b. Write a PL/SQL program to find the sum of digits in a givennumber.

3. a. Write a PL/SQL program to display the number in reverseorder.

   b. Writea PL/SQLprogramtocheckwhetherthegivennumberisprimeornot.

4. a. Write a PL/SQL program to find the factorial of a givennumber.

   b. Write a PL/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in an empty table named areas, consisting of two columns radius andarea.

5. a. Write a PL/SQL program to accept a string and remove the vowels from the string. (When 'hello' passed to the program it should display 'Hll' removing e and o from the worldHello).

   b. Write a PL/SQL program to accept a number and a divisor. Make sure the divisor is less than or equal to 10. Else display an error message. Otherwise Display the remainderin words.

Week-5: PROCEDURES AND FUNCTIONS

1. Write a function to accept employee number as parameter and return Basic +HRA together as single column.

2. Accept year as parameter and write a Function to return the total net salary spent for a givenyear.

3. Create a function to find the factorial of a given number and hence findNCR.

4. Write a PL/SQL block o pint prime Fibonacci series using localfunctions.

5. Create a procedure to find the lucky number of a given birthdate.

6. Create function to the reverse of givennumber

Week-6: TRIGGERS

1. Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and newvalues:

   CUSTOMERS table:

ID	NAME	AGE	ADDRESS	SALARY
1	Alive	24	Khammam	2000
2	Bob	27	Kadappa	3000
3	Catri	25	Guntur	4000
4	Dena	28	Hyderabad	5000
5	Eeshwar	27	Kurnool	6000
6	Farooq	28	Nellore	7000

2. Creation of insert trigger, delete trigger, update trigger practice triggers using the passenger database.
   Passenger(Passport_ id INTEGER PRIMARY KEY, Name VARCHAR (50) NotNULL, Age Integer Not NULL, Sex Char, Address VARCHAR (50) NotNULL);
   a. Write a Insert Trigger to check the Passport_id is exactly six digits ornot.
   b. Write a trigger on passenger to display messages '1 Record is inserted', '1 record is deleted', '1 record is updated' when insertion, deletion and updation are done on passengerrespectively.

3. Insert row in employee table using Triggers. Every trigger is created with name any trigger have same name must be replaced by new name. These triggers can raised before insert, update or delete rows on data base. The main difference between a trigger and a stored procedure is that the former is attached to a table and is only fired when an INSERT, UPDATE or DELETEoccurs.

4. Convert employee name into uppercase whenever an employee record is inserted or updated. Trigger to fire before the insert orupdate.

5. Trigger before deleting a record from emp table. Trigger will insert the row to be deleted into table called delete _emp and also record user who has deleted the record and date and time ofdelete.

6. Create a transparent audit system for a table CUST_MSTR. The system must keep track of the records that are being deleted orupdated

Week-7:PROCEDURES

1. Create the procedure for palindrome of givennumber.
2. Create the procedure for GCD: Program should load two registers with two Numbers and then apply the logic for GCD of two numbers. GCD of two numbers is performed by dividing the greater number by the smaller number till the remainder is zero. If it is zero, the divisor is the GCD if not the remainder and the divisors of the previous division are the new set of two numbers. The process is repeated by dividing greater of the two numbers by the smaller number till the remainder is zero and GCD isfound.
3. Write the PL/SQL programs to create the procedure for factorial of givennumber.
4. Write the PL/SQL programs to create the procedure to find sum of N naturalnumber.
5. Write the PL/SQL programs to create the procedure to find Fibonacciseries.
6. Write the PL/SQL programs to create the procedure to check the given number is perfect ornot

Week-8: CURSORS

1. Write a PL/SQL block that will display the name, dept no, salary of fist highest paidemployees.
2. Update the balance stock in the item master table each time a transaction takes place in the item transaction table. The change in item master table depends on the item id is already present in the item master then update operation is performed to decrease the balance stock by the quantity specified in the item transaction in case the item id is not present in the item master table then the record is inserted in the item mastertable.
3. Write a PL/SQL block that will display the employee details along with salary usingcursors.
4. To write a Cursor to display the list of employees who are working as a ManagersorAnalyst.
5. To write a Cursor to find employee with given job anddeptno.
6. Write a PL/SQL block using implicit cursor that will display message, the salaries of all the employees in the 'employee' table are updated. If none of the employee's salary are updated we getamessage 'None of the salaries were updated'. Else we get a message like for example, 'Salaries for 1000 employees are updated' if there are 1000 rows in 'employee' table

Week-9: CASE STUDY: BOOK PUBLISHING COMPANY

A publishing company produces scientific books on various subjects. The books are written by authors who specialize in one particular subject. The company employs editors who, not necessarily being specialists in a particular area, each take sole responsibility for editing one or more publications.

A publication covers essentially one of the specialist subjects and is normally written by a single author. When writing a particular book, each author works with on editor, but may submit another work for publication to be supervised by other editors. To improve their competitiveness, the company tries to employ a variety of authors, more than one author being a specialist in a particular subject for the above case study, do thefollowing:

1. Analyze the datarequired.
2. Normalize theattributes.

Create the logical data model using E-R diagrams

Week-10: **CASE STUDY GENERAL HOSPITAL**

AGeneralHospitalconsistsofanumberofspecializedwards(suchasMaternity,Pediatric,Oncology, etc.). Each ward hosts a number of patients, who were admitted on the recommendation of their ownGP and confirmed by a consultant employed by the Hospital. On admission, the personal details of every patient are recorded. A separate register is to be held to store the information of the tests undertaken and the results of a prescribed treatment. A number of tests may be conducted for each patient. Each patient is assigned to one leading consultant but may be examined by another doctor, if required. Doctors are specialists in some branch of medicine and may be leading consultants for a number of patients, not necessarily from the same ward. For the above case study, do the following.

1. Analyze the datarequired.
2. Normalize theattributes.

Create the logical data model using E-R diagrams

Week-11: **CASE STUDY: CAR RENTAL COMPANY**

A database is to be designed for a car rental company. The information required includes a description of cars, subcontractors (i.e. garages), company expenditures, company revenues and customers. Cars are to be described by such data as: make, model, year of production, engine size, fuel type, number of passengers, registration number, purchase price, purchase date, rent price and insurance details. It is the company policy not to keep any car for a period exceeding one year. All major repairs and maintenance are done by subcontractors (i.e. franchised garages), with whom CRC has long-term agreements. Therefore the data about garages to be kept in the database includes garage names, addresses, range of services and the like. Some garages require payments immediately after a repair has been made; with others CRC has made arrangements for credit facilities. Company expenditures are to be registered for all outgoings connected with purchases, repairs, maintenance, insurance etc. Similarly the cash inflow coming from all sources: Car hire, car sales, insurance claims must be kept of file. CRC maintains a reasonably stable client base. For this privileged category of customers special creditcard facilities are provided. These customers may also book in advance a particular car. These reservations can be made for any period of time up to one month. Casual customers must pay a deposit for an estimated time of rental, unless they wish to pay by credit card. All major credit cards are accepted. Personal details such as name, address, telephone number, driving license, number about each customer are kept in the database. For the above case study, do thefollowing:

1. Analyze the datarequired.
2. Normalize theattributes.

Create the logical data model using E-R diagrams

Week-12: **CASE STUDY: STUDENT PROGRESS MONITORING SYSTEM**

A database is to be designed for a college to monitor students' progress throughout their course of study. The students are reading for a degree (such as BA, BA (Hons.) M.Sc., etc) within the framework of the modular system. The college provides a number of modules, each being

characterized by its code, title, credit value, module leader, teaching staff and the department they come from. A module is coordinated by a module leader who shares teaching duties with one or more lecturers. A lecturer may teach (and be a module leader for) more than one module. Students are free to choose any module they wish but the following rules must be observed: Some modules require pre- requisites modules and some degree programs have compulsory modules. The database is also to contain some information about studentsincludingtheirnumbers,names,addresses,degreestheyreadfor,andtheirpastperformance i.e. modules taken and examination results. For the above case study, do the following:

1. Analyze the datarequired.
2. Normalize theattributes.
3. Create the logical data model i.e., ERdiagrams.
4. Comprehend the data given in the case study by creating respective tables with primary keys and foreign keys whereverrequired.
5. Insert values into the tables created (Be vigilant about Master- Slavetables).
6. Display the Students who have taken M.Sccourse
7. Display the Module code and Number of Modules taught by eachLecturer.
8. Retrieve the Lecturer names who are not Module Leaders.
9. Display the Department name which offers 'English 'module.
10. Retrieve the Prerequisite Courses offered by every Department (with Departmentnames).
11. Present the Lecturer ID and Name who teaches'Mathematics'.
12. Discover the number of years a Module istaught.
13. List out all the Faculties who work for 'Statistics'Department.
14. List out the number of Modules taught by each ModuleLeader.
15. List out the number of Modules taught by a particularLecturer.
16. Create a view which contains the fields of both Department and Module tables. (Hint- The fields like Module code, title, credit, Department code and itsname).
17. Update the credits of all the prerequisite courses to 5. Delete the Module 'History' from the Moduletable.

References:

1. RamezElmasri, Shamkant, B. Navathe, "Database Systems", Pearson Education, 6th Edition, 2013.
2. Peter Rob, Carles Coronel, "Database System Concepts", Cengage Learning, 7th Edition, 2008.

Online Learning Resources/Virtual Labs:

http://www.scoopworld.in
http://vlabs.iitb.ac.in/vlabs-dev/labs/dblab/index.php

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B.Tech- CSE -(AI &ML) II-II Sem   L   T   P   C
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20A05402P   OPERATING SYSTEMS LAB

(Common to CSE, IT, CSE(DS), CSE (IoT), CSE (AI), CSE (AI & ML) and AI & DS)

Pre-requisite   Basics of CO and DBMS

Course Objectives:

- To familiarize students with the architecture of OS.

- To provide necessary skills for developing and debugging CPU Scheduling algorithms.

- To elucidate the process management and scheduling and memory management.

- To explain the working of an OS as a resource manager, file system manager, process manager, memory manager, and page replacement tool.

- To provide insights into system calls, file systems and deadlock handling.

Course Outcomes (CO):

After completion of the course, students will be able to

- Trace different CPU Scheduling algorithms (L2).

- Implement Bankers Algorithms to Avoid and prevent the Dead Lock (L3).

- Evaluate Page replacement algorithms (L5).

- Illustrate the file organization techniques (L4).

- Illustrate shared memory process (L4).

- Design new scheduling algorithms (L6)

List of Experiments:

1. Practicing of Basic UNIX Commands.

2. Write programs using the following UNIX operating system calls

    Fork, exec, getpid, exit, wait, close, stat, opendir and readdir

3. Simulate UNIX commands like cp, ls, grep, etc.,

4. Simulate the following CPU scheduling algorithms

    a) Round Robin b) SJF c) FCFS d) Priority

5. Implement a dynamic priority scheduling algorithm.

6. Assume that there are five jobs with different weights ranging from 1 to 5. Implement round robin algorithm with time slice equivalent to weight.

7. Implement priority scheduling algorithm. While executing, no process should wait for more than 10 seconds. If the waiting time is more than 10 seconds that process has to be executed

for at least 1 second before waiting again.

8. Control the number of ports opened by the operating system with

    a) Semaphore b) Monitors.

9. Simulate how parent and child processes use shared memory and address space.

10. Simulate sleeping barber problem.

11. Simulate dining philosopher's problem.

12. Simulate producer-consumer problem using threads.

13. Implement the following memory allocation methods for fixed partition

    a) First fit b) Worst fit c) Best fit

14. Simulate the following page replacement algorithms

    a) FIFO b) LRU c) LFU etc.,

15. Simulate Paging Technique of memory management

16. Simulate Bankers Algorithm for Dead Lock avoidance and prevention

17. Simulate the following file allocation strategies

    a) Sequential b) Indexed c) Linked

18. Simulate all File Organization Techniques

    a) Single level directory b) Two level c) Hierarchical d) DAG

References:

1. "Operating System Concepts", Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Eighth

    Edition, John Wiley.

2. "Operating Systems: Internals and Design Principles", Stallings, Sixth Edition–2009,

    Pearson Education

3. "Modern Operating Systems", Andrew S Tanenbaum, Second Edition, PHI.

4. "Operating Systems", S.Haldar, A.A.Aravind, Pearson Education.

5. "Principles of Operating Systems", B.L.Stuart, Cengage learning, India Edition.2013-2014

6. "Operating Systems", A.S.Godbole, Second Edition, TMH.

7. "An Introduction to Operating Systems", P.C.P. Bhatt, PHI.

Online Learning Resources/Virtual Labs:

https://www.cse.iitb.ac.in/~mythili/os/

http://peterindia.net/OperatingSystems.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech- CSE -(AI &ML) II-II Sem   **L   T   P   C**
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20A30401P ARTIFICIAL INTELLIGENCE LAB

(Common to CSE (AI), CSE (AI & ML) and AI & DS)

Pre-requisite   **Fundamental Programming**

Course Objectives:

- To teach the methods of implementing algorithms using artificial intelligence techniques
- To illustrate search algorithms
- To demonstrate the building of intelligent agents

Course Outcomes (CO):

After completion of the course, students will be able to

- Implement search algorithms
- Solve Artificial intelligence problems
- Design chatbot and virtual assistant

List of Experiments:

 1. Write a program to implement DFS and BFS

 2. Write a Program to find the solution for traveling salesman Problem

 3. Write a program to implement Simulated Annealing Algorithm

 4. Write a program to find the solution for the wumpus world problem

 5. Write a program to implement 8 puzzle problem

 6. Write a program to implement Towers of Hanoi problem

 7. Write a program to implement A* Algorithm

 8. Write a program to implement Hill Climbing Algorithm

9. Build a Chatbot using AWS Lex, Pandora bots.

10. Build a bot that provides all the information related to your college.

11. Build a virtual assistant for Wikipedia using Wolfram Alpha and Python

12. The following is a function that counts the number of times a string occurs in another string:

    # Count the number of times string s1 is found in string s2

    def countsubstring(s1,s2):

    count = 0

```
for i in range(0,len(s2)-len(s1)+1):

if s1 == s2[i:i+len(s1)]:

count += 1

return count
```

For instance, countsubstring('ab','cabalaba') returns 2.

Write a recursive version of the above function. To get the rest of a string (i.e. everything but the first character).

13. Higher order functions. Write a higher-order function count that counts the number of elements in a list that satisfy a given test. For instance: count (lambda x: x>2, [1, 2, 3, 4, 5]) should return 3, as there are three elements in the list larger than 2. Solve this task without using any existing higher-order function.

14. Brute force solution to the Knapsack problem. Write a function that allows you to generate random problem instances for the knapsack program. This function should generate a list of items containing N items that each have a unique name, a random size in the range 1 .... 5 and a random value in the range 1..... 10.

Next, you should perform performance measurements to see how long the given knapsack solver take to solve different problem sizes. You should perform at least 10 runs with different randomly generated problem instances for the problem sizes 10,12,14,16,18,20 and 22. Use abackpack size of 2:5 x N for each value problem size N. Please note that the method used togenerate random numbers can also affect performance, since different distributions of values can make the initial conditions of the problem slightly more or less demanding.

How much longer time does it take to run this program when we increase the number of items? Does the backpack size affect the answer?

Try running the above tests again with a backpack size of 1 x N and with 4:0 x N.

15. Assume that you are organising a party for N people and have been given a list L of people who, for social reasons, should not sit at the same table. Furthermore, assume that you have C tables (that are infinitely large).

Write a function layout (N,C,L) that can give a table placement (i.e. a number from 0 : : :C -

1) for each guest such that there will be no social mishaps.

For simplicity we assume that you have a unique number 0 ......N-1 for each guest and that the list of restrictions is of the form [(X, Y) ...] denoting guests X, Y that are not allowed to sit together. Answer with a dictionary mapping each guest into a table assignment, if there are no possible layouts of the guests you should answer False.

References:

1. David Poole, Alan Mackworth, Randy Goebel,"Computational Intelligence: a logical approach", Oxford University Press, 2004.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2002.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers, 1998.
4. Artificial Neural Networks, B. Yagna Narayana, PHI
5. Artificial Intelligence, 2nd Edition, E.Rich and K.Knight, TMH.
6. **Artificial Intelligence and Expert Systems, Patterson, PHI.**

Online Learning Resources/Virtual Labs:

https://www.tensorflow.org/

https://pytorch.org/

https://github.com/pytorch

https://keras.io/

https://github.com/keras-team

http://deeplearning.net/software/theano/

https://github.com/Theano/Theano

https://caffe2.ai/

https://github.com/caffe2

https://deeplearning4j.org/Scikit-learn:https://scikit-learn.org/stable/

https://github.com/scikit-learn/scikit-learn

https://www.deeplearning.ai/

https://opencv.org/

https://github.com/qqwweee/keras-yolo3

https://www.pyimagesearch.com/2018/11/12/yolo-object-detection-with-opencv/

https://developer.nvidia.com/cuda-math-library

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech- CSE -(AI &ML) II-II Sem   **L   T   P   C**
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20A05404 Exploratory Data Analytics with R

(Common to CSE, CSE (AI), CSE (AI & ML) and AI& DS)

Pre-requisite   Fundamental Programming

Course Objectives:

The students will be able to learn:
- How to manipulate data within R and to create simple graphs and charts used in introductory statistics.
- The given data using different distribution functions in R.
- The hypothesis testing and calculate confidence intervals; perform linear regression models for data analysis.
- The relevance and importance of the theory in solving practical problems in the real world.

Course Outcomes (CO):

After completion of the course, students will be able to

- Install and use R for simple programming tasks.
- Extend the functionality of R by using add-on packages
- Extract data from files and other sources and perform various data manipulation tasks on them.
- Explore statistical functions in R.
- Use R Graphics and Tables to visualize results of various statistical operations on data.
- Apply the knowledge of R gained to data Analytics for real-life applications.

List of Experiments:

1: INTRODUCTION TO COMPUTING
a. Installation of R
b. The basics of R syntax, workspace
c. Matrices and lists
d. Subsetting
e. System-defined functions; the help system
f. Errors and warnings; coherence of the workspace

2: GETTING USED TO R: DESCRIBING DATA
a. Viewing and manipulating Data
b. Plotting data
c. Reading the data from console, file (.csv) local disk and web
d. Working with larger datasets

3: SHAPE OF DATA AND DESCRIBING RELATIONSHIPS
a. Tables, charts and plots.
b. Univariate data, measures of central tendency, frequency distributions, variation, and Shape.
c. Multivariate data, relationships between a categorical and a continuous variable,
d. Relationship between two continuous variables – covariance, correlation coefficients, comparing multiple correlations.
e. Visualization methods – categorical and continuous variables, two categorical variables, two continuous variables.

4: PROBABILITY DISTRIBUTIONS
a. Sampling from distributions – Binomial distribution, normal distribution
b. tTest, zTest, Chi Square test
c. Density functions

d. Data Visualization using ggplot – Box plot, histograms, scatter plotter, line chart, bar chart, heat maps

5: EXPLORATORY DATA ANALYSIS Demonstrate the range, summary, mean, variance, median, standard deviation, histogram, box plot, scatter plot using population dataset.

6: TESTING HYPOTHESES

a. Null hypothesis significance testing

b. Testing the mean of one sample

c. Testing two means

7: PREDICTING CONTINUOUS VARIABLES

a. Linear models

b. Simple linear regression

c. Multiple regression

d. Bias-variance trade-off – cross-validation

8: CORRELATION

a. How to calculate the correlation between two variables.

b. How to make scatter plots.

c. Use the scatter plot to investigate the relationship between two variables

9: TESTS OF HYPOTHESES

a. Perform tests of hypotheses about the mean when the variance is known.

b. Compute the p-value.

c. Explore the connection between the critical region, the test statistic, and the p-value

10: **ESTIMATING A LINEAR RELATIONSHIP** Demonstration on a Statistical Model for a Linear Relationship

a. Least Squares Estimates

b. The R Function lm

c. Scrutinizing the Residuals

11: APPLY-TYPE FUNCTIONS

a. Defining user defined classes and operations, Models and methods in R

b. Customizing the user's environment

c. Conditional statements

d. Loops and iterations

12: STATISTICAL FUNCTIONS IN R

a. Write Demonstrate Statistical functions in R

b. Statistical inference, contingency tables, chi-square goodness of fit, regression, generalized linear models, advanced modeling methods.

References:

1. SandipRakshit, "Statistics with R Programming", McGraw Hill Education, 2018.

2. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "AN Introduction to Statistical Learning: with Applications in R", Springer Texts in Statistics, 2017.

3. Joseph Schmuller, "Statistical Analysis with R for Dummies", Wiley, 2017.

4. K G Srinivasa, G M Siddesh, ChetanShetty, Sowmya B J, "Statistical Programming in R", Oxford Higher Education, 2017.

Online Learning Resources/Virtual Labs:

1. www.oikostat.ch

2. https://learningstatisticswithr.com/

3. https://www.coursera.org/learn/probability-intro#syllabus

4. https://www.isibang.ac.in/~athreya/psweur/

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20A99401 Design Thinking for Innovation
(Common to All branches of Engineering)

Course Objectives:
The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

Course Outcomes (CO):
- Define the concepts related to design thinking.
- Explain the fundamentals of Design Thinking and innovation
- Apply the design thinking techniques for solving problems in various sectors.
- Analyse to work in a multidisciplinary environment
- Evaluate the value of creativity
- Formulate specific problem statements of real time issues

UNIT - I   **Introduction to Design Thinking**   **10 Hrs**
Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT - II   **Design Thinking Process**   **10 Hrs**
Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT - III   **Innovation**   **8 Hrs**
Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT - IV   **Product Design**   **8 Hrs**
Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT - V   **Design Thinking in Business Processes**   **10 Hrs**
Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

Textbooks:
1. Change by design, Tim Brown, Harper Bollins (2009)
2. Design Thinking for Strategic Innovation, Idris Mootee, 2013, John Wiley & Sons.
Reference Books:
1. Design Thinking in the Classroom by David Lee, Ulysses press

2. Design the Future, by Shrrutin N Shetty, Norton Press
3. Universal principles of design- William lidwell, kritinaholden, Jill butter.
4. The era of open innovation – chesbrough.H
Online Learning Resources:

https://nptel.ac.in/courses/110/106/110106124/
https://nptel.ac.in/courses/109/104/109104109/
https://swayam.gov.in/nd1_noc19_mg60/preview

COMMUNITY SERVICE PROJECT
……Experiential learning through community engagement

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in a 6 weeksfor the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty incharge.
- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
  - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
  - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
    - Agriculture
    - Health
    - Marketing and Cooperation
    - Animal Husbandry
    - Horticulture
    - Fisheries
    - Sericulture
    - Revenue and Survey
    - Natural Disaster Management
    - Irrigation
    - Law & Order
    - Excise and Prohibition
    - Mines and Geology
    - Energy
    - Internet
    - Free Electricity
    - Drinking Water

EXPECTED OUTCOMES
BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution
- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS
- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES
- Improved institutional commitment
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY
- Satisfaction with student participation
- Valuable human resources needed to achieve community goals
- New energy, enthusiasm and perspectives applied to community work
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students
1. **Water facilities and drinking water availability**
2. **Health and hygiene**
3. **Stress levels and coping mechanisms**
4. **Health intervention programmes**
5. **Horticulture**
6. **Herbal plants**
7. **Botanical survey**
8. **Zoological survey**
9. **Marine products**
10. **Aqua culture**
11. **Inland fisheries**
12. **Animals and species**
13. **Nutrition**

14. **Traditional health care methods**
15. **Food habits**
16. **Air pollution**
17. **Water pollution**
18. **Plantation**
19. **Soil protection**
20. **Renewable energy**
21. **Plant diseases**
22. **Yoga awareness and practice**
23. **Health care awareness programmes and their impact**
24. **Use of chemicals on fruits and vegetables**
25. **Organic farming**
26. **Crop rotation**
27. **Floury culture**
28. **Access to safe drinking water**
29. **Geographical survey**
30. **Geological survey**
31. **Sericulture**
32. **Study of species**
33. **Food adulteration**
34. **Incidence of Diabetes and other chronic diseases**
35. **Human genetics**
36. **Blood groups and blood levels**
37. **Internet Usage in Villages**
38. **Android Phone usage by different people**
39. **Utilisation of free electricity to farmers and related issues**
40. **Gender ration in schooling lvel- observation.**

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are;

Programmes for School Children
1. Reading Skill Programme (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Programme on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment
1. Government Guidelines and Policy Guidelines
2. Womens' Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps
1. General Medical camps
2. Eye Camps
3. Dental Camps

4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programmes on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programmes for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programmes

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programmes in consonance with the Govt. Departments like –
      i. Agriculture
     ii. Health
    iii. Marketing and Cooperation
     iv. Animal Husbandry
      v. Horticulture
     vi. Fisheries
    vii. Sericulture
   viii. Revenue and Survey
     ix. Natural Disaster Management
      x. Irrigation
     xi. Law & Order
    xii. Excise and Prohibition
   xiii. Mines and Geology
    xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.
- An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. **Preliminary Survey (One Week)**
   - A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
   - A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
   - The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

2. **Community Awareness Campaigns (One Week)**
   - Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. **Community Immersion Programme (Three Weeks)**
   Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

4. **Community Exit Report (One Week)**
   - During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks work to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.
   Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI&ML)– III-I Sem	L	T	P	C
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(20A30502a) SOFTWARE ENGINEERING FOR AI

Course Objectives:
- Study the concepts of software engineering
- Understand the issues in development of AI software
- Explore the methods for AI software development
- Discuss the concepts of Machine learning and Expert systems
- Demonstrate the use of AI in Software development

Course Outcomes:
After completion of the course, students will be able to
- Understand the methods and issues in software engineering
- Apply the principles of Artificial Intelligence for Software engineering
- Design AI based software
- Apply the Algorithms of Machine learning in solving problems
- Design Expert systems

UNIT I	Introduction to Computer Software for AI, AI Problems and Conventional SE Problems, Software Engineering Methodology	Lecture Hrs 12

Computers and software systems, An introduction to Software engineering, Bridges and buildings versus software systems, The software crisis, A demand for more software power, Responsiveness to human users, Software systems in new types of domains, Responsiveness to dynamic usage environments, Software systems with self-maintenance capabilities, A need for AI systems

What is an AI problem, Ill-defined specifications, correct versus 'good enough' solutions, It's the HOW not the WHAT, the problem of dynamics, The quality of modular approximations, Context-free problems?

Specify and verify—the SAV methodology, the myth of complete specification, what is verifiable, Specify and test—the SAT methodology, testing for reliability, the strengths, the weaknesses, what are the requirements for testing, what's in a specification, Prototyping as a link

UNIT II	An Incremental and Exploratory Methodology, New Paradigms for System Engineering	Lecture Hrs 8

Classical methodology and AI problems, The RUDE cycle, how do we start, Malleable software, AI muscles on a conventional skeleton How do we proceed, how do we finish, The question of hacking, Conventional paradigms

Automatic programming, Transformational implementation, The "new paradigm" of Blazer, Cheatham and Green, Operational requirements of Kowalski, The POLITE methodology

UNIT III	Towards a Discipline of Exploratory Programming, Machine Learning: Much Promise, Many Problems	Lecture Hrs 8

Reverse engineering, Reusable software Design knowledge, Stepwise abstraction, The problem of decompiling, Controlled modification, Structured growth

Self-adaptive software, The promise of increased software power, The threat of increased software problems

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UNIT IV	Machine Learning and Expert Systems	Lecture Hrs 10

Practical machine learning examples, Multisession inductive programming, Expert Systems: The Success Story, Expert systems as Al software, Engineering expert systems, The lessons of expert systems for engineering Al software

UNIT V   **AI into Practical Software**   Lecture Hrs: 8

Support environments, Reduction of effective complexity,Moderately stupid assistance, An engineering toolbox, Self-reflective software, Overengineering software, Summary and What the Future Holds

Textbooks:

1) Derek Partridge, "Artificial Intelligence and Software Engineering", Glenlake Publishing Company, 1998.

Reference Books:

1) Charles Rich and Richard C. Waters, Readings in Artificial Intelligence and Sofrware Engineering, Morgan Kaufmann, 2014.
2) Farid Meziane &Sunil Vadera, "Artificial Intelligence Applications for Improved Software Engineering Development", Information Science Reference, 2009

Online Learning Resources:
1) Software Engineering: Software Engineering - Course (nptel.ac.in)
2) Software Engineering: Software Engineering Tutorial - javatpoint
3) Coursera: Saeed Aghabozorgi, IBM AI Engineering Professional Certificate course(s), https://www.coursera.org/professional-certificates/ai-engineer

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI&ML)– III-I Sem   **L T P C**
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(20A05602T) MACHINE LEARNING
Common to CSE, IT, CSD, CSE(AI),CSE(AI&ML),CSE(DS),AI&DS,CSE(IOT)

Course Objectives:
The course is introduced for students to
- Understand basic concepts of Machine Learning
- Study different learning algorithms
- Illustrate evaluation of learning algorithms

Course Outcomes (CO):
After completion of the course, students will be able to
- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Design application using machine learning techniques

UNIT – I   Introduction to Machine Learning &Preparing to Model   Lecture 9Hrs
Introduction: What is Human Learning? Types of Human Learning, what is Machine Learning?Types of Machine Learning, Problems Not to Be Solved Using Machine Learning, Applications of Machine Learning, State-of-The-Art Languages/Tools in Machine Learning, Issues in Machine Learning
Preparing to Model: Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing

UNIT – II   Modelling and Evaluation &Basics of Feature Engineering   Lecture 9Hrs
Introduction, selecting a Model, training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model
Basics of Feature Engineering: Introduction, Feature Transformation, Feature Subset Selection

UNIT – III Bayesian Concept Learning & Supervised Learning: Classification Lecture 10Hrs
Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network
Supervised Learning: Classification: Introduction**,** Example of Supervised Learning**,** Classification Model**,** Classification Learning Steps**,** Common Classification Algorithms-*k*-Nearest Neighbour(*k*NN), Decision tree, Random forest model, Support vector machines

UNIT – IV   Supervised Learning: Regression   Lecture 10Hrs
Introduction, Example of Regression, Common Regression Algorithms-Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving Accuracy of the Linear Regression Model, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

UNIT – V   Unsupervised Learning Lecture 9Hrs
Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning, Clustering – Clustering as a machine learning task, Different types of clustering techniques, Partitioning methods,
K-Medoids: a representative object-based technique, Hierarchical clustering, Density-based methods-DBSCAN
Finding Pattern using Association Rule- Definition of common terms, Association rule, Theapriori algorithm for association rule learning, Build the aprioriprinciplerules

Textbooks:

1. Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

Reference Books:
1. EthernAlpaydin, "Introduction to Machine Learning", MIT Press, 2004.
2. Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014.
1. Andreas C. Müller and Sarah Guido "Introduction to Machine Learning with Python: A Guide for Data Scientists", Oreilly.

Online Learning Resources:
- Andrew Ng, "Machine Learning Yearning"
- https://www.deeplearning.ai/machine-learning- yearning/
- Shai Shalev-Shwartz , Shai Ben-David, "Understanding Machine Learning: From Theory to Algorithms" , Cambridge University Press https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech CSE (AI&ML)– III-I Sem   L T P C
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(20A05703c) DEEP LEARNING

Course Objectives:
- Demonstrate the major technology trends driving Deep Learning
- Build, train, and apply fully connected deep neural networks
- Implement efficient (vectorized) neural networks
- Analyse the key parameters and hyper parameters in a neural network's architecture

Course Outcomes:
After completion of the course, students will be able to
- Demonstrate the mathematical foundation of neural network
- Describe the machine learning basics
- Differentiate architecture of deep neural network
- Build a convolutional neural network
- Build and train RNN and LSTMs

UNIT I   **Lecture 8Hrs**
Linear Algebra: Scalars, Vectors, Matrices and Tensors, Matrix operations, types of matrices, Norms, Eigen decomposition, Singular Value Decomposition, Principal Components Analysis.
Probability and Information Theory: Random Variables, Probability Distributions, Marginal Probability, Conditional Probability, Expectation, Variance and Covariance, Bayes' Rule, Information Theory. Numerical Computation: Overflow and Underflow, Gradient-Based Optimization, Constrained Optimization, Linear Least Squares.

UNIT II   **Lecture 9Hrs**
Machine Learning: Basics and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Bayesian Statistics, Supervised and Unsupervised Learning, Stochastic Gradient Descent, Challenges Motivating Deep Learning. Deep Feed forward Networks: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and other Differentiation Algorithms.

UNIT III   **Lecture 8Hrs**
Regularization for Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop and Manifold Tangent Classifier. Optimization for Training Deep Models: Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT IV   **Lecture 9Hrs**
Convolutional Networks: The Convolution Operation, Pooling, Convolution, Basic Convolution Functions, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, Basis for Convolutional Networks.

UNIT V   **Lecture 8Hrs**
Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, LSTM, Gated RNNs, Optimization for Long-Term Dependencies, Auto encoders, Deep Generative Models.

Textbooks:
1. Ian Goodfellow, YoshuaBengio, Aaron Courville, "Deep Learning", MIT Press,2016.

2. Josh Patterson and Adam Gibson, "Deep learning: A practitioner's approach", O'Reilly Media, First Edition,2017.

Reference Books:
1. Fundamentals of Deep Learning, Designing next-generation machine intelligence algorithms, Nikhil Buduma, O'Reilly, Shroff Publishers,2019.
2. Deep learning Cook Book, Practical recipes to get started Quickly, DouweOsinga, O'Reilly, Shroff Publishers,2019.

Online Learning Resources:
- https://keras.io/datasets/
- http://deeplearning.net/tutorial/deeplearning.pdf
- https://arxiv.org/pdf/1404.7828v4.pdf
- https://www.cse.iitm.ac.in/~miteshk/CS7015.html
- https://www.deeplearningbook.org
- https://nptel.ac.in/courses/106105215

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech CSE (AI&ML)– III-I Sem   L   T   P   C
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(20A05504c)BIG DATA TECHNOLOGIES
Common to CSE, IT, CSE(AI), CSE(AI&ML), AI&DS

(Professional Elective Course– I)

Course Objectives:

To learn the big data characteristics, study challenges and Hadoop framework to handle big data.

Course Outcomes:

After completion of the course, students will be able to

- Understand the elements of Big data

- Use different technologies to tame Big Data

- Process Given data using Map Reduce

- Develop applications using Hive, NoSQL.

UNIT I   Lecture 8Hrs

Getting an Overview of Big Data: Introduction to Big Data, Structuring Big Data, Elements of Big Data, Big Data Analytics. Exploring the use of Big Data in Business Context Use of Big Data in Social Networking, Use of Big Data Preventing Fraudulent Activities, Use of Big Data in Retail Industry

UNIT II   Lecture 9Hrs

Introducing Technologies for Handling Big Data Distributed and Parallel Computing for Big Data, Introducing Hadoop, Cloud Computing and Big Data, In-memory Computing Technology for Big Data.

Understanding Hadoop Ecosystem Hadoop Ecosystem, Hadoop Distributed File System, Map Reduce, Hadoop YARN, Introducing HBase, Combining HBase and HDFS, Hive, Pig and Pig Latin, Sqoop, ZooKeeper, Flume, Oozie.

UNIT III   Lecture 9Hrs

Understanding Map Reduce Fundamentals and H Base The Map Reduce Framework, Techniques to Optimize Map Reduce Jobs, Uses of Map Reduce, Role of H Base in Big Data Processing. Processing Your Data with Map Reduce Recollecting he Concept of Map Reduce Framework, Developing Simple Map Reduce Application, Points to Consider while Designing Map Reduce.

UNIT IV Lecture 8Hrs

Customizing Map Reduce Execution and Implementing Map Reduce Program Controllong Map Reduce Execution with Input Format, Reading Data with Custom Record Reader, Organizing Output Data with Output Formats, Customizing Data with Record Writer, Customizing the Map Reduce Execution in Terms of YARN, Implementing a Map Reduce Program for Sorting Text Data.

Testing and Debugging Map Reduce Application Debugging Hadoop Map Reduce Locally, Performing Unit Testing for Map Reduce Applications.

UNIT V Lecture 8Hrs

Exploring Hive: Introducing Hive, Hive Service, Built-In Functions in Hive, Hive DDl, Data Manipulation in Hive, Data Retrieval Queries, Using JOINS in Hive.

NoSQL Data Management Introduction to NoSQL, Types of NoSQL Data Models, Schema-Less Databases, Materialized Views, Distribution Models, Sharding.

Textbooks:

1. Big Data Black Book, DT Editorial services, Dreamtech Press

Reference Books:

1. Data Science for Business by F. Provost and T. Fawcett, O'Reilly Media.

2. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced

3. Hadoop: The Definitive Guide by Tom White, O'Reilly Media.

4. Big Data and Business Analytics by Jay Liebowitz, Auerbach Publications, CRC Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI&ML)– III-I Sem	**L T P C** **3 0 0 3**

(20A05501T) COMPUTER NETWORKS

Common to CSE, IT, CSD, CSE(AI), CSE(AI&ML), AI&DS, CSE(IOT)

PROFESSIONAL ELCTIVE COURSE - I

Course Objectives:

The course is designed to

- Understand the basic concepts of Computer Networks.

- Introduce the layered approach for design of computer networks

- Expose the network protocols used in Internet environment

- Explain the format of headers of IP, TCP and UDP

- Familiarize with the applications of Internet

- Elucidate the design issues for a computer network

Course Outcomes (CO):

After completion of the course, students will be able to

- Identify the software and hardware components of a computer network

- Design software for a computer network

- Develop new routing, and congestion control algorithms

- Assess critically the existing routing protocols

- Explain the functionality of each layer of a computer network

- Choose the appropriate transport protocol based on the application requirements

UNIT I	**Computer Networks and the Internet**	Lecture 8Hrs

What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks(Textbook 2), Reference Models, Example Networks, Guided Transmission Media, Wireless Transmission(Textbook 1)

UNIT II	**The Data Link Layer, Access Networks, and LANs**	Lecture 10Hrs

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols (Textbook 1) Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks

Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request (Textbook 2)

UNIT III **The Network Layer** Lecture 8Hrs

Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1)

UNIT IV **The Transport Layer** Lecture 9Hrs

Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1)

UNIT V **Principles of Network Applications** Lecture 8Hrs

Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications Video Streaming and Content Distribution Networks (Textbook 2)

Textbooks:

1. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.

2. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", 6th edition, Pearson, 2019.

Reference Books:

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.

2. Youlu Zheng, Shakil Akthar, "Networks for Computer Scientists and Engineers", Oxford Publishers, 2016.

Online Learning Resources:

https://nptel.ac.in/courses/106105183/25

http://www.nptelvideos.in/2012/11/computer-networks.html

https://nptel.ac.in/courses/106105183/3

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B.Tech CSE (AI&ML)– III-I Sem	L	T	P	C
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(20A31501a) ROBOTICS PROCESS AUTOMATION
Professional Elective Course– I

Course Objectives:
- Describe Intelligent Automation and its impact on the transformation of business
- Study the technologies and best practices used to enable process automation
- Identify areas where Intelligent Automation is applicable and formulate its value (quantify and qualify).

Course Outcomes (CO):
After completion of the course, students will be able to
- Outline the benefits of RPA and various platforms available on the market.
- Describe RPA, where it can be applied and how it's implemented.
- Identify and understand different types of variables, Image, Text and Data Tables Automation.
- Understand the Deployment of the Robot and to maintain the connection.
- Describe how to handle the User Events and various types of Exceptions and strategies.

UNIT I RPA Foundations& RPA Skills   Lecture 8Hrs
What Is RPA? Flavors of RPA History of RPA, The Benefits of RPA, The Downsides of RPA, RPA Compared to BPO, BPM, and BPA, Consumer Willingness for Automation, The Workforce of the Future.
RPA Skills: On-Premise Vs. the Cloud, Web Technology, Programming Languages and Low Code, OCR (Optical Character Recognition),Databases,
APIs (Application Programming Interfaces), AI (Artificial Intelligence), Cognitive Automation, Agile, Scrum, Kanban, and Waterfall, DevOps, Flowcharts

UNIT II   Process Methodologies & Planning   Lecture 9Hrs
Lean, Six Sigma, How to Implement Six Sigma, Six Sigma Roles and Levels, Lean Six Sigma, Finding the Right Balance, Applying Lean and Six Sigma to RPA.
Planning: The Preliminaries, Use a Consulting Firm?
RPA Consulting: Some Case Studies, What to Automate? ROI for RPA, RPA Use Cases, The Plan

UNIT III RPA Vendor Evaluation & Center of Excellence (CoE)   Lecture 8Hrs
Be Realistic, Check Out Third Parties, Minimum Capabilities, Who Is the User?, Funding, Ecosystem, Costs, Training and Education, Support, Best-of-Breed vs. End-to-End, Thought Leadership and Vision, Industry Expertise, Security, Monitoring, and Deployment, What Type of RPA?, The Design, Next-Generation Technologies
Center of Excellence (CoE): What Is the CoE? Why Have a CoE? Forming the Team, Business Analyst, Developer, RPA Solution Architect, RPA Supervisor, What Should a CoE Do? Communication, Change Management, CoE Case Study: Intuit

UNIT IV   Bot Development, Deployment and Monitoring & Data Preparation Lecture 10Hrs
Preliminaries, Installation of UiPath, Getting Started, Activities, Flowcharts and Sequences, Log Message, Variables, Loops and Conditionals, For Each Loop, Do While Loop and While Loop, IF/THEN/ELSE Conditionals, Switch, Debug, Common UiPath Functions, The UiPath Orchestrator, Best Practices for Bot Development
Deployment and Monitoring: Testing, Going into Production, Monitoring, Security, Scaling
Data Preparation: Types of Data, Big Data, The Issues with Big Data, The Data Process, Types of Algorithms, The Perils of the Moonshot, Bias

UNIT V   Open Source RPA, Process Mining & Future of RPA   Lecture 9 Hrs
What Is Open Source Software?, The Business Model of Open Source?, The Pros and Cons of Open Source Software, Open RPA, UI. Vision, Robot Framework, Robocorp, Orchestra, TagUI
Process Mining: Old Way Vs. Process Mining, Backgrounder on Process Mining, How Process Mining Works, Celonis, ProM, Signavio, Fluxicon, ABBYY, The Future of Process Mining
Future of RPA: Consolidation and IPOs, Microsoft, Attended Automation, Vertical-Specific Companies, Hype Factor, Software-as-a-Service (SaaS) and Open Source, Chatbots, Artificial Intelligence, Privacy and Ethics.

Textbooks:
1. Tom Taulli, "The Robotic Process Automation Handbook", Apress, 2020
Reference Books:
   1. Alok Mani Tripathi, "Learning Robotic Process Automation", March 2018
   2. Robotic process and Cognitive Automation by, Mary C Lacity& Leslie P Willcocks, 2018.
Online Learning Resources:
1. https://www.uipath.com/rpa/robotic-process-automation
2. https://www.academy.uipath.com

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B.Tech CSE (AI&ML)– III-I Sem   **L   T   P   C**

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(20A05602P) MACHINE LEARNING LAB
Common to CSE, CSD,CSE(AI),CSE(AI&ML),CSE(DS),AI&DS

Course Objectives:
- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.

Course Outcomes (CO):
After completion of the course, students will be able to
- Understand the Mathematical and statistical prospectives of machine learning algorithms through python programming
- Appreciate the importance of visualization in the data analytics solution.
- Derive insights using Machine learning algorithms

List of Experiments:
Note:
     a. The programs can be implemented in either JAVA or Python.
     b. For Problems 1 to 6 and 10, programs are to be developed without using the built-in classes or APIs of Java/Python.
     c. Data sets can be taken from standard repositories (https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm.
   Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets.
5. 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.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Projects
     1. Predicting the Sale price of a house using Linear regression
     2. Spam classification using Naïve Bayes algorithm
     3. Predict car sale prices using Artificial Neural Networks

4. Predict Stock market trends using LSTM
5. Detecting faces from images

References:
1. Python Machine Learning Workbook for beginners, AI Publishing, 2020.

Online Learning Resources/Virtual Labs:
1) Machine Learning A-Z (Python & R in Data Science Course) | Udemy
2) Machine Learning | Coursera

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B.Tech CSE (AI&ML)– III-I Sem   L   T   P   C

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(20A31502) DEEP LEARNING LAB

Course Objectives:
- Understand the context of Neural networks and deep learning.
- Introduce major Deep learning algorithms, the problem settings, and their applications to solve real world problems

Course Outcomes (CO):

After completion of the course, students will be able to
- Identify the Deep learning algorithms which are more appropriate for various types of learning tasks in various domains
- Implementing Deep learning algorithms and solve real-world problems.

List of Experiments:
1. Introduction of Keras.
2. Installing Keras and packages in Keras.
3. Train the model to add two numbers and report the result.
4. Train the model to multiply two matrices and report the result using keras.
5. Train the model to print the prime numbers using Keras
6. Recurrent Neural Network
   a. Numpy implement of a simple recurrent neural network
   b. Create a recurrent layer in keras
   c. Prepare IMDB data for movie review classification problem.
   d. Train the model with embedding and simple RNN layers.
   e. Plot the Results
7. Consider temperature-forecast as one the example for recurrent neural network and implement the following.
   a. Inspect the data of the weather dataset
   b. Parsing the data
   c. Plotting the temperature timeseries
   d. Plotting the first 10 days of the temperature timeseries
8. Long short-term memory network
   a. Implement LSTM using LSTM layer in keras
   b. Train and evaluate using reversed sequences for IMDB data
   c. Train and evaluate a bidirectional LSTM for IMDB data
   Train and evaluate a Gated Recurrent Unit based model
   a. By using GRU layer
   b. By adding dropout and recurrent dropout to GRU layer.
   c. Train a bidirectional GRU for temperature prediction data
   Convolutional Neural Networks
   a. Preparing the IMDB data
   b. Train and evaluate a simple 1D convent on IMDB Data
   c. Train and evaluate a simple 1D convent on temperature prediction data
   Develop a traditional LSTM for sequence classification problem.

PROJECTS:
1)Write a program for Multilabel Movie Poster Classification.
2)Write a program for Predicting Bike-Sharing patterns

References:
1) Ian Goodfellow, YoshuaBengio, Aaraon Courville, "Deep Learning (Adaptive Computation and Machine Learning series)", MIT Press, 2016.

Online Learning Resources/Virtual Labs:

1)Introduction to Deep Learning Course | Introduction to Deep Learning Course (rses-dl-course.github.io)
2)Deep Learning | Introduction to Long Short Term Memory - GeeksforGeeks

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B.Tech CSE (AI&ML)– III-I Sem   **L   T P C**
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(20A30503) WEB APPLICATION DESIGN
Skill Oriented Course - III

Course Objectives:
- Explore the programming aspects of Web
- Teach concepts related to client side and server-side programming
- Understand Full Stack Development

Course Outcomes (CO):
After completion of the course, students will be able to
- Develop Client-side applications
- Develop Server-side applications
- Connect to Databases
- Design comprehensive web applications

Activities:

Module 1:
Introduction, MERN Components: React, Node.js, Express, MongoDB, Tools and Libraries, Why MERN? JavaScript Everywhere, JSON Everywhere , Node.js Performance, The npm Ecosystem Isomorphic, It's Not a Framework!
Hello World: Server-Less Hello World, Server Setup, Build-Time JSX Compilation

Task: Create a simple Hello world web page using node.js and express.

Module 2:
React Components, Issue Tracker, React Classes, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition.
React State, Async State Initialization, Event Handling, communicating from child to parent, Stateless Components, Designing Components: State vs. Props, Component Hierarchy, Communication, Stateless Components.

Task: Create the Issue Tracker Application: -
1. The user should be able to view a list of issues, with an ability to filter the list by various parameters.
2. The user should be able to add new issues, by supplying the initial values of the issue's fields.
3. The user should be able to edit and update an issue by changing its field values.
4. The user should be able delete an issue.
5. An issue should have following attributes: A title that summarizes the issue (freeform long text),An owner to whom the issue is assigned (freeform short text), A status indicator (a list of possible status values),Creation date (a date, automatically assigned),Effort required to address the issue (number of days, a number),Estimated completion date or due date (a date, optional)

Module 3:
Express REST APIs, REST: Resource Based, HTTP Methods as Actions, JSON ,Express: Routing, Handler Function, Middleware, The List API: Automatic Server Restart ,Testing. The Create API , Using the List API, Using the Create API, Error Handling.

Task : Create a Issues API to
1. Show the list of Issues which are sorted according to creation date.
2. To create the new Issue.
3. To delete the existing Issue title.
4. To update the existing Issue.

Module 4:

MongoDB Basics: Documents, Collections, Databases, Query Language, Installation, The mongo Shell, Shell Scripting, Schema Initialization, MongoDB Node.js Driver, Reading from MongoDB, Writing to MongoDB.

Task : Develop the Student Management API to store the student data into Database :-
1. To add the new students.
2. To remove the existing student.
3. To update the existing student details.
4. To list all the students.
5. To list all the students based on Roll Number or any unique ID or Age.
6. The student should have the following attributes:- Name , Date of Birth , Branch , Year of Study , Address , Roll Number or any unique ID.

Module 5:
Modularization and Webpack: Server-Side Modules, Introduction to Webpack, Using Webpack Manually, Transform and Bundle, Libraries Bundle, Hot Module Replacement, HMR using Middleware, Debugging, Server-Side ES2015, ESLint.
Routing with React Router : Routing Techniques, Simple Routing, Route Parameters, Route Query String, Programmatic Navigation, Nested Routes, Browser History.

Forms: More Filters in the List API, Filter Form, The Get API, Edit Page, UI Components: Number Input , Data Input, Update API , Using the Update API, Delete API, Using the Delete API.
React-Bootstrap: Bootstrap Installation, Navigation, Table and Panel, Forms: Grid-Based Forms, Inline Forms, Horizontal Forms, Alerts: Validations, Results , Modals.

Task: Develop the Student Management System website for the College.

1. The admins should be able to Sign In, Sign out from the website.
2. The admin should be able to see the Dashboard after successful sign in.
3. The Dashboard should contain the Add Student, Delete Student, Update Student, List Student.
4. The admin should able filter the students based on branch or Roll Number or Date of Birth.
Task: Develop the Bookstore Library Website:
1. It should contain the 2 interfaces: User and Admin Interface.
2. User should be able do the following:
    - browse books from the library
    - filter them based on category, author, publications etc.
    - Rent them for a specific duration
    - Like/Review them
3. Admin should be able do the following:
    - List/manage books
    - Track rented books and their availability
4. Deploy the application in Netlify.

References:
    1.   VasanSubramanian , Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, APress, 2nd Edition, 2019.
Online Learning Resources/Virtual Labs:
    1.   https://nodejs.org/en/
    2.   https://expressjs.com/
    3.   https://www.mongodb.com/
    4.   https://reactjs.org/
    5.   https://www.netlify.com/

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B.Tech CSE (AI&ML)– III-I Sem   **L   T   P   C**
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20A99201 ENVIRONMENTAL SCIENCE
(Common to All Branches of Engineering)

Course Objectives:
- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life
- To save earth from the inventions by the engineers.

Course Outcomes (CO):
    At the end of the course, the student will be able to
- Grasp multidisciplinary nature of environmental studies and various renewable and nonrenewable resources.
- Understand flow and bio-geo- chemical cycles and ecological pyramids.
- Understand various causes of pollution and solid waste management and related preventive measures.
- About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
- Casus of population explosion, value education and welfare programmes.

UNIT - I   **8 Hrs**

Multidisciplinary Nature Of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT - II   **12 Hrs**

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:
     a.   Forest ecosystem.
     b.   Grassland ecosystem
     c.   Desert ecosystem
     d.   Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity And Its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT - III   **8 Hrs**

Environmental Pollution: Definition, Cause, effects and control measures of :
     a.   Air Pollution.
     b.   Water pollution
     c.   Soil pollution
     d.   Marine pollution
     e.   Noise pollution

    f.   Thermal pollution
    g.   Nuclear hazards

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT - IV   **10 Hrs**

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT - V   **8 Hrs**

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

Textbooks:
1. Text book of Environmental Studies for Undergraduate Courses ErachBharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education
3. S.AzeemUnnisa, "Environmental Studies" Academic Publishing Company
4. K.Raghavan Nambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

Reference Books:

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech CSE (AI&ML)– III-II Sem   L   T   P   C
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(20A05702c) NATURAL LANGUAGE PROCESSING
Course Objectives:
- Explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP)
- Understand approaches to syntax and semantics in NLP.
- Understand current methods for statistical approaches to machine translation.
- Understand language modeling.
- Understand machine learning techniques used in NLP.

Course Outcomes (CO):
After completion of the course, students will be able to
- Understand the logic behind Natural languages
- Understand the significance of syntax and semantics of natural languages
- Process the Natural languages
- Verify the syntax and semantics of languages
- Design new natural languages

UNIT – I   Introduction to Natural language   Lecture 8Hrs
The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English Syntax.

UNIT - II   Grammars and Parsing   Lecture 8Hrs
Grammars and Parsing- Top- Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayes Rule, Shannon game, Entropy and Cross Entropy.

UNIT - III   Grammars for Natural Language   Lecture 9Hrs
Grammars for Natural Language, Movement Phenomenon in Language, Handling questions in Context Free Grammars, Hold Mechanisms in ATNs, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT - IV   Interpretation and Modelling   Lecture 9Hrs
Semantic Interpretation-Semantic & Logical form, Word senses & ambiguity, the basic logical form language, encoding ambiguity in the logical Form, Verbs & States in logical form, Thematic roles, Speech acts &embedded sentences, Defining semantics structure model theory.
Language Modelling-Introduction, n-Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language-Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.

UNIT - V   Machine Translation and Multilingual Information   Lecture9 Hrs
Machine Translation Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status. Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusaraka Output, Language Bridges.
Multilingual Information Retrieval - Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.
Multilingual Automatic Summarization - Introduction, Approaches to Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

Textbooks:
1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory to Practice-Daniel M.Bikel and ImedZitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineet Chaitanya, Prentice – Hall of India.

Reference Books:
1. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.

2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall, 2008.
3. Manning, Christopher and Henrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

Online Learning Resources:
http://peterindia.net/AILinks.html

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI&ML)– III-II Sem   L   T   P   C
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(20A33601T) ADVANCED MACHINE LEARNING

Course Objectives:
The course is introduced for students to
- Study different advanced machine learning algorithms
- Discuss about evaluation of learning algorithms
- Explore Python concepts related to machine learning

Course Outcomes (CO):
After completion of the course, students will be able to
- Use Deep belief networks and CNN
- Identify machine learning techniques suitable for a given problem
- Solve the problems using various machine learning techniques
- Apply Feature Engineering
- Design application using machine learning techniques

UNIT - I   Unsupervised Machine Learning & Deep Belief Networks   Lecture 8 Hrs

Principal component analysis, Introducing K-means clustering, self-organizing maps. Deep Belief Networks: Neural networks – a primer, composition of a neural network, network topologies, Restricted Boltzmann Machine, Introducing the RBM, Applications of the RBM, Further applications of the RBM, Deep belief Networks-Training a DBN, Applying the DBN, Validating the DBN

UNIT –IIStacked Denoising Autoencoders & Convolutional Neural NetworksLecture 9 Hrs

Autoencoders, Introducing the autoencoder, Topology, Training, Denoising autoencoders, ApplyingadA, Stacked Denoising Autoencoders, Applying the SdA, Assessing SdA performance

Convolutional Neural Networks: Introduction to CNN, Understanding the convnet topology, understanding convent layers and pooling layers, training a convent, Applying a CNN

UNIT - III   Semi-Supervised Learning & Text Feature Engineering   Lecture 9 Hrs

Introduction, understanding semi-supervised learning, Semi-supervised algorithms in action, Self-training, implementing self-training, Finessing your self-training implementation, Contrastive Pessimistic Likelihood Estimation

Text Feature Engineering: Introduction, Text feature engineering, Cleaning text data, Text cleaning with Beautiful Soup, managing punctuation and tokenizing, Tagging and categorizing words, creating features from text data, stemming, Bagging and random forests, Testing our prepared data

UNIT - IV   Feature Engineering   Lecture 9 Hrs

Introduction, creating a feature set, Engineering features for ML applications, using rescaling techniques to improve the learnability of features, creating effective derived variables, reinterpreting non-numeric features, using feature selection techniques, Performing feature selection, Feature engineering in practice, Acquiring data via RESTful APIs, Testing the performance of our model, Twitter, Deriving and selecting variables using feature engineering techniques

UNIT –VEnsemble Methods & Additional Python Machine Learning ToolsLecture 8 Hrs

Introducing ensembles, understanding averaging ensembles, using bagging algorithms, using random forests, applying boosting methods, Using XGBoost, Using stacking ensembles, Applying ensembles in practice, Using models in dynamic applications, Understanding model robustness, Identifying modeling risk factors, Strategies to managing model robustness

Additional Python Machine Learning Tools: Alternative development tools, Introduction to Lasagne, getting to know Lasagne, Introduction to Tensor flow, knowing when to use these libraries

Textbooks:
1. John Hearty, Advanced Machine Learning with Python, Packt Publishing Ltd, 2016.

Reference Books:
1. T.M. Mitchell, "Machine Learning", McGraw-Hill,1997.
2. Machine Learning, SaikatDutt, Subramanian Chandramouli, Amit Kumar Das, Pearson, 2019.

Online Learning Resources:www.packtpub.com

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI&ML)– III-II Sem   L   T   P   C
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(20A05701a) CLOUD COMPUTING
Common to CSE,IT, CSD, CSE(AI), CSE(AI&ML), CSE(DS), AI&DS

Course Objectives:
- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

Course Outcomes (CO):
After completion of the course, students will be able to
- Ability to create cloud computing environment
- Ability to design applications for Cloud environment
- Design & develop backup strategies for cloud data based on features.
- Use and Examine different cloud computing services.
- Apply different cloud programming model as per need.

UNIT - I   **Basics of Cloud computing**   Lecture 8Hrs
Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications
Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.
Cloud Services and Platforms: Compute Services, Storage Services, Database Services, Application services, Content delivery services, Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

UNIT - II   **Hadoop and Python**   Lecture 9Hrs
Hadoop MapReduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Cluster setup.
Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.
Python Basics: Introduction, Installing Python, Python data Types & Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.

UNIT - III   **Python for Cloud computing**   Lecture 8Hrs
Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for MapReduce, Python packages of Interest, Python web Application Frame work, Designing a RESTful web API.
Cloud Application Development in Python: Design Approaches, Image Processing APP, Document Storage App, MapReduce App, Social Media Analytics App.

UNIT - IV   **Big data, multimedia and Tuning**   Lecture 8Hrs
Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems.
Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transcoding App.
Cloud Application Benchmarking and Tuning: Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study.

UNIT - V   **Applications and Issues in Cloud**   Lecture 9 Hrs
Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.
Cloud for Industry, Healthcare &Education: Cloud Computing for Healthcare, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.
Migrating into a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven–

step model of migration into a cloud.

Organizational readiness and Change Management in The Cloud Age: Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self – assessment.

Legal Issues in Cloud Computing: Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and data location, commercial and business considerations, Special Topics.

Textbooks:

1. Cloud computing A hands-on Approach‖ By ArshdeepBahga, Vijay Madisetti, Universities Press, 2016

2. Cloud Computing Principles and Paradigms: By Raj Kumar Buyya, James Broberg, Andrzej Goscinski, Wiley, 2016

Reference Books:

1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, SThamaraiSelvi, TMH
2. Cloud computing A Hands-On Approach by ArshdeepBahga and Vijay Madisetti.
3. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Tata McGraw Hill, rp2011.
4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O 'Reilly, SPD, rp2011.
6. Essentials of Cloud Computing by K. Chandrasekaran. CRC Press.

Online Learning Resources:

Cloud computing - Course (nptel.ac.in)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI&ML)– III-II Sem
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(20A31601a) ROBOTICS
(Professional Elective Course– II)

Course Objectives:
- Discuss the basics of Robotics
- Understand the working of Robots
- Demonstrate the building of Robots

Course Outcomes:
- Ability to process end effectors and robotic controls.
- Analyze Robot Transformations and Sensors
- Able to understand Robot cell design and applications

UNIT I **Introduction** Lecture 9 Hrs

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems Specifications of Robot-Speed of Robot-Robot joints and links-Robot Classifications-Architecture of robotic systems

UNIT II **End Effectors and Robot Controls** Lecture 9 Hrs

Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysitims-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot Control system for robot joint-Control actions-Feedback devices-Encoder, Resolver, LVDTMotion Interpolations-Adaptive control.

UNIT III **Robot Transformations and Sensors** Lecture 9 Hrs

Robot Transformations and Sensors: Robot Kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation- Homogeneouscoordinates, multiple transformation-Simple problems. Sensors in robot – Touch Sensors-Tactile sensor – Proximity and range sensors – Robotic vision sensor-Force Sensor-Light sensors, Pressure sensors.

UNIT IV **Robot Cell Design and Applications** Lecture 8 Hrs

Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle, actuation using MATLAB, NXT Software Introductions-Robot applications Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting and undersea robot.

UNIT V **Micro/Nano Robotics System** Lecture 9 Hrs

Micro/Nanorobotics system overview-Scaling Effect-Top down and bottom up approach Actuators of Micro/Nano robotics system-Nano robot communication techniques-Fabrication of micro/nano grippers-Wall climbing micro robot working principles-Biomimetic robot-Swarm robot-Nano robot in targeted drug delivery system

Textbooks:

1.S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education.,2009

2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012.

Reference Books:

1.Carl D. Crane and Joseph Duffy, Kinematic Analysis of Robot manipulators, Cambridge University press, 2008.

2. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., "Robotics control, sensing, vision and intelligence", McGraw Hill Book co, 1987

3. Craig. J. J. "Introduction to Robotics mechanics and control", Addison- Wesley, 1999.

4. Ray Asfahl. C., "Robots and Manufacturing Automation", John Wiley & Sons Inc., 1985.

Online Learning Resources:

1. Robotics | Coursera

2. Introduction to robotics - Course (nptel.ac.in)

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B.Tech CSE (AI&ML)– III-II Sem

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(20A33602a) AUTOMATION OF MODEL BUILDING
(Professional Elective Course-II

Course Objectives:
To train students with in-depth and advanced knowledge to become professional and capable of identifying, analyzing and solving complex problems in the areas of Automation Engineering.

Course Outcomes (CO):
After completion of the course, students will be able to
- Acquire, demonstrate and apply advanced knowledge in the area of Automation engineering.
- Identify problems in the field of Automation engineering, formulate them and solve by using advanced techniques.
- Apply engineering and scientific principles for the effective management of Automation systems.

UNIT I   Lecture 8Hrs
Introduction to AutoML: Scope of machine learning, what is AutoML? Why use AutoML and how does it help? When do you automate ML? What will you learn? Core components of AutoML system, Building prototype subsystems for each component. Putting it all together as end & end AutoML System Overview of AutoML libraries.

UNIT - II   Lecture 9Hrs
Introduction to Machine Learning Using Python: Technical requirements, Machine learning, Linear regression, What is linear regression? important evaluation metrics regression algorithms, Logistic regression, Important evaluation metrics, classification algorithms, Decision trees, Support Vector Machines, k-Nearest Neighbours, Ensemble methods, Comparing the results of classifiers, Cross-validation: Clustering**.**

UNIT - III   Lecture 9Hrs
Data Preprocessing: Technical requirements, Data transformation, Numerical data transformation, Categorical data transformation, Text Preprocessing, Feature selection, Feature generation.
Automated Algorithm Selection: Technical requirements, Computational complexity, Differences in training and scoring time, Linearity versus non-linearity, Necessary feature transformations, supervised ML, Unsupervised AutoML.

UNIT - IV   Lecture 8Hrs
Hyperparameter Optimization: Technical requirements, Hyperparameters, Warm start, Bayesian-based hyperparameter tuning, An example system
Creating AutoML Pipelines: Technical requirements, An introduction to machine learning pipelines, A simple pipeline, Function Transformer, A complex pipeline.

UNIT - V   Lecture 8Hrs
Dive into Deep Learning: Technical requirements, Overview of neural networks, Neuron, Activation functions, A feed-forward neural network using Keras: Autoencoders, Convolutional Neural Networks.
Critical Aspects of ML and Data Science Projects: Machine learning as a search, Trade-offs in machine learning, Engagement model for a typical data science project, The phases of an engagement model.

Textbooks:
1. Sibanjan Das, UmitMertCakmak "Hands-On Automated Machine Learning" Packt Publishing, 2018.

Reference Books:
1. EthernAlpaydin, "Introduction to Machine Learning", MIT Press,2004.
2. Stephen Marsland, "Machine Learning -An Algorithmic Perspective", Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series,2014.

Online Learning Resources:
Machine Learning for Construction Automation – NPTEL+

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI&ML)– III-II Sem

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(20A05604c) COMPUTER VISION
Common to CSE, IT,CSD, CSE(AI), CSE(AI&ML)AI&DS
(Professional Elective Course– II)

Course Objectives:

The objective of this course is to understand the basic issues in computer vision and major approaches to address the methods to learn the Linear Filters, segmentation by clustering, Edge detection, Texture.

Course Outcomes:

After completing the course, you will be able to:

- Identify basic concepts, terminology, theories, models and methods in the field of computer vision,
- Describe known principles of human visual system,
- Describe basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition,
- Suggest a design of a computer vision system for a specific problem

UNIT I   **LINEAR FILTERS**   Lecture 8Hrs

Introduction to Computer Vision, Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing Filters as Templates, Technique: Normalized Correlation and Finding Patterns, Technique: Scale and Image Pyramids.

UNIT II   **EDGE DETECTION**   Lecture 9Hrs

Noise- Additive Stationary Gaussian Noise, Why Finite Differences Respond to Noise, Estimating Derivatives - Derivative of Gaussian Filters, Why Smoothing Helps, Choosing a Smoothing Filter, Why Smooth with a Gaussian? Detecting Edges-Using the Laplacian to Detect Edges, Gradient-Based Edge Detectors, Technique: Orientation Representations and Corners.

UNIT III   **TEXTURE**   Lecture 9Hrs

Representing Texture –Extracting Image Structure with Filter Banks, Representing Texture using the Statistics of Filter Outputs, Analysis (and Synthesis) Using Oriented Pyramids – The Laplacian Pyramid, Filters in the Spatial Frequency Domain, Oriented Pyramids,

Application: Synthesizing Textures for Rendering, Homogeneity, Synthesis by Sampling Local Models, Shape from Texture, Shape from Texture for Planes,

UNIT IV   SEGMENTATION BY CLUSTERING   Lecture 8Hrs

What is Segmentation, Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction. Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering. The Hough Transform, Fitting Lines, Fitting Curves

UNIT V   RECOGNIZATIONBYRELATIONSBETWEENTEMPLATES   Lecture 8Hrs

Finding Objects by Voting on Relations between Templates, Relational Reasoning Using Probabilistic Models and Search, Using Classifiers to Prune Search, Hidden Markov Models, Application: HMM and Sign Language Understanding, Finding People with HMM.

Textbooks:

David A. Forsyth, Jean Ponce, Computer Vision – A modern Approach, PHI, 2003.

Reference Books:

1. Geometric Computing with Clifford Algebras: Theoretical Foundations and Applications in Computer Vision and Robotics, Springer;1 edition,2001by Sommer.
2. Digital Image Processing and Computer Vision,1/e,bySonka.
3. Computer Vision and Applications: Concise Edition (WithCD) by Jack Academy Press, 2000.

Online Learning Resources:

https://nptel.ac.in/courses/106105216

https://nptel.ac.in/courses/108103174

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI&ML)– III-II Sem	L	T	P	C
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(20A30603) NATURAL LANGUAGE PROCESSING LAB

Course Objectives:
- To introduce the students with the basics of NLP which will empower them for developing advanced NLP tools and solving practical problems in the field.

Course Outcomes (CO):

After completion of the course, students will be able to
- Understand approaches to syntax and semantics in NLP.
- Analyse grammar formalism and context free grammars
- Apply the statistical estimation and statistical alignment models
- Apply Rule based Techniques, Statistical Machine translation (SMT), word alignment, phrase-based translation
- Have the skills (experience) of solving specific NLP tasks, which may involve programming in Python, as well as running experiments on textual data.

List of Experiments:

1. Word Analysis
2. Word Generation
3. Morphology
4. N-Grams
5. N-Grams Smoothing
6. POS Tagging: Hidden Markov Model
7. POS Tagging: Viterbi Decoding
8. Building POS Tagger
9. Chunking
10. Building Chunker

Refer: https://nlp-iiith.vlabs.ac.in/List%20of%20experiments.html

References:

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineet Chaitanya, Prentice –Hall of India.

Online Learning Resources/Virtual Labs:

1. Natural Language Processing in TensorFlow | Coursera

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI&ML)– III-II Sem
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(20A33601P) ADAVNCED MAHINE LEARNING LAB

Course Objectives:
- Study various learning algorithms
- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice
- Learn about feature engineering
- To develop skills of using recent machine learning packages for solving practical problems

Course Outcomes (CO):
At the end of the course students will be able to:
- Familiarize with Python
- Able to generate, analyze and interpret data using Python.
- Use Python to design and implement classifiers for machine learning applications.
- Implement an end to end Machine Learning System

List of Experiments:
1. The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result.
2. Create a K-Means Clustering Algorithm from Scratch in Python?
3. Implement k-nearest neighbours classification using python
4. Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k-means clustering with 3 means (i.e., 3 centroids) VAR1 VAR2 CLASS 1.713 1.586 0 0.180 1.786 1 0.353 1.240 1 0.940 1.566 0 1.486 0.759 1 1.266 1.106 0 1.540 0.419 1 0.459 1.799 1 0.773 0.186 1
5. The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.

Income	Recreation	Job	Status	Age group	Home-owner	Risk
Medium	skiing	design	single	twenties	no	High risk
High	golf	trading	married	forties	yes	Low risk
Low	speedway	transport	married	thirties	yes	Med risk
Medium	football	banking	single	thirties	yes	Low risk
High	flying	media	married	fifties	yes	High risk
Low	football	security	single	twenties	no	Med risk
Medium	golf	media	single	thirties	yes	Med risk
Medium	golf	transport	married	forties	yes	Low risk
High	skiing	banking	single	thirties	yes	High risk
Low	golf	unemployed	married	forties	yes	High risk

Input attributes are (from left to right) income, recreation, job, status, age group, home-owner. Find the unconditional probability of `golf' and the conditional probability of `single' given `med Risk' in the dataset?
6. Implement linear regression using python.
7. Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets.
8. Implement Naïve Bayes' theorem to classify the English text
9. Use the appropriate dataset for implementing feature engineering for machine learning to find
   - Missing data imputation
   - Categorical encoding
   - Outliers

- Feature scaling
- Mixed variables
10. Design an Optical Character Recognizer
11. Design Heart Attack risk predictor using Auto ML
12. Design Petrol price forecasting using Auto Keras
13. Design Cricket score prediction using TPOT (Auto ML)

References:
1. Advanced Machine Learning with python: by john hearty, 2016
2. Hands-On Machine Learning with Scikit-Learn and Tensor Flow (2nd Edition) by Aurelian Ger, 2020
3. Y. S. Abu-Mostafa, M. Magdon-Ismail, H.-T. Lin. Learning from Data: A Short Course. First Edition, 2012
4. C. M. Bishop. Pattern Recognition and Machine Learning. First Edition. Springer, 2006. (Second Indian Reprint, 2015).
5. S. J. Russell, P. Norvig. Artificial Intelligence: A Modern Approach. Third Edition, Prentice-Hall, 2010.
Online Learning Resources/Virtual Labs:
https://github.com/jiadaizhao/Advanced-Machine-Learning-Specialization

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B.Tech (AI &ML)– III-II Sem	L	T	P	C
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(20A121604) CLOUD COMPUTING LAB
Common to IT, CSE(AI), CSE(AI&ML), CSE(DS), AI&DS

Course Objectives:
- Demonstrate application development using Cloud
- Explain features of Hadoop

Course Outcomes (CO):
On completion of this course, the students will be able to:
- Configure various virtualization tools such as Virtual Box, VMware workstation.
- Design and deploy a web application in a PaaS environment.
- Learn how to simulate a cloud environment to implement new schedulers.
- Install and use a generic cloud environment that can be used as a private cloud.
- Manipulate large data sets in a parallel environment.

List of Experiments:
1. Install VirtualBox/VMware Workstation with different flavours of Linux or windows OS on top of windows operating systems.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version)
8. Install Hadoop single node cluster and run simple applications like wordcount
9. Establish an AWS account. Use the AWS Management Console to launch an EC2 instance and connect to it.
10. Develop a Guestbook Application using Google App Engine
11. Develop a Serverless Web App using AWS
12. Design a Content Recommendation system using AWS
13. Design a Cloud based smart traffic management system
14. Design Cloud based attendance management system
15. Design E-learning cloud-based system
16. Using Amazon Lex build a Chatbot

References:
1. https://www.vmware.com/products/workstation-pro/workstation-pro-evaluation.html.
2. http://code.google.com/appengine/downloads.html
3. http://code.google.com/appengine/downloads.html

Online Learning Resources/Virtual Labs:
1. Google Cloud Computing Foundations Course - Course (nptel.ac.in)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech CSE (AI &ML)– III-II Sem   **L   T   P   C**
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(20A52401) SOFT SKILLS
(Skill Oriented course – IV)

Course Objectives:
- To encourage all round development of the students by focusing on soft skills
- To make the students aware of critical thinking and problem-solving skills
- To develop leadership skills and organizational skills through group activities
- To function effectively with heterogeneous teams

Course Outcomes (CO):
By the end of the program students should be able to
- Memorize various elements of effective communicative skills
- Interpret people at the emotional level through emotional intelligence
- apply critical thinking skills in problem solving
- analyse the needs of an organization for team building
- Judge the situation and take necessary decisions as a leader
- Develop social and work-life skills as well as personal and emotional well-being

UNIT I   **Soft Skills & Communication Skills**   **10 Hrs**
Introduction, meaning, significance of soft skills – definition, significance, types of communication skills - Intrapersonal & Inter-personal skills - Verbal and Non-verbal Communication

Activities:
Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self- expression – articulating with felicity
(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)
Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.
Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing-negotiating- agreeing and disagreeing with professional grace.
Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

UNIT II   **Critical Thinking**   **10 Hrs**
Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking
Activities:
Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT III   **Problem Solving & Decision Making**   **10 Hrs**
Meaning & features of Problem Solving – Managing Conflict – Conflict resolution –
Methods of decision making – Effective decision making in teams – Methods & Styles

Activities:
Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.
Case Study & Group Discussion
UNIT IV   **Emotional Intelligence & Stress Management**   **10 Hrs**

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:
Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.
Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT V	Leadership Skills	10 Hrs

Team-Building – Decision-Making – Accountability – Planning – Public Speaking – Motivation – Risk-Taking - Team Building - Time Management

Activities:
Forming group with a consensus among the participants- choosing a leader- encouraging the group members to express views on leadership- democratic attitude- sense of sacrifice – sense of adjustment – vision – accommodating nature- eliciting views on successes and failures of leadership using the past knowledge and experience of the participants, Public Speaking, Activities on Time Management, Motivation, Decision Making, Group discussion etc.

NOTE-:
 1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear or for good Leadership – Mahendar Singh Dhoni etc.

Textbooks:
1. Personality Development and Soft Skills (English, Paperback, Mitra BarunK.)Publisher: Oxford University Press; Pap/Cdr edition (July 22, 2012)
2. Personality Development and Soft Skills: Preparing for Tomorrow, Dr Shikha KapoorPublisher : I K International Publishing House; 0 edition (February 28, 2018)

Reference Books:
1. Soft skills: personality development for life success by Prashant Sharma, BPB publications 2018.
2. Soft Skills By Alex K. Published by S.Chand
3. Soft Skills: An Integrated Approach to Maximise Personality Gajendra Singh Chauhan, Sangeetha Sharma Published by Wiley.
4. Communication Skills and Soft Skills (Hardcover, A. Sharma) Publisher: Yking books
5. SOFT SKILLS for a BIG IMPACT (English, Paperback, RenuShorey) Publisher: Notion Press
6. Life Skills Paperback English Dr. Rajiv Kumar Jain, Dr. Usha Jain Publisher: Vayu Education of India

Online Learning Resources:
1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KlJ
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech CSE (AI&ML)– III-II Sem   **L T P C**
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(20A99601) INTELLECTUAL PROPERTY RIGHTS AND PATENTS
(Mandatory Non-Credit Course)

Course Objectives:
This course introduces the student to the basics of Intellectual Property Rights, Copy Right Laws, Cyber Laws, Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations

Course Outcomes:
- Understand IPR law & Cyber law
- Discuss registration process, maintenance and litigations associated with trademarks
- Illustrate the copy right law
- Enumerate the trade secret law.

UNIT I

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory – Overuse or Misuse of Intellectual Property Rights – Compliance and Liability Issues.

UNIT II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law-Semiconductor Chip Protection Act.

UNIT III

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

UNIT IV

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

UNIT V

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law. Introduction to Cyber Law – Information Technology Act – Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy – International aspects of Computer and Online Crime.

Textbooks:
1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning, New Delhi
2. Kompal Bansal &Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western's Special Topics Collections

References:
1. Prabhuddha Ganguli: ' Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi
2. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
3. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.
4. M. Ashok Kumar and Mohd. Iqbal Ali: "Intellectual Property Right" Serials Pub.

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B.Tech CSE (AI &ML)– IV-I Sem   L   T   P   C
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(20A31701a) RECOMMENDER SYSTEMS
(Professional Elective Course– III)

Course Objectives:
- To provide students with basic concepts and its application in various domain
- To make the students understand different techniques that a data scientist needs to know for analysing big data
- To design and build a complete machine learning solution in many application domains.

Course Outcomes:
After completion of the course, students will be able to
- Aware of various issues related to Personalization and Recommendations.
- Design and implement a set of well-known Recommender System approaches used in E-commerce and Tourism industry.
- Develop new Recommender Systems for a number of domains especially, Education, Health-care.

UNIT I   **An Introduction to Recommender Systems,**   Lecture 8Hrs
                     Neighborhood-Based Collaborative Filtering

Introduction, Goals of Recommender Systems, Basic Models of Recommender Systems, Domain-Specific Challenges in Recommender Systems. Advanced Topics and Applications.
Introduction, Key Properties of Ratings Matrices, Predicting Ratings with Neighborhood-Neighborhood-Based Collaborative Filtering:
Based Methods, Clustering and Neighborhood-Based Methods, Dimensionality Reduction and Neighborhood Methods, Graph Models for Neighborhood-Based Methods,A Regression Modeling View of Neighborhood Methods

UNIT II   **Model-Based Collaborative Filtering, Content-Based**   Lecture 9Hrs
                     Recommender Systems

Introduction, Decision and Regression Trees, Rule-Based Collaborative Filtering, Naive Bayes Collaborative Filtering, Using an Arbitrary Classification Model as a Black-Box, Latent Factor Models, Integrating Factorization and Neighborhood Models.

Content-Based Recommender Systems:

Introduction, Basic Components of Content-Based Systems, Preprocessing and Feature Extraction, Learning User Profiles and Filtering, Content-Based Versus Collaborative Recommendations, Using Content-Based Models for Collaborative Filtering, Summary.

UNIT III   **Knowledge-Based Recommender Systems, Ensemble-**   Lecture 9Hrs
                     Based and Hybrid Recommender Systems

Introduction, Constraint-Based Recommender Systems, Case-Based Recommenders, Persistent Personalization in Knowledge-Based Systems, Summary.

Introduction, Ensemble Methods from the Classification Perspective, Weighted Hybrids, Switching Hybrids, Cascade Hybrids, Feature Augmentation Hybrids, Meta-Level Hybrids, Feature Combination Hybrids, Summary.

UNIT IV   **Evaluating Recommender Systems, Context-Sensitive**   Lecture 8Hrs
                     Recommender Systems

Introduction, Evaluation Paradigms, General Goals of Evaluation Design, Design Issues in Offline Recommender Evaluation, Accuracy Metrics in Offline Evaluation, Limitations of Evaluation Measures, Limitations of Evaluation Measures.
Introduction, The Multidimensional Approach, Contextual Pre-filtering: A Reduction-Based Approach, Contextual Pre-filtering: A Reduction-Based Approach, Contextual Modeling.

UNIT V   **Time- and Location-Sensitive Recommender Systems**   Lecture 8Hrs

Introduction, Temporal Collaborative Filtering, Discrete Temporal Models, Location-Aware Recommender Systems, Location-Aware Recommender Systems Location-Aware Recommender Systems, Summary.

Textbooks:
1. Charu C. Aggarwal, "Recommender Systems", Springer,2016.

Reference Books:
1. Francesco Ricci, LiorRokach, "Recommender Systems Handbook", 2nd ed., Springer, 2015 Edition

Online Learning Resources:
1. Recommendation System -Understanding The Basic Concepts (analyticsvidhya.com)
2. Recommender Systems | Coursera

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B.Tech CSE (AI&ML)– IV-I Sem	L	T	P	C
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(20A30701b) INTELLIGENT INFORMATION RETRIEVAL SYSTEMS
(Professional Elective Course– III)

Course Objectives:
- Teach how to retrieve information
- Discuss indexing and how to use it
- Demonstrate how to automate indexing

Course Outcomes:
After completion of the course, students will be able to
- Recognize the Boolean Model, Vector Space Model, and Probabilistic Model.
- Understand retrieval utilities.
- Understand different formatting tags
- Understand cross-language information retrieval
- Understand the clustering techniques
- Determine the efficiency.

UNIT I   **Introduction**   Lecture 8Hrs
Introduction to Information Retrieval Systems:
Definition of Information Retrieval System,Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.
Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities
UNIT II   **Cataloguing and Indexing, Data structure**   Lecture 9Hrs
Cataloguing and Indexing:
History and objectives of Indexing, Indexing Process, Automatic Indexing, Information extraction.
Data structure:
Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.
UNIT III   **Automatic Indexing, Document and Term Clustering**   Lecture 9Hrs
Automatic Indexing:
Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages.
Document and Term Clustering:
Introduction to Clustering, Thesaurus Generation, Manual Clustering Automatic Term Clustering, Complete Term Relation Method, Clustering Using Existing Clusters, One Pass Assignments, Item Clustering, hierarchy of Clusters.
UNIT IV   **Automatic Indexing, Information visualization**   Lecture 8Hrs
Automatic Indexing:
Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext.
Information visualization:
Introduction to Information visualization, Cognition and perception, Information Visualization Technologies.
UNIT V   **Text Search Algorithms, Multimedia Information**   Lecture 8Hrs
                     Retrieval, Information System Evaluation
Text Search Algorithms:
Introduction to Text Search techniques, software Text Search algorithms, Hardware Text Search Systems.

Multimedia Information Retrieval:
Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph retrieval, Imagery Retrieval,

Video Retrieval.

Information System Evaluation:
Introduction to Information System Evaluation, Measures Used in System Evaluation, Measurement Example- TREC results.

Textbooks:
1. Information Storage and Retrieval Systems: Theory and Implementation by Gerald J. Kowalski, Mark T. Maybury, Springer, 2013.

Reference Books:
1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Modern Information Retrieval by Yates Pearson Education. 3. Information Storage & Retrieval by Robert Korfhage – John Wiley & Sons.

Online Learning Resources:
1. Information Retrieval Systems - an overview | ScienceDirect Topics
2. Information Retrieval (tutorialandexample.com)

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B.Tech CSE (AI&ML)– IV-I Sem   L   T   P   C
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(20A30701c) KNOWLEDGE REPRESENTATION AND REASONING
(Professional Elective Course– III)

Course Objectives:
- To investigate the key concepts of knowledge representation (KR) techniques and different notations.
- To integrate the KR view as a knowledge engineering approach to model organizational knowledge.
- To introduce the study of ontologies as a KR paradigm and applications of ontologies.
- To understand various KR techniques.
- To understand process, knowledge acquisition and sharing of ontology.

Course Outcomes:

After completion of the course, students will be able to
- Analyze and design knowledge-based systems intended for computer implementation.
- Acquire theoretical knowledge about principles for logic-based representation and reasoning.
- Ability to understand knowledge- engineering process
- Ability to implement production systems, frames, inheritance systems and approaches to handle uncertain or in complete knowledge.

UNIT I   Lecture 8Hrs
The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic.
Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity and diversity

UNIT II   Lecture 9Hrs
Ontology: Ontological categories, Philosophical background, Top-level categories, describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time

UNIT III   Lecture 9Hrs
Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation

UNIT IV   Lecture 8Hrs
Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change
Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.

UNIT V   Lecture 8Hrs
Knowledge Soup: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Non-monotonic Logic, Theories, Models and the world, Semiotics
Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition

Textbooks:
1. Knowledge Representation *logical, Philosophical, and Computational Foundations* by JohnF. Sowa, Thomson Learning.
2. Knowledge Representation and Reasoning by Ronald J. Brachman, Hector J. Levesque, Elsevier

Reference Books:
1. Foundations of Knowledge Representation and Reasoning: 810 (Lecture Notes in Computer Science),by Gerhard Lakemeyer,28 June 1994

Online Learning Resources:
Knowledge Representation and Reasoning | ScienceDirect
Knowledge Representation & Reasoning In Artificial Intelligence -ProfessionalAI.com (professional-ai.com)

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B.Tech CSE (AI&ML)– IV-I Sem	L	T	P	C
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(20A31702a) OPTIMIZATION TECHNIQUES IN AI
(Professional Elective Course– IV)

Course Objectives:
- Introduce to optimization techniques using both linear and non-linear programming.
- Discuss optimization though some techniques.

Course Outcomes:

After completion of the course, students will be able to
- Relate key concepts and applications of various optimization techniques
- Identify the appropriate optimization technique for the given problem
- Formulate appropriate objective functions and constraints to solve real life optimization problems

UNIT I   **Lecture 8Hrs**

Statement of an optimization problems classification of optimization problem classical optimization techniques

Single variable optimizations, Multi variable optimization, equality constrainst, inequality constraints, No cons traints.

UNIT II   **Lecture 9Hrs**

Graphical method for two dimensional problems – central problems of Linear Programming
Definitions – Simples – Algorithm – Phase I and II of simplex Method Revised Simplex Method.

Simplex Multipliers   -
Dual and Primal Dual Simplex Method Sensitivity Analysis Transportation problem and its solution –
Assignment problem and its solution –
Assignment problem and its solution by Hungarian method Karmakar's method statement, Conversion of th e Linear Programming problem intothe required form, Algorithm.

UNIT III   **Lecture 9Hrs**

NONLINEAR PROGRAMMING (ONE DIMENSIONAL MINIMIZATION: Introduction –
Unrestricted search – Exhaustive search – interval halving method – Fibonacci method.

NON LINEAR PROGRAMMING: (UNCONSTRAINED OPRIMIZATION): - Introduction
– Random search method – Uni variate method
Pattern search methods Hooke and jeeves method, simplex method- Gradient of a function –
steepest descent method – Conjugate gradient method
NON-LINEAR PROGRAMMING – (CONSTRAINED OPTIMIZATION):
Introduction – Characteristics of the problem – Random search method – Conjugate gradient method

UNIT IV   Lecture 8Hrs

DYNAMIC PROGRAMMING

Introduction – multistage decision processes– Principles of optimality – Computation procedures.

UNIT V   Lecture 8Hrs

DECISIOIN MAKING

Decisions under uncertainty, under certainty and under risk – Decision trees – Expected
Value of perfect information and imperfect information.

Textbooks:
1. Kalynamoy Deb, "Optimization for Engineering Design, Algorithms and Examples", Prentice Hall, 2004.
2. Hamdy A Taha, "Operations Research – An introduction", Pearson Education, 2002.

Reference Books:

1. Hillier / Lieberman, "Introduction to Operations Research", Tata McGraw Hill
Publishing company Ltd, 2002.
2. Singiresu S Rao, "Engineering optimization Theory and Practice", New Age
International, 1996.
3. Mik Misniewski, "Quantitative Methods for Decision makers", MacMillian Press
Ltd., 1994.
4.Kambo N S, "Mathematical Programming Techniques", Affiliated East – West press, 1991.

Online Learning Resources:

1. Understanding Optimization Algorithms in Machine Learning | by SupriyaSecherla | Towards Data Science
2. Optimization Techniques in Machine Learning | by Mlgomez | Medium

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B.Tech CSE (AI&ML)– IV-I Sem   L   T   P   C
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(20A30702b) AI FOR IMAGE ANALYSIS
(Professional Elective Course– IV)

Course Objectives:
- Discuss the format of images
- Explore the APIs of python related to image processing

Course Outcomes:
After completion of the course, students will be able to
- Understand the format of different type of images
- Apply the functionality of python for image processing
- Relate machine learning and image processing

UNIT I   **Image Formation& 3-D Imaging**   Lecture 8Hrs

Introduction to Image Formation:
Introduction, World and camera coordinates, Ideal Imaging: Perspective Projection, Real Imaging, Radiometry of Imaging, Liner System Theory of Imaging, Homogeneous Coordinates
Introduction to 3-D Imaging: Basics, Depth from Triangulation, Depth from Time-of-Flight, Depth from Phase: Interferometry, Shape from Shading, Depth from Multiple Projections: Tomography

UNIT II   **Image Processing**   Lecture 9Hrs
Introduction to Image Processing:
Images, Pixels, Image Resolution, PPI and DPI, Bitmap Images, Lossless Compression, Lossy Compression, Image File Formats, **Color Spaces**: RGB, XYZ, HSV/HSL, LAB, LCH, YPbPr, YUV, YIQ, **Advanced Image Concepts:** Bezire Curve, Ellipsoid, Gamma Correction, Structural Similarity Index, Deconvolution, Homography, Convolution

UNIT III   **Basics of Python and Scikit Image**   Lecture 9Hrs
Basics of Python:
Variables and Data Types, Data Structures, Control Flow Statements, Conditional Statements, Functions
Scikit Image:
Uploading and Viewing an Image, Getting Image Resolution, Looking at Pixel Values, Converting Color Space, Saving an Image, Creating Basic Drawings, Doing Gamma Correction.
Rotating, Shifting, and Scaling Images, Determining Structural Similarity.

UNIT IV   **Advanced Image Processing Using Open CV**   Lecture 8Hrs
Blending Two Images, Changing Contrast and Brightness, Adding Text to Images, **Smoothing Images:** Median Filter, Gaussian Filter, Bilateral Filter.
Changing the Shape of Images, Effecting Image Thresholding, Calculating Gradients, Performing Histogram Equalization.

UNIT V   **Image Processing Using Machine Learning & Real-**   Lecture 8Hrs
                    Time Use Cases
Feature Mapping Using the SIFT Algorithm, Image Registration Using the RANSAC Algorithm: estimate_ affine, residual lengths, processing the Images, The Complete code.
Image Classification Using Artificial Neural Networks, Image Classification Using CNNs,
Image Classification Using Machine Learning Approaches: Decision Trees,Support Vector Machines, Logistics Regression,Code,Important Terms
Introduction to Real-Time Use Cases:
Finding Palm Lines, Detecting Faces, Recognizing Faces, Tracking Movements, Detecting Lanes

Textbooks:
1. Digital Image Processing by **Rafael C. Gonzalez,4th Edition, 2018**
2. Hands-On Image Processing with Python: Expert techniques for advanced image analysis and effective interpretation of image data,by Sandipan Dey, 2018

Reference Books:
1. Digital Image Processing-Bernd Jahne,2005

Online Learning Resources:
1. How to Implement Artificial Intelligence for Solving Image Processing Tasks | Apriorit
2. Image Processing for Engineering and Science | Coursera

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B.Tech CSE (AI&ML)– IV-I Sem		**L T P C**
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(20A33701a) MACHINE LEARNING FOR UNSTRUTURED DATA
(Professional Elective-IV)

Course Objectives:
- Gain knowledge about basic concepts of Machine Learning
- Study different learning algorithms
- Learn about of evaluation of learning algorithms
- Learn about Categorisation and clustering algorithms.

Course Outcomes (CO):
After completion of the course, students will be able to
- Identify machine learning techniques suitable for a given problem
- Solve the different clustering algorithms.
- Apply Preprocessing applications using Probabilistic models.
- Analyze the text mining applications.

UNIT - I   Text Mining Core Text Mining Operations   **8Hrs**

Introduction to Text Mining: Defining Text Mining, General Architecture of Text Mining Systems, Core Text Mining Operations, Using Background Knowledge for Text Mining, Text Mining Query Languages, Task-Oriented Approaches, Further Reading

UNIT - II   Categorization & Clustering   **9Hrs**

Introduction to Categorization: Applications of Text Categorization, Definition of the Problem, Document Representation, Knowledge Engineering Approach to TC, Machine Learning Approach to TC, Using Unlabelled Data to Improve Classification, Evaluation of Text Classifiers, Citations and Notes

Introduction to Clustering: Clustering Tasks in Text Analysis, The General Clustering Problem, Clustering Algorithms, Clustering of Textual Data, Citations and Notes

UNIT III Information Extraction & Probabilistic Models for Information Extraction   **9Hrs**

Introduction to Information Extraction: Introduction to Information Extraction, Historical Evolution of IE: The Message Understanding Conferences and Tipster, IE Examples, Architecture of IE Systems, Anaphora Resolution, Inductive Algorithms for IE, Structural IE

Introduction to Probabilistic Models for Information Extraction: Hidden Markov Models, Stochastic Context-Free Grammars, Maximal Entropy Modeling, Maximal Entropy Markov Models, Conditional Random Fields

Introduction to Preprocessing Applications Using Probabilistic and Hybrid Approaches:

Applications of HMM to Textual Analysis, Using MEMM for Information Extraction, Applications of CRFs to Textual Analysis, TEG: Using SCFG Rules for Hybrid Statistical–Knowledge-Based IE, Bootstrapping

UNIT - IV   **Presentation-Layer Considerations for Browsing and Query Refinement &Visualization Approaches**8Hrs

Introduction to Presentation-Layer Considerations for Browsing and Query Refinement: Browsing, Accessing Constraints and Simple Specification Filtersat the Presentation Layer, Accessing the Underlying Query Language, Citations and Notes

Introduction to Visualization Approaches: Introduction, Architectural Considerations, Common Visualization Approaches for Text Mining, Visualization Techniques in Link Analysis, Real-World Example: The Document Explorer System

UNIT - V   Link Analysis & Text Mining Applications   **8Hrs**

Introduction to Link Analysis: Preliminaries, Automatic Layout of Networks, Paths and Cycles in Graphs, Centrality, Partitioning of Networks, Pattern Matching in Networks, Software Packages for Link Analysis

Introduction to Text Mining Applications: General Considerations, Corporate Finance: Mining Industry Literature for Business Intelligence, A "Horizontal" Text Mining Application: Patent Analysis

Solution Leveraging a Commercial Text Analytics Platform, Life Sciences Research: Mining Biological Pathway Information with Gene Ways.

Textbooks:
1. The Text Mining Hand Book, by Ronen Feldman, James Sanger, 2006

Reference Books:
1. Machine learning by Anuradha Srinivasa Raghavan,2019

Online Learning Resources:
1. ANN on Unstructured Data | Artificial Neural Network on Unstructured Data (analyticsvidhya.com)
2. Machine learning and unstructured data - Operationalizing Machine Learning Models | Coursera

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B.Tech CSE (AI&ML)– IV-I Sem

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(20A30703a) DEV OPS
(Professional Elective Course– V)

Pre-requisite   Fundamentals of software development and maintenance

Course Objectives:
- Understand collaboration and productivity by automating infrastructure and workflows
- Familiarize with continuous measuring applications performance

Course Outcomes:

After completion of the course, students will be able to

- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT serviceability
- Describe Dev Ops &Dev Sec Ops methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools

UNIT I   Lecture 8 Hrs

Dev Ops: An Overview, Dev Ops: Origins, Dev Ops: Roots, Dev Ops: Practices
Dev Ops: Culture.
Adopting Dev Ops: Developing the Playbook.
Developing a Business Case for a Dev Ops: Developing the Business Case

UNIT II   Lecture 9 Hrs

Completing the Business Model Canvas, Customer Segments, Value Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, Cost Structures.
Dev Ops Plays for Optimizing the delivery Pipeline: Dev Ops as an optimization Exercise, Core Themes, The Dev Ops Plays, Specializing Core Plays

UNIT III   Lecture 8 Hrs

Dev Ops Plays for Driving Innovation: Optimize to Innovate, The Uber Syndrome, Innovation and the Role of Technology, Core Themes, play: Build a Dev Ops Platform, play: Deliver Microservices Architectures, play: DevOps an API Economy, play: Organizing for Innovation.

UNIT IV   Lecture 10 Hrs

Scaling Dev Ops for the Enterprise: Core Themes, play: Dev Ops Center of Competency, play: Developing Culture of Innovation at Scale, play: Developing a Culture of continuous Improvement, play: Team Models for Dev Ops, play: Standardization of Tools and Process, play: Security Considerations for Dev Ops, Play: Dev Ops and Outsourcing.

UNIT V   Lecture 10 Hrs

Leading Dev Ops Adoption in the Enterprise: Play: Dev Ops as a transformation Exercise, play: Developing a Culture of Collaboration and Trust, play: Dev Ops Thinking for the Line of Business, play: starting with Pilot Projects, Play: Rearing Unicorns on an Aircrafts Carrier.
Appendix Case Study: Example Dev Ops Adoption Roadmap
Organization Background, Roadmap Structure, Adoption Roadmap.

Textbooks:
1. Sanjeev Sharma, The DevOps Adoption Playbook, Published by John Wiley & Sons, Inc.2017

Reference Books:
1. Sanjeev Sharma & Bernie Coyne, DevOps for Dummies, Published by John Wiley & Sons, Inc.
2. Michael Huttermann, DevOps for Developers, Apress publishers,2012.

Online Learning Resources:

1. Learning DevOps with Terraform Infrastructure Automation Course | Udemy

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B.Tech CSE (AI&ML)– IV-I Sem   **L   T   P   C**
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(**20A05703b) BLOCKCHAIN TECHNOLOGY AND APPLICATIONS**
(Professional Elective Course– V)

Course Objectives:
- Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them,
- Design, build, and deploy smart contracts and distributed applications,
- Integrate ideas from block chain technology into their own projects.

Course Outcomes (CO):
After completion of the course, students will be able to
- Demonstrate the foundation of the Block chain technology and understand the processes in payment and funding. Identify the risks involved in building Block chain applications.
- Review of legal implications using smart contracts.
- Choose the present landscape of Blockchain implementations and Understand Crypto currency markets
- Examine how to profit from trading crypto currencies.

UNIT - I   Introduction   Lecture 8Hrs
Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain. Evolution of Blockchain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT - II   Blockchain Concepts   Lecture 9Hrs
Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT - III   Architecting Blockchain solutions   Lecture 9Hrs
Architecting Blockchain solutions: Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications. Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

UNIT - IV   Ethereum Block chain Implementation   Lecture 8Hrs
Ethereum Block chain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, My Ether Wallet, Ethereum Networks/Environments, Infura, Ether scan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, Open Zeppel in Contracts

UNIT - V   Hyper ledger Block chain Implementation   Lecture 8Hrs
Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chain code Functions Using Client Application.
Advanced Concepts in Blockchain: Introduction, Inter Planetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

Textbooks:
1. Ambadas, Arshad SarfarzAriff, Sham "Blockchain for Enterprise Application Developers", Wiley, 2020
2. Andreas M. Antonopoulos, "Mastering Bitcoin: Programming the Open Blockchain", O'Reilly, 2017

Reference Books:
1. Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc Graw Hill.
2. Blockchain: Blueprint for a New Economy, Melanie Swan, O'Reilly

Online Learning Resources:
https://github.com/blockchainedindia/resources

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech CSE (AI&ML)– IV-I Sem   **L   T   P   C**
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(20A30703b) REINFORCEMENT LEARNING
Professional Elective – V

Pre-requisite   Machine Learning
Course Objectives:
- To learn RL task formulation (action space, state space, environment definition)
- To learn Tabular based solutions (dynamic programming, Monte Carlo, temporal-difference)
- To learn Function approximation solutions (Deep Q-networks)
- To learn Policy gradient from basic (REINFORCE) towards advanced topics (proximal policy optimization, deep deterministic policy gradient, etc.)
- To learn Model-based reinforcement learning

Course Outcomes:

After completion of the course, students will be able to
- Formulate Reinforcement Learning problems
- Apply various Tabular Solution Methods to Markov Reward Process Problems
- Apply various Iterative Solution methods to Markov Decision Process Problems
- Comprehend Function approximation methods

UNIT I   Lecture 8Hrs
Introduction
Course logistics and overview. Origin and history of Reinforcement Learning research. Its connections with other related fields and with different branches of machine learning.
Probability Primer
Brush up of Probability concepts - Axioms of probability, concepts of random variables, PMF, PDFs, CDFs, Expectation. Concepts of joint and multiple random variables, joint, conditional and marginal distributions. Correlation and independence

UNIT II   Lecture 9Hrs
Markov Decision Process
Introduction to RL terminology, Markov property, Markov chains, Markov reward process (MRP). Introduction to and proof of Bellman equations for MRPs along with proof of existence of solution to Bellman equations in MRP. Introduction to Markov decision process (MDP), state and action value functions, Bellman expectation equations, optimality of value functions and policies, Bellman optimality equations.
Prediction and Control by Dynamic Programming
Overview of dynamic programming for MDP, definition and formulation of planning in MDPs, principle of optimality, iterative policy evaluation, policy iteration, value iteration, Banach fixed point theorem, proof of contraction mapping property of Bellman expectation and optimality operators, proof of convergence of policy evaluation and value iteration algorithms, DP extensions.

UNIT III   Lecture 9Hrs
Monte Carlo Methods for Model Free Prediction and Control
Overview of Monte Carlo methods for model free RL, First visit and every visit Monte Carlo, Monte Carlo control, On policy and off policy learning, Importance sampling.
TD Methods
Incremental Monte Carlo Methods for Model Free Prediction, Overview TD(0), TD(1) and TD(λ), k-step estimators, unified view of DP, MC and TD evaluation methods, TD Control methods - SARSA, Q-Learning and their variants

UNIT IV   Lecture 8Hrs

Function Approximation Methods

Getting started with the function approximation methods, Revisiting risk minimization, gradient descent from Machine Learning, Gradient MC and Semi-gradient TD(0) algorithms, Eligibility trace for function approximation, After states, Control with function approximation, Least squares, Experience replay in deep Q-Networks.

UNIT - V   Lecture 8Hrs

Policy Gradients

Getting started with policy gradient methods, Log-derivative trick, Naive REINFORCE algorithm, bias and variance in Reinforcement Learning, Reducing variance in policy gradient estimates, baselines, advantage function, actor-critic methods.

Textbooks:

1. Sutton, Richard S., and Andrew G. Barto. Reinforcement learning: An introduction. MIT press, 2018.

2.Leon-Garcia, Alberto. Probability and random processes for electrical engineering. Pearson Education India, 1994

Reference Books:

1. Murphy, Kevin P. *Machine learning: a probabilistic perspective*. MIT press, 2012.

Online Learning Resources:

1. A brief introduction to reinforcement learning (freecodecamp.org)
2. Reinforcement learning - GeeksforGeeks

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B.Tech (AI&ML)– IV-I Sem	L	T	P	C
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(20A52701a) ENTREPRENEURSHIP & INCUBATION
(HUMANITIES ELECTIVE II)

Course Objectives:
- To make the student understand about Entrepreneurship
- To enable the student in knowing various sources of generating new ideas in setting up of New enterprise
- To facilitate the student in knowing various sources of finance in starting up of a business
- To impart knowledge about various government sources which provide financial assistance to entrepreneurs/ women entrepreneurs
- To encourage the student in creating and designing business plans

Course Outcomes:
- Understand the concept of Entrepreneurship and challenges in the world of competition.
- Apply the Knowledge in generating ideas for New Ventures.
- Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.
- Evaluate the role of central government and state government in promoting Entrepreneurship.
- Create and design business plan structure through incubations.

UNIT I
Entrepreneurship - Concept, knowledge and skills requirement - Characteristics of successful entrepreneurs - Entrepreneurship process - Factors impacting emergence of entrepreneurship - Differences between Entrepreneur and Intrapreneur - Understanding individual entrepreneurial mindset and personality - Recent trends in Entrepreneurship.

UNIT II
Starting the New Venture - Generating business idea – Sources of new ideas & methods of generating ideas - Opportunity recognition - Feasibility study - Market feasibility, technical/operational feasibility - Financial feasibility - Drawing business plan - Preparing project report - Presenting business plan to investors.

UNIT III
Sources of finance - Various sources of Finance available - Long term sources - Short term sources - Institutional Finance – Commercial Banks, SFC's in India - NBFC's in India - their way of financing in India for small and medium business - Entrepreneurship development programs in India - The entrepreneurial journey- Institutions in aid of entrepreneurship development

UNIT IV
Women Entrepreneurship - Entrepreneurship Development and Government - Role of Central Government and State Government in promoting women Entrepreneurship - Introduction to various incentives, subsidies and grants – Export- oriented Units - Fiscal and Tax concessions available - Women entrepreneurship - Role and importance - Growth of women entrepreneurship in India - Issues & Challenges - Entrepreneurial motivations.

UNIT V
Fundamentals of Business Incubation - Principles and good practices of business incubation- Process of business incubation and the business incubator and how they operate and influence the Type/benefits of incubators - Corporate/educational / institutional incubators - Broader business incubation environment - Pre-Incubation and Post - Incubation process - Idea lab, Business plan structure - Value proposition

Textbooks:
1. D F Kuratko and T V Rao, "Entrepreneurship" - A South-Asian Perspective – Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)
2. Nandan H, " Fundamentals of Entrepreneurship", PHI, 2013

References:
1. Vasant Desai, "Small Scale Industries and Entrepreneurship", Himalaya Publishing 2012.

2. Rajeev Roy "Entrepreneurship", 2nd Edition, Oxford, 2012.
3. B.JanakiramandM.Rizwana‖ "Entrepreneurship Development: Text & Cases", Excel Books, 2011.
4. Stuart Read, Effectual "Entrepreneurship", Routledge, 2013.

E-Resources
1. Entrepreneurship-Through-the-Lens-of-enture Capital
2. http://www.onlinevideolecture.com/?course=mba-programs&subject=entrepreneurship
3. http://nptel.ac.in/courses/122106032/Pdf/7_4.pd
4. http://freevideolectures.com/Course/3514/Economics-/-Management-/-Entrepreneurhip/50

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B.Tech (AI&ML)– IV-I Sem   L   T   P   C
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(20A52701b) MANAGEMENT SCIENCE
(HUMANITIES ELECTIVE-II)

Course Objectives:
- To provide fundamental knowledge on Management, Administration, Organization & its concepts.
- To make the students understand the role of management in Production
- To impart the concept of HRM in order to have an idea on Recruitment, Selection,Training& Development, job evaluation and Merit rating concepts
- To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management
- To make the students aware of the contemporary issues in management

Course Outcomes:
- Understand the concepts & principles of management and designs of organization in a practical world
- Apply the knowledge of Work-study principles & Quality Control techniques in industry
- Analyze the concepts of HRM in Recruitment, Selection and Training & Development.
- Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
- Create   Modern technology in management science.

UNITI   INTRODUCTION TO MANAGEMENT
Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both. Schools of Management Thought - Taylor's Scientific Theory-Henry Fayol's principles - Eltan Mayo's Human relations - Systems Theory - **Organisational Designs** - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social responsibilities of Management.

UNIT II OPERATIONS MANAGEMENT
Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- Deming's contribution to Quality. **Material Management -** Objectives - Inventory-Functions - Types, Inventory Techniques - EOQ-ABC Analysis - Purchase Procedure and Stores Management - **Marketing Management -** Concept - Meaning - Nature-Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

UNIT III HUMAN RESOURCES MANAGEMENT (HRM)
HRM - Definition and Meaning – Nature - Managerial and Operative functions - Evolution of HRM - Job Analysis - Human Resource Planning(HRP) - Employee Recruitment-Sources of Recruitment - Employee Selection - Process and Tests in Employee Selection - Employee Training and Development - On-the- job & Off-the-job training methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration

UNIT IV STRATEGIC & PROJECT MANAGEMENT
Definition& Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - **Project Management -** Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

UNIT V CONTEMPORARY ISSUES IN MANAGEMENT
The concept of Management Information System(MIS) - Materials Requirement Planning (MRP) - Customer Relations Management(CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management(SCM) - Enterprise Resource Planning (ERP) - Performance Management - Business Process Outsourcing (BPO) - Business Process Re-engineering and Bench Marking - Balanced Score Card - Knowledge Management.

Textbooks:

1. A.R Aryasri, "Management Science", TMH, 2013
2. Stoner, Freeman, Gilbert, Management, Pearson Education, New Delhi, 2012.

References:

1. Koontz &Weihrich, "Essentials of Management", 6th edition, TMH, 2005.
2. Thomas N.Duening& John M.Ivancevich, "Management Principles and Guidelines", Biztantra.
3. Kanishka Bedi, "Production and Operations Management", Oxford University Press, 2004.
4. Samuel C.Certo, "Modern Management", 9th edition, PHI, 2005

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech (AI&ML)– IV-I Sem   **L   T   P   C**
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(20A52701c) ENTERPRISE RESOURCE PLANNING
(HUMANITIES ELECTIVE-II)

Course Objectives:
- To provide a contemporary and forward-looking on the theory and practice of Enterprise Resource Planning
- To enable the students in knowing the Advantages of ERP
- To train the students to develop the basic understanding of how ERP enriches the
- Business organizations in achieving a multidimensional growth.
- Impart knowledge about the historical background of BPR
- To aim at preparing the students, technologically competitive and make them ready to self-upgrade with the higher technical skills.

Course Outcomes:
- Understand the basic use of ERP Package and its role in integrating business functions.
- Explain the challenges of ERP system in the organization
- Apply the knowledge in implementing ERP system for business
- Evaluate the role of IT in taking decisions with MIS
- Create reengineered business processes with process redesign

UNITI
Introduction to ERP: Enterprise – An Overview Integrated Management Information, Business Modeling, Integrated Data Model Business Processing Reengineering(BPR), Data Warehousing, Data Mining, On-line Analytical Processing(OLAP), Supply Chain Management (SCM), Customer Relationship Management(CRM),

UNITII
Benefits of ERP: Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality Costs, Improved Information Accuracy and Design-making Capability

UNITIII
ERP Implementation Lifecycle: Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation Team Training, Testing, Going Live, End-user Training, Post-implementation (Maintenance mode)

UNITIV
BPR: Historical background: Nature, significance and rationale of business process reengineering (BPR), Fundamentals of BPR. Major issues in process redesign: Business vision and process objectives, Processes to be redesigned, Measuring existing processes,

UNITV
IT in ERP: Role of information technology (IT) and identifying IT levers. Designing and building a prototype of the new process: BPR phases, Relationship between BPR phases. MIS - Management Information System, DSS - Decision Support System, EIS - Executive Information System.

Textbooks:
1. Pankaj Sharma. "Enterprise Resource Planning". Aph Publishing Corporation, New Delhi, 2004.
2. Alexis Leon, "Enterprise Resource Planning", IV Edition, Mc.Graw Hill, 2019

References:
1. Marianne Bradford "Modern ERP", 3rd edition.
2. "ERP making it happen Thomas f. Wallace and Michael
3. Directing the ERP Implementation Michael w pelphrey

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(20A30704) CONVERSATIONAL AI
(Skill Oriented Course-V)

Pre-requisite   Artificial Intelligence

Course Objectives:
- Understand basic concepts in conversational AI
- Learn recent advances in conversational AI

Course Outcomes:
After completion of the course, students will be able to
- Develop a fair understanding of AI applications and to know where and how to apply these tools to improve productivity.
- Understand AI as a tool pretty much like they treat calculator as a tool for simple calculation
- Apply methods for different training and testing assistants
- Design classifier for voice assistants

UNIT I
Introduction to Chatbots, Setting Up the Developer Environment
What are chatbots? Journey of Chatbots, Rise of Chatbots, Messaging Platforms, Botframework, Local Installation
UNIT II   Basics of Bot Building, Advanced Bot Building
Intents, Entities, Design principles, showing product results, saving messages, Building your own intent classifier
UNIT III   Building Chatbots the easy way
Introduction to dialog flow, building a food ordering chatbot, deploying dialog flow chatbot on the web, Integrate dialog flow chatbot on Facebook messenger, Fulfilment
UNIT IV   Building Chatbots the hard way
What is Rasa NLU? Training and building a chatbot from scratch, Dialog management using Rasa core, writing custom actions of chatbot, Data preparing for training the bot, Testing the bot
UNIT V   Deploying your chatbot
First steps, Rasa's credential management, Deploying the chatbot on Facebook, Deploying the chatbot on slack, Deploying the chatbot on your own
Textbooks:
1. Rashid Khan, Anik Das "Build Better Chatbots", Apress, 2018.
2. Sumit Raj "Building Chatbots with Python", Apress, 2019.

Reference Books:
Conversational AI: Chatbots that workBy Andrew Freed,2021
Online Learning Resources:
Building AI Powered Chatbots Without Programming | Coursera
List of Experiments/Projects
1. Design a Chatbot to answer FAQs about your organization
2. Develop a Chatbot which delivers smooth customer experience via Facebook messenger
3. Create a chatbot which helps the students in opening a bank account
4. Design a chatbot which finds the diseases using symptoms provided by the user
5. Develop an e-commerce chatbot
6. Design a chatbot for the Tourism department
7. Design a Chatbot which helps the patients with Insomnia problem.

OPEN ELECTIVES

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem   L   T   P   C
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(20A01505) BUILDING TECHNOLOGY

(Open Elective-I)

Course Objectives:

- To know different types of buildings, principles and planning of the buildings.
- To identify the termite control measure in buildings, and importance of grouping circulation, lighting and ventilation aspects in buildings.
- To know the different modes of vertical transportation in buildings.
- To know the utilization of prefabricated structural elements in buildings.
- To know the importance of acoustics in planning and designing of buildings.

Course Outcomes (CO):

- Understand the principles in planning and design the buildings

- To get different types of buildings, principles and planning of the buildings

- To know the different methods of termite proofing in buildings.

- Know the different methods of vertical transportation in buildings.

- Know the implementation of prefabricated units in buildings and effect of earthquake on buildings.

- Know the importance of acoustics in planning and designing of buildings.

UNIT I

Overview of the course, basic definitions, buildings-types-components-economy and design-principles of planning of buildings and their importance. Definitions and importance of grouping and circulation-lighting and ventilation-consideration of the above aspects during planning of building.

UNIT II

Termite proofing: Inspection-control measures and precautions-lighting protectionof buildings-general principles of design of openings-various types of fire protection measures to be considered while panning a building.

UNIT III

Vertical transportation in a building: Types of vertical transportation-stairs-different forms of stairs-planning of stairs-other modes of vertical transportation –lifts-ramps-escalators.

UNIT IV

Prefabrication systems in residential buildings-walls-openings-cupboards-shelves etc., planning and modules and sizes of components in prefabrication. Planning and designing of residential buildings against the earthquake forces, principles, seismic forces and their effect on buildings.

UNIT V

Acoustics –effect of noise –properties of noise and its measurements, principles of acoustics of building. Sound insulation-importance and measures.

Textbooks:

1. Building construction by Varghese, PHI Learning Private Limited 2nd Edition 2015
2. Building construction by Punmia.B.C, Jain.A.K and Jain.A.K Laxmi Publications 11th edition 2016

Reference Books:

1. National Building Code of India, Bureau of Indian Standards
2. Building construction-Technical teachers training institute, Madras, Tata McGraw Hill.
3. Building construction by S.P.Arora and S.P.BrndraDhanpat Rai and Sons Publications, New Delh 2014 edition
   https://nptel.ac.in/courses/105102206
   https://nptel.ac.in/courses/105103206

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem   **L T P C**
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(20A02505) ELECTRIC VEHICLES

(Open Elective-I)

Course Objectives:

- To get exposed to new technologies of battery electric vehicles, fuel cell electric vehicles
- To get exposed to EV system configuration and parameters
- To know about electro mobility and environmental issues of EVs
- To understand about basic EV propulsion and dynamics
- To understand about fuel cell technologies for EV and HVEs
- To know about basic battery charging and control strategies used in electric vehicles

Course Outcomes:

- Understand and differentiate between conventional and latest trends in Electric Vehicles
- Analyze various EV resources, EV dynamics and Battery charging
- Apply basic concepts of EV to design complete EV system
- Design EV system with various fundamental concepts

UNIT I   INTRODUCTION TO EV SYSTEMS AND PARAMETERS

Past, Present and Future EV, EV Concept, EV Technology, State-of-the Art EVs, EV configuration, EV system, Fixed and Variable gearing, single and multiple motor drive, in-wheel drives, EV parameters: Weight, size, force and energy, performance parameters.

UNIT II   EV AND ENERGY SOURCES

Electro mobility and the environment, history of Electric power trains, carbon emissions from fuels, green houses and pollutants, comparison of conventional, battery, hybrid and fuel cell electric systems

UNIT III   EV PROPULSION AND DYNAMICS

Choice of electric propulsion system, block diagram, concept of EV Motors, single and multi motor configurations, fixed and variable geared transmission, In-wheel motor configuration, classification, Electric motors used in current vehicle applications, Recent EV Motors, Vehicle load factors, vehicle acceleration.

UNIT IV   FUEL CELLS

Introduction of fuel cells, basic operation, model, voltage, power and efficiency, power plant system – characteristics, sizing, Example of fuel cell electric vehicle.

Introduction to HEV, brake specific fuel consumption, comparison of series, series-parallel hybrid systems, examples

UNIT V   BATTERY CHARGING AND CONTROL

Battery charging: Basic requirements, charger architecture, charger functions, wireless charging,

power factor correction.

Control: Introduction, modelling of electromechanical system, feedback controller design approach, PI controllers designing, torque-loop, speed control loop compensation, acceleration of battery electric vehicle

Textbooks:

1. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001.
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

Reference Books:

1. Electric and Hybrid Vehicles Design Fundamentals, Iqbal Husain, CRC Press 2005.
2. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2015.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ee53/preview

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B.Tech III-I Sem   L   T   P   C
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(20A03505) 3D PRINTING TECHNOLOGY
(Open Elective-I)

Course Objectives:
- Familiarize techniques for processing of CAD models for rapid prototyping.
- Explain fundamentals of rapid prototyping techniques.
- Demonstrate appropriate tooling for rapid prototyping process.
- Focus Rapid prototyping techniques for reverse engineering.
- Train Various Pre – Processing, Processing and Post Processing errors in RP Processes.

Course Outcomes:
- Use techniques for processing of CAD models for rapid prototyping.
- Understand and apply fundamentals of rapid prototyping techniques.
- Use appropriate tooling for rapid prototyping process.
- Use rapid prototyping techniques for reverse engineering.
- Identify Various Pre – Processing, Processing and Post Processing errors in RP processes.

UNIT I   Introduction to 3D Printing
Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

UNIT II   Solid and Liquid Based RP Systems
Working Principle, Materials, Advantages, Limitations and Applicationsof Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

UNIT III   Powder Based & Other RP Systems
Powder Based RP Systems: Working Principle,Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping (LENS) and Electron Beam Melting (EBM).
Other RP Systems: Working Principle,Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballastic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM).

UNIT IV   Rapid Tooling & Reverse Engineering
Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods.
Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development.

UNIT V   Errors in 3D Printing and Applications:
Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc.
Software: Need for software, MIMICS, Magics, SurgiGuide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View, 3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP.
Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Textbooks:
1. Chee Kai Chua and Kah Fai Leong, "3D Printing and Additive Manufacturing Principles and Applications" 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing", Springer, 2/e, 2010.

Reference Books:
1. Frank W.Liou, "Rapid Prototyping & Engineering Applications", CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, **"**Rapid Prototyping: Principles and Applications in Manufacturing", John Wiley&Sons, 2006.

Online Learning Resources:
- NPTEL Course on Rapid Manufacturing.
- https://nptel.ac.in/courses/112/104/112104265/
- https://www.hubs.com/knowledge-base/introduction-fdm-3d-printing/
- https://slideplayer.com/slide/6927137/
- https://www.mdpi.com/2073-4360/12/6/1334
- https://www.centropiaggio.unipi.it/sites/default/files/course/material/2013-11-29%20-%20FDM.pdf
- https://lecturenotes.in/subject/197
- https://www.cet.edu.in/noticefiles/258_Lecture%20Notes%20on%20RP-ilovepdf-compressed.pdf
- https://www.vssut.ac.in/lecture_notes/lecture1517967201.pdf
- https://www.youtube.com/watch?v=NkC8TNts4B4

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem	L	T	P	C
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(20A04507) MATLAB PROGRAMMING FOR ENGINEERS

Course Objectives:
To provide fundamental knowledge of programming language for solving problems.
Course Outcomes: On completion of the course, students will be able to
- Generate arrays and matrices for numerical problems solving.
- Represent data and solution in graphical display.
- Write scripts and functions to easily execute series of tasks in problem solving.
- Use arrays, matrices and functions in Engineering applications
- Design GUI for basic mathematical applications.

UNIT I
Introduction: Basics of MATLAB, MATLAB windows, Advantages of MATLAB, on-line help, file types. MATLAB Basics: Variables and Constants –Vectors and Matrices- Arrays - manipulation- Built-in MATLAB Functions. Creating and printing simple plots, Creating, Saving and Executing a Script File, Creating and Executing a function file. Programming Basics: Data Types-Operators – Hierarchy of operations, Relational and logical operators, if-end structure, if-else-end structure, if-elseif-else-end structure, switch-case statement, for-end loop, while-end loop, break and continue commands.

UNIT II
Scripts and Functions Script Files, Function Files, Debugging methods in MATLAB. Graphics: Basic 2D plots: Printing labels- grid and axes box- Entering text in a box- Axis control-Style options Multiple plots-subplots-specialized 2D plots: stem-, bar, hist, pi, stairs, loglog, semilog,polar,comet 3D plots: Mesh,Contour,Surf,Stem3,ezplot.

UNIT III
Numerical Methods Using MATLAB Numerical Differentiation, Numerical integration- Newton-Cotes integration formulae, Multi-step application of Trapezoidal rule, Simpson's 1/3 Rule for Numerical Integration. MATLAB functions for integration. Linear Equations- Linear algebra in MATLAB, solving a linear system, Gauss Elimination, Finding eigen values and eigen vectors, Matrix factorizations, Advanced topics.

UNIT IV
Nonlinear Equations System of Non-linear equations, Solving System of Equations Using MATLAB function fsolve, Interpolation Lagrange Interpolation, Two dimensional Interpolation, Straight line fit using Least Square Method, Curve fitting using built-in functions ployval and polyfit, cubic fit using least square method. Finding roots of a polynomial - roots function, Newton-Raphson Method.

UNIT V
Solution of Ordinary differential Equations (ODEs)-The 4th order Runge-kutta Method, ODE Solvers in MATLAB, Solving First –order equations using ODE23 and ODE45. Structures and Graphical user interface (GUI): Advanced data Objects, how a GUI works, Creating and displaying a GUI. GUI components, Dialog Boxes.

Learning Resources:
1. Getting started with MATLAB "A quick introduction for scientist and engineers by Rudra Pratap, Oxford publications.
2. Advanced Guide to MATLAB-Practical Examples in Science and Engineering by S.N.Alam, S.Islam, S.K. Patel-I.K. International Publishing House Pvt. Ltd.
3. Stephen J. Chapman-"MATLAB Programming for Engineers"- 5th Edition- Cengage Learning- 2015. Getting started with MATLAB (Version 9) The Math works.
4. An Introduction to MATLAB® Programming and Numerical Methods for Engineers 1st Edition by Timmy Siauw Alexandre Bayen, Elsevier-18th April 2014.
5. https://nptel.ac.in/courses/103106118/2

6. https://www.udemy.com/numerical-methods

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-I Sem

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(20A04508) INTRODUCTION TO CONTROL SYSTEMS

Course Objectives:
- To learn the concepts of linear Systems theory and its analysis.

Course Outcomes:
- Understand different system representation, block diagram reduction and Mason's rule.
- Determine Time response analysis of LTI systems and steady state error.
- Plot open loop and closed loop frequency responses of systems
- Understand Stability concept.
- Perform State variable analysis.

UNIT I   MATHEMATICAL MODELS OF PHYSICAL SYSTEMS
Definition & classification of system – terminology & structure of feedback control theory – Analogous systems - Physical system representation by Differential equations – Block diagram reduction– Signal flow graphs.

UNIT II   TIME RESPONSE ANALYSIS & ROOT LOCUS TECHNIQUE
Standard test signals – Steady state error & error constants – Time Response of I and II order system – Root locus – Rules for sketching root loci.

UNIT III   FREQUENCY RESPONSE ANALYSIS
Correlation between Time & Frequency response – Polar plots – Bode Plots – Determination of Transfer Function from Bode plot.

UNIT IV   STABILITY CONCEPTS & ANALYSIS
Concept of stability – Necessary condition – RH criterion – Relative stability – Nyquist stability criterion – Stability from Bode plot – Relative stability from Nyquist & Bode – Closed loop frequency response.

UNIT V   STATE VARIABLE ANALYSIS
Concept of state – State Variable & State Model – State models for linear & continuous time systems – Solution of state & output equation – controllability & observability.

Textbooks:
1. Benjamin C. Kuo, Automatic Control Systems, PHI Learning Private Ltd, 2010.
2. J. Nagrath and M. Gopal, Control Systems Engineering, Tata McGraw-Hill Education Private Limited, Reprint, 2010.

References:
1. Richard C. Dorf and Robert H. Bishop, Modern Control Systems, Pearson Education, Third Impression, 2009.
2. S. Palani, Control System Engineering, Tata McGraw-Hill Education Private Limited, First Reprint, 2010.

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B.Tech III-I Sem

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(20A27505) COMPUTER APPLICATIONS IN FOOD TECHNOLOGY
(Open Elective-1)

Course Objectives:
- To know different software and applications in food technology.
- To understand the Chemical kinetics in food processing, Microbial distraction in thermal processing of food.
- To acquire knowledge on computer aided manufacturing and control of food machinery, inventory control, process control.

Course Outcomes:
- Students will gain knowledge on software in food technology, data analysis, Chemical kinetics, microbial distortion in thermal process
- Use of linear regression in analyzing sensory data, application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants.

UNIT I

Introduction to various software and their applications in food technology. Application of MS Excel to solve the problems of Food Technology, SPSS and JMP for data analysis, Pro-Engineering for design, Lab VIEW and SCADA for process control .

UNIT II

Chemical kinetics in food processing: Determining rate constant of zero order reaction First order rate constant and half-life of reactions. Determining energy of activation of vitamin degradation during food storage Rates of Enzymes catalyzed reaction. Microbial distraction in thermal processing of food. Determining decimal reduction time from microbial survival data, Thermal resistance factor, Z-values in thermal processing of food. Sampling to ensure that a lot is not contaminated with more than a given percentage Statistical quality control. Probability of occurrence in normal distribution. Using binomial distribution to determine probability of occurrence. Probability of defective items in a sample obtained from large lot

UNIT III

Sensory evaluation of food Statistical descriptors of a population estimated from sensory data obtained from a sample Analysis of variance**.** One factor, completely randomized design For two factor design without replication**.** Use of linear regression in analyzing sensory data. Mechanical transport of liquid food**.** Measuring viscosity of liquid food using a capillary tube viscometer . Solving simultaneous equations in designing multiple effect evaporator while using matrix algebra available in excel.

UNIT IV

Familiarization with the application of computer in some common food industries like, milk plant, bakery units & fruits vegetable plants, stating from the receiving of raw material up to the storage & dispatch of finished product.

UNIT V

Basic Introduction to computer aided manufacturing. Application of computers, instrumentation and control of food machinery, inventory control, process control etc.

Recommended books:
1. Computer Applications in Food Technology: Use of Spreadsheets in Graphical, Statistical and Process Analysis by R. Paul Singh, AP.
2. Manuals of MS Office.

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B.Tech III-I Sem	L T P C
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(20A54501) OPTIMIZATION TECHNIQUES

(Open Elective- I)

Course Objectives:

This course enables the students to classify and formulate real-life problem for modeling as optimization problem, solving and applying for decision making.

Course Outcomes: Student will be able to

- formulate a linear programming problem and solve it by various methods.
- give an optimal solution in assignment jobs, give transportation of items from sources to destinations.
- identify strategies in a game for optimal profit.
- implement project planning.

UNIT I

Introduction to operational research-Linear programming problems (LPP)-Graphical method-Simplex method-Big M Method-Dual simplex method.

UNIT II

Transportation problems- assignment problems-Game theory.

UNIT III

CPM and PERT –Network diagram-Events and activities-Project Planning-Reducing critical events and activities-Critical path calculations.

UNIT IV

Sequencing Problems-Replacement problems-Capital equipment- Discounting costs- Group replacement.

UNIT V

Inventory models-various costs- Deterministic inventory models-Economic lot size-Stochastic inventory models- Single period inventory models with shortage cost.

Textbooks:

1. Operations Research , S.D. Sharma.
2. Operations Research, An Introduction, Hamdy A. Taha, Pearson publishers.
3. Operations Research, Nita H Shah, Ravi M Gor, Hardik Soni, PHI publishers

Reference Books:

1. Problems on Operations Research, Er. Prem kumargupta, Dr.D.S. Hira, Chand publishers
2. Operations Research, CB Gupta, PK Dwivedi, Sunil kumaryadav

Online Learning Resources:

https://nptel.ac.in/content/storage2/courses/105108127/pdf/Module_1/M1L2slides.pdf

https://slideplayer.com/slide/7790901/

https://www.ime.unicamp.br/~andreani/MS515/capitulo12.pdf

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B.Tech III-I Sem   L T P C
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(20A56501) MATERIALS CHARACTERIZATION TECHNIQUES
(Open Elective- I)

Course Objectives:
- To provide an exposure to different characterization techniques.
- To enlighten the basic principles and analysis of different spectroscopic techniques.
- To explain the basic principle of Scanning electron microscope along with its limitations and applications.
- To identify the Resolving power and Magnification of Transmission electron microscope and its applications.
- To educate the uses of advanced electric and magnetic instruments for characterization.

Course Outcomes: At the end of the course the student will be able
- To explain the structural analysis by X-ray diffraction.
- To understand the morphology of different materials using SEM and TEM.
- To recognize basic principles of various spectroscopic techniques.
- To study the electric and magnetic properties of the materials.
- To make out which technique can be used to analyse a material

UNIT I

Structure analysis by Powder X-Ray Diffraction: Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherrer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

UNIT II

Microscopy technique -1 –Scanning Electron Microscopy (SEM)
Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT III

Microscopy Technique -2 - Transmission Electron Microscopy (TEM): Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy.

UNIT IV

Spectroscopy techniques – Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

UNIT V

Electrical & Magnetic Characterization techniques: Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.

Textbooks:
1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods –Yang
Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2008
2. Handbook of Materials Characterization -by Sharma S. K. - Springer

References:
1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and Elaine M.
McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity& Stuart R Stocks, Prentice Hall, 2001
3. Materials Characterization: Introduction to Microscopic and Spectroscopic Methods-Yang Leng- John Wiley & Sons
4. Characterization of Materials 2nd Edition, 3 Volumes-Kaufmann E N -John Wiley (Bp)

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B.Tech III-I Sem   L   T   P   C
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(20A51501) CHEMISTRY OF ENERGY MATERIALS
(Open Elective- I)

Course Objectives:
- To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
- To understand the basic concepts of processing and limitations of fossil fuels and Fuel cells & their applications.
- To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method
- Necessasity of harnessing alternate energy resources such as solar energy and its basic concepts.
- To understand and apply the basics of calculations related to material and energy flow in the processes.

Course Outcomes:
- Ability to perform simultaneous material and energy balances.
- Student learn about various electrochemical and energy systems
- Knowledge of solid, liquid and gaseous fuels
- To know the energy demand of world, nation and available resources to fulfill the demand
- To know about the conventional energy resources and their effective utilization
- To acquire the knowledge of modern energy conversion technologies
- To be able to understand and perform the various characterization techniques of fuels
- To be able to identify available nonconventional (renewable) energy resources and techniques to utilize them effectively

UNIT I: Electrochemical Systems: Galvanic cell, standard electrode potential, application of EMF, electrical double layer, dipole moments, polarization, Batteries-Lead-acid and Lithium ion batterie**s.**

UNIT II: Fuel Cells: Fuel cell working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency, Basic design of fuel cell,.

UNIT III: Hydrogen Storage: Hydrogen Storage, Chemical and Physical methods of hydrogen storage, Hydrogen Storage in metal hydrides, metal organic frame works (MOF), Carbon structures, metal oxide porous structures, hydrogel storage by high pressure methods. Liquifaction method.

UNIT IV:Solar Energy: Solar energy introduction and prospects, photo voltaic (PV) technology, concentrated solar power (CSP), Solar Fuels, Solar cells.

UNIT V: Photo and Photo electrochemical Conversions: Photochemical cells and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions.

References:
1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins
4. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services and corporation)
5. Hand book of solar energy and applications by Arvind Tiwari and Shyam.
6. Solar energy fundamental, technology and systems by Klaus Jagar et.al.
7. Hydrogen storage by Levine Klebonoff

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem	**L**	**T**	**P**	**C**

B.Tech IV-I Sem   L   T   P   C

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(20A01605) ENVIRONMENTAL ECONOMICS

(Open Elective Course - II)

Course Objectives:

- To impart knowledge on sustainable development and economics of energy
- To teach regarding environmental degradation and economic analysis of degradation
- To inculcate the knowledge of economics of pollution and their management
- To demonstrate the understanding of cost benefit analysis of environmental resources
- To make the students to understand principles of economics of biodiversity

Course Outcomes :

After the completion of the course, the students will be able to know
- The information on sustainable development and economics of energy
- The information regarding environmental degradation and economic analysis of degradation
- The identification of economics of pollution and their management
- The cost benefit analysis of environmental resources
- The principles of economics of biodiversity

UNIT I

Sustainable Development: Introduction to sustainable development - Economy-Environment inter-linkages - Meaning of sustainable development - Limits to growth and the environmental Kuznets curve – The sustainability debate - Issues of energy and the economics of energy – Nonrenewable energy, scarcity, optimal resources, backstop technology, property research, externalities, and the conversion of uncertainty.

UNIT II

Environmental Degradation: Economic significance and causes of environmental degradation - The concepts of policy failure, externality and market failure - Economic analysis of environmental degradation – Equi –marginal principle.

UNIT - III

Economics of Pollution: Economics of Pollution - Economics of optimal pollution, regulation, monitoring and enforcement - Managing pollution using existing markets: Bargaining solutions – Managing pollution through market intervention: Taxes, subsidies and permits.

UNIT IV

Cost – Benefit Analysis: Economic value of environmental resources and environmental damage - Concept of Total Economic Value - Alternative approaches to valuation – Cost-benefit analysis and discounting.

UNIT V

Economics of biodiversity: Economics of biodiversity conservation - Valuing individual species and diversity of species -Policy responses at national and international levels. Economics of Climate

Change – stern Report

Textbooks:

1. An Introduction to Environmental Economics by N. Hanley, J. Shogren and B. White Oxford University Press.(2001)

2. Blueprint for a Green Economy by D.W. Pearce, A. Markandya and E.B. Barbier Earthscan, London.(1989)

Reference Books:

1. Environmental Economics: An Elementary Introduction by R.K. Turner, D.W. Pearce and I. Bateman Harvester Wheatsheaft, London. (1994),

2. Economics of Natural Resources and the Environment by D.W. Pearce and R.K. Turner Harvester Wheat sheaf, London. (1990),

3. Environmental and Resource Economics: An Introduction by Michael S. Common and Michael Stuart 2ndEdition, Harlow: Longman.(1996),

4. Natural Resource and Environmental Economics by Roger Perman, Michael Common, Yue Ma and James Mc Gilvray 3rdEdition, Pearson Education.(2003),

Online Learning Resources:

https://nptel.ac.in/courses/109107171

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem   **L T P C**

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(20A02605) SMART ELECTRIC GRID
(Open Elective Course-II)

Course Objectives:

- Understand recent trends in grids, smart grid architecture and technologies
- Analyze smart substations
- Apply the concepts to design smart transmission systems
- Apply the concepts to design smart distribution systems

Course Outcomes:

- Understand trends in Smart grids, needs and roles of Smart substations
- Design and Analyze Smart Transmission systems
- Design and Analyze Smart Distribution systems
- Analyze SCADA and DSCADA systems in practical working environment

UNIT I   INTRODUCTION TO SMART GRID

Working definitions of Smart Grid and Associated Concepts – Smart Grid Functions – Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid

UNIT II   SMART GRID TECHNOLOGIES

Characteristics of Smart grid, Micro grids, Definitions, Drives, benefits, types of Micro grid, building blocks, Renewable energy resources, needs in smart grid, integration impact, integration standards, Load frequency control, reactive power control, case studies and test beds

UNIT III   SMART SUBSTATIONS

Protection, Monitoring and control devices, sensors, SCADA, Master stations, Remote terminal unit, interoperability and IEC 61850, Process level, Bay level, Station level, Benefits, role of substations in smart grid, Volt/VAR control equipment inside substation

UNIT IV   SMART TRANSMISSION SYSTEMS

Energy Management systems, History, current technology, EMS for the smart grid, Synchro Phasor Measurement Units (PMUs), Wide Area Monitoring Systems (WAMS), protection & Control (WAMPC), needs in smart grid, Role of WAMPC smart grid, Drivers and benefits, Role of transmission systems in smart grid

UNIT V   SMART DISTRIBUTION SYSTEMS

DMS, DSCADA, trends in DSCADA and control, current and advanced DMSs, Voltage fluctuations, effect of voltage on customer load, Drivers, objectives and benefits, voltage-VAR control, VAR control equipment on distribution feeders, implementation and optimization, FDIR - Fault Detection Isolation and Service restoration (FDIR),faults, objectives and benefits, equipment, implementation

Textbooks:

1. Stuart Borlase, Smart Grids - Infrastructure, Technology and Solutions, CRC Press, 1e, 2013
2. Gil Masters, Renewable and Efficient Electric Power System, Wiley–IEEE Press, 2e, 2013.

Reference Books:

1. A.G. Phadke and J.S. Thorp, Synchronized Phasor Measurements and their Applications, Springer Edition, 2e, 2017.
2. T. Ackermann, Wind Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2e, 2012.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ee82/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech IV-I Sem   L   T   P   C
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(20A04605) SIGNAL PROCESSING
(Open Elective Course –II)

Course objectives:
- Understand, represent and classify continuous time and discrete time signals and systems, together with the representation of LTI systems.
- Ability to represent continuous time signals (both periodic and non-periodic) in the time domain, sdomain and the frequency domain
- Understand the properties of analog filters, and have the ability to design Butterworth filters
- Understand and apply sampling theorem and convert a signal from continuous time to discrete time or from discrete time to continuous time (without loss of information)
- Able to represent the discrete time signal in the frequency domain
- Able to design FIR and IIR filters to meet given specifications

Course Outcomes:
- Understand and explain continuous time and discrete time signals and systems, in time and frequency domain
- Apply the concepts of signals and systems to obtain the desired parameter/ representation
- Analyse the given system and classify the system/arrive at a suitable conclusion
- Design analog/digital filters to meet given specifications
- Design and implement the analog filter using components/ suitable simulation tools
- Design and implement the digital filter using suitable simulation tools, and record the input and output of the filter for the given audio signal

UNIT I
Signal Definition, Signal Classification, System definition, System classification, for both continuous time and discrete time. Definition of LTI systems

UNIT II
Introduction to Fourier Transform, Fourier Series, Relating the Laplace Transform to Fourier Transform, Frequency response of continuous time systems

UNIT III
Frequency response of ideal analog filters, Salient features of Butterworth filters Design and implementation of Analog Butterworth filters to meet given specifications

UNIT IV
Sampling Theorem- Statement and proof, converting the analog signal to a digital signal. Practical sampling. The Discrete Fourier Transform, Properties of DFT. Comparing the frequency response of analog and digital systems.

UNIT V
Definition of FIR and IIR filters. Frequency response of ideal digital filters
Transforming the Analog Butterworth filter to the Digital IIR Filter using suitable mapping techniques, to meet given specifications. Design of FIR Filters using the Window technique, and the frequency sampling technique to meet given specifications Comparing the designed filter with the desired filter frequency response

Textbooks:
1. 'Signals and Systems', by Simon Haykin and Barry Van Veen, Wiley.

References:
1. 'Theory and Application of Digital Signal Processing', Rabiner and Gold
2. 'Signals and Systems', Schaum's Outline series
3. 'Digital Signal Processing', Schaum's Outline series

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem   L   T   P   C

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(20A04606) BASIC VLSI DESIGN

Course Objectives:
- Understand the fundamental aspects of circuits in silicon
- Relate to VLSI design processes and design rules

Course Outcomes:
- Identify the CMOS layout levels, and the design layers used in the process sequence.
- Describe the general steps required for processing of CMOS integrated circuits.
- Design static CMOS combinational and sequential logic at the transistor level.
- Demonstrate different logic styles such as complementary CMOS logic, pass-transistor Logic, dynamic logic, etc.
- Interpret the need for testability and testing methods in VLSI.

UNIT I

Moore's law, speed power performance, nMOS fabrication, CMOS fabrication: n-well, pwell processes, BiCMOS, Comparison of bipolar and CMOS. Basic Electrical Properties of MOS And BiCMOS Circuits: Drain to source current versus voltage characteristics, threshold voltage, transconductance.

UNIT II

Basic Electrical Properties of MOS And BiCMOS Circuits: nMOS inverter, Determination of pull up to pull down ratio: nMOS inverter driven through one or more pass transistors, alternative forms of pull up, CMOS inverter, BiCMOS inverters, latch up. Basic Circuit Concepts: Sheet resistance, area capacitance calculation, Delay unit, inverter delay, estimation of CMOS inverter delay, super buffers, BiCMOS drivers.

UNIT III

MOS and BiCMOS Circuit Design Processes: MOS layers, stick diagrams, nMOS design style, CMOS design style Design rules and layout & Scaling of MOS Circuits: λ - based design rules, scaling factors for device parameters

UNIT IV

Subsystem Design and Layout-1: Switch logic pass transistor, Gate logic inverter, NAND gates, NOR gates, pseudo nMOS, Dynamic CMOS Examples of structured design: Parity generator, Bus arbitration, multiplexers, logic function block, code converter.

UNIT V

Subsystem Design and Layout-2: Clocked sequential circuits, dynamic shift registers, bus lines, General considerations, 4-bit arithmetic processes, 4-bit shifter, RegularityDefinition& Computation Practical aspects and testability: Some thoughts of performance, optimization and CAD tools for design and simulation.

Textbooks:
1. "Basic VLSI Design", Douglas A Pucknell, Kamran Eshraghian, 3 rd Edition, Prentice Hall of India publication, 2005.

References:
1. "CMOS Digital Integrated Circuits, Analysis And Design", Sung – Mo (Steve) Kang, Yusuf Leblebici, Tata McGraw Hill, 3 rd Edition, 2003.
   "VLSI Technology", S.M. Sze, 2nd edition, Tata McGraw Hill, 2003

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem   L   T   P   C
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(20A27605) FOOD REFRIGERATION AND COLD CHAIN MANAGEMENT
OPEN ELECTIVE II

Course Objectives:
- To know the equipment available to store perishable items for a long time
- To understand to increase the storage life of food items

Course Outcomes
By the end of the course, the students will
- Understand various principles and theories involved in refrigeration systems
- Understand the different equipment useful to store the food items for a long period.
- Understand how to increase the storage life of food items

UNIT I
Principles of refrigeration: Definition, background with second law of thermodynamics, unit of refrigerating capacity, coefficient of performance; Production of low temperatures: Expansion of a liquid with flashing, reversible/ irreversible adiabatic expansion of a gas/ real gas, thermoelectric cooling, adiabatic demagnetization; Air refrigerators working on reverse Carnot cycle: Carnot cycle, reversed Carnot cycle, selection of operating temperatures;

UNIT II
Air refrigerators working on Bell Coleman cycle: Reversed Brayton or Joule or Bell Coleman cycle, analysis of gas cycle, polytropic and multistage compression; Vapour refrigeration: Vapor as a refrigerant in reversed Carnot cycle with p-V and T-s diagrams, limitations of reversed Carnot cycle; Vapour compression system: Modifications in reverse Carnot cycle with vapour as a refrigerant (dry vs wet compression, throttling vs isentropic expansion), representation of vapor compression cycle on pressure- enthalpy diagram, super heating, sub cooling;

UNIT III
Liquid-vapour regenerative heat exchanger for vapour compression system, effect of suction vapour super heat and liquid sub cooling, actual vapour compression cycle; Vapour-absorption refrigeration system: Process, calculations, maximum coefficient of performance of a heat operated refrigerating machine, Common refrigerants and their properties: classification, nomenclature, desirable properties of refrigerants- physical, chemical, safety, thermodynamic and economical; Azeotropes; Components of vapour compression refrigeration system, evaporator, compressor, condenser and expansion valve;

UNIT IV
Ice manufacture, principles and systems of ice production, Treatment of water for making ice, brines, freezing tanks, ice cans, air agitation, quality of ice; Cold storage: Cold store, design of cold storage for different categories of food resources, size and shape, construction and material, insulation, vapour barriers, floors, frost-heave, interior finish and fitting, evaporators, automated cold stores, security of operations; Refrigerated transport: Handling and distribution, cold chain, refrigerated product handling, order picking, refrigerated vans, refrigerated display;

UNIT V
Air-conditioning: Meaning, factors affecting comfort air-conditioning, classification, sensible heat factor, industrial air-conditioning, problems on sensible heat factor; Winter/summer/year round air-conditioning, unitary air-conditioning systems, central air-conditioning, physiological principles in air-conditioning, air distribution and duct design methods; design of complete air-conditioning systems; humidifiers and dehumidifiers; Cooling load calculations: Load sources, product cooling, conducted heat, convicted heat, internal heat sources, heat of respiration, peak load; etc.

Textbooks:

1. Arora, C. P. "Refrigeration and Air Conditioning". Tata MC Graw Hill Publishing Co.Ltd., New Delhi. 1993.

References:
1. Adithan, M. and Laroiya, S. C. "Practical Refrigeration and Air Conditioning". Wiley Estern Ltd., New Delhi 1991

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B.Tech III-II Sem   **L T P C**
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(20A54701) WAVELET TRANSFORMS AND ITS APPLICATIONS

(Open Elective-II)

Course Objectives:

This course provides the students to understand Wavelet transforms and its applications.

Course Outcomes:

- Understand wavelets and wavelet expansion systems.
- Illustrate the multi resolution analysis ad scaling functions.
- Form fine scale to coarse scale analysis.
- Find the lattices and lifting.
- Perform numerical complexity of discrete wavelet transforms.
- Find the frames and tight frames using fourier series.

UNIT I   Wavelets

Wavelets and Wavelet Expansion Systems - Wavelet Expansion- Wavelet Transform- Wavelet System- More Specific Characteristics of Wavelet Systems -Haar Scaling Functions and Wavelets - effectiveness of Wavelet Analysis -The Discrete Wavelet Transform the Discrete-Time and Continuous Wavelet Transforms.

UNIT II   A Multiresolution Formulation of Wavelet Systems

Signal Spaces -The Scaling Function -Multiresolution Analysis - The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT III   Filter Banks and the Discrete Wavelet Transform

Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating - Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients - Lattices and Lifting - -Different Points of View.

UNIT IV   Time-Frequency and Complexity

Multiresolution versus Time-Frequency Analysis- Periodic versus Nonperiodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

UNIT V   Bases and Matrix Examples

Bases, Orthogonal Bases, and Biorthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames - Matrix Examples -Sine Expansion as a Tight

Frame Example.

Textbooks:

1. C. Sidney Burrus, Ramesh A. Gopinath, "Introduction to Wavelets and Wavelets Transforms",Prentice Hall, (1997).
2. James S. Walker, "A Primer on Wavelets and their Scientific Applications", CRC Press, (1999).

Reference Books:

1. Raghuveer Rao, "Wavelet Transforms", Pearson Education, Asia.

Online Learning Resources:

https://www.slideshare.net/RajEndiran1/introduction-to-wavelet-transform-51504915

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B.Tech III-II Sem   L   T   P   C
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(20A56701) PHYSICS OF ELECTRONIC MATERIALS AND DEVICES
(Open Elective-II)

Course Objectives:
- To impart the fundamental knowledge on various materials, their properties and applications.
- To provide insight into various semiconducting materials, and their properties.
- To enlighten the characteristic behavior of various semiconductor devices.
- To provide the basics of dielectric and piezoelectric materials and their properties.
- To explain different categories of magnetic materials, mechanism and their advanced applications.

Course Outcome: At the end of the course the student will be able
- To understand the fundamentals of various materials.
- To exploit the physics of semiconducting materials
- To familiarize with the working principles of semiconductor-based devices.
- To understand the behaviour of dielectric and piezoelectric materials.
- To identify the magnetic materials and their advanced applications.

UNIT I   Fundamentals of Materials Science
Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. Basic idea of point, line and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RT and glow discharge).

UNIT II   Semiconductors
Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

UNIT III Physics of Semiconductor devices
Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Construction and working principles of: Light emitting diodes, Heterojunctions, Transistors, FET and MOSFETs.

UNIT IV Dielectric Materials and their applications:
Introduction, Dielectric properties, Electronic polarizability and susceptibility, Dielectric constant and frequency dependence of polarization, Dielectric strength and dielectric loss, Piezoelectric properties.

UNIT V Magnetic Materials and their applications
Introduction, Magnetism & various contributions to para and dia magnetism, Ferro and Ferri magnetism and ferrites, Concepts of Spin waves and Magnons, Anti-ferromagnetism, Domains and domain walls, Coercive force, Hysteresis, Nano-magnetism, Super-paramagnetism – Properties and applications.

Textbooks
1. Principles of Electronic Materials and Devices- S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd., 3rd edition, 2007.
2. Electronic Components and Materials- Grover and Jamwal, Dhanpat Rai and Co.

Reference Books:
1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning, 6th edition
2. Electronic Materials Science- Eugene A. Irene, , Wiley, 2005
3. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd., , 2nd Edition,2011
4. A First Course In Material Science- by Raghvan, McGraw Hill Pub.
5. The Science and Engineering of materials- Donald R.Askeland, Chapman& Hall Pub.

NPTEL courses links
        https://nptel.ac.in/courses/113/106/113106062/
https://onlinecourses.nptel.ac.in/noc20_mm02/preview,   https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-mm07

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech III-II Sem   **L T P C**
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(20A51701) CHEMISTRY OF POLYMERS AND ITS APPLICATIONS

Course Objectives:
- To understand the basic principles of polymers
- To synthesize the different polymeric materials and their characterization by various instrumental methods.
- To impart knowledge to the students about fundamental concepts of Hydro gels of polymer networks, surface phenomenon by micelles
- To enumerate the applications of polymers in engineering

Course Outcome
- At the end of the course, the student will be able to:
- Understand the state of art synthesis of Polymeric materials
- Understand the hydro gels preparation, properties and applications in drug delivery system.
- Characterize polymers materials using IR, NMR, XRD.
- Analyze surface phenomenon fo micelles and characterise using photoelectron spectroscopy, ESCA and Auger spectroscopy

UNIT I : Polymers-Basics and Characterization
Basic concepts: monomers, repeat units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: condensation, addition, radical chain, ionic and coordination and copolymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution Measurement of molecular weight: end group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

Unit II : Synthetic Polymers   Addition and
condensation polymerization processes – Bulk, Solution, Suspension and Emulsion polymerization.
Preparation and significance, classification of polymers based on physical properties, Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications.
Preparation of Polymers based on different types of monomers, Olefin polymers, Diene polymers, nylons, Urea - formaldehyde, phenol - formaldehyde and melamine Epoxy and Ion exchange resins. Characterization of polymers by IR, NMR, XRD.

UNIT III : Natural Polymers & Modified cellulosics
Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.
Modified cellulosics: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEAK.
Learning Outcomes:

UNIT IV: Hydrogels of Polymer networks and Drug delivery
Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.
Introduction to drug systems including, drug development, regulation, absorption and disposition, routes of administration and dosage forms. Advanced drug delivery systems and controlled release.

UNIT V : Surface phenomena
Surface tension, adsorption on solids, electrical phenomena at interfaces including electrokinetics, micelles, reverse micelles, solubilization. Application of photoelectron spectroscopy, ESCA and Auger spectroscopy to the study of surfaces.

References :
1. A Text book of Polymer science, Billmayer

2. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
3. Advanced Organic Chemistry, B.Miller, Prentice Hall
4. Polymer Chemistry – G.S.Mishra
5. Polymer Chemistry – Gowarikar
6. Physical Chemistry –Galston
7. Drug Delivery- Ashim K. Misra

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem   L   T   P   C
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(20A01704) COST EFFECTIVE HOUSING TECHNIQUES

(Open Elective Course - III)

Course Objectives:

- To understand the requirements of structural safety for future construction.
- To know about the housing scenario, housing financial systems land use and physical
- planning for housing and housing the urban poor
- To know the traditional practices of rural housing
- To know the different innovative cost effective construction techniques
- To know the alternative building materials for low cost housing.

Course Outcomes:

- To know the repair and restore action of earthquake damaged non engineered buildings and ability to understand the requirements of structural safety for future construction
- To know about the housing scenario, housing financial systems land use and physical planning for housing and housing the urban poor
- Apply the traditional practices of rural housing
- Understand the different innovative cost effective construction techniques
- Suggest the alternative building materials for low cost housing

UNIT I

a) **Housing Scenario :**Introducing - Status of urban housing - Status of Rural Housing
b) **Housing Finance**: Introducing - Existing finance system in India - Government role as facilitator - Status at Rural Housing Finance - Impedimently in housing finance and related issues
c) **Land use and physical planning for housing :**Introduction - Planning of urban land - Urban land ceiling and regulation act - Efficiency of building bye lass - Residential Densities
d) **Housing the urban poor :**Introduction - Living conditions in slums - Approaches and strategies for housing urban poor

UNIT II

Development and adoption of low cost housing technology

Introduction - Adoption of innovative cost effective construction techniques - Adoption of precast elements in partial prefatroices - Adopting of total prefactcation of mass housing in India- General remarks on pre cast rooting/flooring systems -Economical wall system - Single Brick thick loading bearing wall - 19cm thick load bearing masonry walls - Half brick thick load bearing wall – Fly-ash gypsum thick for masonry - Stone Block masonry - Adoption of precast R.C. plank and join system for roof/floor in the building

UNIT III

Alternative building materials for low cost housing

Introduction - Substitute for scarce materials – Ferro-cement - Gypsum boards - Timber substitutions - Industrial wastes - Agricultural wastes - alternative building maintenance

Low cost Infrastructure services:

Introduce - Present status - Technological options - Low cost sanitation - Domestic wall - Water supply, energy

UNIT IV

Rural Housing: Introduction traditional practice of rural housing continuous - Mud Housing technology Mud roofs - Characteristics of mud - Fire treatment for thatch roof - Soil stabilization - Rural Housing programs

UNIT V

Housing in Disaster prone areas:

Introduction – Earthquake - Damages to houses - Traditional prone areas - Type of Damages and Railways of non-engineered buildings - Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions. Requirement's of structural safety of thin precast roofing units against Earthquake forces Status of R& D in earthquake strengthening measures - Floods, cyclone, future safety

Textbooks:

1. Building materials for low – income houses – International council for building research studies and documentation.

2. Hand book of low cost housing by A.K.Lal – Newage international publishers.

3. Low cost Housing – G.C. Mathur by South Asia Books

Reference Books:

1. Properties of concrete – Neville A.m. Pitman Publishing Limited, London.

2. Light weight concrete, Academic Kiado, Rudhai.G – Publishing home of Hungarian Academy of Sciences 1963.

3. Modern trends in housing in developing countries – A.G. Madhava Rao, D.S. Rama chandra Murthy &G.Annamalai. E. & F. N. Spon Publishers

Online Learning Resources:

https://nptel.ac.in/courses/124107001

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B.Tech IV-I Sem   L T P C
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(20A02704) IoT APPLICATIONS IN ELECTRICAL ENGINEERING

(Open Elective Course – III)

Course Objectives:

- Understand basics of Internet of Things and Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process
- Analyze motion less and motion detectors in IoT applications
- Understand about Analyze applications of IoT in smart grid
- Apply the concept of Internet of Energy for various applications

Course Outcomes:

- Understand the concept of IoT in Electrical Engineering
- Analyze various types of motionless sensors and various types of motion detectors
- Apply various applications of IoT in smart grid
- Design future working environment with Energy internet

UNIT I   SENSORS

Definitions, Terminology, Classification, Temperature sensors, Thermoresistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric

UNIT II   OCCUPANCY AND MOTION DETECTORS

Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, Capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors - Resistive microphones, Piezoelectric, Photo resistors

UNIT III   MEMS

Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RF MEMS switches, Electric and Magnetic field sensors

UNIT IV   IoT FOR SMART GRID

Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home

UNIT V   INTERNET of ENERGY (IoE)

Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IoE, Architecture, Energy routines, information sensing and processing issues, Energy internet as smart

grid

Textbooks:

1. Jon S. Wilson, Sensor Technology Hand book, Newnes Publisher, 2004
2. Tai Ran Hsu, MEMS and Microsystems: Design and manufacture, 1st Edition, Mc Grawhill Education, 2017
3. Ersan Kabalci and Yasin Kabalci, From Smart grid to Internet of Energy, 1st Edition, Academic Press, 2019

Reference Books:

1. Raj Kumar Buyya and Amir Vahid Dastjerdi, Internet of Things: Principles and Paradigms, Kindle Edition, Morgan Kaufmann Publisher, 2016
2. Yen Kheng Tan and Mark Wong, Energy Harvesting Systems for IoT Applications: Generation, Storage and Power Management, 1st Edition, CRC Press, 2019
3. RMD Sundaram Shriram, K. Vasudevan and Abhishek S. Nagarajan, Internet of Things, Wiley, 2019

Online Learning Resources:

1.https://onlinecourses.nptel.ac.in/noc22_cs96/preview

2. https://nptel.ac.in/courses/108108123

3. https://nptel.ac.in/courses/108108179

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(20A03704) PRODUCT DESIGN AND DEVELOPMENT
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Course Objectives:
- To Design products creatively while applying engineering design principles.
- To Apply principles of human factors, ethics and environmental factorsin product design.
- To Work in groups or individually in their pursuit of innovative product design.
- To implement value design for optimum product cost.

Course Outcomes: After successful completion of the course, the student will be able to
- Apply knowledge of basic science and engineering fundamentals
- Undertake problem identification, formulation and solution
- Understanding of the principles of sustainable design and development
- Understanding of professional and ethical responsibilities and commitment to them

UNIT I   Product Development Process

General problem-solving process - Flow of Work during the process of designing - Activity Planning Timing and scheduling, Planning Project and Product Costs - Effective Organization Structures - Interdisciplinary Cooperation, Leadership and Team behaviour.

UNIT II   Task Clarification

Importance of Task Clarification - Setting up a requirements list - Contents, Format, Identifying the requirements, refining and extending the requirements, Compiling the requirements list, Examples. Using requirements lists - Updating, Partial requirements lists, Further uses - Practical applications of requirements lists.

UNIT III   Conceptual Design

Steps in Conceptual Design. Abstracting to identify the essential problems - Aim of Abstraction, Broadening the problem. Formulation, Identifying the essential problems from the requirements list, establishing functions structures, Overall function, Breaking a function down into sub-functions. Developing working structures - Searching for working principles, Combining Working Principles, Selecting Working Structures, Practical Application of working structures. Developing Concepts - Firming up into principle solution variants, Evaluating principle solution variants, Practical Applications of working structures. Examples of Conceptual Design - One Handed Household Water Mixing Tap, Impulse - Loading Test Rig.

UNIT IV Embodiment Design

Steps of Embodiment Design, Checklist for Embodiment Design Basic rules of Embodiment Design Principles of Embodiment Design - Principles of Force Transformations, Principles of Division of Tasks, Principles of Self-Help, Principles of Stability and Bi-Stability, Principles of Fault-Free Design Guide for Embodiment Design - General Considerations, Design to allow for expansion, Design to allow for creep and relaxation, Design against Corrosion, Design to minimize wear, Design to Ergonomics, Design for Aesthetics, Design for Production, Design for Assembly, Design for Maintenance, Design for Recycling, Design for Minimum risk, Design to standards. Evaluation of Embodiment Designs.

UNIT V Mechanical Connections, Mechatronics AndAdaptronics:

Mechanical Connections - General functions and General Behaviour, Material connections, From Connections, Force connections, Applications. Mechatronics - General Architecture and Terminology, Goals and Limitations, Development of Mechatronic Solution, Examples. Adaptronics - Fundamentals and Terminology, Goals and Limitations, Development of Adaptronics Solutions, Examples.

Textbooks:
1. G.Paul; W. Beitzetal, Engineering Design, Springer International Education, 2010.
2. Kevin Otto: K. Wood, Product Design And Development, Pearson Education, 2013.

References:
1. Kenith B. Kahu, Product Planning Essentials, Yes dee Publishing, 2011.
2. K.T. Ulrich, Product Design and Development, TMH Publishers, 2011.

Online Learning Resources:
- https://nptel.ac.in/courses/112107217
- https://nptel.ac.in/courses/112104230
- https://www.youtube.com/watch?v=mvaqZAFdL6U
- https://nptel.ac.in/courses/107103082
- https://quizxp.com/nptel-product-design-and-manufacturing-assignment-5/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech IV-I Sem   L   T   P   C
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(20A04704) ELECTRONIC SENSORS
(Open Elective Course –III)

Course Objectives:
- Learn the characterization of sensors.
- Known the working of Electromechanical, Thermal, Magnetic and radiation sensors
- Understand the concepts of Electro analytic and smart sensors
- Able to use sensors in different applications

Course Outcomes:
- Learn about sensor Principle, Classification and Characterization.
- Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro analytic sensors
- Understand the basic concepts of Smart Sensors
- Design a system with sensors

UNIT I
Sensors / Transducers: Principles, Classification, Parameters, Characteristics, Environmental
Parameters (EP), Characterization
Electromechanical Sensors: Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge,
Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor – Types-Capacitive
Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors

UNIT II
Thermal Sensors: Introduction, Gas thermometric Sensors, Thermal Expansion Type Thermometric Sensors,
Acoustic Temperature Sensor ,Dielectric Constant and Refractive Index thermo sensors, Helium Low
Temperature Thermometer ,Nuclear Thermometer ,Magnetic Thermometer ,Resistance Change Type
Thermometric Sensors, Thermo emf Sensors, Junction Semiconductor Types, Thermal Radiation Sensors,
Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry,
Heat Flux Sensors

UNIT III
Magnetic sensors: Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors,
Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors, Inductance
and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros.

UNIT IV
Radiation Sensors: Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, Xray and
Nuclear Radiation Sensors, Fibre Optic Sensors
Electro analytical Sensors: The Electrochemical Cell, The Cell Potential - Standard Hydrogen
Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference
Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

UNIT V
Smart Sensors: Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters,
Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface,
the Automation Sensors –Applications: Introduction, On-board Automobile Sensors (Automotive Sensors),
Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing –Sensors for environmental
Monitoring

Textbooks:
1. "Sensors and Transducers - D. Patranabis" –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravindraghu, CRC press, 2011

References:
1. Sensors and Actuators, D. Patranabis, 2nd Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villeyvaltokari, 1st edition, maker media,2014.
3. Sensors handbook- Sabriesoloman, 2nd Ed. TMH, 2009

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B.Tech   **L T P C**
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(20A04506) PRINCIPLES OF COMMUNICATION SYSTEMS

Course Objectives:
- To understand the concept of various modulation schemes and multiplexing.
- To apply the concept of various modulation schemes to solve engineering problems.
- To analyse various modulation schemes.
- To evaluate various modulation scheme in real time applications.

Course Outcomes:
- Understand the concept of various modulation schemes and multiplexing
- Apply the concept of various modulation schemes to solve engineering problems
- Analyse various modulation schemes, and evaluate various modulation scheme in real time applications

UNIT I   Amplitude Modulation
Introduction to Noise and Fourier Transform. An overview of Electronic Communication Systems. Need for Frequency Translation, Amplitude Modulation: DSB-FC, DSB-SC, SSB-SC and VSB. Frequency Division Multiplexing. Radio Transmitter and Receiver.

UNIT II   Angle Modulation
Angle Modulation, Tone modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulation and Demodulation. Stereophonic FM Broadcasting.

UNIT III   Pulse Modulation
Sampling Theorem: Low pass and Band pass Signals. Pulse Amplitude Modulation and Concept of Time Division Multiplexing. Pulse Width Modulation. Digital Representation of Analog Signals.

UNIT IV   Digital Modulation
Binary Amplitude Shift Keying, Binary Phase Shift Keying and Quadrature Phase Shift Keying, Binary Frequency Shift Keying. Regenerative Repeater.

UNIT VCommunication Systems
Satellite, RADAR, Optical, Mobile and Computer Communication (Block diagram approach only).

Note: The main emphasis is on qualitative treatment. Complex mathematical treatment may be avoided.

Textbooks:
1. Herbert Taub, Donald L Schilling and Goutam Saha, "Principles of Communication   Systems", 3rdEdition, Tata McGraw-Hill Publishing Company Ltd., 2008.

References:
1. B. P. Lathi, Zhi Ding and Hari M. Gupta, "Modern Digital and Analog Communication Systems", 4th Edition, Oxford University Press, 2017.
2. K. Sam Shanmugam "Digital and Analog Communication Systems", Wiley India Edition, 2008.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem

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(20A27704) HUMAN NUTRITION
(OPEN ELECTIVE-III)

Course Objectives:
- To get knowledge on Concepts and content of nutrition source and metabolic functions.
- To know about Balanced diets for various groups; Diets and disorders, recommended dietary allowances
- To learn about Epidemiology of under nutrition and over nutrition.
- To understand Nutrition and immunity.

Course Outcomes:
- To study the Salient features of Concepts and content of nutrition, Malnutrition, Nutrition education
- Assessment of nutritional status, disorders Food fad and faddism.

UNIT I
Concepts and content of nutrition: Nutrition agencies; Nutrition of community; Nutritional policies and their implementation; Metabolic function of nutrients. Nutrients: Sources, functions, digestion, absorption, assimilation and transport of carbohydrates, proteins and fats in human beings;

UNIT II
Water and energy balance: Water intake and losses; Basal metabolism- BMR; Body surface area and factors affecting BMR Formulation of diets: Classification of balanced diet; Balanced diets for various groups; Diets and disorders. Recommended dietary allowances (RDA); For various age group; According physiological status; Athletic and sports man; Geriatric persons

UNIT III
Malnutrition: Type of Malnutrition; Multi-factorial causes; Epidemiology of under nutrition and over nutrition; Nutrition and immunity.

UNIT IV
Nutrition education Assessment of nutritional status: Diet surveys; Anthropometry; Clinical examination; Biochemical assessment; Additional medical information

UNIT V
Blood constituents; Hormone types; Miscellaneous disorders Food fad and faddism. Potentially toxic substances in human food.

Textbooks:
1. Swaminathan M, Advanced Text Book on Food & Nutrition (Volume I and II) , The Bangalore Printing and Publishing Co.Ltd, Bangalore. 2006
2. Stewart Truswell, ABC of Nutrition (4th edition) , BMJ Publishing Group 2003, ISBN 0727916645.
3. Martin Eastwood, Principles of Human Nutrition , Blackwell Publishing, Boca Rotan

Reference:
1. Mike Lean and E. Combet ,Barasi's Human Nutrition – A Health Perspective , Second Edition CRC Press, London
2. Introduction to Human Nutrition, Micheal J. G., Susan A.L. Aedin C. and Hester H.V, Wiley-Blackwell Publication, UK 2009 , ISBN 9781405168076
3. Bogert L.J., Goerge M.B, Doris H.C., Nutrition and Physical Fitness, W.B. Saunders Company, Toronto, Canada

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem   L T P C
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(20A54702) NUMERICAL METHODS FOR ENGINEERS

(OPEN ELECTIVE-III)

Course Objectives:

This course aims at providing the student with the knowledge on various numerical methods for solving equations, interpolating the polynomials, evaluation of integral equations and solution of differential equations.

Course Outcomes:

- Apply numerical methods to solve algebraic and transcendental equations.
- Understand fitting of several kinds of curves.
- Derive interpolating polynomials using interpolation formulae.
- Solve differential and integral equations numerically.

UNIT I   **Solution of Algebraic & Transcendental Equations**

Introduction-Bisection Method-Iterative method-Regula falsi method-Newton Raphson method.
System of Algebraic equations: Gauss Jordan method-Gauss Siedal method.

UNIT II   **Curve Fitting**

Principle of Least squares- Fitting of curves- Fitting of linear, quadratic and exponential curves.

UNIT III   **Interpolation**

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae
Gauss forward and backward formula, Stirling's formula, Bessel's formula

UNIT IV   **Numerical Integration**

Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule

UNIT V   **Solution of Initial value problems to Ordinary differential equations**

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Modified Euler's Method-Runge-Kutta Methods.

Textbooks:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Probability and Statistics for Engineers and Scientists, Ronald E. Walpole,PNIE.

3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India

Reference Books:

1. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
2. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

Online Learning Resources:

https://slideplayer.com/slide/8588078/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem   **L   T   P   C**

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(20A56702) SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS
(OPEN ELECTIVE-III)

Course Objectives:
- To provide exposure to various kinds of sensors and actuators and their engineering applications.
- To impart knowledge on the basic laws and phenomenon behind the working of sensors and actuators
- To enlighten the operating principles of various sensors and actuators
- To educate the fabrication of sensors
- To identify the required sensor and actuator for interdisciplinary application

Course Outcomes:
- To recognize the need of sensors and actuators
- To understand working principles of various sensors and actuators
- To identify different type of sensors and actuators used in real life applications
- To exploit basics in common methods for converting a physical parameter into an electrical quantity
- To make use of sensors and actuators for different applications

UNIT I Introduction to Sensors and Actuators
Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Materials used and their fabrication process: Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.
Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Hydraulic, Pneumatic, Mechanical, Electrical, Magnetic, Electromagnetic, piezo-electric and piezo-resistive actuators, Simple applications of Actuators.

UNIT II Temperature and Mechanical Sensors
Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Resistance temperature sensors, Silicon resistive sensors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors
Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: strain gauges, tactile sensors, Pressure sensors: semiconductor, piezoresistive, capacitive, VRP.
UNIT III Optical and Acoustic Sensors
Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photo-resistors based sensors, Photomultipliers, Infrared sensors: thermal, PIR, thermopiles
Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones.
UNIT IV Magnetic, Electromagnetic Sensors and Actuators
 Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magneto-strictive sensors and actuators, Voice coil actuators (speakers and speaker-like actuators).

UNIT V Chemical and Radiation Sensors
Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.
Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Geiger-Mueller counters, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Textbooks:
1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

Reference Books:

1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.
5. Principles of Industrial Instrumentation By D. Patranabhis

NPTEL courses links
https://onlinecourses.nptel.ac.in/noc21_ee32/preview

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem   **L T P C**

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(20A51702) CHEMISTRY OF NANOMATERIALS AND APPLICATIONS

(OPEN ELECTIVE-III)

Course Objectives:
- To understand synthetic principles of Nanomaterials by various methods
- To characterize the synthetic nanomaterials by various instrumental methods
- To enumerate the applications of nanomaterials in engineering

Course Outcomes:
- Understand the state of art synthesis of nano materials
- Characterize nano materials using ion beam, scanning probe methodologies, position sensitive atom probe and spectroscopic ellipsometry.
- Analyze nanoscale structure in metals, polymers and ceramics
- Analyze structure-property relationship in coarser scale structures
- Understand structures of carbon nano tubes

UNIT I

Introduction: Scope of nanoscience and nanotecnology, nanoscience in nature, classification of nanostructured materials, importance of nano materials.

Synthetic Methods**:** Bottom-Up approach**:** Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and sonochemical synthesis.

UNIT II

Top-Down approach: Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, high energy ball milling.

UNIT III

Techniques for characterization: Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.

UNIT IV

Studies of Nano-structured Materials: Synthesis, properties and applications of the following nanomaterials, fullerenes, carbon nanotubes, core-shell nanoparticles, nanoshells, self- assembled monolayers, and monolayer protected metal nanoparticles, nanocrystalline materials, magnetic nanoparticles and important properties in relation to nanomagnetic materials, thermoelectric materials, non-linear optical materials, liquid crystals.

UNIT V

Engineering Applications of Nanomaterials

Textbooks:
1. NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007.
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, BaldevRai,   BB Rath and James Murday, Univ. Press, 2012.

References:
1. Concepts of Nanochemistry; Ludovico Cademrtiri and Geoffrey A. Ozin& Geoffrey A. Ozin, Wiley-VCH, 2011.
2. Nanostructures & Nanomaterials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007.
3. Nanomaterials Chemistry, C. N. R. Rao, Achim Muller, K.Cheetham, Wiley-VCH, 2007.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-I Sem   L   T   P   C
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(20A01705) HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT PRACTICES

(Open Elective Course-IV)

Course Objectives:

- To understand safety, health and environmental management.
- To be familiar with hazard classification and assessment, hazard evaluation and hazard . control, environmental issues and management
- To get exposed to accidents modeling, accident investigation and reporting, concepts of. HAZOP and PHA
- To be familiar with safety measures in design and process operations.
- To get exposed to risk assessment and management, principles and methods

Course Outcomes:

- To understand safety, health and environmental management.
- To be familiar with hazard classification and assessment, hazard evaluation and hazard.
- To get exposed to accidents modelling, accident investigation and reporting control, environmental issues and management
- To get concepts of HAZOP and PHA.
- To be familiar with safety measures in design and process operations.

UNIT I

Introduction to safety, health and environmental management - Basic terms and their definitions - Importance of safety - Safety assurance and assessment - Safety in design and operation - Organizing for safety.

UNIT II

Hazard classification and assessment - Hazard evaluation and hazard control.

Environmental issues and Management - Atmospheric pollution - Flaring and fugitive release - Water pollution - Environmental monitoring - Environmental management.

UNIT III

Accidents modelling - Release modelling - Fire and explosion modelling - Toxic release and dispersion Modelling

UNIT IV

Accident investigation and reporting - concepts of HAZOP and PHA.

Safety measures in design and process operations - Inserting, explosion, fire prevention, sprinkler systems.

UNIT V

Risk assesment and management - Risk picture - Definition and characteristics - Risk acceptance criteria - Quantified risk assessment - Hazard assessment - Fatality risk assessment - Risk

management principles and methods.

Textbooks:

1. Process Safety Analysis, by Skelton. B, Gulf Publishing Company, Houston, 210pp., 1997.
2. Risk Management with Applications from Offshore Petroleum Industry, by TerjeAven and Jan Erik Vinnem, Springer, 200pp., 2007.

References:

1. Introduction to Safety and Reliability of Structures, by Jorg Schneider
2. Structural Engineering Documents Vol. 5, International Association for Bridge and Structural Engineering (IABSE), 138pp., 1997.
3. Safety and Health for Engineers, by Roger L. Brauer, John Wiley and Sons Inc. pp. 645-663, 2006.
4. Health, Safety and Environmental Management in Offshore and Petroleum Engineering, Srinivasan Chandrasekaran, John Wiley and Sons, 2016.

Online Learning Resources:https://nptel.ac.in/courses/114106017

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B.Tech IV-I Sem　　　　　　　　　　　　　　　　　　　　**L　T　P　C**
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(20A02705) RENEWABLE ENERGY SYSTEMS

(Open Elective Course – IV)

Course Objectives:

- Understand various sources of Energy and the need of Renewable Energy Systems.
- Understand the concepts of Solar Radiation, Wind energy and its applications.
- Analyze solar thermal and solar PV systems
- Understand the concept of geothermal energy and its applications, biomass energy, the concept of Ocean energy and fuel cells.

Course Outcomes:

- Understand various alternate sources of energy for different suitable application requirements
- Understand the concepts of solar energy generation strategies and wind energy system
- Analyze Solar and Wind energy systems
- Understand the basics of Geothermal Energy Systems, various diversified energy scenarios of ocean, biomass and fuel cells

UNIT I　　　　　　SOLAR ENERGY

Solar radiation - beam and diffuse radiation, solar constant, earth sun angles, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

UNIT II　　　　　　PV ENERGY SYSTEMS

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Electrical characteristics of silicon PV cells and modules, PV systems for remote power, Grid connected PV systems.

UNIT III　　　　　　WIND ENERGY

Principle of wind energy conversion; Basic components of wind energy conversion systems; windmill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades and estimation of power output; wind data and site selection considerations.

UNIT IV　　　　　　GEOTHERMAL ENERGY

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geo-pressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

UNIT V   MISCELLANEOUS ENERGY TECHNOLOGIES

Ocean Energy: Tidal Energy-Principle of working, performance and limitations. Wave Energy-Principle of working, performance and limitations.

Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration

Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Textbooks:

1. Stephen Peake, "Renewable Energy Power for a Sustainable Future", Oxford International Edition, 2018.
2. G. D. Rai, "Non-Conventional Energy Sources", 4th Edition, Khanna Publishers, 2000.

Reference Books:

1. S. P. Sukhatme, "Solar Energy",3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
2. B H Khan , " Non-Conventional Energy Resources", 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
3. S. Hasan Saeed and D.K.Sharma,"Non-Conventional Energy Resources",3rd Edition, S.K.Kataria& Sons, 2012.
4. G. N. Tiwari and M.K.Ghosal, "Renewable Energy Resource: Basic Principles and Applications", Narosa Publishing House, 2004.

Online Learning Resources:

1. https://nptel.ac.in/courses/103103206

2. https://nptel.ac.in/courses/108108078

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B.Tech IV-I Sem   **L   T   P   C**
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(20A03705) INTRODUCTION TO COMPOSITE MATERIALS
(Open Elective-IV)

Course Objectives:
- Introduce composite materials and their applications.
- Build proper background for stress analysis in the design of composite structures.
- Familiarize various properties of composite materials.
- Focus on biodegradable composites.

Course Outcomes:
- Identify the practical applications of composites. (L3)
- Identify the polymer matrix composites. (L3)
- Classify of bio- degradable composites. (L2)
- Outline the various types of ceramic matrix materials. (L2)

UNIT I   Introduction to composites
Fundamentals of composites – Definition – classification– based on Matrix – based on structure – Advantages and applications of composites - Reinforcement – whiskers – glass fiber – carbon fiber - Aramid fiber – ceramic fiber – Properties and applications.

UNIT II   Polymer matrix composites
Polymers - Polymer matrix materials – PMC processes - hand layup processes – spray up processes – resin transfer moulding – Pultrusion – Filament winding – Auto clave based methods - Injection moulding – sheet moulding compound – properties and applications of PMCs.

UNIT III   Metal matrix composites
Metals - types of metal matrix composites – Metallic Matrices. Processing of MMC – Liquid state processes – solid state processes – In-situ processes. Properties and applications of MMCs.

UNIT IV   Ceramic matrix composites
Ceramic matrix materials – properties – processing of CMCs –Sintering - Hot pressing – Infiltration – Lanxide process – Insitu chemical reaction techniques – solgel polymer pyrolsis –SHS - Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing). Properties and Applications of CCMs.

UNIT V   Advances & Applications of composites
Advantages of carbon matrix – limitations of carbon matrix carbon fibre – chemical vapour deposition of carbon on carbonfibre perform. Properties and applications of Carbon-carbon composites. Composites for aerospace applications.Bio degradability, introduction of bio composites, classification, processing of bio composites, applications of bio composites - Mechanical, Biomedical, automobile Engineering.

Textbooks:
1. Chawla K.K, Composite materials, 2/e, Springer – Verlag, 1998.
2. Mathews F.L. and Rawlings R.D., Chapman and Hall, Composite Materials: Engineering and Science, 1/e, England, 1994.

Reference Books:
1. H K Shivanand, B V Babu Kiran, Composite Materials, ASIAN BOOKS, 2011.
2. A.B. Strong , Fundamentals of Composite Manufacturing, SME Publications, 1989.
3. S.C. Sharma, Composite materials, Narosa Publications, 2000.
4. Maureen Mitton, Hand Book of Bio plastics & Bio composites for Engineering applications, John Wiley publications, 2011.

Online Learning Resources:
- https://nptel.ac.in/courses/112104229
- https://nptel.ac.in/courses/112104168
- https://nptel.ac.in/courses/101104010
- https://nptel.ac.in/courses/105108124
- https://nptel.ac.in/courses/112104221

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B.Tech IV-I Sem
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(20A04705) MICROCONTROLLERS & APPLICATIONS
(Open Elective Course –IV)

Course Objectives:
- Describe the Architecture of 8051 Microcontroller and Interfacing of 8051 to external memory.
- Write 8051 Assembly level programs using 8051 instruction set.
- Describe the Interrupt system, operation of Timers/Counters and Serial port of 8051.
- Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051.

Course Outcomes:
- Understand the importance of Microcontroller and Acquire the knowledge of Architecture of 8051 Microcontroller.
- Apply and Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to using 8051 I/O ports.
- Develop the 8051 Assembly level programs using 8051 Instruction set
- Design the Interrupt system, operation of Timers/Counters and Serial port of 8051

UNIT 1   8051 Microcontroller:

Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture-Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.

UNIT II

Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples to use these instructions.

UNIT III

8051 Stack, Stack and Subroutine instructions. Simple Assembly language program examples to use subroutine instructions.8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode- 2 on a port pin.

UNIT IV

8051 Serial Communication- Basics of Serial Data Communication, RS- 232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.8051 Interrupts. 8051 Assembly language programming to generate an external interrupt using a switch.

UNIT V

8051 C programming to generate a square waveform on a port pin using a Timer interrupt. Interfacing 8051 to ADC-0804, DAC, LCD and Interfacing with relays and opto isolators, Stepper Motor Interfacing, DC motor interfacing, PWM generation using 8051.

Textbooks:
1. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; "The 8051 Microcontroller and Embedded Systems – using assembly and C", PHI, 2006 / Pearson, 2006.
2. Kenneth J. Ayala, "The 8051 Microcontroller", 3rd Edition, Thomson/Cengage Learning.

References:
1. Manish K Patel, "The 8051 Microcontroller Based Embedded Systems", McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2. Raj Kamal, "Microcontrollers: Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.

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B.Tech IV- I Sem

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(20A04706) PRINCIPLES OF CELLULAR AND MOBILE COMMUNICATIONS

Course Objectives:
- To understand the concepts and operation of cellular systems.
- To apply the concepts of cellular systems to solve engineering problems.
- To analyse cellular systems for meaningful conclusions.
- To evaluate suitability of a cellular system in real time applications.
- To design cellular patterns based on frequency reuse factor.

Course Outcomes:

At the end of the course, the student should be able to
- Understand the concepts and operation of cellular systems (L1)
- Apply the concepts of cellular systems to solve engineering problems (L2).
- Analyse cellular systems for meaningful conclusions, Evaluate suitability of a cellular system in real time applications (L3).
- Design cellular patterns based on frequency reuse factor (L4).

UNIT I   Introduction to Cellular Mobile Systems

Why cellular mobile communication systems? A basic cellular system, Evolution of mobile radio communications, Performance criteria, Characteristics of mobile radio environment, Operation of cellular systems. Examples for analog and digital cellular systems.

UNIT II   Cellular Radio System Design

General description of the problem, Concept of frequency reuse channels, Cochannel interference reduction, Desired C/I ratio, Cell splitting and sectoring.

UNIT III   Handoffs and Dropped Calls

Why handoffs and types of handoffs, Initiation of handoff, Delaying a handoff, Forced handoffs, Queuing of handoffs, Power-difference handoffs, Mobile assisted handoff and soft handoff, Cell-site handoff, Intersystem handoff. Introduction to dropped call rate.

UNIT IV   Multiple Access Techniques for Wireless Communications

Introduction, Frequency Division Multiple Access, Time Division Multiple Access, Code Division Multiple Access and Space Division Multiple Access.

UNIT V   Digital Cellular Systems

Global System for Mobile Systems, Time Division Multiple Access Systems, Code Division Multiple Access Systems. Examples for 2G, 3G and 4G systems. Introduction to 5G system.

Textbooks:
1. William C. Y. Lee, "Mobile Cellular Telecommunications", 2nd Edition, McGraw-Hill International, 1995.
2. Theodore S. Rappaport, "Wireless Communications – Principles and Practice", 2nd Edition, PHI, 2004.

References:
1. Aditya K. Jagannatham "Principles of Modern Wireless Communications Systems – Theory and Practice", McGraw-Hill International, 2015.

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B.Tech IV-I Sem   **L   T   P   C**
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(20A27705) WASTE AND EFFLUENT MANAGEMENT
(OPEN ELECTIVE-IV)

Course Objectives:
- To understand the wastewater treatment process.
- To gain knowledge on waste disposal in various ways.
- To know about advances in wastewater treatment.

Course Outcomes:
- Acquires knowledge on technologies used for chemical and biological methods of waste water and effluent treatment

UNIT I

Wastewater Treatment an Overview: Terminology – Regulations – Health and Environment Concerns in waste water management – Constituents in waste water inorganic – Organic and metallic constituents. Process Analysis and Selection: Components of waste water flows – Analysis of Data – Reactors used in waste water treatment – Mass Balance Analysis – Modeling of ideal and non ideal flow in Reactors – Process Selection

UNIT II

Waste disposal methods – Physical, Chemical & Biological; Economical aspects of waste treatment and disposal. Treatment methods of solid wastes: Biological composting, drying and incineration; Design of Solid Waste Management System: Landfill Digester, Vermicomposting Pit.

UNIT III

Introduction: Classification and characterization of food industrial wastes from Fruit and Vegetable processing industry, Beverage industry; Fish, Meat & Poultry industry, Sugar industry and Dairy industry.
Chemical Unit Processes: Role of unit processes in waste water treatment chemical coagulation – Chemical precipitation for improved plant performance chemical oxidation – Neutralization – Chemical Storage

UNIT IV

Biological Treatment: Overview of biological Treatment – Microbial metabolism – Bacterial growth and energetics – Aerobic biological oxidation – Anaerobic fermentation and oxidation – Trickling filters – Rotating biological contractors – Combined aerobic processes – Activated sludge film packing.

UNIT V

Advanced Wastewater Treatment: Technologies used in advanced treatment – Classification of technologies. Removal of Colloids and suspended particles – Depth Filtration – Surface Filtration – Membrane Filtration-Absorption – Ion Exchange – Advanced oxidation process.

Textbooks:
1. Herzka A & Booth RG; "Food Industry Wastes: Disposal and Recovery"; Applied Science Pub Ltd. 1981,
2. Fair GM, Geyer JC & Okun DA; "Water & Wastewater Engineering"; John Wiley & Sons, Inc. 1986,

References:
1. GE; "Symposium: Processing Agricultural & Municipal Wastes"; AVI. 1973,
2. Inglett Green JH & Kramer A; "Food Processing Waste Management"; AVI. 1979,
3. Rittmann BE & McCarty PL; "Environmental Biotechnology: Principles and Applications"; Mc-Grow-Hill International editions2001,.
4. Bhattacharyya B C & Banerjee R; "Environmental Biotechnology"; Oxford University Press.
5. Bartlett RE; " Wastewater Treatment; Applied Science" Pub Ltd.
6. G. Tchobanoglous, FI Biston, "Waste water Engineering Treatment and Reuse": Mc Graw Hill, 2002.
7. "Industrial Waste Water Management Treatment and Disposal by Waste Water" 3rd Edition Mc Graw Hill 2008

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B.Tech IV-I Sem   L T P C
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(20A54703) NUMBER THEORY AND ITS APPLICATIONS

(OPEN ELECTIVE-IV)

Course Objectives:

This course enables the students to learn the concepts of number theory and its applications to information security.

Course Outcomes:

- Understand number theory and its properties.
- Understand principles on congruences
- Develop the knowledge to apply various applications
- Develop various encryption methods and its applications.

UNIT I   Integers, Greatest common divisors and prime Factorization

The well-ordering property-Divisibility-Representation of integers-Computer operations with integers-Prime numbers-Greatest common divisors-The Euclidean algorithm -The fundamental theorem of arithmetic-Factorization of integers and the Fermat numbers-Linear Diophantine equations

UNIT II   Congruences

Introduction to congruences -Linear congruences-The Chinese remainder theorem-Systems of linear congruences

UNIT III   Applications of Congruences

Divisibility tests-The perpetual calendar-Round-robin tournaments-Computer file storage and hashing functions. Wilson's theorem and Fermat's little theorem- Pseudo primes- Euler's theorem-Euler's p hi-function- The sum and number of divisors- Perfect numbers and Mersenne primes.

UNIT IV   Finite fields & Primality, factoring

Finite fields- quadratic residues and reciprocity-Pseudo primes-rho method-fermat factorization and factor bases.

UNIT V Cryptology

Basic terminology-complexity theorem-Character ciphers-Block ciphers-Exponentiation ciphers-Public-key cryptography-Discrete logarithm-Knapsack ciphers- RSA algorithm-Some applications to computer science.

Textbooks:

1. Elementary number theory and its applications, Kenneth H Rosen, AT & T Information systems & Bell laboratories.
2. A course in Number theory & Cryptography, Neal Koblitz, Springer.

Reference Books:

1. An Introduction To The Theory Of Numbers, Herbert S. Zuckerman, Hugh L. Montgomery, Ivan Niven, wiley publishers
2. Introduction to Analytic number theory-Tom M Apostol, springer
3. Elementary number theory, VK Krishnan, Universities press

Online Learning Resources:

https://www.slideshare.net/ItishreeDash3/a-study-on-number-theory-and-its-applications

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B.Tech IV-I Sem   **L   T   P   C**
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(20A56703) SMART MATERIALS AND DEVICES
(OPEN ELECTIVE-IV)

Course Objectives:
- To provide exposure to smart materials and their engineering applications.
- To impart knowledge on the basics and phenomenon behind the working of smart materials
- To enlighten the properties exhibited by smart materials
- To educate various techniques used to synthesize and characterize smart materials
- To identify the required smart material for distinct applications/devices

Course Outcomes:
- to recognize the need of smart materials
- to understand the working principles of smart materials
- to know different techniques used to synthesize and characterize smart materials
- to exploit the properties of smart materials
- to make use of smart materials for different applications

UNIT I

Introduction: Historical account of the discovery and development of smart materials, Two phases: Austenite and Martensite, Temperature induced phase changes, Shape memory effect, Pseudoelasticity, One-way shape memory effect, Two-way shape memory effect.

UNIT II: Properties of Smart Materials: Physical principles of optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials

UNIT III: Synthesis of smart materials: Solid state reaction technique, Chemical route: Chemical vapour deposition, Sol-gel technique, Hydrothermal method, Co-precipitaiton. Green synthesis, Mechanical alloying and Thin film deposition techniques: Chemical etching, Sol-gel, spray pyrolysis.

UNIT IV: Characterization techniques: X-ray diffraction, Raman spectroscopy (RS), Fourier-transform infrared reflection (FTIR), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy, Atomic force microscopy (AFM) and Differential Scanning Calorimetry (DSC).

UNIT V: Materials and Devices: Characteristics of shape memory alloys, Magnetostrictive, Optoelectronic, Piezoelectric, Metamaterials, Electro-rheological and Magneto-rheological materials and Composite materials.
Devices based on smart materials: Sensors & Actuators, MEMS and intelligent devices, Future scope of the smart materials.

Textbooks:
1. Encyclopaedia of Smart Materials- Mel Schwartz, John Wiley & Sons, Inc.2002
2. Smart Materials and Structures - M. V. Gandhi and B.S. Thompson, Champman and Hall, 1992

References:
1. Smart Materials and Technologies- M. Addington and D. L. Schodek, , Elsevier, 2005.
2. Characterization and Application of smart Materials -R. Rai, Synthesis, , Nova Science, 2011.
3. Electroceramics: Materials, Properties, Applications -A.J. Moulson and J.M. Herbert, 2nd Edn., John Wiley & Sons, 2003.
4. Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic 1. Emission Sensors, Materials and Amplifiers, G. Gautschi, Springer, 2002.
5. Optical Metamaterials: Fundamentals and Applications -W. Cai and V. Shalaev, springer,2010.
6. Smart Materials and Structures - P. L Reece, New Research, Nova Science, 2007

NPTEL courses links

https://nptel.ac.in/courses/112/104/112104173/
https://nptel.ac.in/courses/112/104/112104251/
https://nptel.ac.in/content/storage2/courses/112104173/Mod_1_smart_mat_lec

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B.Tech IV-I Sem   L   T   P   C
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(20A51703) GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (OPEN ELECTIVE-IV)

Course Objectives:
- 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 and the redesign of chemicals, industrial processes and products.
- Understand the use of alternatives assessments that combine chemical, environmental health, regulatory, and business considerations to develop safer products.

Course Outcomes:
- Recognize and acquire green chemistry concepts and apply these ideas to develop respect for the inter connectedness of our world and an ethic of environmental care and sustainability.

UNIT I: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY
Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement and addition reactions and un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling.

UNIT II: CATALYSIS AND GREEN CHEMISTRY
Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, Asymmetric Catalysis, Heterogenising the Homogenous catalysts, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide, Bio-catalysis and photo-catalysis with examples.

UNIT III: ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS
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
Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Other Forms of Renewable Energy, Fuel Cells, Chemicals from Renewable feedstocks: Chemicals from Renewable Feedstocks: Chemicals from Fatty Acids, Polymers from Renewable Resources, Some Other Chemicals from Natural Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency: Photochemical Reactions: Advantages of and Challenges Faced by Photochemical Processes, Examples of Photochemical Reactions, Chemistry Using Microwaves: Microwave Heating, Microwave-assisted Reactions, Sonochemistry: Sonochemistry and Green Chemistry, Electrochemical Synthesis: Examples of Electrochemical Synthesis. Industrial applications of alternative environmentally benign catalytic systems for carrying out the important reactions such as selective oxidation, reduction and C-C bond formations (specific reactions).

UNIT V: GREEN PROCESSES FOR GREEN NANOSCIENCE
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

Textbooks:
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

References:
1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and AckmezMudhoo, CRC Press, 2010.
2. Edited by AlvisePerosa and Maurizio Selva , Hand Book of Green chemistry Volume 8:Green Nanoscience, wiley-VCH, 2013.

HONOURS

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
B.Tech CSE (AI& ML)   **L   T   P   C**
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(20A3H01) VIRTUAL REALITY AND AUGMENTED REALITY

Pre-requisite   Fundamentals of Computer Graphics
Course Objectives:

The course is designed to
- Teach about human interaction with computers
- Demonstrate Virtual reality
- Introduce to the current state of VR Hardware and Software.
- Explain how to apply VR/MR/AR for various applications

Course Outcomes:
- After completion of the course, students will be able to
- Understand the fundamentals of VR, AR and MR
- Select appropriate software and hardware for developing VR Applications
- Design VR Applications
- Create game objects using Unity

UNIT I   Introduction to Virtual Reality   Lecture 8 Hrs
What is Virtual Reality, Modern VR experiences, History Repeats.
Unity: Virtually Everything for you, what is virtual reality to you, types of head-mounted displays:
Desktop VR, Mobile VR, the difference between virtual reality and augmented reality, Applications
vs Games, Types of VR experiences, and Technical skills that are important to VR.

UNIT II   **Bird's-Eye View**   Lecture 10 Hrs
Hardware, Software, Human Physiology and Perception.
Unity: Objects and Scale: Getting started with unity, creating a simple Diorama, Measurement tools,
First Person Character: Understanding the Unity characters, Unity standard assets.

UNIT III   **The Geometry of Virtual Worlds & Light and Optics**   Lecture 8 Hrs
Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation,
Viewing Transformations, Chaining the Transformations
Light and Optics: Basic behavior of light, lenses, Optical Aberrations**,** Human Eye, Cameras, and
Displays

UNIT IV   **The Physiology of Human Vision**   Lecture 9 Hrs
From the Cornea to Photoreceptors, From Photoreceptors to the Visual Cortex, Eye Movements,
Implications for VR

UNIT V   **Motion in Real and Virtual Worlds**   Lecture 8 Hrs
The Vestibular System, Physics in the Virtual World.
Audio: The Physics of Sound, the Physiology of Human Hearing, Auditory Perception

Textbooks:
1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016
2. Unity Virtual reality Projects, Jonathan Linowes, PACKT Publishing.

Reference Books:
1. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach",
   2005.
2. Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User
   Interfaces, Theory and Practice", Addison Wesley, USA, 2005.
3. Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Merging Real and
   Virtual Worlds", 2005.

4. Burdea, Grigore C and Philippe Coiffet, "Virtual Reality Technology", Wiley Interscience, India, 2003.

Online Learning Resources:
1. Coursera: Virtual Reality Specialization
2. NPTEL course: Prof. Steven LaValle, Virtual Reality, IIT Madras

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B.Tech CSE (AI& ML)   L   T   P   C
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(20A33H01) SOFTWARE PROJECT MANAGEMENT USING AGILE

Pre-requisite   **Software Engineering Fundamentals**

Course Objectives:
- Teach how to manage a Project
- Discuss Agile method of handling projects

Course Outcomes:
After completion of the course, students will be able to
- Apply Agile methodology for software development
- Critically analyze quality of software
- Estimate the software cost

UNIT I   Introduction, The Agile Business Case   Lecture 8Hrs
History, Background, and the Manifesto, Traditional Lifecycle, Agile Lifecycle, Scaling for Enterprise Agile, Four Agile Methodologies

The Agile Business Case: The Business Case, Business Value Models, Project Balance Sheet, Building the Business Case by Levels

UNIT II   Quality in the Agile Space   Lecture 9Hrs
Quality Values and Principles, Thought Leaders and Agile Quality, Sampling for Quality Validation, Agile in the Waterfall: First Principles and Requisite Conditions, The Black Box, Interfaces, and Connectivity, Governing

UNIT III   Scope and Requirements   Lecture 9Hrs
Developing the Scope and Requirements: Agile Scope, Envisioning, Requirements, Planning at a Distance
Planning and Scheduling: Planning in the Enterprise Context, Scheduling, Other Plans in the Enterprise Agile Project

UNIT IV   Estimating Cost and Schedule   Lecture 8Hrs
The Nature of Estimates, Drivers on Cost and Schedule, Building Estimates
Teams Are Everything: The Social Unit, Principle and Values Guide Teams, Teams Are Building Blocks, Some Teams Work; Others Do Not, Matrix Management in the Agile Space

UNIT V   Governance, Managing Value   Lecture 8Hrs
Governance Is Built on Quality Principles, Governance Verifies Compliance
Managing Value: Defining and Accounting for Value, Burn-down Charts and Value Scorecards
Textbooks:
   1. John C. Goodpasture, PMP, "Project Management the Agile Way", Second Edition, J. Ross Publishing 2016.

Reference Books:
   1. Kalpesh Ashar, Agile Essentials you always wanted to know, Vibrant publishers, 2020
   2. Jutta Eckstein, Agile Software development in the large: Diving into the Deep, Jutta Eckstein Publisher, 2022

Online Learning Resources:
   1. Coursera: Agile Project Management offered by Google

   2. Coursera: Alex Cowan, Agile Development Specialization

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.TechCSE(AI &ML)   **L T P C**

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(20A30H03) ETHICS AND PRIVACY IN AI

Course Objectives:

The course is designed to
- To understand the need for ensuring ethics in AI
- To understand ethical issues with the development of AI agents
- To apply the ethical considerations in different AI applications
- To evaluate the relation of ethics with nature
- To overcome the risk for Human rights and other fundamental values

Course Outcomes:

After completion of the course, students will be able to
- Understand the ethical issues in the development of AI agents
- Learn the ethical considerations of AI with perspectives on ethical values
- Apply the ethical policies in AI based applications and Robot development
- To implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights.
- This study will help to overcome the evil genesis in the concepts of AI.

UNIT I	**Introduction, What Do We Need to Understand About Ethics?**	Lecture 8 Hrs

Introduction: Artificial Intelligence and Ethics, Why Ethics in AI? Why Now?, Current Initiatives in AI and Ethics, Codes of Ethics in Context: Other Approaches to Ethical Questions in AI

What Do We Need to Understand About Ethics?: A Preliminary Plea: Ethics Is Not About 'Banning' Things, Normative Ethical Theories, Ethics and Empirical Evidence, So Why Do We Even Need Ethics?, So, With What Sort of Issues Is Ethics Concerned?, Who (orWhat) Is The Proper Object of Moral Concerns, and How Widely Should Our Concerns Extend?, Four Domains of Ethics: Self, Friend, Stranger, World, What Counts as Adequate Justification and Argumentin Ethics?, Moral Relativism, Moral Justification and AI, A Distributed Morality?, Moral Agents, Moral Motivation, AI, Codes of Ethics and the Law

UNIT II	**Does AIRaise Any Distinctive Ethical Questions? Codes of Professional Ethics**	Lecture 10 Hrs

Does AIRaise Any Distinctive Ethical Questions? Methodology: Focusing in on Ethical Questions, Many Ethical Issues in AI Are Shared with Other Rapidly Developing Technology, Ethical Questions Arise from AI's Typical Use to Enhance, Supplement, or Replace the Work of Humans, We Also Need to Consider the Methods of Production of AI, Hype in AI and Implications for Methodology in Ethics

Codes of Professional Ethics: Introduction: The Varieties of Ethical Codes, Professional Codes of Ethics Tendto Have Certain Commonalities, Codes of Ethics and Institutional Backing, The Context of Codes of Ethics, Can Codes of Ethics Make the Situation Worse? Yes

UNIT III	**How AI Challenges Professional Ethics, Developing Codes of Ethics Amidst Fast Technological Change**	Lecture 8 Hrs

How AI Challenges Professional Ethics: AI Professional Organizations and Companies, and the Nature of Its Development and Production, Gradients of Professional Power and Vulnerability in AI, A Third Layer of Complexity in Codes of Professional Ethics for AI: The Behaviour of Machines, The Authority of Any Resulting Codes.

Developing Codes of Ethics Amidst Fast Technological Change: Social, Cultural and Technological   Change   and Ethics,Social,Cultural,EconomicandTechnologicalChange:TheExampleofAIandEmployment, Regulating for Whom? The Global Reach of AI, Universalism, and Relativism, Diversity in Participation as Part of the Solution.

UNIT IV	**Some Characteristic Pitfalls in Considering the Ethics of**	Lecture 9 Hrs

AI, and What to Do About Them, Some Suggestions for How to Proceed

Some Characteristic Pitfalls in Considering the Ethics of AI, and

What to Do About Them: The Idealisation of Human and of Machine Agency, Building Ethics into AI and the Idealisation of Moral Agency, Replacing and Enhancing Human Agency, Boundaries and AI, Addressing the Increased Gradient of Vulnerability, Common Language, Miscommunication and the Search for Clarity.

Some Suggestions for How to Proceed: Organisations and Codes, Procedures for Drawing Up and Implementing Codes, The Content of Codes, Thinking About Ethical Issues in Developing and Implementing Codes of Ethics, Asilomar AI Principles

| **UNIT V** | **An Introduction to Privacy Aspects of Information and Communication Technologies, Data Mining in Large Databases** | Lecture 8 Hrs |

Introduction, Privacy and the Internet, Privacy in Databases, Privacy in Ubiquitous Computing.

Data Mining in Large Databases— Strategies for Managing the Trade-Off Between Societal Benefit and Individual Privacy: Introduction, Examples of data-collecting institutions and data users, Strategies for controlling privacy, Measures of the utility of published data sets and outputs.

Textbooks:
1. Paula Boddington," Towards a Code of Ethics for Artificial Intelligence", Springer.
2. AgustiSolanas& Antoni Martínez-Ballesté "Advances in Artificial Intelligence for Privacy Protection and Security" World Scientific

Reference Books:
1. "Oxford Handbook of Ethics of AI",MarkusD.Dubber frank pasqualesunitDas,oxford university press.

Online Learning Resources:
1. Coursera: Ethics of Artificial Intelligence
2. Coursera: Artificial Intelligence Privacy and Convenience

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B.Tech CSE (AI &ML)   **L T P C**
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(20A30H04) MEDICAL IMAGE DATA PROCESSING

Pre-requisite   **Computer Graphics Fundamentals**
Course Objectives:
   • Understand the significance of image process in medical industry
   • Teach the process of extracting correct information in medical images
Course Outcomes:
The course is designed to

• Analyze medical images

• Apply image processing techniques to medical images

UNIT I   Basics of Medical Image Sources   Lecture 8 Hrs
Radiology, The Electromagnetic Spectrum, Basic X-Ray Physics, Attenuation and Imaging, Computed Tomography, Magnetic Resonance Tomography, Ultrasound, Nuclear Medicine and Molecular Imaging, Other Imaging Techniques, Radiation Protection and Dosimetry
Image Processing in Clinical Practice: Application Examples, Image Databases, Intensity Operations, Filter Operations, Segmentation, Spatial Transforms, Rendering and Surface Models, Registration, CT Reconstruction

UNIT II   Image Representation   Lecture 10 Hrs
Pixels and Voxels, Gray Scale and Color Representation, Image File Formats, Dicom, Other Formats – Analyze 7.5, NIFTI And Interfile, Image Quality and The Signal-To-Noise Ratio, Practical Lessons
Operations in Intensity Space: The Intensity Transform Function and The
Dynamic Range, Windowing, Histograms and Histogram Operations, Dithering and Depth, Practical Lessons

UNIT III   Filtering and Transformations, Segmentation   Lecture 8 Hrs
The Filtering Operation, The Fourier Transform, Other Transforms, Practical Lessons
Segmentation: The Segmentation Problem, ROI Definition and Centroids, Thresholding, Region Growing, More Sophisticated Segmentation Methods, Morphological Operations, Evaluation of Segmentation Results

UNIT IV   Spatial Transforms   Lecture 9 Hrs
Discretization – Resolution and Artifacts, Interpolation and Volume Regularization, Translation and Rotation, Reformatting, Tracking and Image-Guided Therapy
Rendering and Surface Models: Visualization, Orthogonal and Perspective Projection, and The Viewpoint, Raycasting, Surface–Based Rendering

UNIT V   Registration, CT Reconstruction   Lecture 8 Hrs
Fusing Information, Registration Paradigms, Merit Functions, Optimization Strategies, Some General Comments, Camera Calibration, Registration to Physical Space, Evaluation of Registration Results
CT Reconstruction: Introduction, Radon Transform, Algebraic Reconstruction, Some Remarks on Fourier Transform and Filtering, Filtered Back projection

Textbooks:
1. Wolfgang Birkfellner, "Applied Medical Image Processing", Second Edition, CRC Press.

Reference Books:
1. Sinha G.R., Medical Image Processing Concepts and Application, PHI, 2014
2. Geoff Dougherty, Digital Image Processing for Medical Applications, Cambridge university press, 2010
Online Learning Resources:
1. Coursera: Pranav Rajpurkar, AI for Medical Diagnosis