School of Engineering and Technology

Programme Structure & Syllabus

Computer Science & Engineering

Bachelor of Technology (B. Tech)

2022-23

K.K. University

Bihar Sharif, Nalanda – 803115

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FIRST SEMESTER

S. No	CODE	TITLE	CREDIT	L	T	P	HOURS PER WEEK	Internal Marks	External Marks
1	ETSH-101	Engineering Physics	3	3	0	0	3	30	70
2	ETSH-102	Engineering Mathematics-I	3	2	1	0	3	30	70
3	ETCS-101	Introduction to Artificial Intelligence	3	3	0	0	3	30	70
4	ETSH-103	Soft Skills	3	3	0	0	3	30	70
5	ETSH-105	Engineering Chemistry	3	3	0	0	3	30	70
6	ETEA-111	Inter-disciplinary Experimental Active Learning (IDEA LAB)	2	0	0	3	3	30	70
7	ETME-111	Engineering Workshop Lab	1	0	0	2	2	30	70
8	ETSH-111	Engineering Physics Lab	1	0	0	2	2	30	70
9	ETSH-115	Engineering Chemistry Lab	1	0	0	2	2	30	70
10	ETCS-111	Introduction to Artificial Intelligence with Python Lab	1	0	0	2	2	30	70
11	ETSH-113	Soft Skill Lab	1	0	0	1	1	30	70
Total			**22**	**14**	**1**	**12**	**27**	**330**	**770**

SECOND SEMESTER

S. No	CODE	COURSE TITLE	CREDIT	L	T	P	HOURS PER WEEK	INTERNAL MARKS	EXTERNAL MARKS
1	ETSH-201	Engineering Mathematics -II	3	2	1	0	3	30	70
2	ETEE-201	Basic Electrical & Electronics Engineering	3	3	0	0	3	30	70
3	ETCS-201	C Programming	3	3	0	0	3	30	70
4	ETME-201	Fundamental of Mechanical & Civil Engineering	3	3	0	0	3	30	70
5	ETSH-202	Technical Communication & Project Management	3	2	1	0	3	30	70
6	ETME-202	Engineering Graphics & Design	3	1	0	3	4	30	70
7	ETCS-202	Basics of Internet of Things (IoT)	NC	2	0	0	2	30	70
8	ETEE-211	Basic Electrical & Electronics Engineering Lab	1	0	0	2	2	30	70
9	ETME-211	Fundamental of Mechanical & Civil Engineering Lab	1	0	0	2	2	30	70
10	ETCS-211	C Programming Lab	1	0	0	2	2	30	70
TOTAL			**21**	**16**	**2**	**09**	**27**	**300**	**700**

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THIRD SEMESTER

S.NO	CODE	COURSE TITLE	CREDIT	L	T	P	Hour/ week	Internal marks	External marks
1	ETEC301	Electronic Device and Circuit	3	3	0	0	3	30	70
2	ETCS301	Data structure and algorithm	3	3	1	0	4	30	70
3	ETEC302	Digital Electronics	3	3	0	0	3	30	70
4	ETSH301	Engineering Mathematics-III	4	3	1	0	4	30	70
5	ETSH302	Entrepreneurship development and Business Incubation	3	3	0	0	3	30	70
6	ETCS311	Data structure and algorithm Lab	2	0	0	3	4	30	70
7	ETEC312	Digital Electronics Lab	2	0	0	3	4	30	70
8	ETEC311	Electronic Device and Circuit Lab	2	0	0	3	4	30	70
TOTAL			**22**	**15**	**2**	**9**	**29**	**240**	**560**

FOURTH SEMESTER

S.NO	CODE	COURSE TITLE	CREDIT	L	T	P	Hours/ week	Internal marks	External marks
1	ETCS401	Discrete Mathematics	3	3	1	0	4	30	70
2	ETCS402	Computer Organization & Architecture	3	3	0	0	3	30	70
3	ETCS403	Operating Systems	3	3	0	0	3	30	70
4	ETCS404	Design and Analysis of Algorithms	3	3	0	0	3	30	70
5	ETSH401	Organizational Behavior	3	3	0	0	3	30	70
6	ETCS405	Problem Solving and Python Programming	3	3	0	0	3	30	70
7	ETCS413	Operating Systems Lab	2	0	0	2	4	30	70
8	ETCS415	Problem Solving and Python Lab	2	0	0	2	4	30	70
TOTAL			**22**	**18**	**1**	**4**	**27**	**240**	**560**

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FIFTH SEMESTER

S.NO	CODE	COURSE TITLE	CREDIT	L	T	P	Hours/ week	Internal marks	External marks
1	ETCS501	Database Management System	3	3	0	0	3	30	70
2	ETCS502	Theory of Computation	3	3	1	0	4	30	70
3	ETCS503	Object Oriented programming	3	3	0	0	3	30	70
4	ETCS504	Java Programming	3	3	0	0	3	30	70
5	ETSH501	Business Management & Economics	2	3	0	0	3	30	70
6	*****	Elective-I	3	3	0	0	3	30	70
7	ETCS511	Database Management System Lab	2	0	0	3	4	30	70
8	ETCS513	Object Oriented programming Lab	2	0	0	3	4	30	70
9	ETCS514	Java Programming Lab	2	0	0	3	4	30	70
TOTAL			**23**	**18**	**1**	**9**	**31**	**270**	**630**

Elective-I: ETCS521 : Data Warehousing and Data mining
ETCS522 : **Software Testing**
ETCS523 : Graph Theory and Application

SIXTH SEMESTER

S.NO	CODE	COURSE TITLE	CREDIT	L	T	P	Hours/ week	Internal marks	External marks
1	ETCS601	Compiler Design	3	3	0	0	3	30	70
2	ETCS602	Computer Network	3	3	1	0	4	30	70
3	ETCS603	Computer Graphics	3	3	0	0	3	30	70
4	ETCS604	Web Technology	3	3	0	0	3	30	70
5	*****	Elective II	2	3	0	0	3	30	70
6	*****	Elective III	3	3	1	0	4	30	70
7	ETCS611	Compiler Design Lab	2	0	0	3	4	30	70
8	ETCS613	Computer Graphics Lab	2	0	0	3	4	30	70
9	ETCS614	Web Technology Lab	2	0	0	3	4	30	70
		TOTAL	**23**	**18**	**2**	**9**	**32**	**270**	**630**

Elective II

ETCS621: **Software Engineering**
ETCS622: Embeded System
ETCS623: Intellectual Property Rights

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Elective III

ETCS624: **Machine Learning**

ETCS625: Computational Intelligence

SEVENTH SEMESTER

S.NO	CODE	COURSE TITLE	CREDIT	L	T	P	Hours/ week	Internal marks	External marks
1	ETCS701	Internet Of Things	3	3	1	0	3	30	70
2	ETCS702	Artificial Intelligence with Deep Learning	3	3	0	0	3	30	70
3	*****	Elective IV	2	3	0	0	3	30	70
4	*****	Elective V	3	3	0	0	3	30	70
5	*****	Elective VI	3	3	0	0	3	30	70
6	ETCS705	Engineering Biology	3	0	0	3	4	30	70
7	ETCS712	Artificial Intelligence with Deep Learning Lab	2	0	0	3	4	30	70
8	ETCS713	Minor Project	2	0	0	3	3	30	70
9	ETCS714	Industrial training	3	0	0	3	3	30	70
TOTAL			**24**	**15**	**1**	**12**	**29**	**270**	**630**

Elective IV

ETCS721: Distributed Computing ETCS722: **Big Data Analytics**

ETCS723: Human Computer Interaction

Elective V

ETCS724: **Introduction to Data Science**

ETCS725: Wireless Adhoc and Sensor Network

ETCS726: C# and .Net Programming

Elective VI

ETCS727: **Cyber Security**

ETCS728: Cloud Computing

EIGHTH SEMESTER

S.NO	CODE	COURSE TITLE	CREDIT	L	T	P	Hours per week	Internal marks	External marks
1	ETCS801	Cryptography	3	3	1	0	3	30	70
2	ETCS802	Data Mining	2	3	1	0	3	30	70
3	*****	Elective VII	3	3	1	0	4	30	70
4	*****	Elective VIII	4	4	0	0	4	30	70
	ETCS812	Data Mining Lab	2	0	0	3	4	30	70
6	ETCS813	Major Project	8	0	0	11	7	50	150
7	ETCS814	Seminar	2	0	0	3	2	30	70
TOTAL			**24**	**13**	**3**	**21**	**27**	**170**	**430**

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Elective VII

ETCS821: **Fundamental of Data Communication**
ETCS822: Information Security
ETCS823: Software Defined Network

Elective VIII

ETCS824: **Neural Networks & Its Applications**
ETCS825: Natural Language Processing
ETCS826: Parallel Algorithms

SEMESTER I

ETSH-101 ENGINEERING PHYSICS

OBJECTIVES OF THE COURSE:

1. To impart knowledge in basic concepts of physics relevant to engineering applications.
2. To introduce advances in technology for engineering applications.
3. Apply Biot- Savart Law and Ampere's Law to compute magnetic field due to a current distribution.
4. Calculate the field of a magnetized object.
5. To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.

LEARNING OUTCOME:-

1. To design and conduct simple experiments as well as analyze and interpret data.
2. Engineering applications Capability to understand advanced topics in engineering.
3. Identify formula and solve engineering problems.
4. Apply quantum physics to electrical phenomena.

UNIT -1 ELECTROSTATICS AND ELECTROMAGNETIC Hours - 12

Electrostatics, Electric charge as point charge, charge distribution, Coulomb s law, Electric field, electric field due to point charge & charge distribution, Electrostatic Potential , Potential due to point charge, long charged wire, charged Spherical conductor & Electric dipole ,Ampere's law, application of Ampere's law, Biot- Savart law, Application of biot- savart law.

UNIT -2 OPTICS & LASER Hours - 07

Reflection and refraction, Snell's law, physical significance of refractive index (simple problems), Total internal reflection, Lasers , Characteristics of Laser, Ruby laser, Working Principle of He-Ne Laser. Polarization of light, Brewster's Law, Malu's Law.

UNIT- 3 QUANTUM PHYSICS Hours - 09

Planck's theory of black body radiation, Compton effect, Photo electric effect, Wave particle duality, De-Broglie waves, De-Broglie wave velocity, Wave and group velocity, Heisenberg's uncertainty principle, Application of uncertainty principle.

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UNIT - 4 SEMICONDUCTORS **Hours - 08**

Introduction of semiconductor, intrinsic & Extrinsic semiconductor, P –N junction , P-N junction with fordward bias, P-N junction with reverse bias, reverse breakdown ,light emitting diode ,Zener diode, properties of zener diode .

UNIT -5 NANO-PHYSICS **Hours - 05**

Introduction and Basic definition of Nano Technology, Properties of Nano particles, Elementary ideas of Synthesis of Nano particles, Application of Nano particles.

REFERENCE BOOKS:

1. Modern Physics by G. Aruldhas & P. Rajagopal; Pub: Prentice Hall of India.
2. Quantum Physics by H.C. Verma Pub.: Surya Publication .
3. Lasers and Non-Linear Optics by B.B. Laud; Pub: New Age International (P) Ltd.
4. Principles of electricity by Leigh Page and Normal llsley Adams, Pub.: Eurasia Publishing House, New Delhi.
5. Engineering physics by Dr. Rakesh Dogra Pub: S.k kataria & sons.
6. Engineering physics by Dr. Abhijit Nayak Pub: S.k kataria & sons.

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ETSH-111 ENGINEERING PHYSICS LABORATORY

Minimum six experiments are required to be performed in a semester: -

1. Find the acceleration due to gravity (g) with the help of bar Pendulum.
2. To determine the external diameter of solid Cylinder by the slide calipers.
3. To determine the thickness of glass plate by using Spherometer.
4. To determine the diameter of metal wire by using Micrometer (Screw Gauge).
5. Study the junction diode.
6. To find the refractive index of a material given in the form of a prism by using a Spectrometer.
7. To obtain the particle size by the laser.

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ETSH-102 ENGINEERING MATHEMATICS-I

OBJECTIVES OF THE COURSE:

The objective of this course is to familiarize the prospective engineers with

- Techniques in matrices, differentiation and Integration.
- It aims to equip the student's to deal with advanced level of Mathematics and applications that would be essential for their disciplines.

UNIT-1: LINEAR ALGEBRA

Matrix algebra, Determinant, Inverse and rank of a matrix by elementary transformation, solution of system of linear equation, vector, Basis, L.D&L.I, Eigen value and Eigen vector of a real matrix, properties of Eigen values, cay-lay Hamilton theorem. diagonalization of matrices.

UNIT -2: DIFFERENTIAL CALCULUS

Limit, continuity and Differentiability, Successive differentiation, Leibnitz theorem, mean value theorem (Rolle's, Lagrange's Cauchy) Maxima & Minima for single variable, Taylor & Maclaurin Series.

UNIT -3: FUNCTION OF SEVERAL VARIABLES

Partial derivative, Homogeneous functions and euler's theorem Total derivative, Differentiation of implicit function of two variables, Maxima and Minima of function of variables, Lagrange's method of undetermined co-efficient.

UNIT -4: INTEGRAL CALCULUS

Integration of various functions, Definition of proper and improper integral, Convergence of improper integral, Beta and gamma functions, Differentiation under integral sign.

UNIT -5: CURVE TRACING

Curve tracing of Cartesian and Polar form, Surface area and volume of Surface of revolution.

COURSE OUTCOMES:

After completing this course, students should demonstrate competency in the following skills:

1. Use both the limit definition and rules of differentiation to differentiate functions.
2. Apply differentiation to solve maxima and minima problems.
3. Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
4. Evaluate integrals using techniques of integration, such as substitution, partial fractions and

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integration by parts.

5. Determine convergence/divergence of improper integrals and evaluate convergent proper integrals.
6. Apply various techniques in solving differential equations.

REFERENCE BOOKS

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher's, 36 th edition, 2010.
2. Erwin Kresyszig, Advance Engineering Mathematics, John Wiley and Sons, 9 th edition, 2006.

ETCS-101 INTRODUCTION TO ARTIFICIAL INTELLIGENCE

OBJECTIVES OF THE COURSE:

The primary objective of this course is to introduce the basic principles, techniques, and applications of. Artificial Intelligence. In this course, students will get a basic introduction to the building blocks and components of artificial intelligence, learning about concepts like algorithms.

MODULE -1:

Introduction to AI : History of AI, Overview of AI, Problems of AI, AI technique, Production Systems, Characteristics of production systems, Tic-Tac-Toe problems, Searching techniques like hill climbing,A* Algorithm, AO* Algorithm etc , and various types of control strategies.

MODULE -2:

Introduction to Python: Python basics – Data types, Variables, Basic input –output operations, Basic operators, Python literals, Strings, Number, list, tuple, Dictionary, Functions, Conditional Statement, Loop Statements, Numpy, Matplotlib, Simple programming exercises using Python.

MODULE -3:

Knowledge representation, Problem in representing knowledge, Knowledge representation using propositional and predicate logic, resolution, refutation, deducation, Theory proving, monotonic and non-monotonic reasoning.

MODULE -4:

Probabilistic reasoning, Baye's Theorem, Semantic networks, Scripts, Schema, frames, conceptual dependency, fuzzy logic, forward and backward reasoning, introduction to understanding,natural language processing.

MODULE -5:

Introduction to learning, various techniques in Learning, Introduction to neural networks, application Neural network, common sense, reasoning, some example of expert systems.

COURSE OUTCOMES:

- Understand concepts of Artificial Intelligence and different types of intelligent agents andTheir architecture.
- Formulate problems as state space search problem & efficiently solve them.
- Understand the working of various informed and uninformed searching algorithms andDifferent heuristics
- Understand concept of knowledge representation i.e. propositional logic, first order logic.

TEXT BOOKS

1. Stuart Russell and Peter Norvig – Artificial Intelligence A Modern Approach, PEARSON Education.
2. Simon Haykin -Neural Networks PHI.

REFERENCE BOOKS

1. N. P. Padhy – Artificial Intelligence and Intelligence Systems, OXFORD publication.
2. B. YagnaNarayana - Artificial Neural Networks, PHI

ETCS-111 INTRODUCTION TO ARTIFICIAL INTELLIGENCE WITH PYTHON LAB

LIST OF EXPERIMENTS

1. Program to define an integer value and print it
2. Input two integers and find their addition
3. Python program to find sum of two numbers
4. Python program to demonstrate the example for arithmetic operators
5. Python program for simple interest
6. Python program for compound interest
7. Python program to check the given year is a leap year or not
8. Python program to find power of a number using exponential operator
9. Python program to extract and print digits in reverse order of a number
10. Python program Input age and check eligibility for voting.
11. Python program Find largest of three number using nested if else.
12. Python program Calculate discount based on the sale amount.
13. Python program Calculate discount based on the sale amount using Nested if else.
14. Python program Demonstrate an example of for loop
15. Python program Examples of loops (based on their control)
16. Python program Demonstrate an Example of break statement
17. Python program Demonstrate an Example of continue statement
18. Python program Demonstrate an Example of pass statement
19. Python Print all numbers between 1 to 1000 which are divisible by 7 and must not be divisible by 5.
20. Python | Find factorial of a given number
21. Python Find the factorial of a number using recursion
22. Python Program to print Odd and Even numbers from the list of integers.
23. Python Program to calculate n-th term of a Fibonacci Series
24. Python program for sum of square of first N natural numbers
25. Python program for sum of cube of first N natural numbers

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ETSH-103 SOFT SKILLS

OBJECTIVES OF THE COURSE:

The objective of this course to help the students to develop as team member, leader and all round professional in the long run. This course would focus on over all personality development of the student and to improve his technical writing and documentation.

MODULE -1: SELFAWARENESSANDSELF-DEVELOPMENT

Self-Assessment, Self-Awareness, Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Self-Esteem, Self-appraisal, Personal Goal setting, Career Planning, Personal success factors, Handling failure, Emotional Intelligence, Lateral thinking, Depression and Habit, relating SWOT analysis &goal setting, prioritization.

MODULE -2: COMMUNICATIONSKILL

Importance of communication, Aspects of communication, communication through words, communicationthroughbodylanguage,communicationthroughtechnology,Oralcommunication,
Listening Skills, Group Discussion and Interview Skills, Presentations kills: preparing the presentation, performing the presentation, Written communication: Reading comprehension, précis writing, Business and technical reports, Styles, Business correspondence, Memorandum writing, Notice, Agenda and Minutes, Research papers and articles, Advertising and job Description, Mechanics of Manuscript preparation.

MODULE -3: INTERPERSONALRELATIONSHIP

Teamwork, Team effectiveness, Group discussion, Decision making- Team Communication. Team, Conflict Resolution, Team Goal Setting, Team Motivation Understanding Team Development, Team Problem Solving, Building the team dynamics, Multicultural Diversity and Socializing

MODULE -4: LEADERSHIPSKILLS

Leaders: their skills, roles, and responsibilities. Vision, Empowering and delegation, motivating others, organizational skills, team building, Organizing and conductingmeetings,decisionmaking,givingsupport,Vision,Mission,Coaching,Mentoringandcounseling,Appraisalsandfeedback, conflict, Power and Politics, Public Speaking.

MODULE -5: OTHERSKILLS

Managing Time, Managing Stress, Meditation. Improving personal memory, Study skills that include Rapid Reading, Notes Taking, Self-learning, Complex problem solving and creativity, listening skill and speaking skills, Corporate and Business Etiquettes.

MODULE -6: ETHICS IN ENGINEERING PRACTICE AND RESEARCH

Introduction to ethical reasoning and engineer ethics, Right and responsibilities regarding Intellectual

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property, workplace rights and responsibilities, Central Professional Responsibilities of Engineers, Responsibility for environment.

COURSE OUTCOMES:

Having successfully completed this course, the student will be able to:

- Communicate, interact and present his ideas to the other professionals.
- Understand and aware of importance, role and contents of soft skills through instructions, knowledge acquisition, demonstration and practice.
- Have right attitude in al and behavioral aspects, and build the same through activities.
- Possess right professional and social ethical values.

TEXTBOOKS:

1. DevelopingCommunicationSkill:KrishnaMohan,MeeraBanerji,-MacMillanIndiaLtd.

2. BNGhosh, :ManagingSoftSkillsforPersanalityDevelopment"McGrawHill

3. EthicsinEngineeringPracticeandResearch:CarolineWhitbeck,CambridgeUniversitypress
4. ACourseInCommunicationSkills:KiranmaiDutt,CambridgeUniversitypress

5. EnglishforBusinessCommunication:SimonSweeney,CambridgeUniversityPress

6. BasicsOfCommunicationInEnglish:FrancisSounderaj,MacMillanIndiaLtd.

7. GroupDiscussionsandInterviewSkills:PriyadarshiPatnaik,CambridgeUniversityPress
8. ProfessionalPresentations:MalcolmGoodale,CambridgeUniversityPress

9. An IntroductiontoProfessionalEnglishAndSoft Skills:Das,CambridgeUniversityPress
ApracticalcourseinEffectiveEnglishspeakingskills,G.K.Gangal,PHIPublication.

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ETSH-113 SOFT SKILL LAB

LIST OF EXPERIMENTS

- Work/Assignments
- SWOT analysis Personal & Career Goal setting – Short term &long term Presentation Skill
- Dining EtiquettesLetter/Application/Notice/Agenda/MinuteswritingReportwriting
- Listening skills using Language laboratory
- Group discussion
- Resume writing

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ETSH-105 ENGINEERING CHEMISTRY

UNIT- I: CHEMICAL BONDING

Introduction, Molecular Orbital Theory (MOT), Sigma (σ) and pi (π) Molecular Orbitals, Energy level Diagram for Mono and Di atomic Molecules, Linear Combination of Atomic Orbitals (LCAO) Method, Crystal Field Theory, Calculation of CFSE

UNIT- II: WATER AND ITS TREATMENT

Introduction, Soft and Hard Water, Type of Hardness, Techniques for Water Softening- Lime Soda Process, Zeolite Process, Ion Exchange Process.

UNIT- III: SPECTROSCOPIC TECHNIQUES AND APPLICATIONS

Basic concept of spectroscopy. Principle and Applications of different spectroscopic techniques (UV-Visible and IR spectroscopy). Nuclear magnetic resonance and magnetic resonance imaging. Elementary Discussion of Flame photometry.

UNIT- IV: POLYMER

Introduction, types of polymerization. Classification, mechanism of polymerization (Free radical and Ionic polymerization). Thermoplastic, and thermosetting polymers Elementary idea of Biodegradable polymers, preparation, properties and uses of the following polymers- PVC, PMMA, Teflon, Nylon-6, Polyester phenol formaldehyde, Urea- Formaldehyde, Buna-s, Vulcanization of Rubber.

UNIT- V: CORROSION AND LUBRICANT

Lubricant- Definition, Classification with examples. Functions of Lubricant, Physical Characterisitics of Lubricants Such and Viscosity, Viscosity Index, Oiliness, Volatility, Flash & Fire Point, and Cloud & Pour Point. Chemical Characteristics of Luricant such as Acid Value or Neutralization Number, Emulsification, Saponification Value etc.

COURSE OUTCOME:

The course will enable the student to:

1. Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecularforces.
2. Rationalize bulk properties and processes using thermodynamicconsiderations.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

TEXT BOOKS:

- University Chemistry,by B.H.Mahan
- Chemistry Principles and Applications, by M.J.Sienko and R.A.Plane
- Fundamentals of Molecular Spectroscopy, by C.N.Banwell
- Engineering Chemistry(NPTEL Web-book),by B.L. Tembe,Kamaluddin andM.S.Krishnan
- Physical Chemistry, by P.W.Atkins

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ETSH-115 ENGINEERING CHEMISTRY LAB

OBJECTIVES OF THE COURSE:

This Engineering Chemistry Laboratory is common to first year branches of UG Engineering. At
The end of the course the student is expected to provide the students with a solid foundation in Chemistry laboratory required to solve engineering problems. Practical implementation of fundamental concepts.

LIST OF EXPERIMENT:-

1. Qualitative analysis of given salts having three acidic and basic radicals.
   Basic radicals:- Pb2+,Cu2+,Al3+,Fe2+,Fe3+,Cr3+,Zn2+,Ca2+,Ba2+ etc.
   Acidic radicals:- Cl-,Br-,I-,,SO4,NO3,OH- etc.

2. Determination the total hardness of given water sample.

3. To Determine the Saponification value of given oil sample.

4. To Determine the acid value of given oil sample.

4. Adsorption of acetic acid by charcoal.

6. Synthesis of polymer /drug.

7. To Determine the Ph of given solution by universal indicator or pH meter.

8. To determine dissolved oxygen in water sample.

9. To determine thinner content in oil paint.

10. To determine carbon monoxide, carbon di-oxide, ontent emission from petrol vehicle.

COURSE OUTCOMES:-

- Students are able to estimate the impurities present in water.
- Ability to select lubricants for various purposes.
- Ability to prepare advanced polymer materials.
- Ability to find the Fe+2, Ca & Cl- present in unknown substances/ ores using titrimetric and instrumental methods.

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ETEA-111 INTER-DISCIPLINARY EXPERIMENTAL ACTIVE LEARNING (IDEA LAB)

VISION: -

To create globally competitive electronics and communication professionals with strong values for the advancement of the nation.

MISSION:-

M1- To provide an ambiance of excellence in teaching and learning replete with innovation, collaboration and research.

M2- To instill human values, social obligations and national responsibilities.

M3- To promote a learning ecosystem for progress and development of all in the department.

LIST OF EXPERIMENTS

1. To study various active & passive devices like R, L & C, battery etc.
2. To study the CRO and function generator for signal analysis.
3. To study the basics of mechatronics and various parts of a robot.
4. To study the refrigeration and Air-conditioning system with future perspectives.
5. Identification of various types fabrics like cotton, woolen, linen, silk etc
6. Identification of different types of stones and aggregates (visual identification) with study of their properties and applications.
7. Identification of timbers: teak, sal, chir, shisum, siras, deodar, kail and mango. (visual identification) and with study of their properties and applications.
8. Identification of hard drive, RAM, mother board and other important parts in a desktop computer.
9. To learn the parts of fan, LED bulb, induction cooktop, electric iron etc
10. To study the types of soil, water and renewable energy with present scenario and future challenges for sustainable development.
11. To study the working principle and various parts of a Hybrid Electric Vehicle (HEV)
12. To study the electrical switch board and staircase wiring.
13. To learn to use the various types of pliers, wrenches & screw drivers.
14. To study the various components of Green Building (also called as Zero Energy Building).

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ETME-111 ENGINEERING WORKSHOP LAB

OBJECTIVES OF THE COURSE:

Providing basic knowledge of workshop tools, equipment, machineries and various workshop activities related to carpentry, smithy, foundry etc. with hands-on practices.

LIST OF EXPERIMENTS:-

1. Smithy Shop
(a) To prepare a ring a mild steel rod in black smithy shop.
(b) To prepare an eye-nail of M.S rod of 125 mm long & 8 mm thickness.
2. Foundry Shop
(a) To prepare a V block casting using pit furnace.
3. Carpentry Shop
(a) To prepare a dovetail joint in carpentry shop.
(b) To prepare a cross lap joint in carpentry shop.
4. Fitting Shop
(a) Toprepare a matching joint in fitting shop.
(b) To prepare a square by chipping & filling.
5. Machine Shop
(a) To prepare a cylindrical job of dia. 25 mm to 22.5 mm on lathe using turning operation.
(b) DrillingPractice
6. Welding
(a) To prepare a T-joint by arc welding.
(b) To prepare an L-shape corner joint by Arc welding.
7. Sheet Metal Shop
(a) Toprepare a conical funnel with soldering in sheet metal shop.

COURSE OUTCOMES:

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

- Use welding equipments to join the structures.
- Carry out the basic machining operations
- Illustrate on operations of smithy, Carpentry, foundry and fittings

TEXT BOOK:

1. Jain, R.K. Production Technology.
2. Rao, P. N. Manufacturing Technology (Vol. I &II)

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SEMESTER II

ETSH-201 ENGINEERING MATHEMATICS –II

OBJECTIVES OF THE COURSE:

- The objective of this course is to familiarize the prospective engineers with techniques in ordinary and partially differential equations, Laplace and Fourier transform, Fourier series, complex variables
- It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their discipline

UNIT 1: ORDINARY DIFFERENTIAL EQUATION

Ordinary differential equation: definitions,order and degree of differential equation, equation, exact differential equations, equations solvable for x, y and p, Clairaut's form, second order linear differential equation with constant coefficient, Cauchy -Euler's equation, Method of variation of parameter.

UNIT 2: PARTIAL DIFFERENTIAL EQUATION

Partial differential equations: Definition and formulation, partial differential equation of the first order, Non-linear Partial differential equations, Legendre's and Charpit's method,Homogeneous linear partial differential equation with constant co-efficient, Methods for finding C.F. and P.I. of Linear Homogeneous Partial Differential Equations.

UNIT 3: LAPLACE TRANSFORM

Laplace Transform: Definition and properties of Laplace transform, shifting theorem, Transform of derivative and integrals, Multiplication by t^n, Division by t.Inverse Laplace transform, convolution theorem (without proof) and its application.

UNIT 4: FOURIER SERIES AND FOURIER TRANSFORM

Fourier series: Periodic Function, Function of arbitrary period, Even and odd functions, half range SeriesFourier Transform: definition and properties of Fourier transform, convolution, Parseval's identity for Fourier transforms, Relation between Fourier transform and Laplace transform.

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UNIT 5: COMPLEX ANALYSIS

Complex Analysis: definitions, Cauchy- Riemann Equations, Harmonic functions, Elementary Analytic function and their properties, Cauchy Integral formula (without proof),Taylor's Series, Singularities, Residues, Cauchy Residue Theorem (without proof).

COURSE OUTCOME:

- After successfully completing the course, the student will have a good understanding of the following topics and their applications:
- Analytic function, singularity, residues and complex integration
- Laplace and Fourier transform and its properties, application of Laplace and Fourier transform
- Finding the solution of ode and pde

REFERENCE BOOK:

B.S. Grewal, Higher Engineering Mathematics, Khanna publisher's,44thedition
Erwin Kresyszig, Advance Engineering mathematics, John Wiley and Sons,9th edition

ETEE-201 BASIC ELECTRICAL & ELECTRONICS ENGINEERING

OBJECTIVES OF THE COURSE:

- To explain the laws used in the analysis of DC and AC circuits.
- To understand and analyses AC & DC circuits.
- To provide students with a fundamental knowledge of Single phase transformer construction and working.
- To provide students with a fundamental knowledge of AC Fundamentals.
- To provide students with a fundamental knowledge of Electrostatics.
- Familiarize with semi conductor devices, rectifier circuits and its applications.
- Describe the basic applications of transistor.
- Define logic gates&understand the working principles of logical circuits**.**
- Describe the significance of Boolean algebra in digital circuits.

MODULE-1: ELEMENTARY CONCEPTS

(A) Prerequisite: Concept of Potential difference. Current and resistance. Ohm's law, resistance temperature coefficient, insulation resistance, SI units of work Power and Energy

(B) Electromagnetism: Magnetic effect of an electric current, cross and dot conventions, right hand thumb rule and cork screw rule, Concept of M.M.F., flux, flux density, reluctance, permeability and field strength, their units and relationships, analogy of electrical and magnetic circuit, Energy stored in magnetic field.

MODULE-2: D. C. CIRCUITS AND AC FUNDAMENTALS

(A) Kirchhoff's law, ideal and practical voltage and current sources. Mesh and Nodal analysis (Super node and super Mesh excluded). Source transformation. Star delta transformation. Superposition theorem, Thevevnins's theorem Norton's theorem, maximum power transfer theorem (Source transformation not allowed for superposition theorem, Mesh and Nodal analysis.

(B) Sinusoidal voltage and currents, their mathematical and graphical representation, concept of cycle

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period, frequency, instantaneous, peak, average, r.m.s. values, peak factor , and form factor, phase difference.

MODULE-3: SINGLE PHASE TRANSFORMER AND ELECTROSTATICS

A) Single phase transformers: Construction, principle of working, e.m.f equations, voltage and current ratios, losses, definition of regulation and efficiency, determination of these by direct loading method.

B) Electrostatics: electrostatic field, electric flux density, electric field strength, absolute permittivity, relative permittivity and capacitance, composite dielectric capacitors, capacitors in series and parallel, energy stored in capacitors.

MODULE-4: ANALOG DEVICES

A) Semiconductor theory:- Intrinsic and Extrinsic Semiconductors - N type and P type materials – mechanism of hole and free electrons- majority and minority carriers, drift and diffusion current - Semiconductor diode - V -I characteristics of PN Junction diode,.

B) Rectifiers: Working and Waveforms of Half wave - Full wave - Bridge rectifiers (without filters) – Differences.

C) Transistor: Working Principle of NPN and PNP transistor - Transistor as a switch - Transistor working as an amplifier- common base - common collector- common emitter configuration - input and output characteristics.

MODULE-5: BOOLEAN ALGEBRA AND LOGIC GATES

A) Number representation: Decimal, Binary, Octal and Hexa- decimal number systems - Conversion of number from one number system to another without decimal points - BCD Codes and limitations – Conversion of BCD to decimal and vice versa .

B) Logic gates: Definition, truth table, symbol and logical equations of logic gates: AND – OR - NOT-NAND – NOR-EXOR - EXNOR (Only 2-inputs) – Universal gates.

C) Logic Simplification: Rules and laws of Boolean algebra – Demorgan's Theorem and proof - Simplification of logic functions using Boolean.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

- Analyze basic DC and AC electric circuits.
- Explain the working principles of transformers.
- To understand and analyses AC & DC circuits.
- Analyze Semi conductor devices and their applications.
- Explain the working principles of Rectifiers.
- To understand Number system representation and Boolean algebra& to understand Logic gates.

TEXT / REFERENCES:

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

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ETEE-211 BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

LIST OF EXPERIMENTS:

A. BASIC ELECTRICAL ENGINEERING-

1. Verification of Ohm's Law.
2. Verification of KVL (Kirchhoff's Voltage Law) and KCL (Kirchhoff's Current Law).
3. Verification of Superposition theorem.
4. To Verify Maximum Power Transfer theorem.
5. Measurement of power and power factor of single phase ac circuit using three voltmeter methods.
6. Verification of The venin's theorem.
7. To verify Norton's theorem.
8. To measure power and power factor in a single phase A.C circuit using wattmeter.

B. BASIC ELECTRONICS ENGINEERING-

1. CRO – Applications.
2. V- I characteristics of Silicon & Germanium PN junction diodes.
3. V-I characteristics of Zener diode.
4. Characteristics of BJT in Common Emitter Configuration.
5. Characteristics of JFET in common source configuration.
6. Half and Full wave rectifier without filter.

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7. Half wave and Full wave rectifier with Filter.
8. Characteristics of Common Emitter BJT amplifier.

ETCS-201 C PROGRAMMING

BJECTIVES OF THE COURSE:

- Understand the basic concept of C Programming, and its different modules that include conditional and looping expressions, Arrays, Strings, Functions, Pointers, and Structures.
- Acquire knowledge about the basic concept of writing a program.
- Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language
- Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.

MODULE-1: INTRODUCTION TO PROGRAMMING

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples. From

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algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code, Arithmetic expressions and precedence

MODULE-2: CONDITIONAL BRANCHING AND LOOPS & ARRAYS

Writing and evaluation of conditionals and consequent branching, Iteration and loops Arrays (1-D, 2-D), Character arrays and Strings

MODULE-3: BASIC ALGORITHMS & FUNCTIONS

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required) Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

MODULE-4: RECURSION

Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort**.**

MODULE-5: STRUCTURE & POINTERS

Structures, Defining structures and Array of Structures Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

COURSE OUTCOMES:

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language)
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.

TEXTBOOKS /REFERENCES

1. ByronGottfried,Schaum'sOutlineofProgrammingwithC,McGraw-Hill
2. E.Balaguruswamy,ProgrammingANSIC,TataMcGraw-Hill

ETCS-211 C PROGRAMMING LAB

S. No	Experiment Name
A	Theory: Variable, Data type, Keyword ,Operator, Hello world Program, Control Structure, Array, Pointer
1	Write a C program to find the sum of individual digits of a positive integer.
2	Write a C program to generate Fibonacci series.
3	Write a C program to generate all the prime numbers between 1 and n is a Value supplied by the user.
4	Write a C program to find the roots of a quadratic equation.

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5 Two integer operands and one operator form user, performs the operation and then prints the result.

6 Write a C program to find the factorial of a given integer by using recursive and non-recursive functions.

7 A C program to find both the largest and smallest number in list of integers

8 Write A C- Program to Determine If The Given String Is A Palindrome Or Not

9 Example of Array In C programming to find out the average of 4 integers

10 Write a program in c to Addition of two matrix in C

11 Write a C program to implement the following searching method.

i) Linear search ii) Binary search

12 Write C programs that implement the following sorting methods to sort a given list of integers in ascending order by using Bubble sort.

ETME-201 FUNDAMENTAL OF MECHANICAL & CIVIL ENGINEERING

OBJECTIVES OF THE COURSE:

The main learning objective of this course is to prepare the students for:

- Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.

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- Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
- To understand the concepts of Centroid and centre of gravity.
- To study the concepts of power plant, IC engine components refrigeration's and air conditioning.
- To study the concepts of properties of fluids.
- To study the civil engineering materials and building components.

MODULE-1: FORCE SYSTEMS AND FRICTION

Introduction –Laws of Mechanics – Lami's theorem,Triangle, Parallelogram and polygon law of forces – Force system and its classifications –Equivalent systems of forces, free body diagram.

Beam and types of beam – Support and types of support, Shear force and bending moment diagram– for cantilever and simply supported beam with concentrated, distributed load and couple. Friction-its types, Laws of friction, Co-efficient of friction, Angle of friction, Angle of repose and its relation.

MODULE-2: CENTROID, CENTRE OF GRAVITY AND MOMENT OF INERTIA

Center of gravity and Moment of inertia; Centroid and center of gravity, Moment Inertia of area and mass, Radius of Gyration

MODULE-3: THERMAL ENGINEERING

Introduction, Classification of power plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear power plants - Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles - Principle of vapour compression system – Layout of typical domestic refrigerator – Window and split type room Air conditioner

MODULE-4: BASIC CONCEPTS OF FLUID MECHANICS

Fluid – definition, - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension,Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.Bernoulli's equation and its applications.

MODULE-5: CIVIL ENGINEERING MATERIAL, SURVEY AND BUILDING COMPONENTS

Civil Engineering Material: Brick, Stone, Cement, Concrete and its properties. Surveying: Principles, Measurements of distances, Determination of angles, area, and leveling Building components: Foundation and its types, bearing capacity, Requirement of good foundation Superstructure: Brick masonry, Stone Masonry, beams, columns, Lintels, roofing, flooring, plastering.

COURSE OUTCOME:

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

- Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
- Apply the concepts of locating Centroid / center of gravity of various sections

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- Apply the concepts of frictional forces at the contact surfaces of various engineering systems.
- To study the concepts of power plant, IC engine components refrigeration's and air conditioning.
- To study the conceptsproperties of fluids.
- To study the Civil Engineering Material, Survey and Building Components.

TEXT BOOKS:

1. Beer Ferdinand P, Russel Johnston Jr., David F Mazurek, Philip J Cornwell, SanjeevSanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Higher Education. 11thEdition, 2017
2. Vela Murali, "Engineering Mechanics-Statics and Dynamics", Oxford University Press, 2018.
3. Nag. P.K. "Power Plant Engineering" Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008
4. B. C. Punamia- Surveying part-1
5. N.S. Basak – Surveying
6. Building Material – S. K. Duggal
7. R. K. Bansal Fluid Mechanics and Machinery

REFERENCES:

1. Boresi P and Schmidt J, Engineering Mechanics: Statics and Dynamics, 1/e, Cengage learning, 2008.
2. Hibbeller, R.C., and Engineering Mechanics: Statics, and Engineering Mechanics: Dynamics, 13th edition, Prentice Hall, 2013.

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LIST OF EXPERIMENT

1. To verify the parallelogram law of forces.
2. To verify the lami's theorem.
3. To determine the coefficient of Friction of an inclined Plane.
4. To study about the model of two stroke petrol engine.
5. To study about the four stroke petrol engine and diesel engine.
6. To Verify the Bernoulli's Theorem.
7. To determine the compressive strength of Brick
8. To determine the horizontal angle with prismatic and surveyor compass.
9. To determine the area by chain survey.
10. To measure horizontal and vertical angles in the field by using Theodolite.

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ETSH-202 TECHNICAL COMMUNICATION & PROJECT MANAGEMENT

OBJECTIVES OF THE COURSE:

- To introduce the students to the fundamentals of mechanics of writing.
- To facilitate them with the style of documentation and specific formal written communication.
- To initiate in them the art of critical thinking and analysis.
- To help them develop techniques of scanning for specific information, comprehension and organization of ideas.
- To enhance their technical presentation skills.

MODULE-1:

Mechanics of Writing: Grammar rules -Articles, Tenses, Part of Speech.General Reading and Listening comprehension – rearrangement & organization of sentences.

MODULE-2:

Different kinds of written documents: Definitions- descriptions- instructions-recommendations- user manuals – reports – proposals.Formal Correspondence: Writing formal Letters.Reading & Listening Comprehension.

MODULE-3:

Technical paper writing: documentation style – document editing – proof reading – Organizing and formattingReading and listening comprehension of technical documentsTechnical presentations

MODULE-4:

Reading and listening comprehension of technical documents Technical presentations

MODULE-5:

Project Writing

TEXT BOOKS:

- Essential Communication Strategies for Scientists, Engineers and Technology Professionals. II Edition. New York: IEEE press, 2002
- Technical Communication: A Reader-Centred Approach. V Edition. Harcourt Brace College Publication, 2003

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- Technical Report Writing Today. VIII Edition (Indian Adaptation). New Delhi: Biztantra, 2004.
- Practical English Usage, Oxford University Press, 2000

ETME-202 ENGINEERING GRAPHICS & DESIGN

OBJECTIVES OF THE COURSE:

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products
- To expose them to existing national standards related to technical drawings.

MODULE-1: PLANE CURVES

Importance of graphics in engineering applications–Use of drafting instruments; BISconventions and specifications; Size, layout and folding ofdrawing sheets; Lettering anddimensioning; Scales; Plane Curves: - Basic Geometrical constructions; Curves used in engineering practices

Conics; Construction of ellipse, parabola and hyperbola, cycloid, involutes of square and circle; Drawing oftangents and normal to the above curves.

MODULE-2: PROJECTION

Types of projection; Orthographic projection; Orthographic projection; First and Third angle projection; Projection of points and Lines; Line inclined to one plane and both planes.

MODULE-3: PROJECTION OF PLANES AND SOLIDS

Projection of Planes: Circle, Polygons; Projection of Polyhedrons: Prisms, Pyramids; Projection of Solids: Cylinders, Cones.

MODULE-4:SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES

Section of right solids by normal and inclined planes; Intersection ofcylinders; Parallel line and radial - line method for right solids; Introduction of surfaces-cylinder

MODULE-5:ISOMETRIC PROJECTIONS & COMPUTER AIDED DRAFTING

Isometric Projections:Isometric scale, Isometric axes; Isometric Projection fromorthographic drawing; Computer Aided Drafting (CAD): Introduction, Benefit; Software's basic commands ofdrafting entities like line, circle, polygon, polyhedron, cylinders; transformations and editingcommands like move,

rotate, mirror, array; solution of projection problems on CAD

COURSE OUTCOME:

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

- Familiarize with the fundamentals and standards of Engineeringgraphics
- Perform freehand sketching of basic geometrical constructions and multiple views ofobjects.
- Project orthographic projections of lines and planesurfaces.
- Draw projections and solids and development ofsurfaces.
- Visualize and to project isometric and perspective sections of simplesolids**.**

TEXT BOOK:

1. Bhatt, N.D. EngineeringDrawing.
2. Dhawan, R.K. A Textbook of Engineering Drawing.
3. Venugopal, K. Engineering Drawing andGraphics.

ETCS-202 BASICS OF INTERNET OF THINGS (IOT)

OBJECTIVES OF THE COURSE:

- The Internet is evolving to connect people to physical things and also physical things to other physical things all in real time.
- It's becoming the Internet of Things (IoT).
- The course enables student to understand the basics of Internet of things and protocols.
- It introduces some of the application areas where Internet of Things can be applied.
- Students will learn about the middleware for Internet of Things.

MODULE - 1 INTRODUCTION

Introduction, Definition and Characteristics of IoT, Some basic terminologies related to IoT, The technology behind IoT, Design principles of IoT:Physical design of IoT, Logical design of IoT, Functional blocks of IoT, , Advantage & Disadvantage of IoT. Applications of IoT.

MODULE-2 IOT& M2M

IoT& M2M ,M2M Communication, Key features of M2M, M2M Applications, Difference between IoT and M2M, Sensing, Actuation, Basic of Networking. M2M ecosystem.

MODULE-3 IOT ARCHITECTURE

IOT ARCHITECTURE - IoT Open source architecture (OIC)- OIC Architecture & Design principles- IoT Devices and deployment models- IoTivity : An Open source IoT stack - Overview- IoTivity stack architecture- Resource model and Abstraction.

MODULE-4 IOT AND ITS COMPONENT

IoT and its component –Introduction, RFID, Applications of RFID, Wireless Sensor network (WSN &

VSN),Participatory Sensing Technology, Embedded platform for IoT. Interfacing a gas sensor to Arduino.

MODULE- 5 IOT APPLICATION DEVELOPMENT AND DESIGN CHALLENGES

IoT Design methodology, Requirement and process model of IoT, Process specification, Information model for IoT application. IoT applications- smart city street lights-control and monitoring, Home automation, E-health, Smart farming.

COURSE OUTCOMES:

- Able to understand the application areas of IOT
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- Able to understand building blocks of Internet of Things and characteristics.

TEXT BOOKS /REFERENCES:

- Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press,2012.
- Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet ofThings", Springer, 2011.
- David Easley and Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a HighlyConnected World", Cambridge University Press, 2010.
- Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applicationsand Protocols", Wiley, 2012. References:
- Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)",1st Edition, VPT, 2014
- Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to ConnectingEverything", 1st Edition, Apress Publications, 2013
- CunoPfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1- 4493-9357-1

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SEMESTER III

ETEC-301 ELECTRONIC DEVICES AND CIRCUIT

OBJECTIVES OF THE COURSE:

- To understand the principles of semiconductor Physics
- To learn and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems.
- To understand the application of op -amp.

MODULE I: INTRODUCTION TO SEMICONDUCTOR PHYSICS

Review of Quantum Mechanics, Electrons in periodic Lattices, E-k diagrams. Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; sheet resistance, design of resistors

MODULE II: PN JUNCTION DIODE

Generation and recombination of carriers; Poisson and continuity equation P-N junction characteristics, I-V characteristics, Rectifier, Clipper & Clamper and small signal switching models; Avalanche breakdown, Zener diode, Schottky diode

MODULE III: BJT & MOSFET

Bipolar Junction Transistor, I-V characteristics, Early effect, Ebers-Moll Model , MOS capacitor, C-V characteristics, MOSFET, I-V characteristics, and small signal models of MOS transistor.

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MODULE IV: CMOS FABRICATION & SPECIAL TYPES OF DIODES

Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography, etching, chemical vapor deposition, sputtering, twin-tub CMOS process. Photodiodes, photo detectors, solar cell, light emitting diodes, semiconductor lasers, light emitting materials. Tunnel Diode

MODULE V: OPERATIONAL AMPLIFIER

Characteristics of an ideal op-amp, Introduction- Summing, Scaling and averaging amplifier, Substractor or difference amplifier, Voltage to current converter ,Current to voltage converter, Controlled sources, Opamp integrator and differentiator.

TEXT /REFERENCE BOOKS:

1. G. Streetman, and S. K. Banerjee, " Solid State Electronic Devices," 7th edition, Pearson,2014.
2. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, " Physics of Semiconductor Devices," 3rd edition, John Wiley &Sons, 2006.

ETEC-311 ELECTRONIC DEVICES AND CIRCUITS LABORATORY

OBJECTIVES OF THE COURSE:

- To be exposed to the characteristics of basic electronic devices.

LIST OF EXPERIMENT:-

1. To perform and get familiar with working knowledge of following instruments:-
(a) Function generator (b) CRO (cathode ray oscilloscope)
2. To perform and plot the forward and reverse V-I characteristics of a PN junction diode.
3. To perform and plot the characteristics of Zener diode.
4. To perform and plot the wave shape of Half wave rectifier.
5. To perform and plot the wave shape of full wave rectifier.
6. To perform and study the input and output characteristics of common base transistor.
7. To perform and study the input and output characteristics of common emitter transistor.
8. To perform and study transfer and drain characteristics of FET.
9. Measurement of H-Parameter of CB Configuration.
10. Drain and Transfer Characteristics of JFET.
11. . To perform and plot the characteristics of Photo diode.
12. To perform and plot the characteristics of light emitting diode.

COURSE OUTCOMES:

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- Learn the characteristics of basic electronic devices.

ETCS-301 DATA STRUCTURE & ALGORITHMS

OBJECTIVES OF THE COURSE:

- To understand the concepts of ADTs
- To Learn linear data structures – lists, stacks, and queues
- To understand sorting, searching and hashing algorithms
- To apply Tree and Graph structures

UNIT I LINEAR DATA STRUCTURES – LIST

Abstract Data Types (ADTs) – List ADT – array-based implementation - linked list implementation - singly linked lists - circularly linked lists- doubly-linked lists - applications of lists - Polynomial Manipulation- All operations (Insertion, Deletion, Merge, Traversal).

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue - deQueue – applications of queues.

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UNIT III NON LINEAR DATA STRUCTURES – TREES

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree - Heap – Applications of heap.

UNIT IV NON LINEAR DATA STRUCTURES - GRAPHS

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Shell sort – Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

COURSE OUTCOMES:

- At the end of the course, the student should be able to:
- Implement abstract data types for linear data structures.
- Apply the different linear and non-linear data structures to problem solutions.
- Critically analyze the various sorting algorithms.

TEXT BOOKS:

- Mark Allen Weiss, —Data Structures and Algorithm Analysis in C‖, 2nd Edition, Pearson Education,1997.
- Reema Thareja, —Data Structures Using C‖, Second Edition , Oxford University Press, 2011

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, —Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, —Data Structures and Algorithms‖, Pearson Education, 1983.
3. Stephen G. Kochan, —Programming in C‖, 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, —Fundamentals of Data Structures in C‖, Second Edition, University Press, 2008
5. “How to Solve it by Computer”, 2nd Impression by R. G. Dromey, Pearson Education.

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ETCS-311 DATA STRUCTURES & ALGORITHMS LABORATORY

OBJECTIVES OF THE COURSE:

- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To implement graph traversal algorithms
- To get familiarized to sorting and searching algorithms

LIST OF EXPERIMENT

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1. Array implementation of Stack and Queue ADTs
2. Array implementation of List ADT
3. Linked list implementation of List, Stack and Queue ADTs
4. Applications of List, Stack and Queue ADTs
5. Implementation of Binary Trees and operations of Binary Trees
6. Implementation of Binary Search Trees
7. Implementation of AVL Trees
8. Implementation of Heaps using Priority Queues.
9. Graph representation and Traversal algorithms
10. Applications of Graphs
11. Implementation of searching and sorting algorithms
12. Hashing – any two collision techniques

COURSE OUTCOMES:

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

- Write functions to implement linear and non-linear data structure operations
- Suggest appropriate linear / non-linear data structure operations for solving a given problem
- Appropriately use the linear / non-linear data structure operations for a given problem
- Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval

ETEC-302 DIGITAL ELECTRONICS

OBJECTIVES OF THE COURSE:

- To present the Digital fundamentals, Boolean algebra and its applications in digital systems To

familiarize with the design of various combinational digital circuits using logic gates

- To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits
- To explain the various semiconductor memories and related technology
- To introduce the electronic circuits involved in the making of logic gates

UNIT I INTRODUCTION TO LOGIC GATES

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan‟s Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion.

UNIT II COMBINATIONAL CIRCUITS

MSI devices like Comparators, Multiplexers, Encoder, Decoder, Driver & Multiplexed Display, Half andFull Adders, Subtractors, Serial and Parallel Adders, BCD Adder, Barrel shifter and ALU

UNIT III SEQUENTIAL LOGIC DESIGN

Building blocks like S-R, JK and Master-Slave JK FF, Edge triggered FF, Rippleand Synchronous counters, Shift registers, Finite state machines, Design of synchronous FSM,Algorithmic State Machines charts. Designing synchronous circuits like Pulse train generator, PseudoRandom Binary Sequence generator, Clock generation

UNIT IV LOGIC FAMILIES AND SEMICONDUCTOR MEMORIES

TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan-out, Tristate TTL, ECL, CMOS families and their interfacing, Memory elements, Conceptof Programmable logic devices like FPGA. Logic implementation using Programmable Devices.

UNIT V THE 555 IC TIMER

555 Timer pin configuration, Basics and block diagram of 555 timer, Working, 555timer as a monostable & astable multivibrator, 555 timer as a VCO.

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to

- Design and analyze combinational logic circuits
- Design & analyze modular combinational circuits with MUX/DEMUX, Decoder,
- Encoder
- Design & analyze synchronous sequential logic circuits
- Use HDL & appropriate EDA tools for digital logic design and simulation

TEXT/ REFERENCE BOOKS:

1. R.P. Jain, “ Modern digital Electronics”, Tata McGraw Hill, 4th edition, 2009.
2. Douglas Perry, “ VHDL” , Tata McGraw Hill, 4th edition, 2002.
3. W.H. Gothmann, “ Digital Electronics- An introduction to theory and practice”, PHI, 2nd edition ,2006.

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4. D.V. Hall, " Digital Circuits and Systems" , Tata McGraw Hill, 1989
5. Charles Roth, " Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.

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ETEC-312 DIGITAL ELECTRONICS LAB

COURSE OBJECTIVES:

Students will learn and understand the Basics of digital electronics and able to design basic logic circuits, combinational and sequential circuits.

LIST OF EXPERIMENT

1. To study and verify the truth table of gates.
2. To study and verify the truth table of half adder and full adder using gates.
3. To study and verify the truth table of half substractor and full substractor using gates.
4. To study and verify NAND as a universal gate.
5. To study and verify the truth table of S-R and J-K flip flop.
6. To study and verify the truth table of D and T-flip flop.
7. To study and verify the truth table of MUX and DEMUX.
8. To study about analog to digital converter.
9. To study about digital to analog converter.
10. To study about Counters.

COURSE OUTCOMES:

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

- Distinguish between analog and digital systems.
- Identify the various digital ICs and understand their operation.
- Apply Boolean laws to simplify the digital circuits.

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ETSH-301 ENGINEERING MATHEMATICS III (PDE, PROBABILITY & STATISTICS)

OBJECTIVES OF THE COURSE:

- To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering
- To provide an overview of probability and statistics to engineers

UNIT I BASIC PROBABILITY

Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev & #39;s Inequality.

UNIT II CONTINUOUS PROBABILITY DISTRIBUTIONS AND BIVARIATE DISTRIBUTIONS

Continuous random variables and their properties, distribution functions and densities, normal, bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes rule.

UNIT III BASIC STATISTICS: MEASURES OF CENTRAL TENDENCY: MOMENTS, SKEWNESS AND KURTOSIS

Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

UNIT IV APPLIED STATISTICS

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

UNIT V SMALL SAMPLES

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

COURSE OUTCOMES:

Upon completion of this course, students will be able to

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- Solve field problems in engineering involving PDEs.
- They can also formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.

TEXT BOOKS / REFERENCES:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher‟s, 36 th edition, 2010.
2. Erwin Kresyszig, Advance Engineering Mathematics, John Wiley and Sons, 9 th edition, 2006.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
5. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).

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ETSH-302 ENTREPRENEURSHIP DEVELOPMENT AND BUSINESS INCUBATION

OBJECTIVES OF THE COURSE:

To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

UNIT I ENTREPRENEURSHIP

Importance and growth Characteristics and qualities of entrepreneur, Role of enterepreneship Ethics and social responsibilities properties, Entrepreneurship development,

UNIT II OVERVIEW OF BUSINESS ENVIRONMENT IN INDIA

Assessing overall business environment in the Indian economy, Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs, Globalization and the emerging business/entrepreneurial environment managing an enterprise.

UNIT III ENTREPRENEURIAL AND MANAGERIAL CHARACTERISTICS AND ENTREPRENEURSHIP

Concept of entrepreneurship, Entrepreneurial and managerial characteristics, managing an enterprise, motivation and entrepreneurship development, Importance of planning, monitoring evolution and follows up, Managing competition, Entrepreneurship development programs, SWOT analysis. Corporate enterprenshiup, Planning and evolution of projects, Creativity.

UNIT IV GOVT. POLICIES AND PUBLIC- PRIVATE PARTNERSHIP

Govt. policies on SME/SSIs/ business incubation and relevant schemes, Social responsibility of business, Public- Private Partnership, Characteristics of Indian industries:- Characteristics of Indian industries working in Civil engineering/Mechanical engineering/ Electrical engineering/ IT and Computer/ Electronics and communication sectors, Import and export scenarios.

UNIT V BUSINESS INCUBATION AND VENTURE MANAGEMENT

Business incubation and commercialization of ideas and innovations, Project selection, Planning and control, Venture capital, Joint venture management.

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COURSE OUTCOMES:

Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

TEXT BOOKS:

1. Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd.,Ram Nagar, New Delhi, 2013.
2. Donald F Kuratko, " Entreprenuership – Theory, Process and Practice", 9th Edition, Cengage Learning 2014.

REFERENCES:

1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.
2. Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2nd Edition Dream tech, 2005.
3. Rajeev Roy, „Entrepreneurship" 2nd Edition, Oxford University Press, 2011.
4. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986.

SEMESTER IV

ETCS-401 DISCRETE MATHEMATICS

OBJECTIVES OF THE COURSE:

Throughout the course, students will be expected to demonstrate their understanding of Discrete Mathematics by being able to do each of the following:

- Use mathematically correct terminology and notation.
- Construct correct direct and indirect proofs.
- Use division into cases in a proof.
- Use counterexamples.
- Apply logical reasoning to solve a variety of problems.

UNIT I SETS, RELATION AND FUNCTION

Operations and Laws of Sets, Cartesian Products, Binary Relation, Partial Ordering Relation, Equivalence Relation, Image of a Set, Sum and Product of Functions, Bijective functions, Inverse and Composite Function, Size of a Set, Finite and infinite Sets, Countable and uncountable Sets, Cantor's diagonal argument and The Power Set theorem, Schroeder-Bernstein theorem.

UNIT II PRINCIPLES OF MATHEMATICAL INDUCTION

The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic. Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.

UNIT III PROPOSITIONAL LOGIC

Syntax, Semantics, Validity and Satisfiability, Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication, Rules of Inference, The use of Quantifiers. Proof Techniques: Some Terminology, Proof Methods and Strategies, Forward Proof, Proof by Contradiction, Proof by

Contraposition, Proof of Necessity and Sufficiency.

UNIT IV ALGEBRAIC STRUCTURES AND MORPHISM

Algebraic Structures with one Binary Operation, Semi Groups, Monoids, Groups, Congruence Relation and Quotient Structures, Free and Cyclic Monoids and Groups, Permutation Groups, Substructures, Normal Subgroups, Algebraic Structures with two Binary Operation, Rings, Integral Domain and Fields. Boolean Algebra and Boolean Ring, Identities of Boolean Algebra, Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form

UNIT V GRAPHS AND TREES

Graphs and their properties, Degree, Connectivity, Path, Cycle, Sub Graph, Isomorphism, Eulerian and Hamiltonian Walks, Graph Colouring, Colouring maps and Planar Graphs, Colouring Vertices, Colouring Edges, List Colouring, Perfect Graph, definition properties and Example, rooted trees, trees and sorting, weighted trees and prefix codes, Bi-connected component and Articulation Points, Shortest distances.

COURSE OUTCOMES:

- For a given logic sentence express it in terms of predicates, quantifiers, and logical connectives
- For a given a problem, derive the solution using deductive logic and prove the solution based on logical inference
- For a given a mathematical problem, classify its algebraic structure
- Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra
- Develop the given problem as graph networks and solve with techniques of graphtheory.

TEXT BOOKS:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw – Hill
2. Susanna S. Epp, Discrete Mathematics with Applications, 4th edition, Wadsworth Publishing Co. Inc.
3. C L Liu and D P Mohapatra, Elements of Discrete Mathematics A Computer Oriented Approach, 3rd Edition by, Tata McGraw – Hill.

REFERENCES:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structure and It‟s Application to Computer Science”, TMG Edition, TataMcgraw-Hill
2. Norman L. Biggs, Discrete Mathematics, 2nd Edition, Oxford University Press. Schaum‟s Outlines Series, Seymour Lipschutz, Marc Lipson,
3. Discrete Mathematics, Tata McGraw - Hill

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ETCS-402 COMPUTER ORGANIZATION & ARCHITECTURE

OBJECTIVES OF THE COURSE:

- To learn the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To learn the basics of pipelined execution.
- To understand parallelism and multi-core processors.
- To understand the memory hierarchies, cache memories and virtual memories.
- To learn the different ways of communication with I/O devices.

UNIT I BASIC STRUCTURE OF A COMPUTER SYSTEM

Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing.

UNIT II ARITHMETIC FOR COMPUTERS

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Subword Parallelism

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UNIT III PROCESSOR AND CONTROL UNIT

A Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined datapath and control – Handling Data Hazards & Control Hazards – Exceptions.

UNIT IV PARALLELISIM

Parallel processing challenges – Flynn„s classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors - Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

UNIT V MEMORY & I/O SYSTEMS

Memory Hierarchy - memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB„s – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits - USB.

COURSE OUTCOMES:

On Completion of the course, the students should be able to:

- Understand the basics structure of computers, operations and instructions.
- Design arithmetic and logic unit.
- Understand pipelined execution and design control unit.
- Understand parallel processing architectures.
- Understand the various memory systems and I/O communication.

TEXT BOOKS:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.

REFERENCE BOOKS:

1. William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach‖, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

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ETCS-403 OPERATING SYSTEMS

OBJECTIVES OF THE COURSE

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

UNIT I INTRODUCTION

Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems,

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Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.

UNIT II PROCESSES

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

UNIT III INTER-PROCESS COMMUNICATION

Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson‟s Solution, The Producer \ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader‟s & Writer Problem, Dinning Philosopher Problem etc.

UNIT IV DEADLOCKS

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

UNIT V I/O HARDWARE

I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance. Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

COURSE OUTCOMES:

- Create processes and threads.
- Develop algorithms for process scheduling for a given specification of CPU utilization,
- Throughput, Turnaround Time, Waiting Time, Response Time.
- For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
- Design and implement file management system.

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- For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

TEXT BOOKS:

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

REFERENCES:

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

ETCS-413 OPERATING SYSTEMS LABORATORY

OBJECTIVES OF THE COURSE

- To learn Unix commands and shell programming
- To implement various CPU Scheduling Algorithms

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- To implement Process Creation and Inter Process Communication.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To implement Page Replacement Algorithms
- To implement File Organization and File Allocation Strategies

LIST OF EXPERIMENTS:

1. Basics of UNIX commands
2. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir
3. Write C programs to simulate UNIX commands like cp, ls, grep, etc.
4. Shell Programming
5. Write C programs to implement the various CPU Scheduling Algorithms
6. Implementation of Semaphores
7. Implementation of Shared memory and IPC
8. Bankers Algorithm for Deadlock Avoidance
9. Implementation of Deadlock Detection Algorithm
10. Write C program to implement Threading & Synchronization Applications
11. Implementation of the following Memory Allocation Methods for fixed partition

a) First Fit b) Worst Fit c) Best Fit

12. Implementation of Paging Technique of Memory Management
13. Implementation of the following Page Replacement Algorithms a) FIFO b) LRU c) LFU
14. Implementation of the various File Organization Techniques
15. Implementation of the following File Allocation Strategies a) Sequential b) Indexed c) Linked

COURSE OUTCOMES:

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

- Compare the performance of various CPU Scheduling Algorithms
- Implement Deadlock avoidance and Detection Algorithms
- Implement Semaphores
- Create processes and implement IPC
- Analyze the performance of the various Page Replacement Algorithms
- Implement File Organization and File Allocation Strategies

ETCS-404 DESIGN AND ANALYSIS OF ALGORITHMS

OBJECTIVES OF THE COURSE

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

UNIT I INTRODUCTION

Characteristics of algorithm. Analysis of algorithm: Asymptotic analysis of complexity bounds – best, average and worst-case behavior; Performance measurements of Algorithm, Time and space trade-offs, Analysis of recursive algorithms through recurrence relations: Substitution method, Recursion tree method and Masters‟ theorem.

UNIT II FUNDAMENTAL ALGORITHMIC STRATEGIES

Brute-Force, Greedy,Dynamic Programming, Branch- and-Bound and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics – characteristics and their applicationdomains.

UNIT III GRAPH AND TREE ALGORITHMS

Traversal algorithms: Depth First Search (DFS) and Breadth First Search (BFS); Shortest path algorithms, Transitive closure, Minimum Spanning Tree, Topological sorting, Network Flow Algorithm.

UNIT IV TRACTABLE AND INTRACTABLE PROBLEMS

Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook‟s theorem, Standard NP-complete problems and Reduction techniques.

UNIT V ADVANCED TOPICS

Approximation algorithms, Randomized algorithms, Class of problems beyond NP – P SPACE

COURSE OUTCOMES

- For a given algorithms analyze worst-case running times of algorithms based on asymptotic analysis and justify the correctness of algorithms .
- Describe the greedy paradigm and explain when an algorithmic design situation calls for it. For a given problem develop the greedy algorithms.
- Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Synthesize divide-and-conquer algorithms. Derive and solve recurrence relation.
- Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. For a given problems of dynamic-programming and develop the dynamic programming algorithms, and analyze it to determine its computational complexity.
- For a given model engineering problem model it using graph and write the corresponding algorithm to solve the problems.
- Explain the ways to analyze randomized algorithms (expected

running time, probability of error).

- Explain what an approximation algorithm is. Compute the approximation factor of an approximation algorithm (PTAS and FPTAS).

TEXT BOOKS:

1. Introduction to Algorithms, 4TH Edition, Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, MIT Press/McGraw-Hill.
2. Fundamentals of Algorithms – E. Horowitz et al.

REFERENCES:

1. Algorithm Design, 1ST Edition, Jon Kleinberg and ÉvaTardos, Pearson.
2. Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Michael T Goodrich and Roberto Tamassia, Wiley.
3. Algorithms -- A Creative Approach, 3rd Edition, UdiManber, Addison-Wesley, Reading, MA.

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ETSH-401 ORGANIZATIONAL BEHAVIOR

OBJECTIVES OF THE COURSE:

1. To help the students to develop cognizance of the importance of human behaviour.
2. To enable students to describe how people behave under different conditions and understand why people behave as they do.
3. To provide the students to analyse specific strategic human resources demands for future action.
4. To enable students to synthesize related information and evaluate options for the most logical and optimal solution such that they would be able to predict and control human behaviour and improve results.

UNIT I FOCUS AND PURPOSE

Definition, need and importance of organizational behaviour – Nature and scope – Frame work – Organizational behaviour models.

UNIT II INDIVIDUAL BEHAVIOUR

Personality – types – Factors influencing personality – Theories – Learning – Types of learners – The learning process – Learning theories – Organizational behaviour modification. Misbehaviour – Types – Management Intervention. Emotions - Emotional Labour – Emotional Intelligence – Theories. Attitudes – Characteristics – Components – Formation – Measurement- Values. Perceptions – Importance – Factors influencing perception – Interpersonal perception- Impression Management. Motivation – importance – Types – Effects on work behavior.

UNIT III GROUP BEHAVIOUR

Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Team building - Interpersonal relations – Communication – Control.

UNIT IV LEADERSHIP AND POWER

Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.

UNIT V DYNAMICS OF ORGANIZATIONAL BEHAVIOUR

Organizational culture and climate – Factors affecting organizational climate – Importance. Job satisfaction – Determinants – Measurements – Influence on behavior. Organizational change –

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Importance – Stability Vs Change – Proactive Vs Reaction change – the change process – Resistance to change – Managing change. Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life. Organizational development – Characteristics – objectives –. Organizational effectiveness.

COURSE OUTCOMES:

On completion of this course, the students will be able to

- Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization.
- Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization.
- Analyze the complexities associated with management of the group behavior in the organization.
- Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.

TEXT BOOKS:

1. Stephen P. Robins, Organizational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.
2. Fred Luthans, Organizational Behavior, McGraw Hill, 11th Edition, 2001.

REFERENCES:

1. Schermerhorn, Hunt and Osborn, Organizational behavior, John Wiley, 9th Edition, 2008.
2. Udai Pareek, Understanding Organisational Behaviour, 2nd Edition, Oxford Higher Education, 2004.
3. Mc Shane & Von Glinov, Organisational Behaviour, 4th Edition, Tata Mc Graw Hill, 2007.
4. Hellrigal, Slocum and Woodman, Organisational Behavior, Cengage Learning, 11th Edition 2007.

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ETCS405 PROBLEM SOLVING AND PYTHON PROGRAMMING

OBJECTIVES OF THE COURSE:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd,

exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

COURSE OUTCOMES:

- Upon completion of the course, students will be able to
- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. John V Guttag, —Introduction to Computation and Programming Using Python„„, Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, —Exploring Python‖, Mc-Graw Hill Education (India) Private Ltd.,, 2015.
4. Kenneth A. Lambert, —Fundamentals of Python: First Programs‖, CENGAGE Learning, 2012.
5. Charles Dierbach, —Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, —Practical Programming: An Introduction to Computer Science using Python 3‖, Second edition, Pragmatic Programmers, LLC, 2013.

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ETCS-415 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

OBJECTIVES OF THE COURSE:

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

LIST OF PROGRAMS:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton„s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices

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10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED Python 3 interpreter for Windows/Linux

COURSE OUTCOMES:

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

- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

SEMESTER V

ETCS-501 DATABASE MANAGEMENT SYSTEMS

OBJECTIVES OF THE COURSE:

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
- To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

UNIT I DATABASE SYSTEM ARCHITECTURE

Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object oriented data

models, integrity constraints, data manipulation operations.

UNIT II RELATIONAL QUERY LANGUAGES

Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.

UNIT III QUERY PROCESSING AND OPTIMIZATION

Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms. Storage strategies: Indices, B-trees, hashing.

UNIT IV TRANSACTION PROCESSING

Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

UNIT V DATABASE SECURITY & ADVANCED TOPICS

Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection. Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

COURSE OUTCOMES:

1. For a given query write relational algebra expressions for that query and optimize the developed expressions
2. For a given specification of the requirement design the databases using E R method and normalization.
3. For a given specification construct the SQL queries for Open source and Commercial DBMS - MYSQL, ORACLE, and DB2.
4. For a given query optimize its execution using Query optimization algorithms
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
6. Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

TEXT BOOKS:

1. "Database System Concepts" , 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

REFERENCES:

1. "Principles of Database and Knowledge – Base Systems", Vol 1 by J. D. Ullman, Computer Science Press.
2. "Fundamentals of Database Systems" , 5th Edition by R. Elmasri and S. Navathe, Pearson Education

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3. “Foundations of Databases”, Reprint by Serge Abiteboul, Richard Hull, Victor Vianu, Addison-Wesley

ETCS-511 DATABASE MANAGEMENT SYSTEMS LABORATORY

AIM: The aim of this laboratory is to inculcate the abilities of applying the principles of the database management systems. This course aims to prepare the students for projects where a proper implementation of databases will be required.

OBJECTIVES OF THE COURSE:

- To understand data definitions and data manipulation commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of data bases
- To be familiar with the use of a front end tool

- To understand design and implementation of typical database applications

LIST OF PROGRAMS:

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2. Database Querying – Simple queries, Nested queries, Sub queries and Joins
3. Views, Sequences, Synonyms
4. Database Programming: Implicit and Explicit Cursors
5. Procedures and Functions
6. Triggers
7. Exception Handling
8. Database Design using ER modeling, normalization and Implementation for any application
9. Database Connectivity with Front End Tools
10. Case Study using real life database applications

COURSE OUTCOMES:

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

- Use typical data definitions and manipulation commands.
- Design applications to test Nested and Join Queries
- Implement simple applications that use Views
- Implement applications that require a Front-end Tool
- Critically analyze the use of Tables, Views, Functions and Procedures

ETCS-502 THEORY OF COMPUTATION

OBJECTIVES OF THE COURSE:

- Develop a formal notation for strings, languages and machines.
- Design finite automata to accept a set of strings of a language.
- Prove that a given language is regular and apply the closure properties of languages.
- Design context free grammars to generate strings from a context free language and convert

them into normal forms.

- Prove equivalence of languages accepted by Push Down Automata and languages generated by context free grammars
- Identify the hierarchy of formal languages, grammars and machines.
- Distinguish between computability and non-computability and Decidability and undesirability.

UNIT I AUTOMATA FUNDAMENTALS

Introduction to formal proof – Additional forms of Proof – Inductive Proofs –Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with Epsilon Transitions

UNIT II REGULAR EXPRESSIONS AND LANGUAGES

Regular Expressions – FA and Regular Expressions – Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

UNIT III CONTEXT FREE GRAMMAR AND LANGUAGES

CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

UNIT IV PROPERTIES OF CONTEXT FREE LANGUAGES

Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM.

UNIT V UNDECIDABILITY

Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post„s Correspondence Problem, The Class P and NP.

COURSE OUTCOMES

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

1. Construct automata, regular expression for any pattern.
2. Write Context free grammar for any construct.
3. Design Turing machines for any language.
4. Propose computation solutions using Turing machines.
5. Derive whether a problem is decidable or not.

TEXT BOOK:

1. J.E.Hopcroft, R.Motwani and J.D Ullman, —Introduction to Automata Theory, Languages and Computations‖, Second Edition, Pearson Education, 2003.

REFERENCE BOOKS:

1. H.R.Lewis and C.H.Papadimitriou, —Elements of the theory of Computation‖, Second Edition,

PHI, 2003. 2. J.Martin, —Introduction to Languages and the Theory of Computation‖, Third Edition, TMH, 2003. 3. Micheal Sipser, —Introduction of the Theory and Computation‖, Thomson Brokecole, 1997.

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ETCS-503 OBJECT ORIENTED PROGRAMMING

OBJECTIVES OF THE COURSE

- To get a clear understanding of object-oriented concepts.
- To understand object oriented programming through C++.

UNIT I

Introduction to OOPs: What Is Object-Oriented Programming? , Encapsulation, Polymorphism, Inheritance.

C++ Overview: The Origins of C++,The General Form of a C++ Program, different data types, operators, expressions, arrays and strings, reference variables. Function Components, argument passing, inline functions, function overloading, function templates.

UNIT II

Classes & Objects: Introduction, Class Specification, Class Objects, access members, defining member functions, data hiding, constructors, destructors, parameterized constructors, static data members, static member functions, scope resolution operator, Passing Objects to Functions, Returning Objects, Object Assignment.

Pointers and dynamic memory allocation: Pointers, Pointer as function arguments, Dynamic Allocation Operators new and delete, Initializing Allocated Memory, Allocating Arrays, Allocating Objects.

UNIT III

Operator overloading: Operator overloading as member functions and using friend functions. Overloading of binary operators like +, -, *.Creating Prefix and Postfix forms of ++, -- Operators, Operator Overloading Restrictions, Operator Overloading Using a Friend Function to Overload ++ or – – , Overloading ( ).

Inheritance: Base Class, Inheritance & protected members, protected base class inheritance, inheriting multiple base classes, Constructors, Destructors & Inheritance. Passing parameters to base Class Constructors, Granting access, Virtual base classes.

UNIT IV

Virtual Functions and Runtime Polymorphism: Virtual function -Calling a Virtual function through a base class reference, Virtual attribute is inherited, Virtual functions are hierarchical, pure virtual functions, abstract classes, using Virtual functions, Early & late binding.

Standard C++ I/O Classes: Old vs. Modern C++ I/O, C++ Streams, The C++ Stream Classes, C++'s Predefined Streams, Formatted I/O, Formatting Using the ios Members, Setting the Format Flags, Clearing Format Flags, Overloading << and >>, manipulators.

UNIT V

Exception Handling: Exception Handling, Fundamentals, Catching Class Types, Using Multiple catch Statements, Handling Derived-Class Exceptions, Exception Handling Options, Catching All Exceptions, Restricting Exceptions, Rethrowing an Exception, Understanding terminate( ) and unexpected( ),

uncaught_exception( ) Function, The exception and bad_exception Classes, Applying Exception Handling.

STL: Class template, An overview of STL, containers, vectors

COURSE OUTCOMES

1. Gain the basic knowledge on Object Oriented concepts.
2. Ability to develop applications using Object Oriented Programming Concepts.
3. Ability to implement features of object oriented programming to solve real world problems.

TEXT BOOKS:

1. Ira Pohl, “Object-Oriented Programming Using C++”, Pearson Education Asia, 2003.
2. Object-Oriented Programming with C++ by E Balagurusamy

REFERENCE BOOKS:

1. Herbert Schildt, "Complete Reference", Fourth edition, TMH, 2002
2. Bjarne Stroustrup, “The C++ Programming Language”, Pearson Education, 2004.
3. Stanley B. Lippman and Josee Lajoie , “C++ Primer”, Pearson Education, 2003.
4. K.R.Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", TMH, 2003

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ETCS-513 OBJECT ORIENTED PROGRAMMING LAB

OBJECTIVES OF THE COURSE:

- To get a clear understanding of object-oriented concepts.
- To understand object oriented programming through C++ & JAVA.

LIST OF EXPERIMENT:

1 Write a C++ program to find the sum of the given variables using function with default arguments.
2 Write a C++ program to find the value of a number raised to its power using call by value.
3 Write a C++ program to implement the concept of Call by Address.
4 Write a program in C++ to implement the concept of call by reference.
5 Write C++ program to implement inline function.
6 Write a program in C++ to display product detail using classes with array as data members.
7 Write a program in C++ implements the concept of class with constant data member.
8 Write a program in C++ to implement the concept of class with static member functions.
9 Write a C++ program to implement the friend function concept.
10 a) Write a C++ program to implement the concept of unary operator overloading using c++.
b) Write a C++ program to implement the concept of Binary operator overloading.
11 Write a C++ program to implement the concept of Function Overloading.
12 a) To implement single inheritance using c++.
b) To write a C++ program to implement multiple inheritance.
c) To write a C++ program to implement multilevel inheritance.
13 a) Write a C++ program to implement the concept of class template.
b) Write a C++ program for swapping two values using function templates

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ETCS-504 JAVA PROGRAMMING

OBJECTIVES OF THE COURSE:

- To understand the basic concepts and fundamentals of platform independent object oriented language.
- To demonstrate skills in writing programs using exception handling techniques and multithreading.
- To understand streams and efficient user interface design techniques.

OUTCOMES OF THE COURSE:

After successful completion of the course, the students are able to

- Use the syntax and semantics of java programming language and basic concepts of OOP.
- Develop reusable programs using the concepts of inheritance, polymorphism, interfaces and packages.
- Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.
- Design event driven GUI and web related applications which mimic the real word scenarios.

UNIT I

Introduction to Java & The Java Environment, Basic Language Elements & Extending Classes and Inheritance. Introduction to Java, Installing Java, Java Program Development, Java Source File Structure, Compilation, Executions. Lexical Tokens, Identifiers, Keywords, Literals, Comments, Primitive Data types, Operators Assignments. Use and Benefits of Inheritance in OOP, Types of Inheritance in Java Inheriting Data members and Methods, Role of Constructors inheritance, Overriding Super Class Methods, Use of "super" , Polymorphism in inheritance, Type Compatibility and Conversion Implementing interfaces.

UNIT II

Input and Output, Arrays and Strings & Wrapper Classes, Accepting Input from the keyboard, reading input in Java, Util, Scanner class, displaying output with System.out.print(), Displaying formatted output with string, Format, Types of Arrays, Array name, Length, Command Line Arguments, Creating

Strings, String Class Methods, String Comparison, Immutability of Strings, Creating String Buffer Objects, String Buffer Class, Methods, String Builder Class, String Builder Class Methods. Number class, Character class, Byte class, Short class, Integer class, Long class, Float class, Double class, Boolean class, Math class

UNIT III

Methods of Java, Inheritance and Polymorphism & Packages Method Prototype, Method Body, Understanding Methods, Static Methods Static Block, The keyword 'this 'instance Methods, Passing Primitive Data Types to Methods, Passing Objects to Methods, Passing Arrays to Methods, Recursion, Factory Methods. Inheritance, The Keyword 'super' The Protected Specified, Types of Inheritance. Polymorphism with variables, Polymorphism using methods, Polymorphism with Static Methods, Polymorphism with Private Methods, Abstract Classes. Exceptional handling, Threads & Introduction to AWT and Applets.

UNIT IV

Errors in Java Program, Exceptions throws and throw clause, Types of exceptions, Re-throwing an exception Single and Multitasking, Creating and terminating the thread, Creating and terminating the thread, Single and Multi-tasking using threads, Deadlock of threads, Thread communication. AWT components, Creating and closing the frame, Drawing in the frame, Displaying dots and text in the frame, Event Handling, Listeners and Listener methods, Creating and uses of Applets, An applet with swing components, Applet parameters. Introduction on Java database connectivity.

UNIT V

Database servers and clients, JDBC Connecting to a Database, Stored Procedures and Callable Statement, Storing file and Image into database Retrieving a file and images from database, Types of JDBC drivers

REFERENCE BOOKS:

1. E. Balagurusamy, "Programming with Java, a Primer", TMH, ISBN-13: 978-0-07-061713-
2. Patrick Naughton and Herbert Schildt, "Java: the Complete Reference", TMH Publication.
3. Yashavant kanetkar, "Let us Java", BPB Publications.
5. Cay Horstmann, "Big Java", Wiley Publication
6. Peter Norton, "Java Programming", Techmedia Publications.
7. Joseph Weber, "Using Java 1.2", PHI

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ETCS-514 JAVA PROGRAMMING LAB

LIST OF EXPERIMENTS:

1 Write a java program to find the Fibonacci series using recursive and non recursive functions.
2 Write a java program to multiply two given matrices.
3 Write a java program for Method overloading and Constructor overloading.
4 Write a java program to display the employee details using Scanner class.
5 Write a java program that checks whether a given string is palindrome or not.
6 Write a java program to represent Abstract class with example.
7 Write a java program to implement Interface using extends keyword.
8 Write a java program to create inner classes.
9 Write a java program for creating multiple catch blocks.
10 Write a Java program that implements a multi-thread application that has three threads.
11 Write an applet program that displays a simple message.
12 Write a Java program compute factorial value using Applet.
13 Write a program for passing parameters using Applet.
14 Write a java program for handling Mouse events and Key events
15 Write a java program that connects to a database using JDBC
16 Write a java program that works as a simple calculator. Use a Grid Layout to arrange Buttons for digits and for the + - * % operations. Add a text field to display the result.

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ETSH-501 BUSINESS MANAGEMENT AND ECONOMICS

OBJECTIVES OF THE COURSE:

To integrate the basic concepts of economics with the tools of mathematics and statistics in order to analyze and make optimal business decisions.

UNIT I INTRODUCTION OF MANAGEMENT

Definitions, management principles, scientific principles, administrative principles; Maslow‟s Hierarchy of needs theory; Functions of management: Planning, organizing, Staffing, directing, Controlling.

UNIT II ORGANIZATIONAL STRUCTURES, PRINCIPLES OF ORGANIZATION

Types of organization: Formal and Informal, line, line and staff matrix, hybrid.

UNIT III INTRODUCTION OF ECONOMICS

Definitions, nature, scope, difference between microeconomics and macroeconomics; Theory of demand and supply, elasticity of demand, price and income elasticity; Markets: types of markets and their characteristics; National income: GDP, GNP, NNP, disposable personal income, per capita variable proportions and law of returns to scale.

UNIT IV COST

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short run and long run cost, fixed cost; variable cost , total cost , average cost , marginal cost, opportunity cost ; Break even analysis ; Finance management: Definition, scope, objective; Different systems of accounting: financial accounting, cost accounting, management accounting.

UNIT V HUMAN RESOURCE MANAGEMENT

Definitions, objective of manpower planning, process, sources of recruitment, process of selection; corporate social responsibility: Importance, business ethics.

COURSE OUTCOMES:

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

1. Understand the roles of managers in firms
2. Understand the internal and external decisions to be made by managers
3. Analyze the demand and supply conditions and assess the position of a company
4. Design competition strategies, including costing, pricing, product differentiation, and market environment according to the natures of products and the structures of the markets.
5. Analyze real-world business problems with a systematic theoretical framework.
6. Make optimal business decisions by integrating the concepts of economics, mathematics and statistics.

REFERENCES:

1. L.M. PRASAD. 2001 Principles and practices of Management, 9th Ed. S. Chand & Sons, New Delhi.
2. Koontz Harlod. Principles of Management. Tata McGraw- Hill Education Private Limited, New Delhi.
3. P. C Thomas Managerial Economics Theory. S. Chand & Sons, New Delhi.
4. K. K. Dewett and M.H. Navalur. Modern Economics Theory. S. Chand & Sons, New Delhi.5
5. P. Subba Rao. Human Resource Management. Himalaya Publications.
6. S.P. Jain Financial Accounting. Kalyani Publications, Ludhiana.

ELECTIVE I

ETCS-521 DATA WAREHOUSING AND DATA MINING

OBJECTIVES OF THE COURSE:

- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools.

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

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

UNIT II DATA MINING – INTRODUCTION

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

UNIT III DATA MINING – FREQUENT PATTERN ANALYSIS

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT IV CLASSIFICATION AND CLUSTERING

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

UNIT V WEKA TOOL

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

COURSE OUTCOMES:

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

- Design a Data warehouse system and perform business analysis with OLAP tools.
- Apply suitable pre-processing and visualization techniques for data analysis
- Apply frequent pattern and association rule mining techniques for data analysis
- Apply appropriate classification and clustering techniques for data analysis

TEXT BOOK:

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

REFERENCES:

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

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ETCS-522 SOFTWARE TESTING

OBJECTIVES OF THE COURSE:

- To learn the criteria for test cases.
- To learn the design of test cases.
- To understand test management and test automation techniques
- To apply test metrics and measurements.

UNIT I INTRODUCTION

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Testing as an Engineering Activity – Testing as a Process – Testing Maturity Model- Testing axioms – Basic definitions – Software Testing Principles – The Testers Role in a Software Development Organization – Origins of Defects – Cost of defects – Defect Classes – The Defect Repository and Test Design –Defect Examples- Developer/Tester Support of Developing a Defect Repository.

UNIT II TEST CASE DESIGN STRATEGIES

Test case Design Strategies – Using Black Box Approach to Test Case Design – Boundary Value Analysis – Equivalence Class Partitioning – State based testing – Cause-effect graphing – Compatibility testing – user documentation testing – domain testing - Random Testing – Requirements based testing – Using White Box Approach to Test design – Test Adequacy Criteria – static testing vs. structural testing – code functional testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – code complexity testing – Additional White box testing approaches- Evaluating Test Adequacy Criteria.

UNIT III LEVELS OF TESTING

The need for Levels of Testing – Unit Test – Unit Test Planning – Designing the Unit Tests – The Test Harness – Running the Unit tests and Recording results – Integration tests – Designing Integration Tests – Integration Test Planning – Scenario testing – Defect bash elimination System Testing – Acceptance testing – Performance testing – Regression Testing – Internationalization testing – Ad-hoc testing – Alpha, Beta Tests – Testing OO systems – Usability and Accessibility testing – Configuration testing – Compatibility testing – Testing the documentation – Website testing.

UNIT IV TEST MANAGEMENT

People and organizational issues in testing – Organization structures for testing teams – testing services

– Test Planning – Test Plan Components – Test Plan Attachments – Locating Test Items – test management – test process – Reporting Test Results – Introducing the test specialist – Skills needed by a test specialist – Building a Testing Group- The Structure of Testing Group- .The Technical Training Program.

UNIT V TEST AUTOMATION

Software test automation – skills needed for automation – scope of automation – design and architecture for automation – requirements for a test tool – challenges in automation – Test metrics and measurements – project, progress and productivity metrics.

COURSE OUTCOMES:

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

- Design test cases suitable for a software development for different domains.
- Identify suitable tests to be carried out.
- Prepare test planning based on the document.
- Document test plans and test cases designed.
- Use automatic testing tools.
- Develop and validate a test plan.

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TEXT BOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, —Software Testing – Principles and Practices‖, Pearson Education, 2006. 2. Ron Patton, —Software Testing‖, Second Edition, Sams Publishing, Pearson Education, 2007.

REFERENCES:

1. Ilene Burnstein, —Practical Software Testing‖, Springer International Edition, 2003.
2. Edward Kit,‖ Software Testing in the Real World – Improving the Process‖, Pearson Education, 1995.
3. Boris Beizer,‖ Software Testing Techniques‖ – 2nd Edition, Van Nostrand Reinhold, New York, 1990.
4. Aditya P. Mathur, —Foundations of Software Testing _ Fundamental Algorithms and Techniques‖, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

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ETCS-523 GRAPH THEORY AND APPLICATIONS

OBJECTIVES OF THE COURSE:

- To understand fundamentals of graph theory.
- To study proof techniques related to various concepts in graphs.
- To explore modern applications of graph theory.

UNIT I INTRODUCTION

Graphs – Introduction – Isomorphism – Sub graphs – Walks, Paths, Circuits –Connectedness – Components – Euler graphs – Hamiltonian paths and circuits – Trees – Properties of trees – Distance and centers in tree – Rooted and binary trees.

UNIT II TREES, CONNECTIVITY & PLANARITY

Spanning trees – Fundamental circuits – Spanning trees in a weighted graph – cut sets – Properties of cut set – All cut sets – Fundamental circuits and cut sets – Connectivity and separability – Network flows – 1-Isomorphism – 2-Isomorphism – Combinational and geometric graphs – Planer graphs – Different representation of a planer graph.

UNIT III MATRICES, COLOURING AND DIRECTED GRAPH

Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four color problem – Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness – Euler graphs.

UNIT IV PERMUTATIONS & COMBINATIONS

Fundamental principles of counting - Permutations and combinations - Binomial theorem - combinations with repetition - Combinatorial numbers - Principle of inclusion and exclusion - Derangements - Arrangements with forbidden positions.

UNIT V GENERATING FUNCTIONS

Generating functions - Partitions of integers - Exponential generating function – Summation operator - Recurrence relations - First order and second order – Non-homogeneous recurrence relations - Method of generating functions.

COURSE OUTCOMES:

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

- Understand the basic concepts of graphs, and different types of graphs
- Understand the properties, theorems and be able to prove theorems.
- Apply suitable graph model and algorithm for solving applications.

TEXT BOOKS:

1. Narsingh Deo, "Graph Theory with Application to Engineering and Computer Science", Prentice-Hall of India Pvt.Ltd, 2003.
2. L.R.Foulds , "Graph Theory Applications", Springer ,2016.

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REFERENCES:

1. Bondy, J. A. and Murty, U.S.R., “Graph Theory with Applications", North Holland Publication,2008.
2. West, D. B., —Introduction to Graph Theory‖, Pearson Education,2011.
3. John Clark , Derek Allan Holton, —A First Look at Graph Theory‖, World Scientific Publishing Company, 1991.
4. Diestel, R, "Graph Theory", Springer,3rd Edition,2006.
5. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Mc Graw Hill , 2007.

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SEMESTER VI

ETCS-601 COMPLIER DESIGN

OBJECTIVES OF THE COURSE:

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment.
- To learn to implement front-end of the compiler.
- To learn to implement code generator.

UNIT I INTRODUCTION TO COMPILERS

Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.

UNIT II SYNTAX ANALYSIS

Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar – Top Down Parsing - General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item Construction of SLR Parsing Table -Introduction to LALR Parser
- Error Handling and Recovery in Syntax Analyzer-YACC.

UNIT III INTERMEDIATE CODE GENERATION

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

UNIT IV RUN-TIME ENVIRONMENT AND CODE GENERATION

Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management - Issues in Code Generation - Design of a simple Code Generator.

UNIT V CODE OPTIMIZATION

Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks- Global Data Flow Analysis - Efficient Data Flow Algorithm.

COURSE OUTCOMES:

On Completion of the course, the students should be able to:

1. Understand the different phases of compiler.
2. Design a lexical analyzer for a sample language.
3. Apply different parsing algorithms to develop the parsers for a given grammar.
4. Understand syntax-directed translation and run-time environment.
5. Learn to implement code optimization techniques and a simple code generator.
6. Design and implement a scanner and a parser using LEX and YACC tools.

TEXT BOOK:

7. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools‖, Second Edition, Pearson Education, 2009.

REFERENCES:

1. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, Advanced Compiler Design and Implementation‖, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
3. Keith D Cooper and Linda Torczon, Engineering a Compiler‖, Morgan Kaufmann Publishers Elsevier Science, 2004.
4. V. Raghavan, Principles of Compiler Design‖, Tata McGraw Hill Education Publishers, 2010.
5. Allen I. Holub, Compiler Design in C‖, Prentice-Hall Software Series, 1993.

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ETCS-611 COMPILER DESIGN LAB

LIST OF EXPERIMENTS

1. Implementation of a symbol table
2. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.). Create a symbol table, while recognizing identifiers.
3. Implement a Lexical Analyzer using Lex Tool
4. Program to recognize a valid arithmetic expression that Uses operator +, - , * and /
5. Program to recognize a valid variable which starts with a
6. Letter followed by any number of letters or digits
7. Implement an Arithmetic Calculator using LEX and YACC
8. Generate three address code for a simple program using LEX and YACC
9. Convert the BNF rules into Yacc form Implement type checking
10. Implement control flow analysis and Data flow Analysis
11. Implement any one storage allocation strategies(Heap, Stack, Static) Construction of DAG
12. Implement simple code optimization techniques (Constant folding, Strength reduction and Algebraic transformation)
13. Implement back-end of the compiler for which the three address code is given as input and the 8086 assembly language code is produced as output.

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ETCS-602 COMPUTER NETWORKS

OBJECTIVES OF THE COURSE:

- To understand the protocol layering and physical level communication.
- To analyze the performance of a network.
- To understand the various components required to build different networks.
- To learn the functions of network layer and the various routing protocols.
- To familiarize the functions and protocols of the Transport layer.

UNIT I INTRODUCTION AND PHYSICAL LAYER

Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

UNIT II DATA-LINK LAYER & MEDIA ACCESS

Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP - Media Access Control - Wired LANs: Ethernet - Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.

UNIT III NETWORK LAYER

Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets - Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.

UNIT IV TRANSPORT LAYER

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Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.

UNIT V APPLICATION LAYER

WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP.

COURSE OUTCOMES:

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

- Understand the basic layers and its functions in computer networks.
- Evaluate the performance of a network.
- Understand the basics of how data flows from one node to another.
- Analyze and design routing algorithms.
- Design protocols for various functions in the network.
- Understand the working of various application layer protocols.

TEXT BOOK:

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.

REFERENCES:

1. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.
5. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.

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ETCS-603 COMPUTER GRAPHICS

OBJECTIVES OF THE COURSE:

- This course prepares students for activities involving the design, development, and testing of modeling, rendering, and animation solutions to a broad variety of problems found in entertainment, sciences, and engineering.
- Students will learn: (1) how to develop interactive programs that use effectively the graphics functionalities available in contemporary personal computers, (2) the fundamental principles and technologies upon which these functionalities, and possibly their future evolutions, are based, and (3) the skills for designing and implementing practical graphic solutions to challenging problems in different application domains.

UNIT I

A Survey of Computer Graphics : computer-Aided Design, Presentation Graphics, computer Art, entertainment, Education and Training, visualization, Image Processing, Graphical User Interfaces Overview of Graphics systems : Application of Computer Graphics, Video Display Devices, refresh Cathode-Ray Tubes Raster-Scan Display, Random-Scan displays Colour CRT Monitors, Direct-View

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Storage Tubes, Flat-Panel displays, Three-Dimensional Viewing Devices, Stereoscopic and Virtual-Reality Systems, Raster-Scan Systems, Random-Scan systems, Graphics Monitors and Workstations, Input Devices, Hard-copy devices,Graphics Software.

UNIT II

Output Primitives : Points and Lines, Line-Drawing Algorithms, DDA Algorithm, Bresenham's Line Algorithms,Parallel Line Algorithms, Loading and Frame Buffer, Line Function, Circle-Generating Algorithms, Pixel Addressing, Filled-Area Primitives, Fill-Area Function, Cell array, Character Generation. Attributes of Output Primitives : Line Attributes, Curve Attributes Colour and Grayscale Levels, Area-Fill Attributes, Character Attributes, Bundled Attributes, Inquiry functions, Antialiasing.

UNIT III

Two dimensional Geometric Transformations : Basic Transformations, Matrix Representations Homogeneous Coordinates Composite Transformations, Transformation Functions, raster Methods for Transformations. Two Dimensional Viewing : The Viewing Pipeline, Viewing Coordinate Reference Frame,Window-to-Viewport Coordinate transformation, Two- dimensional Viewing functions, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping, Curve Clipping, Text Clipping, Exterior Clipping.Three-Dimensional Concepts : Three-Dimensional display Methods, parallel Projection, Perspective Projection, Depth cueing visible Line and Surface

UNIT IV

dentification, Surface Rendering, Exploded and Cutaway Views, Three-Dimensional and Stereoscopic Views, Three- Dimensional Graphics Packages. Three-Dimensional Object Representations : Polygon Surface, Curved Lines and Surfaces, Quadric, Surfaces, Super Quadrics, Blobby Objects, Spline

UNIT V

Representations, Cubic Spline Interpolation Methods, Bezier Curves and Surfaces, Bezier Curves, Properties of Bezier Curves, Design Techniques Using Bezier Curves,Cubic Bezier Curves, Bezier Surfaces, B-Spline Curves and Surfaces B-Spline Curves, Uniform, Periodic B-Splines, Cubic, Periodic B-Splines, Open Uniform B-Splines, B-Spline ,Surfaces, Beta-Splines, Beta Spline,Continuity Conditions, Cubic, Periodic Beta-Spline Matrix Representation,Rational Splines. Computer Animation : Design of Animation Sequences, General Computer-Animation Functions Raster Animations, Computer-Animation Languages, Key- Frame Systems, Morphing, Simulating Accelerations Motion Specifications, Direct Motion Specification, Goal- Directed Systems, Kinematics and Dynamics.

REFERENCE BOOKS:

1. Computer Graphics C Version, D. Hearn And P. Baker, Pearson Education
2. Computer Graphics, Foley and van Dam, Person Education
3. Computer Graphics with OpenGL, Hearn and Baker, Pearson
4. Procedural Methods for computer graphics, Rogers, TMH
5. Computer Graphics with virtual reality systems, R. K. Maurya, Wiley-India
6. Computer Graphics, Sinha & Udai, TMH

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ETCS-613 COMPUTER GRAPHICS

1. Implementation of line generation using slope's method, DDA and Bresenhem's algorithms.
2. Implementation of circle generation using Mid-point method and Bresenhem's algorithm.
3. Implementation of ellipse generation using Mid-point method.
4. Implementation of polygon filling using Flood-fill, Boundary- fill and Scanline algorithms.
5. Implementation of 2D transformation: Translation, Scaling, Rotation, Mirror Reflection and

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Shearing (write a menu driven program).

6. Implementation of Line Clipping using Cohen-Sutherland algorithm and Bisection Method.
7. Implementation of Polygon Clipping using Sutherland- Hodgeman algorithm.
8. Implementation of 3D geometric transformations: Translation, Scaling and rotation.
9. Implementation of Curve generation using Interpolation methods.
10. Implementation of Curve generation using B-spline and Bezier curves.
11. Implementation of any one of Back face removal algorithms such as Depth-Buffer algorithm, Painter's algorithm, Warnock's algorithm, Scan-line algorithm)

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ETCS-604 WEB TECHNOLOGY

OBJECTIVES OF THE COURSE:

This Subject is useful for Making own Web page and how to host own web site on internet. Along with that Students will also learn about the protocols involve in internet technology.

UNIT I

Introduction, HTML- List, Tables, Images, Forms, Frames, Cascading Style sheets, XML- Document Type definition, XML Schemas, Document Object model

UNIT II

Java-Script, Java Script -Control statements, Functions, Arrays, Objects Events, Dynamic HTML with Java Script, Ajax, Web servers, Web servers – IIS (XAMPP, LAMPP), Tomcat Servers, Java Web Technologies- Servlets

UNIT III

JavaServer Pages, Java Server Faces, Web Technologies in Netbeans,, Building a Web Application in Netbeans, JSF Components, Session Tracking, Cookies

UNIT IV

PHP- Basics, PHP- Basics, String Processing and Regular Expressions, Form Processing and Business Logic, Using Cookies, Dynamic Content, Operator Precedence Chart

UNIT V

Database Connectivity, Database Connectivity with MySQL - Servlets, JSP, PHP, Case Studies- Student information system, Health Management System

REFERENCE BOOKS:

1. Steven Holzner,"HTML Black Book", Dremtech press.
2. Web Technologies, Black Book, Dreamtech Press
3. Web Applications : Concepts and Real World Design, Knuckles, Wiley-India
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.

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ETCS-614 WEB TECHNOLOGY LAB

LIST OF EXPERIMENTS:

1 Home page Development static pages (using Only HTML) of an online Book store.

2 Validate the Registration, user login and payment by credit card pages using JavaScript.

3 To write a program, which takes user id as input and displays the user details by taking the user information from the XML document.

4 To create a JavaBean so that it converts value of INR (Indian Rupees) into equivalent American/Canadian/Australian Dollar value.

5 To create a simple Bean with a label - which is the count of number of clicks and a Bean Info class such that only the "count" property is visible in the Property Window.

6 To create two Beans Traffic Light which implemented as a Label with only three background colours- Red, Green, Yellow and Automobile which is implemented as a Textbox which states its state/movement with above stated conditions.

7 To convert the static web pages online library into dynamic web pages using servlets and cookies.

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ELECTIVE II

ETCS-621 SOFTWARE ENGINEERING

Objectives of the course:

- To outline the need for Software Project Management
- To highlight different techniques for software cost estimation and activity planning.

UNIT I

Introduction of Software Engineering & Software Life Cycle Models/W Engineering Discipline-Evolution and Impact, Emergence of S/W Engineering Waterfall Model, Prototyping Model, Evolutionary Model Spiral models and their comparisons.

UNIT II

Software Project Management & Requirements Analysis and Specification Project Manager Responsibilities, Project Planning Project Size estimation Metrics, Project estimation Techniques COCOMO, Staffing Level Estimation, Scheduling, Organization & Team Structures, Staffing, Risk Management,S/W Configuration Management, Requirement Gathering and Analysis, Software Requirement Specification, Formal System Development Techniques

UNIT III

Software Design & Function-Oriented S/W Design, Overview of Software Design, Cohesion and Coupling, S/W Design Approaches, Object-Oriented vs. Function-Oriented Design, SA/SD Methodology Structured Analysis, Data Flow Diagrams(DFDs), Structured Design, Detailed Design, Design Preview

UNIT IV

Object Modelling Using UML & Object-Oriented Software Development , UML, UML Diagrams Use Case Model, Class Diagrams, Design Patterns, Object-Oriented analysis and Design Process OOD Goodness Criteria

UNIT V

User Interface Design & Coding and Testing, Basic Concepts, Types, Components Based GUI Development, User Interface Design Methodology, Coding, Code Review, Unit Testing, Black Box Testing, White-Box Testing, Debugging, Program Analysis Tools, Integration Testing, System Testing

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Software Reliability and Quality Management & Software Maintenance, S/W Reliability, Statistical Testing, S/W Quality, Management System, ISO 9000, SEI CMM, S/W Reverse Engineering, S/W Maintenance Process Models,

TEXT BOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, —Software Testing – Principles and Practices‖, Pearson Education, 2006. 2. Ron Patton, —Software Testing‖, Second Edition, Sams Publishing, Pearson Education, 2007.

REFERENCES:

1. Ilene Burnstein, —Practical Software Testing‖, Springer International Edition, 2003.
2. Edward Kit,‖ Software Testing in the Real World – Improving the Process‖, Pearson Education, 1995.
3. Boris Beizer,‖ Software Testing Techniques‖ – 2nd Edition, Van Nostrand Reinhold, New York, 1990.
4. Aditya P. Mathur, —Foundations of Software Testing _ Fundamental Algorithms and Techniques‖, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

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ETCS-622 EMBEDDED SYSTEMS

Objectives of the course:

- To learn the architecture and programming of ARM processor.
- To become familiar with the embedded computing platform design and analysis.
- To get thorough knowledge in interfacing concepts
- To design an embedded system and to develop programs

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS

Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries - ARM Processor – CPU: programming input and output-supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.

UNIT II EMBEDDED COMPUTING PLATFORM DESIGN

The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis - Components for embedded programs-Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT III SENSOR INTERFACING WITH ARDUINO

Basics of hardware design and functions of basic passive components-sensors and actuators-Arduino code - library file for sensor interfacing-construction of basic applications

UNIT IV EMBEDDED FIRMWARE

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Reset Circuit, Brown-out Protection Circuit-Oscillator Unit - Real Time Clock-Watchdog Timer - Embedded Firmware Design Approaches and Development Languages.

UNIT V EMBEDDED C PROGRAMMING

Introduction-Creating _hardware delays„using Timer 0 and Timer 1-Reading switches-Adding Structure to the code-Generating a minimum and maximum delay-Example: Creating a portable hardware delay-Timeout mechanisms-Creating loop timeouts-Testing loop timeouts- hardware timeouts-Testing a hardware timeout

COURSE OUTCOMES:

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

- Describe the architecture and programming of ARM processor.
- Explain the concepts of embedded systems
- Understand the Concepts of peripherals and interfacing of sensors.
- Capable of using the system design techniques to develop firmware
- Illustrate the code for constructing a system

TEXT BOOKS:

1.Marilyn Wolf, —Computers as Components - Principles of Embedded Computing System Design‖, Third Edition —Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (Unit I & Unit II)
2 https://www.coursera.org/learn/interface-with-arduino#syllabus (Unit III) 3 .Michael J. Pont, —Embedded C‖, 2 nd Edition, Pearson Education, 2008.(Unit IV & V)

REFERENCES:

1. Shibu K.V, —Introduction to Embedded Systems, McGraw Hill.2014
2. Jonathan W.Valvano, —Embedded Microcomputer Systems Real Time Interfacing, Third Edition Cengage Learning, 2012
3. Raj Kamal, —Embedded Systems-Architecture,programming and design‖, 3 edition,TMH.2015
4. Lyla, —Embedded Systems, Pearson, 2013
5. David E. Simon, —An Embedded Software Primer‖, Pearson Education, 2000.

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ETCS-623 INTELLECTUAL PROPERTY RIGHTS

OBJECTIVES OF THE COURSE:

- To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

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UNIT IV DIGITAL PRODUCTS AND LAW

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V ENFORCEMENT OF IPRs

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

COURSE OUTCOMES:

- Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS:

1. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S. V. Satakar, —Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002

REFERENCE BOOKS:

1. Deborah E. Bouchoux, —Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets‖, Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli,‖Intellectual Property Rights: Unleashing the Knowledge Economy‖, McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

ELECTIVE III

ETCS-624 MACHINE LEARNING

OBJECTIVES OF THE COURSE:

- To understand the need for machine learning for various problem solving
- To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
- To understand the latest trends in machine learning To design appropriate machine learning algorithms for problem solving

UNIT I INTRODUCTION

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate

Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV INSTANT BASED LEARNING

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

UNIT V:ADVANCED LEARNING

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical

Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

COURSE OUTCOMES:

- Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
- Discuss the decision tree algorithm and indentity and overcome the problem of overfitting
- Discuss and apply the back propagation algorithm and genetic algorithms to various problems
- Apply the Bayesian concepts to machine learning
- Analyse and suggest appropriate machine learning approaches for various types of problems

TEXT BOOK:

1. Tom M. Mitchell, —Machine Learning, McGraw-Hill Education (India) Private Limited, 2013.

REFERENCES:

1. Ethem Alpaydin, —Introduction to Machine Learning (Adaptive Computation and Machine Learning), The MIT Press 2004.
2. Stephen Marsland, —Machine Learning: An Algorithmic Perspective, CRC Press, 2009.

ETCS-625 COMPUTATIONAL INTELLIGENCE

OBJECTIVES OF THE COURSE:

- To provide a strong foundation on fundamental concepts in Computational Intelligence.
- To enable Problem-solving through various searching techniques.

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- To apply these techniques in applications which involve perception, reasoning and learning.
- To apply Computational Intelligence techniques for information retrieval
- To apply Computational Intelligence techniques primarily for machine learning.

UNIT I INTRODUCTION

Introduction to Artificial Intelligence-Search-Heuristic Search-A* algorithm-Game Playing- Alpha- Beta Pruning-Expert systems-Inference-Rules-Forward Chaining and Backward Chaining- Genetic Algorithms.

UNIT II KNOWLEDGE REPRESENTATION AND REASONING

Proposition Logic - First Order Predicate Logic – Unification – Forward Chaining -Backward Chaining

- Resolution – Knowledge Representation - Ontological Engineering - Categories and Objects – Events

- Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information - Prolog Programming.

UNIT III UNCERTAINTY

Non monotonic reasoning-Fuzzy Logic-Fuzzy rules-fuzzy inference-Temporal Logic-Temporal Reasoning-Neural Networks-Neuro-fuzzy Inference.

UNIT IV LEARNING

Probability basics - Bayes Rule and its Applications - Bayesian Networks – Exact and Approximate Inference in Bayesian Networks - Hidden Markov Models - Forms of Learning - Supervised Learning - Learning Decision Trees – Regression and Classification with Linear Models - Artificial Neural Networks – Nonparametric Models - Support Vector Machines - Statistical Learning - Learning with Complete Data - Learning with Hidden Variables- The EM Algorithm – Reinforcement Learning

UNIT V INTELLIGENCE AND APPLICATIONS

Natural language processing-Morphological Analysis-Syntax analysis-Semantic Analysis-AII applications – Language Models - Information Retrieval – Information Extraction - Machine Translation – Machine Learning - Symbol-Based – Machine Learning: Connectionist – Machine Learning.

COURSE OUTCOMES:

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

- Provide a basic exposition to the goals and methods of Computational Intelligence.
- Study of the design of intelligent computational techniques.
- Apply the Intelligent techniques for problem solving
- Improve problem solving skills using the acquired knowledge in the areas of, reasoning, natural language understanding, computer vision, automatic programming and machine learning.

TEXT BOOKS:

1. Stuart Russell, Peter Norvig, —Artificial Intelligence: A Modern Approach‖, Third Edition, Pearson Education / Prentice Hall of India, 2010.

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2. Elaine Rich and Kevin Knight, —Artificial Intelligence‖, Third Edition, Tata McGraw-Hill, 2010.

REFERENCES:

1. Patrick H. Winston. "Artificial Intelligence", Third edition, Pearson Edition, 2006.
2. Dan W.Patterson, —Introduction to Artificial Intelligence and Expert Systems‖, PHI, 2006.
3. Nils J. Nilsson, —Artificial Intelligence: A new Synthesis‖, Harcourt Asia Pvt. Ltd., 2000.

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ETCS-626 GENETIC ALGORITHM

OBJECTIVES OF THE COURSE:

- The objective of the course is to introduce the role of nature–inspired algorithms in computationally hard problems.

UNIT I INTRODUCTION TO EVOLUTIONARY COMPUTATION (EC)

Biological and artificial evolution, Different branches of EC, e.g., GAs, EP, ES, GP, etc. A simple evolutionary algorithm Search Operators: Recombination/ Crossover for strings (e.g. binary strings), e.g., one point, multipoint and uniform crossover operators.

UNIT II MUTATION FOR STRINGS

bit flipping, recombination/crossover and mutation rates, Recombination for real –valued representations, e.g. discrete and intermediate recombinations, Mutation for real- valued representations, e.g., Gaussian and Cauchy mutations, self-adaptive mutations, etc. Why and how a recombination or mutation operator works.

UNIT III SELECTION SCHEMES

Fitness Proportional selection and fitness scaling, Ranking, including linear, power, exponential and other ranking methods, Tournament selection, Selection pressure and its impact on evolutionary search.

UNIT IV SEARCH OPERATORS AND REPRESENTATIONS

Mixing different search operators, an anomaly of self- adaptive mutations, the importance of representation, e.g., binary vs. Gray Coding, Adaptive representation, Analysis, some examples.

UNIT V MULTIOBJECTIVE EVOLUTIONARY

Optimization: Pareto optimality, Multiobjective, Evolutionary algorithms, computational time complexity of EAs, No free lunch theorem Some Applications

COURSE OUTCOMES:

After learning the course the students should be able to:

- Identify and describe soft computing techniques and their roles in building intelligent machines
- Recognize the feasibility of applying a soft computing methodology for a particular problem Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
- Apply genetic algorithms to combinatorial optimization problems
- Apply neural networks to pattern classification and regression problems
- Effectively use existing software tools to solve real problems using a soft computing approach Evaluate and compare solutions by various soft computing approaches for a given problem.

TEXT BOOKS:

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1. Genetic Algorithms and Engineering Optimization, Mitsuo Gen Runwei Cheng
2. Genetic Algorithms, Goldberg David E.
3. Fundamentals of Neural Networks 01 Edition 1 Edition, Laurene Fausett

REFERENCES:

1. David A Coley, “An introduction to Genetic Algorithms for Scientists and Engineers”, World scientific publishing company(1997)
2. Mitsuo Gen Runwei Cheng, Wiley-Interscience, “Genetic Algorithms and Engineering Design”, 1st Edition, (1997)
3. Thomas Back, “Evolution algorithms in theory and practice evolution strategies, Evolutionary programming, Genetic Algorithms”, Oxford University press,(1996)
4. Kalyanmoy Deb, “ Multi Objective Optimization using Evolutionary Algorithms”, John Wiley and Sons(2001)
5. William M, “Evolutionary Algorithms: The Role of Mutation and Recombination”,(Natural Computing Series), Springer-Verlag (2000)

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SEMESTER VII

ETCS-701 INTERNET OF THINGS

COURSE OBJECTIVES:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

COURSE OUTCOMES:

- Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved.
- Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules
- Market forecast for IoT devices with a focus on sensors
- Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry

UNIT I

Introduction: Objective, scope and outcome of the course.

UNIT II

Introduction to IoT: Definition and characteristics of IoT, Design of IOT: Physical design of IOT, Logical Design of IOT- Functional Blocks, communication models, communication APIs, IOT enabling Technologies- Wireless Sensor Networks, Cloud computing, big data analytics, embedded systems. IOT Levels and deployment templates.

UNIT III

IoT Hardware and Software: Sensor and actuator, Humidity sensors, Ultrasonic sensor, Temperature Sensor, Arduino, Raspberry Pi, LiteOS, RIoTOS, Contiki OS, Tiny OS.

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UNIT IV

Architecture and Reference Model: Introduction, Reference Model and architecture, Representational State Transfer (REST) architectural style, Uniform Resource Identifiers (URIs). Challenges in IoT- Design challenges, Development challenges, Security challenges, Other challenges.

UNIT V

IOT and M2M: M2M, Difference and similarities between IOT and M2M, Software defined networks, network function virtualization, difference between SDN and NFV for IoT.

UNIT VI

Case study of IoT Applications: Domain specific IOTs- Home automation, Cities, environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyles.

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

REFERENCE BOOKS:

1. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan
2. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014
3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

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ETCS-702 ARTIFICIAL INTELLIGENCE WITH DEEP LEARNING

COURSE OBJECTIVE:

The primary objective of this course is to introduce the basic principles, techniques, and applications of Artificial Intelligence. Emphasis will be placed on the teaching of these fundamentals, not on providing a mastery of specific software tools or programming environments. Assigned projects promote a 'hands-on' approach for understanding, as well as a challenging avenue for exploration and creativity.

Specifically:

1. Gain a historical perspective of AI and its foundations.
2. Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
3. Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.
4. Experience AI development tools such as an 'AI language', expert system shell, and/or data mining tool.
5. Experiment with a machine learning model for simulation and analysis.
6. Explore the current scope, potential, limitations, and implications of intelligent systems.

COURSE OUTCOMES:

Upon successful completion of this course, the student shall be able to:

1) Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
2) Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
3) Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

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4) Demonstrate proficiency developing applications in an 'AI language', expert system shell, or data mining tool.
5) Demonstrate proficiency in applying scientific method to models of machine learning.
6) Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications

UNIT I

Introduction, What is Artificial Intelligence, I Technique, Level of the Model, Problem Spaces, and Search Defining the Problem as a State Space Search, Production Systems, Problem, Characteristics, Production System Characteristics, Issues in the Design of Search Programs, Heuristic Search Techniques: Generate-and-Test, Hill Climbing, Best-first Search, Problem Reduction, Constraint Satisfaction, Means-end Analysis, Knowledge, Means-ends Analysis, Knowledge

UNIT II

Using Predicate Logic, Representing Simple Facts in Logic, Representing , Instance and ISA Relationships Computable Functions and Predicates, Resolution, Natural Deduction, Introduction to Nonmonotonic Reasoning, Logics for Nonmonotonic Reasoning, Implementation Issues, Augmenting a Problem-solver Depth-first Search, Breadth-first Search, Semantic Nets, Frames, Conceptual Dependency Scripts Weak and Strong Slot-and-Filler Structures: Semantic

UNIT III

Game Playing, The Minimax Search Procedure, Adding Alpha-beta Cutoffs, Iterative Deepening
The Blocks World, Components of a Planning System, Components of a Planning System
Goal Stack Planning, Nonlinear Planning Using Constraint Posting, Hierarchical Planning Other Planning Techniques. What is Understanding, What Makes Understanding Hard? Understanding as Constraint Satisfaction

UNIT IV

Learning, Rote Learning, Learning by Taking Advice, Learning by Taking Advice, Learning in Problem-solving, Learning, Learning from Examples: Induction, Explanation-based Learning, Discovery, Analogy, Formal Learning Theory, Neural Net Learning and Genetic Learning

UNIT V

Expert Systems, Representing and Using Domain Knowledge, Expert System Shells Knowledge Acquisition

TEXT BOOKS:

1. Introduction to Artificial Intelligence by Rajendra Akerkar, PHI
2. Introduction to Artificial Intelligence by Eugene Charniak, Pearson Educat ion.
3. Artificial Intelligence by Rich & Knight. Tata McGraw Hills.
4. Introduction to Artificial Intelligence & Expert system by Dan W. Patterson, PHI

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REFERENCE BOOK:

1. Artificial Intelligence. A Modern Approach by Stuart Russell. Peter Norving and Pearson E ducation.
2. Introduction to Expert System, Peter Jackson. Pearson Education.
3. Artificial Intelligence application programming by M. Tim Jones, Dreamtech Press

ETCS-712 ARTIFICIAL INTELLIGENCE WITH DEEP LEARNING LAB

LIST OF EXPERIMENTS:

1 Write a program in prolog to implement simple facts and Queries
2 Write a program in prolog to implement simple arithmetic
3 Write a program in prolog to solve Monkey banana problem
4 Write a program in prolog to solve Tower of Hanoi
5 Write a program in prolog to solve 8 Puzzle problems
6 Write a program in prolog to solve 4-Queens problem
7 Write a program in prolog to solve Traveling salesman problem
8 Write a program in prolog for Water jug problem
9. Write a program to implement a Tic-Tac-Toe game.
10. Write a python program to implement simple Chatbot?

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ELECTIVE IV

ETCS-721 DISTRIBUTED COMPUTING

OBJECTIVE OF THE COURSE:

Distributed Systems combine the computational power of multiple computers to solve complex problems. The individual computers in a distributed system are typically spread over wide geographies, and possess heterogeneous processor and operating system architectures. Hence, an important challenge in distributed systems is to design system models, algorithms and protocols that allow computers to communicate and coordinate their actions to solve a problem.

Our aim in this course is to introduce you to the area of distributed systems. You will examine and analyze how a set of connected computers can form a functional, usable and high performance distributed system.

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The course has three goals:

• To learn the principles, architectures, algorithms and programming models used in distributed systems.

• To examine state-of-the-art distributed systems, such as Google File System.

• To design and implement sample distributed systems.

Through these objectives, the course will transform your computational thinking from designing applications for a single computer system, towards that of distributed systems

UNIT I

Fundamentals, Definition Evaluation of distributed Computing System, Distributed Computer System Models, Distributed Operating System Designing a distributed Operating System, Introduction of distributed computing Environment.

UNIT II

Message Passing, Basics, Design features, Issues in IPC by message passing, Issues in IPC by message passing, Synchronization, Synchronization Buffering, Multidiagram messages, Encoding and decoding message data Remote Procedure Calls, Basics, The RPC Model, The RPC Model

UNIT III

Transparency of RPC, Implementing RPC mechanism RPC messages server management, Parameter-passing and call semantic, Communication protocols for RPC's

UNIT IV

Distributed Shared Memory & Resource Management, Architecture of DSM Systems Design and Implementation, Granularly, Structure shared memory space Consistency models, Replacement strategy,

Thrashing., Desirable feature, Task assignment approach, Load-balancing approach, Load-sharing , approach

UNIT V

Process Management & Distributed File System, Process Migration, Threads, Intake, Desirable features, File model, File accessing models, File-sharing semantic, File-catching schemes, File replication, Fault tolerance, Automatic transactions, Design principle.

REFERENCE BOOKS:

1. Tanenbaum, A.S. and Van Steen, M., 2007. Distributed systems: principles and paradigms. Prentice-Hall.
2. Sinha, P.K., 1998. Distributed operating systems: concepts and design. PHI Learning Pvt. Ltd..
3. Liu, M.L., 2003. Distributed computing: principles and applications. Pearson Education Inc..
4. Lynch, N.A., 1996. Distributed algorithms. Elsevier.
5. Coulouris, G.F., Dollimore, J. and Kindberg, T., 2005. Distributed systems: concepts and

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ETCS-722 BIG DATA ANALYTICS

OBJECTIVES OF THE COURSE:

- To know the fundamental concepts of big data and analytics.

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- To explore tools and practices for working with big data
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data.

UNIT I INTRODUCTION TO BIG DATA

Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics - Validating - The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value -Understanding Big Data Storage - A General Overview of High-Performance Architecture - HDFS - MapReduce and YARN - Map Reduce Programming Model

UNIT II CLUSTERING AND CLASSIFICATION

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions .- Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes - Bayes„ Theorem - Naïve Bayes Classifier. Total Quality Management.

UNIT III ASSOCIATION AND RECOMMENDATION SYSTEM

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association& finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT IV STREAM MEMORY

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

UNIT V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION

NoSQL Databases : Schema-less Models‖: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding –- Hbase – Analyzing big data with twitter - Big data for E-Commerce Big data for blogs - Review of Basic Data Analytic Methods using R.

COURSE OUTCOMES:

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

- Work with big data tools and its analysis techniques
- Analyze data by utilizing clustering and classification algorithms
- Learn and apply different mining algorithms and recommendation systems for large volumes of data

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- Perform analytics on data streams
- Learn NoSQL databases and management.

TEXT BOOKS:

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013.

REFERENCES:

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
4. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press, 2015.
5. .Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010.

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ETCS-723 HUMAN COMPUTER INTERACTION

OBJECTIVES OF THE COURSE:

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

UNIT I FOUNDATIONS OF HCI

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

UNIT II DESIGN & SOFTWARE PROCESS

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

UNIT III MODELS AND THEORIES

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV MOBILE HCI

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies

UNIT V WEB INTERFACE DESIGN

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

COURSE OUTCOMES:

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

- Design effective dialog for HCI
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- Develop meaningful user interface.

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TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (UNIT I , II & III)
2. Brian Fling, "Mobile Design and Development", First Edition , O"Reilly Media Inc., 2009 (UNIT – IV)
3. Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O"Reilly, 2009. (UNIT-V)

ELECTIVE V

ETCS-724 INTRODUCTION TO DATA SCIENCE

OBJECTIVES OF THE COURSE:

- Graduates will demonstrate proficiency with statistical analysis of Data.
- Graduates will execute statistical analyses with professional statistical software.
- Graduates will demonstrate skill in Data management.
- Graduates will develop the ability to build and assess Data based models.
- Graduates will apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

UNIT – I: INTRODUCTION

Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.

UNIT – II:

Data Collection and Data Pre-Processing, Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data, Integration and Transformation – Data Reduction – Data Discretization.

Unit – III:

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

Unit – IV:

Model Development Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.

Unit – V:

Model Evaluation Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.

REFERENCES:

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1. Jojo Moolayil, “Smarter Decisions: The Intersection of IoT and Data Science”, PACKT, 2016.
2. Cathy O’Neil and Rachel Schutt, “Doing Data Science”, O'Reilly, 2015.
3. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC 2013
4. Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big Data Analytics”, IGI Global.

ETCS-725 WIRELESS ADHOC AND SENSOR NETWORKS

OBJECTIVES OF THE COURSE:

- To learn about the issues and challenges in the design of wireless ad hoc networks.
- To understand the working of MAC and Routing Protocols for ad hoc and sensor networks
- To learn about the Transport Layer protocols and their QoS for ad hoc and sensor networks.
- To understand various security issues in ad hoc and sensor networks and the corresponding solutions.

UNIT I FOUNDATIONS OF HCI

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

UNIT II DESIGN & SOFTWARE PROCESS

Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

UNIT III MODELS AND THEORIES

HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

UNIT IV MOBILE HCI

Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies

UNIT V WEB INTERFACE DESIGN

Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and

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Virtual Pages, Process Flow - Case Studies

COURSE OUTCOMES:

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

- Design effective dialog for HCI
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- Develop meaningful user interface.

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, —Human Computer Interaction‖, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, —Mobile Design and Development‖, First Edition, O„Reilly Media Inc., 2009 (UNIT – IV)
3. Bill Scott and Theresa Neil, Designing Web Interfaces‖, First Edition, O„Reilly, 2009.(UNIT- V)

ETCS-726 C# AND .NET PROGRAMMING

OBJECTIVES OF THE COURSE:

- To learn basic programming in C# and the object oriented programming concepts.
- To update and enhance skills in writing Windows applications, ADO.NET and ASP .NET.
- To study the advanced concepts in data connectivity, WPF, WCF and WWF with C# and .NET 4.5.
- To implement mobile applications using .Net compact framework
- To understand the working of base class libraries, their operations and manipulation of data using XML.

UNIT I C# LANGUAGE BASICS

.Net Architecture - Core C# - Variables - Data Types - Flow control - Objects and Types- Classes and Structs - Inheritance- Generics – Arrays and Tuples - Operators and Casts - Indexers

UNIT II C# ADVANCED FEATURES

Delegates - Lambdas - Lambda Expressions - Events - Event Publisher - Event Listener - Strings and Regular Expressions - Generics - Collections - Memory Management and Pointers - Errors and Exceptions - Reflection

UNIT III BASE CLASS LIBRARIES AND DATA MANIPULATION

Diagnostics -Tasks, Threads and Synchronization - .Net Security - Localization - Manipulating XML- SAX and DOM - Manipulating files and the Registry- Transactions - ADO.NET- Peer-to-Peer Networking - PNRP - Building P2P Applications - Windows Presentation Foundation (WPF).

UNIT IV WINDOW BASED APPLICATIONS, WCF AND WWF

Window based applications - Core ASP.NET- ASP.NET Web forms -Windows Communication

Foundation (WCF)- Introduction to Web Services - .Net Remoting - Windows Service - Windows Workflow Foundation (WWF) - Activities – Workflows

UNIT V .NET FRAMEWORK AND COMPACT FRAMEWORK

Assemblies - Shared assemblies - Custom Hosting with CLR Objects - Appdomains - Core XAML - Bubbling and Tunneling Events- Reading and Writing XAML - .Net Compact Framework - Compact Edition Data Stores – Errors, Testing and Debugging – Optimizing performance – Packaging and Deployment – Networking and Mobile Devices

COURSE OUTCOMES:

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

- Write various applications using C# Language in the .NET Framework.
- Develop distributed applications using .NET Framework.
- Create mobile applications using .NET compact Framework.

TEXT BOOKS:

1. Christian Nagel, Bill Evjen, Jay Glynn, Karli Watson, Morgan Skinner . —Professional C# 2012 and .NET 4.5‖, Wiley, 2012
2. Harsh Bhasin, —Programming in C#‖, Oxford University Press, 2014.

REFERENCES:

1. Ian Gariffiths, Mathew Adams, Jesse Liberty, —Programming C# 4.0‖, O_Reilly, Fourth Edition, 2010.
2. Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Apress publication, 2012.
3. Andy Wigley, Daniel Moth, Peter Foot, —Mobile Development Handbook‖, Microsoft Press, 2011.

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ELECTIVE VI

ETCS-727 CYBER SECURITY

OBJECTIVE OF THE COURSE:

Course Objectives:

- To introduce components such as diodes, BJTs and FETs.
- To know the applications of components.
- To give understanding of various types of amplifier circuits.
- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand the concepts of combinational logic circuits and sequential circuits.

UNIT I

Introduction to cyber crime, Challenges of cyber crime,Classification of cyber crime, Email spoofing,spamming, Internet Time Theft, Salami Attack/ Salami Technique

UNIT 1I

Web jacking, online fraud, Software Piracy, Computer network Intrusion, Password Sniffing, Identity

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theft, Cyber terrorism, virtual Crimes, Perception of Cyber Criminals, hackers, Insurgents and extremists groups, etc. web servers Hacking, Session Hijacking.

UNIT III

Cyber Crime and Criminal justice: Concepts of cyber crime and the IT act, 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cheating, Defamation, Harassment and Email abuse, Other IT offenses, Monetary penalties, Jurisdictions and Cyber Crime, Nature of Criminality, Strategy to tackle cyber crime and trends.

UNIT 1V

The Indain Evidence Act 1872 v Information Technology Act, 2000, Status of Electronic Records as Evidence, Proof and Management of electronic records, Relevancy, Admissibility and Probative Value of E – Evidence, Proving Digital Signature, Proof of electronics agreements, proving electronics messages.

UNIT V

Tools and Methods in cyber crime: proxy servers and Anonymizers , password cracking, key logger and spyware , virus and worms, Trojan Horses and backdoors, DoS and DDoS attack, buffer and overflow, Attacks on wireless networks, Phishing: methods of Phishing and Phishing techniques

COURSE OUTCOME:

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

- Know the characteristics of various components.
- Understand the utilization of components.
- Design and analyze small signal amplifier circuits.
- Learn Postulates of Boolean algebra and to minimize combinational functions
- Design and analyze combinational and sequential circuits
- Know about the logic families and realization of logic gates.

TEXT BOOKS:

1. Integrated Electronics: Analog and Digital Circuits and Systems, 2/e, Jaccob Millman, Christos Halkias and Chethan D. Parikh, Tata McGraw-Hill Education, India, 2010.
2. Digital Design, 5/e, Morris Mano and Michael D. Cilette, Pearson, 2011.

REFERENCE BOOKS:

1. Electronic Devices and Circuits, Jimmy J Cathey, Schaum's outline series, 1988.
2. Digital Principles, 3/e, Roger L. Tokheim, Schaum's outline series, 1994.

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ETCS-728 CLOUD COMPUTING

OBJECTIVES OF THE COURSE:

- To understand the concept of cloud computing.
- To appreciate the evolution of cloud from the existing technologies.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I INTRODUCTION

Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-

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demand Provisioning.

UNIT II CLOUD ENABLING TECHNOLOGIES

Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices – Virtualization Support and Disaster Recovery.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE

Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage- as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD

Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as- a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

UNIT V CLOUD TECHNOLOGIES AND ADVANCEMENTS

Hadoop – MapReduce – Virtual Box -- Google App Engine – Programming Environment for Google App Engine –— Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

COURSE OUTCOMES:

On Completion of the course, the students should be able to:

- Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- Learn the key and enabling technologies that help in the development of cloud.
- Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
- Explain the core issues of cloud computing such as resource management and security.
- Be able to install and use current cloud technologies.
- Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

TEXT BOOKS:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, —Cloud Computing: Implementation, Management and Security‖, CRC Press, 2017.

REFERENCE BOOKS:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, —Mastering Cloud Computing‖, Tata Mcgraw Hill, 2013.

2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach‖, Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)‖, O'Reilly, 2009.

SEMESTER VIII

ETCS-801 CRYPTOGRAPHY

OBJECTIVES OF THE COURSE:

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.

UNIT I INTRODUCTION

What is cryptology: (cryptography + cryptanalysis), Overview of cryptology: How cryptography works?, how to break a cryptographic system ? Classical conventional encryption, modern conventional encryption. public key encryption, hashing algorithm. OSI Security Architecture, Cryptanalysis of Classical Cryptosystems, Shannon's Theory

UNIT II SYMMETRIC CIPHER

Classical Encryption Techniques, Symmetric Cipher Model, Block Cipher Principles, DES, Triple DES, Cryptanalysis of Symmetric Key Ciphers: Differential and Linear Cryptanalysis Block Cipher Design Principle, The Euclidean Algorithm, Finite field of Form GP(p) Advance Encryption Standard (AES), AES Cipher, Multiple Encryption and Triple DES Stream Cipher and RC4, Placement of Encryption Function, Traffic Confidentiality, Key Distribution Random number generation. System Security: Intrusion detection, Password Management Virus countermeasure, Denial of Service Attack, Firewall design principles, Trusted System.

UNIT III PUBLIC KEY CRYPTOGRAPHY

Key Management - The Discrete Logarithm Problem (DLP) The Diffie Hellman Key Exchange algorithm, Cryptanalysis of DLP, Elliptic Curve Architecture and Cryptography, Confidentiality using Symmetric Encryption - Public Key Cryptography RSA, Primality Testing, Factoring Algorithms, Other attacks on RSA and Semantic Security of RSA ElGamal Cryptosystems. Authentication and Hash Function: Authentication requirements - Authentication functions.

UNIT IV MESSAGE AUTHENTICATION CODES

Hash Functions -Security of Hash Functions, Hash functions: The Merkle Damgard Construction and MACs.

UNIT V MD5 MESSAGE DIGEST ALGORITHM

Secure Hash Algorithm - RIPEMD– HMAC, CMAC Whirlpool and Comparative analysis Digital Signatures - Authentication Protocols - Digital Signature Standard.

COURSE OUTCOMES:

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

- Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
- Apply the different cryptographic operations of symmetric cryptographic algorithms
- Apply the different cryptographic operations of public key cryptography
- Apply the various Authentication schemes to simulate different applications.
- Understand various Security practices and System security standards

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TEXT BOOK:

1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.

REFERENCES:

1. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd
2. BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.
3. Charlie Kaufman, Radia Perlman, and Mike Speciner, Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall, ISBN 0-13-046019-2

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ELECTIVE VII

ETCS-821 FUNDAMENTALS OF DATA COMMUNICATION

OBJECTIVES OF THE COURSE:

This course teaches the design and implementation techniques essential for engineering robust networks. Topics include networking principles, Transmission Control Protocol/Internet Protocol, naming and addressing (Domain Name System), data encoding/decoding techniques, link layer protocols, routing protocols, transport layer services, congestion control, quality of service, network services, programmable routers and overlay networks.

UNIT-I INTRODUCTION

Data Communication, Network Architecture, Protocols & Standard. Signal, Noise, Modulation & Demodulation: Signal analysis, Signal-to-noise ratio, Bit rate, Baud, Digital Modulation.

Unit-II Transmission Media

Guided transmission Media, Wireless Transmission. Digital transmission. Multiplexing: Time Division Multiplexing, Frequency Division Multiplex, Frequency Division multiplexing. Data Communication Codes, Error Control and Data Format: Data communication Character codes, Bar codes, Error Control & Detection, Character Synchronization.

Unit-III Data Communication Hardware

Data Communication Hardware & circuits, serial interfaces. Data Communication Equipment : Digital service Unit, Channels service Unit, Bell- system Compatible voice band modem. Asynchronous and Synchronous voice band modem.

Unit-IV Circuit Switching

Switching Networks, Circuit Switching Networks, Circuit Switching concepts, Routing in Circuit Switching Networks Control Signaling. Packet Switching : Packet Switching Principles, outing, X .25.

Unit-V Asynchronous transfer mode

Protocol Architecture, ATM Logical Connection, ATM Cell, Transmission of ATM Cells, ATM Service categories, ATM adaptation layer. Routing in Switched Network : Routing in circuit-switching & Packet switching network. Integrated Service Data Network : Public Switch Data Network. X. 25 user-to-network Interface protocol. ISDN.

Suggested Reading:

1. Introduction to data Communication and Networking by Wayne Tomasi Pearson Education.
2. Data and Computer Communication by William Stallings, Pearson Education.

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Communication system and network by Ray Horak, Wiley India

ETCS-822 INFORMATION SECURITY

OBJECTIVES OF THE COURSE:

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To know the aspects of risk management
- To become aware of various standards in this area
- To know the technological aspects of Information Security

UNIT I INTRODUCTION

History, What is Information Security?, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT II SECURITY INVESTIGATION

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies

UNIT III SECURITY ANALYSIS

Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk - Systems: Access Control Mechanisms, Information Flow and Confinement Problem

UNIT IV LOGICAL DESIGN

Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity

UNIT V PHYSICAL DESIGN

Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel

COURSE OUTCOMES:

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

- Discuss the basics of information security
- Illustrate the legal, ethical and professional issues in information security

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- Demonstrate the aspects of risk management.
- Become aware of various standards in the Information Security System
- Design and implementation of Security Techniques.

TEXT BOOK:

1. Michael E Whitman and Herbert J Mattord, —Principles of Information Security‖, Vikas Publishing House, New Delhi, 2003

REFERENCES:

1. Micki Krause, Harold F. Tipton, — Handbook of Information Security Management‖, Vol 1-3 CRCPress LLC, 2004.
2. Stuart McClure, Joel Scrambray, George Kurtz, —Hacking Exposed‖, Tata McGraw- Hill, 2003
3. Matt Bishop, —Computer Security Art and Science‖, Pearson/PHI, 2002.

ETCS-823 SOFTWARE DEFINED NETWORKS

OBJECTIVES OF THE COURSE:

- To learn the fundamentals of software defined networks.
- To understand the separation of the data plane and the control plane.
- To study about the SDN Programming.
- To study about the various applications of SDN

UNIT I INTRODUCTION

History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Date Planes

UNIT II OPEN FLOW & SDN CONTROLLERS

Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts

UNIT III DATA CENTERS

Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE

UNIT IV SDN PROGRAMMING

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications

UNIT V SDN

Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration

COURSE OUTCOMES

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

- Analyze the evolution of software defined networks
- Express the various components of SDN and their uses
- Explain the use of SDN in the current networking scenario
- Design and develop various applications of SDN

TEXT BOOKS:

1. Paul Goransson and Chuck Black, —Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.
2. Thomas D. Nadeau, Ken Gray, —SDN: Software Defined Networks, O'Reilly Media, 2013.

REFERENCES:

1. Siamak Azodolmolky, —Software Defined Networking with Open Flow, Packet Publishing, 2013.
2. Vivek Tiwari, —SDN and Open Flow for Beginners‖, Amazon Digital Services, Inc., 2013.
3. Fei Hu, Editor, —Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

ELECTIVE-VIII

ETCS-824 NEURAL NETWORKS & ITS APPLICATIONS

OBJECTIVES OF THE COURSE:

This Unit examines mathematical and computational fundamentals of artificial neural networks and their applications in signal and image processing, pattern recognition and modelling. Basic knowledge of vectors and matrices is assumed. Introduction to AI .tudents should be able to apply the concept of Neural Networks into different domains of AI, Data Mining etc.

UNIT-I

Basic concepts of Neurocomputing : Artificial Neural Networks (ANN) and their biological roots and motivations. ANNs as numerical data/signal/image processing devices. Encoding (training phase) and decoding (active phase).Taxonomy of neural networks: feedforward and recurrent networks with supervised and unsupervised learning laws. Static and dynamic processing systems. Basic data structures: mapping of vector spaces, clusters, principal components.

UNIT-II

Basic terminology related to an artificial neuron : a summing dendrite, synapses and their weights, pre- and post-synaptic signals, activation potential and activation function. Excitatory and inhibitory synapses. The biasing input. Types of activating functions.

UNIT-III

The Perceptron and its learning law. Classification of linearly separable patterns, Structure and learning of perceptrons, Pattern classifier - introduction and Bayes' classifiers, Perceptron as a pattern classifier. Perceptron convergence, Limitations of a perceptrons. Multi-Layer Perceptrons. Supervised Learning. Approximation and interpolation of functions. Back-Propagation Learning law. Fast training algorithms, Practical and design issues of back propagation learning, Applications of multilayer perceptrons: Image

coding, Paint-quality inspection, Nettalk.

UNIT-IV

Self-Organizing systems : Unsupervised Learning. Local learning laws. Generalised Hebbian Algorithm. The Oja's and Sanger's rules. Principal component analysis --- Karhunen-Loeve transform.

UNIT-V

Competitive Learning : MinNet and MaxNet networks. Clustering. Learning Vector Quantisation. Codebooks. Application in data compression. Fuzzy Neural Networks- Neuro-fuzzy systems, Background of fuzzy sets and logic, Design of fuzzy stems, Design of fuzzy ANNs.

Suggested Reading:

1. Simon Haykin, Neural Networks -- a Comprehensive Foundation, Prentice Hall, 2nd ed., 1999, ISBN 0-13-273350-1
2. Andrew P. Paplinski -- Lecture notes: ~app/CSE5312
3. H. Demuth, M. Beale, Neural Network Toolbox User's Guide. For use with MATLAB, The MathWorks Inc, (file:/sw/matlab/help/fulldocset.html from Unix workstations)
4. Martin T. Hagan, H. Demuth, M. Beale, Neural Network Design, PWS Publishing, 1996, ISBN 0-534-94332-2

ETCS-825 NATURAL LANGUAGE PROCESSING

OBJECTIVES OF THE COURSE:

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics
- To apply the NLP techniques to IR applications

UNIT I INTRODUCTION

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT II WORD LEVEL ANALYSIS

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III SYNTACTIC ANALYSIS

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

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UNIT IV SEMANTICS AND PRAGMATICS

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT V DISCOURSE ANALYSIS AND LEXICAL RESOURCES

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

COURSE OUTCOMES:

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

- To tag a given text with basic Language features
- To design an innovative application using NLP components
- To implement a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python‖, First Edition, O_Reilly Media, 2009.

REFERENCES:

1. Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, —Natural Language Processing with Java‖, O_Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval‖, Oxford University Press, 2008.

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