

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)**B.Tech. I and II Semester****Scheme of Instruction and Examination**

[Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

(Choice Based Credit System)For the batches to be admitted with effect from the academic year **2021-22****I Semester**

S.No	Course Code	Course Title	Instruction			Examination		Credits	
			Hours Per Week			Max. Marks			Duration of SEE in Hours
			L	T	P/D	CIE	SEE		
Induction Program									
1	EN101HS	English	2	0	0	30	70	3	2
2	MA101BS	Mathematics-I	3	1	0	30	70	3	4
3	CH101BS	Chemistry	3	1	0	30	70	3	4
4	EE101ES	Basic Electrical Engineering	3	0	0	30	70	3	3
5	ME151ES	Engineering Workshop	1	0	3	30	70	3	2.5
6	EN151HS	The English Language and Communication Skills Lab	0	0	2	30	70	3	1
7	CH151BS	Engineering Chemistry Lab	0	0	3	30	70	3	1.5
8	EE151ES	Basic Electrical Engineering Lab	0	0	2	30	70	3	1
Total Hours/Marks/Credits			12	2	10	240	560	...	19

II Semester

S.No	Course Code	Course Title	Instruction			Examination		Credits	
			Hours Per Week			Max. Marks			Duration of SEE in Hours
			L	T	P/D	CIE	SEE		
1	MA202BS	Mathematics – II	3	1	0	30	70	3	4
2	PH202BS	Applied Physics	3	1	0	30	70	3	4
3	CS201ES	Programming for Problem Solving	3	1	0	30	70	3	4
4	ME201ES	Engineering Graphics	1	0	4	30	70	3	3
5	MC201ESC	Environmental Science	3	0	0	30	70	3	0
6	PH252BS	Applied Physics Lab	0	0	3	30	70	3	1.5
7	CS251ES	Programming for Problem Solving Lab	0	0	3	30	70	3	1.5
Total Hours/Marks/Credits			13	3	10	210	490	...	18

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

L	T	P	C
2	0	0	2

B.Tech. I Semester**EN101HS: English**

[Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

The course aims

- To develop an understanding of the nuances of vocabulary, grammar, reading and writing skills in English and allow them to practice in formal and informal contexts.
- To improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- To facilitate students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
- To practice study skills and communication skills in formal and informal situations

Course Outcomes

Students should be able to

- Use English Language effectively in spoken and written forms.
- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts and different cultures.
- Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Introduction

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.

Unit-I

‘Toasted English’ a short essay by R.K. Narayan

Vocabulary: The Concept of Word Formation –The Use of Prefixes and Suffixes.

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences - Importance of Punctuation-

Techniques for writing precisely – Paragraph writing – Types, Structures and Features of a Paragraph -

Creating Coherence-Organizing Principles of Paragraphs in Documents.

Unit-II

‘Ancient Architecture in India’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.

Vocabulary: Synonyms and Antonyms.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Improving Comprehension Skills – Techniques for Good Comprehension

Writing: Nature and Style of Sensible Writing- Defining- Describing Objects, Places and Events – Classifying- Providing Examples or Evidence

Unit-III

‘Blue Jeans’ from the prescribed textbook ‘English for Engineers’

Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives- Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Information Transfer, Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Job Application with Resume.

Unit-IV

‘The Road Not Taken’ by Robert Frost

Vocabulary: Standard Abbreviations and Acronyms in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension- Intensive Reading and Extensive Reading

Writing: Writing Practices–Writing Introduction and Conclusion – Essay Writing-Précis Writing.

Unit-V

‘What should you be Eating’ from the prescribed textbook ‘English for Engineers’

Vocabulary: Technical Vocabulary and its usage

Grammar: Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports – Writing a Report.

Suggested Readings:

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.
2. Toasted English by R.K. Narayan
3. The Road Not Taken by Robert Frost

Reference Books:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Murali, K and Mishra, S. (2011) Communication Skills for Engineers Pearson Publisher
3. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
4. Wood, F.T. (2007) Remedial English Grammar. Macmillan.
5. Zinsser, William. (2001) On Writing Well. Harper Resource Book.
6. Hamp-Lyons, L. (2006) Study Writing. Cambridge University Press.

L	T	P	C
3	1	0	4

B.Tech. I Semester
MA101BS: Mathematics-I
(Common to all Branches)

Course Objectives

To learn

- The concept of the rank of a matrix and applying it to know the consistency and solution of the system of linear equations.
- The concept of eigen values and eigen vectors and to reduce the quadratic form to canonical form.
- Concept of Sequences and Series.
- Geometrical approach to the mean value theorems and their application and evaluation of improper integrals using Beta and Gamma functions.
- The concept of partial differentiation, total derivative and finding maxima and minima of function of two and three variables.

Course Outcomes

After learning the contents of this paper, the student must be able to

- Write the matrix representation of a set of linear equations and analyze the solution of the system of equations.
- Find the eigen values and eigen vectors & reduce the quadratic form to canonical form using orthogonal transformations.
- Analyze the nature of sequences and series.
- Evaluate the improper integrals using Beta and Gamma functions.
- Find the extreme values of functions of two variables with/ without constraints.

Unit-I: Matrices

Types of Matrices - Real Matrix, Symmetric, Skew-Symmetric and Orthogonal Matrices, Complex matrix, Hermitian, Skew-Hermitian and Unitary Matrices; Elementary Transformations, Definition of rank of a Matrix, Computation of rank of a matrix by reducing it into Echelon form and Normal form; Inverse of a Matrix by Gauss-Jordan method; System of linear equations-Solution of Homogeneous Systems, Consistency and Solution of system of Non-Homogeneous linear equations by Rank Method; Direct Method-Gauss elimination method; Indirect Method-Gauss Jacobi Method, Gauss Seidel Iteration Method.

Unit-II: Eigen values and Eigen vectors

Definition of Vectors, Norm of a vector, Linearly dependent, Linearly independent and Orthogonal Vectors; Linear Transformation and Orthogonal Transformation, Eigen values and Eigenvectors and their properties; Diagonalization of a Matrix, Modal Matrix, Normalised Modal Matrix; Cayley-Hamilton Theorem (without proof), finding inverse and power of a Matrix by Cayley-Hamilton Theorem; Quadratic Forms, Index, Signature and Nature of the Quadratic Forms, reduction of Quadratic Form to Canonical Forms by Orthogonal Transformation.

Unit-III: Sequences & Series

Sequence: Definition of a Sequence, Limit, Convergent, Divergent and Oscillatory Sequences; Series: Convergent, Divergent and Oscillatory Series; Geometric Series Test; Series of positive terms- Comparison test, p-test, D-Alembert's ratio test, Raabe's test, Cauchy's Integral test, Cauchy's n^{th} root test, Logarithmic test; Alternating series; Leibnitz test, Absolute and Conditionally Convergence.

Unit-IV: Calculus

Basic concepts of limit, continuity and differentiability of function of single variables; Mean value theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation and applications, Cauchy's mean value Theorem. Taylor's series; Definition of Improper Integral: Beta, Gamma functions and their properties.

Unit-V: Multivariable calculus

Definitions of limit and continuity for functions of several variables; Partial Differentiation- Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence; Maxima and Minima of functions of two variables and three variables using method of Lagrange multipliers.

Suggested Readings:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

L	T	P	C
3	1	0	4

**B.Tech. I Semester
CH101BS: Chemistry**

[Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer:

- To understand water quality, industrial usage, softening methods and related problems.
- To acquire the knowledge of electrochemistry and corrosion which are essential for the Engineers and applications in industries.
- To get exposed to qualitative and quantitative parameters of fuels and to develop understanding of the combustion process. To understand the basic principles and applications of lubricants.
- To understand the preparation, properties and applications of polymeric materials, refractories and nanomaterials in the real world scenario.
- To acquire the skills pertaining to spectroscopic techniques and to apply them for medical and other fields.

Course Outcomes

After completing the course, the student will be able to acquire:

- Knowledge on the disadvantages of hard water for domestic and industrial purposes. The techniques of softening of hard water and treatment of potable water.
- Knowledge about the principles of electrochemistry. Storage of electrical energy in batteries, construction of batteries and fuel cells. Mechanism of corrosion of metals and alloys and corrosion control methods.
- Knowledge about the techniques of analysis for quality parameters of fuels and their combustion process and also applications of lubricants.
- Skills on the application of engineering materials like polymers, nanomaterials and refractories.
- The required skills on basic concepts of spectroscopy and its application to medical and other fields.

Unit-I: Water and its Treatment

Introduction – Hardness of water – Causes and effects. Types of hardness - temporary and permanent hardness – units of hardness – Estimation of hardness of water by complexometric method - Numerical problems.

Boiler feed water - Boiler troubles: Priming and Foaming, Scale and Sludge, Caustic embrittlement and Boiler corrosion. Internal treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment – Ion exchange process. Desalination of brackish water by Reverse Osmosis. Potable water and its specifications. Steps involved in the treatment of Municipal water – Disinfection of water by Ozonation and Chlorination including Breakpoint Chlorination.

Unit-II: Electrochemistry and Corrosion

Electrochemistry: Electrochemical cells – Electrode, Electrode potential, Standard Electrode Potential, Nernst Equation and its applications. Electrochemical Series and its applications. Cell EMF - Numerical problems. Construction and functioning of Calomel, Quinhydrone and Glass electrodes. Determination of pH of a solution using Quinhydrone and Glass electrodes.

Batteries : Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium-ion battery). Fuel cells (H₂ - O₂ and Methanol - Oxygen fuel cells).

Corrosion and its Control: Corrosion - Causes and effects - Theories of Chemical and Electrochemical Corrosion. Types of Corrosion: Galvanic, Concentration Cell Corrosion (Waterline and Pitting corrosion). Factors influencing the rate of corrosion. Corrosion control methods - Cathodic protection (Sacrificial anodic and impressed current cathodic protection), Protective Coatings - Metallic coatings: methods of applications – Hot Dipping (Tinning and Galvanisation), Electroplating of Copper, Electroless plating of Nickel.

Unit-III: Fuels and Lubricants

Chemical fuels: Classification of Fuels - Primary and Secondary fuels. Characteristics of a good fuel.

Solid Fuels: Coal and its ranking. Analysis of coal – Proximate and Ultimate analysis and their significance – Numerical problems.

Liquid Fuels: Fractional distillation of petroleum. Knocking - Fuel rating – Octane and Cetane numbers.

Gaseous Fuels: Composition, Characteristics and uses of LPG, CNG and Biogas. Introduction to Propellants.

Combustion: Definition, Calorific value of fuel – Higher Calorific Value (HCV), Lower Calorific Value (LCV) - Dulong's formula – Numerical problems. Calculation of air quantity required for combustion of a fuel.

Lubricants: Definition, Classification of lubricants with examples. Properties of lubricants - Viscosity, Cloud point, Pour point, Flash point and Fire point. Characteristics of a good lubricant.

Unit-IV: Engineering Materials

Polymers: Introduction and Terminology

Plastics: Preparation, properties and engineering applications of Bakelite and Acrylonitrile Butadiene Styrene (ABS).

Conducting Polymers: Classification with examples. Mechanism of conduction in polyacetylene and polyaniline. Effect of doping on conductance. Applications of conducting polymers.

Biodegradable Polymers: Concept and advantages - Preparation, properties and applications of Polylactic acid and polyvinyl alcohol.

Fibres: Preparation, properties and applications of Nylon 6, 6 and Dacron.

Elastomers: Preparation, properties and applications of Butyl rubber and Neoprene.

Refractories: Definition, Classification, Characteristics of a good refractory. Properties - Refractoriness, Refractoriness under Load, Porosity and Chemical inertness. Applications of refractories.

Nanomaterials: Introduction - Preparation by Sol - Gel method, General applications of Nanomaterials.

Unit-V: Spectroscopic Techniques and Applications

Spectroscopy: Introduction

Electronic (UV - Visible) Spectroscopy: Principles - Laws of Absorption (Beer-Lamberts Law), Types of Electronic Transitions, Concept of Chromophore and Auxochrome, Absorption and Intensity shifts. Applications of UV - Visible spectroscopy.

Infrared (IR) Spectroscopy: Principle, Selection rules, Molecular vibrations - number of fundamental vibrations for linear and nonlinear molecules. Functional Group and Fingerprint regions of IR spectroscopy. Applications.

Nuclear Magnetic Resonance (NMR) Spectroscopy: Basic concepts of NMR, Chemical shift - Shielding and Deshielding, Number of signals and splitting pattern of the signals - Examples. Applications of NMR spectroscopy. Introduction to Magnetic Resonance Imaging (MRI).

Suggested Readings:

1. Jain, P.C. and Jain, M., Engineering Chemistry, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 17th Edition (2018).
2. Prashanth Rath, Rama Devi, B., Venkata Ramana Reddy, Ch. and Chakroborty Subhendu, Engineering Chemistry, Cengage Learning India Pvt. Ltd., 2nd edition.

Reference Books:

1. Shikha Agarwal, Engineering Chemistry, Cambridge Univ. Press.
2. Shashi Chawla, Text Book of Engineering Chemistry, Dhanpat Rai Publications.
3. Sharma, Y.R., Elementary Organic Spectroscopy, S. Chand & Company Pvt. Ltd.

L	T	P	C
3	0	0	3

B.Tech. I Semester
EE101ES: Basic Electrical Engineering
 [Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC / AC machines and Transformers
- To impart the knowledge of various electrical installations
- To introduce the concept of power, power factor and its improvement

Course Outcomes

- To analyze and solve electrical circuits using network laws and theorems
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations

Unit-I : D.C. Circuits

The SI System of Units, Electrical circuit elements (R, L and C), Colour Coding of Resistors, Ohm's Law, Voltage and Current sources, Power, Energy, Current Sources in Parallel and Series, Voltage Sources in Parallel and Series, Series Circuits, Parallel Circuits, Kirchhoff's Voltage Law & Kirchhoff's Current Law, The Voltage Divider Rule, Current Divider Rule, Analysis of Series-Parallel Circuits, analysis of simple circuits with DC excitation - Mesh (Loop) Analysis, Nodal Analysis, Delta-Wye (Pi-Tee) Conversion, Superposition, Thevenin and Norton Theorems. Time-domain analysis of first order RL and RC circuits.

Unit-II : A.C. Circuits

Generation of AC Voltages, Frequency, Period, Amplitude, and Peak Value, Representation of sinusoidal waveforms, peak and rms values, Complex Number Review, phasor representation, R, L, and C Circuits with Sinusoidal Excitation, The Impedance Concept, Analysis of single-phase ac circuits consisting of R, L, C, R-L, R-C, R-L-C combinations (series and parallel), real power, reactive power, apparent power, power factor, The Relationship between P, Q, and S, resonance in series R-L-C circuit. Three-phase connections, voltage and current relations in star and delta connections, Power in a Balanced System

Unit-III: Transformers

Principle of operation, construction of transformers, EMF equation of transformer, voltage and turns ratio, ideal transformer on no load and on load, practical transformer on load including winding resistance and reactance, referring of parameters – to primary and secondary, equivalent circuit of transformer, approximate equivalent circuit of transformer, losses in transformers, Open circuit and short circuit tests, regulation and efficiency calculations.

Unit-IV: Electrical Machines

Generation of rotating magnetic fields, construction and working of a three-phase induction motor, slip of induction motor, torque in three phase induction motor, significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Working principle and construction of DC machine, EMF equation of DC generator, types of DC generators, torque in DC motor, types of DC motors, torque-speed characteristics and speed control of separately excited DC motor. Construction and working of synchronous generators.

Unit-V : Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker (ELCB), Modular Case Circuit Breaker (MCCB), Types of Wires and Cables, Earthing – types of earthing.

Group – I: MR-21 B.Tech.**MGIT, Hyderabad**

Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement, methods to improve power factor and battery backup.

Suggested Readings:

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.

Reference Books:

1. L.S. Bobrow, Fundamentals of Electrical Engineering”, Oxford University Press, 2011
2. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
3. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989

L	T	P	C
1	0	3	2.5

B.Tech. I Semester**ME151ES: Engineering Workshop**

[Common to CSE, IT, CSBS, CSE (AI&ML) & CSE(DS)]

Course Objectives

At the end of this course students are expected to

- Study of different hand operated power tools, uses and their demonstration.
- Gain a good basic working knowledge required for the production of various engineering products.
- Provide hands on experience about use of different engineering materials, tools, equipment and processes those are common in the engineering field.
- Study commonly used Engineering trades like Carpentry, Fitting, Tin smithy, Foundry, House wiring, Plumbing & Black smithy and practical exposure to these trades.
- Study of various machining operations.

Course Outcomes

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

- Practice on various workshop trades including plumbing, Fitting, Carpentry, Foundry, House wiring, Tin smithy, Black smithy and Welding by using different tools.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring and chiseling.
- Apply basic electrical engineering knowledge for House wiring practice.
- Implement the knowledge of basic workshop processes under safety norms.
- Understand different metal joining techniques using arc welding process.

1. Trades for Exercises (At least two exercises from each trade)

- I. Carpentry –Bridle Joint, Half - Lap Joint, Mortise & Tenon Joint
- II. Fitting – L- fit, V-Fit & Dovetail Fit
- III. Tin-Smithy – Square Tin, Rectangular scoop & Rectangular tray
- IV. Foundry – Preparation of Green Sand Mould using Single Piece and Split Pattern
- V. Welding Practice – Arc Welding- Lap Joint, Butt Joint & T Joint
- VI. House-wiring – Parallel & Series, Two-way Switch and Tube Light
- VII. Black Smithy – Oval shape, S – Hook & Fan Hook

2. Trades for Demonstration & Exposure

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools used in construction and Wood working operations.

Suggested Readings:

1. B. L. Juneja, Workshop Practice / Cengage
2. K. Venugopal, Workshop Manual / Anuradha.

Reference Books:

1. P. Kannaiah/ K. L. Narayana, Work shop Manual - SciTech
2. Venkat Reddy, Workshop Manual / BSP

L	T	P	C
0	0	2	1

B.Tech. I Semester**EN151HS: The English Language and Communication Skills Lab**

[Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

- To develop an understanding of the nuances of listening and speaking skills in English and allow them to practice in formal and informal contexts.
- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- To sensitize students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize their mother tongue interference
- To train students to use language appropriately for oral presentation and interview skills
- To improve language proficiency of the students through practice sessions in English Language Labs

Course Outcomes

Students will be able to attain:

- Better understanding of nuances of English language through audio- visual experience and group activities
- Neutralization of accent for intelligibility
- Speaking skills with clarity and confidence which in turn enhances their employability skills
- Enhancement of fluency in verbal and non-verbal communication
- Ability to use English both in written and spoken modes through JAM sessions, GDs, Interview skills etc.
- Proficiency in Listening for specific and general purposes.

The English Language and Communication Skills Lab (ELCS) shall have two parts:

- a. Computer Assisted Language Learning (CALL)Lab**
- b. Interactive Communication Skills (ICS)Lab**

Listening Skills

Objectives

1. To enable students develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation.
2. To facilitate students to practice listening for general content, listening for specific information and for intensive listening.
3. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to understand and practise word accent, recognize and use the right intonation in sentences.

Speaking Skills

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
 - Oral practice: Just A Minute (JAM)Sessions/Introduction to structured talk
 - Describing objects/situations/people
 - Role play – Individual/Group activities
 - Interview skills

Exercise – I

CALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers to Listening.

Practice: Introduction to Phonetics – Speech Sounds - Vowels – Monophthongs and Diphthongs –Consonants – Voiced and Voiceless- Past tense markers (-ed & -es) and Plural Markers.

ICS Lab:

Understand: Communication at Work Place- Spoken vs. Written language.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II

CALL Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab:

Understand: Features of Good Conversation – Starting a Conversation – Joining a Conversation – Ending a Conversation - Non-verbal Communication – Eye contact and Facial gestures.

Practice: Situational Dialogues – Role-Play-Individual & Group - Expressions in Various Situations –Making Requests and Seeking Permissions – Telephone Etiquette – Dos and Don'ts of Mobile phone Etiquette.

Exercise - III

CALL Lab:

Understand: Intonation-Errors in Pronunciation-the Interference of Mother Tongue (MTI).

Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab:

Understand: How to make Formal Presentations.

Practice: Formal Presentations.

Exercise – IV

CALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks – Power Point Presentations – Poster Presentations.

Practice: Making a Short Speech – Extempore and Prepared – Aspects of Presentation.

Exercise – V

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests.

ICS Lab:

Understand: Interview Skills – Resume Preparation – Salient features of Interview Skills – Before the Interview – During the Interview – After the Interview.

Practice: Mock Interviews.

Suggested Readings:

1. Exercises in Spoken English. Parts 1, 2 & 3. CIEFL, Hyderabad: OUP
2. ELCS Lab Manual, A Workbook for CALL and ICS Lab Activities, published by Orient Blackswan Private Limited, Hyderabad.

Reference Books:

1. Cambridge English, Business Benchmark, South Asian Edition, Student's Book, Norman Whitby - B2 Level.
2. Communication Skills for Engineers Pearson Publishers
3. Skills Annexe, Functional English for Success, published by Orient Blackswan, Hyderabad.
4. Technical Communication, published by Oxford University Press, New Delhi.

Group – I: MR-21 B.Tech.

MGIT, Hyderabad

5. English for Engineering Course Workbook published by Hitech Publishing Company Pvt. Ltd., Hyderabad.
6. Selected TED Talks

L	T	P	C
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B.Tech. I Semester
CH151BS: Engineering Chemistry Lab
 [Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

The course consists of experiments related to the principles of chemistry required for an engineering student. The student will learn :

- Quantitative analytical techniques like Estimation of hardness of water by Complexometry. Estimation of ferrous iron by Dichrometry and Permanganometry.
- The measurement of physical properties like Viscosity and Surface Tension.
- Quantitative estimations by instrumental techniques – Conductometry, Potentiometry and Colorimetry.
- Synthetic procedures of drugs like Aspirin and fibers like Nylon.
- Determination of Acid Value of Coconut oil.

Course Outcomes

After completing the course, the student will gain practical knowledge on:

- Quantitative Analytical Techniques with Volumetric procedures.
- Quantitative Analytical Techniques with Instrumental methods.
- Measurement of Physical Properties like Viscosity and Surface Tension.
- Synthetic procedures of Drugs and Polymers.
- The concept of Acid Value of oils and its determination.

List of Experiments:

1. Determination of total hardness of water by complexometric method using EDTA.
2. Estimation of the amount of Fe^{2+} in a given solution by Dichrometry.
3. Estimation of the amount of Fe^{2+} in a given solution by Permanganometry.
4. Estimation of the amount of HCl in a given solution by Conductometry.
5. Estimation of the amount of Acetic acid in a given solution by Conductometry.
6. Estimation of the amount of HCl in a given solution by Potentiometry.
7. Estimation of the amount of Fe^{2+} in a given solution by Potentiometry using KMnO_4
8. Estimation of the amount of Mn^{+2} in a given solution by Colorimetry.
9. Determination of Viscosity of a given lubricating oil using Redwood Viscometer.
10. Determination of Surface Tension of a given liquid using Stalagmometer.
11. Synthesis of Polymers (Nylon /Bakelite).
12. Synthesis of Aspirin.
13. Determination of Acid Value of Coconut oil.

Reference Books:

1. Khosla B.D., Gulati A. and Garg V.C., Senior Practical Physical Chemistry, R. Chand & Co., New Delhi.
2. Sharma K.K. and Sharma D. S., An Introduction to Practical Chemistry, Vikas publishing house Pvt Ltd., New Delhi, 1st edition, 1982.
3. Mendhan J., Denney R.C., Barnes J.D., Thomas M. and Siva Sankar B., A Text Book of Quantitative Chemical Analysis, Pearson, 6th edition.
4. Dara S.S., Text Book on Experiments and Calculations in Engineering Chemistry, S. Chand publishers, 1st edition, 2018.

L	T	P	C
0	0	2	1

B.Tech. I Semester**EE151ES: Basic Electrical Engineering Lab**

[Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

- To analyze a given network by applying various electrical laws and network theorems
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters
- To analyze the performance characteristics of DC and AC electrical machines

Course Outcomes

On completion of this course the student shall

- Get an exposure to basic electrical laws
- Understand the response of different types of electrical circuits to different excitations
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the basic characteristics of transformers and electrical machines

List of experiments/demonstrations:

1. Verification of Ohm's Law
2. Verification of KVL and KCL
3. Transient Response of Series R-L and R-C circuits using DC excitation
4. Transient Response of R-L-C Series circuit using DC excitation
5. Resonance in series R-L-C circuit
6. Calculations and Verification of Impedance and Current of R-L, R-C and R-L-C series circuits
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
12. Performance Characteristics of a Three-phase Induction Motor
13. No-Load Characteristics of a Three-phase Alternator

Any 10 of the above experiments to be conducted

L	T	P	C
3	1	0	4

B.Tech. II Semester
MA202BS: Mathematics-II
(Common to all Branches)

Course Objectives

To learn

- Various methods of solving the differential equations of first order.
- Methods of solving higher order differential equations.
- Evaluation of multiple integrals and their applications.
- The study of physical quantities involved in engineering fields related to vector valued functions.
- The basic properties of vector valued functions and their applications to line, surface and volume integrals and converting one into another.

Course Outcomes

After learning the contents of this paper, the student must be able to

- Solve the first order differential equation with real world application.
- Use various methods to solve higher order differential equations with constant and variable coefficients.
- Evaluate multiple integrals to obtain area and volume.
- To analyze the physical quantities involved in engineering field related to vector valued functions.
- Evaluate line, surface and volume integrals and understand the relation between them.

Unit-I: First Order Ordinary Differential Equations

Overview of first order and first degree differential equations; Exact differential equations, Differential equations reducible to Exact, Linear and Bernoulli's differential equations; Applications: Newton's law of cooling, Law of natural growth and decay.

Equations not of first degree: equations solvable for p, equations solvable for x, equations solvable for y and Clairaut's type.

Unit-II: Ordinary Differential Equations of Higher Order

Higher order linear differential equations with constant coefficients: Solutions of Homogeneous differential equations and Solutions of Non-Homogeneous equations with terms of the type $\sin ax$, $\cos ax$, x^m , e^{ax} , $xv(x)$ and $v(x)e^{ax}$; Method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

Unit-III: Multivariable Calculus (Integration)

Introduction to curve tracing (regular curves); Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals. Applications: Evaluation of Area (by double integrals) and volume (by double integrals and triple integrals).

Unit-IV: Vector Differentiation

Vector point functions and scalar point functions. Gradient, Divergence, Curl, Scalar potential functions, Solenoidal and Irrotational vectors. Directional derivatives, Tangent plane and Normal plane and Laplacian Operator. Vector Identities.

Unit-V: Vector Integration

Line, Surface and Volume Integrals. Green's Theorem, Gauss divergence Theorem and Stoke's Theorem (without proofs) and their applications.

Suggested Readings:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

L	T	P	C
3	1	0	4

B.Tech. II Semester
PH202BS: Applied Physics
 [Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

The objectives of the course is to make the student

- To understand the basic principles of quantum mechanics
- Acquire knowledge on the basic semiconductor devices and its physics
- Study on optoelectronic devices, specifically focusing on photo detector and emissive devices.
- To understand the interaction of light with matter.
- Able to apply the concepts on dielectric and magnetic properties of materials

Course Outcomes

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

- Gain knowledge on different principles of quantum mechanics, semiconductor physics, optoelectronic devices, principles of lasers and fiber optics, dielectric and magnetic properties of materials.
- Acquaint knowledge on basic understandings of quantum mechanics.
- Understand the physics relying on semiconductor and optoelectronic devices and utilize them for various problems in their respective engineering fields.
- Familiarize and apply the concepts of optics and radiation-matter interaction.
- Understand and apply the concepts for dielectric and magnetic properties of materials towards better engineered products.

Unit-I: Principles of Quantum Mechanics

Drawbacks of classical physics, black body radiation, photoelectric effect, origin of quantum mechanics, Planck's law, Einstein's explanation for photoelectric effect, Compton effect, waves and particles, de-Broglie's hypothesis - wave-particle duality, Davisson and Germer's experiment.

Schrodinger's time independent wave equation – significance of wave function, application - particle in 1-D box, Heisenberg's uncertainty principle: non-existence of electrons in nucleus.

Unit-II: Semiconductor Physics and Devices

Introduction to semiconductors, intrinsic and extrinsic semiconductors, Fermi energy level, carrier-concentration in intrinsic and extrinsic semiconductor, variation of Fermi level with doping concentration and temperature, carrier transport mechanisms in semiconductors - diffusion and drift, Hall effect.

p-n junction diode: energy level diagram, V-I characteristics, Zener diode and its V-I characteristics, introduction to Bipolar Junction Transistor (BJT): principle, construction, working, CE configuration as an amplifier.

Unit-III: Optoelectronics

Introduction to compound semiconductors, direct and indirect band gap semiconductors, radiative and non-radiative mechanisms, light emitting device: LED - principle, construction and working.

Introduction to photodetectors, light detecting devices - PiN and Avalanche photo diodes: principle, construction and working and their applications, solar cell: principle, construction and working, V-I and P-I characteristics and efficiency of solar cell, applications.

Unit-IV: Lasers and Fiber Optics

Lasers: absorption, spontaneous emission, stimulated emission, population inversion, Einstein coefficients, characteristics of lasers, principle, construction and working of laser: ruby laser, carbon dioxide (CO₂) laser, He-Ne laser and semiconductor lasers, applications of lasers.

Fiber Optics: introduction, optical fiber and its principle, acceptance angle, numerical aperture, step and graded index fibers, attenuation mechanism in optical fibers, applications of optical fibers.

Unit-V: Dielectric and Magnetic Properties of Materials

Introduction to dielectrics: polarization, permittivity, dielectric susceptibility and dielectric constant, polarizability – types of polarization and calculation of electronic and ionic polarizabilities, internal fields in a solid, Clausius - Mossotti equation, piezo electricity and ferroelectricity.

Magnetic materials: origin of magnetic moment, classification of magnetic materials based on magnetic moment, magnetic domains and Weiss theory of ferromagnetism, hysteresis, soft and hard magnetic materials, applications of magnetic materials.

Suggested Readings:

1. Dr. Avadhanulu, M.N., Dr. Kshirsagar, P.G., A textbook of Engineering Physics - S. Chand.
2. Pandey, B.K., Chaturvedi, S., Engineering Physics - Cengage Learning.
3. Singh, J., Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hill inc. (1995).

Reference Books:

1. Halliday and Resnick, Physics – Wiley.
2. Svelto, O., “Principles of Lasers”, Springer 5th Edition, 2010.
3. Sze, S.M., Physics of Semiconductor Devices, John Wiley and Sons (WIE) (1981).

L	T	P	C
3	1	0	4

B.Tech. II Semester
CS201ES: Programming for Problem Solving
 [Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

- To learn the fundamentals of computers.
- To understand the various steps in Program development.
- To learn the syntax and semantics of C Programming Language.
- To learn how to write modular and readable C Programs.
- To learn structured programming approach in solving problems.

Course Outcomes

- Formulate algorithms and design flowcharts for simple problems and to know the usage of various operators and control statements in program development.
- Understand and analyze the concepts of arrays and pointers for real world problems.
- Understand and analyze the concepts of strings and structures for real world problems.
- Applying concept reusability and handling dynamic memory allocation
- Apply various file handling techniques for better data management.

Unit – I

Introduction to Computing - Components of a computer, Art of programming through Algorithms and Flowcharts, Number System-Decimal, Binary, Octal, Hexadecimal.

Introduction to C Language – History of C, Importance of C, Sample Programs, Basic structure of C programs, executing a C program. Character set, C tokens-keywords, identifiers, constants, variables, data types, managing input and output operations, operators-arithmetic, relational, logical, assignment, increment/decrement, conditional operator, bitwise, special operators, type conversions in expressions, operator precedence and associativity, decision making and branching-if, switch, goto, decision making and looping-while, do, for, jumps in loops-break, continue.

Unit – II

Arrays: Introduction, One-Dimensional Arrays-declaration of one-dimensional array, initializing of one-dimensional array, Two Dimensional Arrays- declaration of two-dimensional array, initializing of two-dimensional array, Multidimensional Arrays.

Pointers: Introduction-declaring a pointer variable, initialization of pointer variables, accessing a variable through its pointer, chain of pointers, pointer expressions, pointer increment and scale factor, pointer and arrays, pointer and character strings.

Unit –III

Strings: Introduction to strings, declaring and initializing string variables, reading strings from terminal and writing strings to screen, putting strings together, comparison of two strings, string handling functions.

Structures: Introduction-defining a structure, declaring a structure variable, accessing structure members, structure initialization, copying and comparing structure variables, arrays of structures, arrays within structures. structures within structures, structures and functions, Unions, Enumerated data types.

Unit –IV

User-Defined Functions: Introduction, elements of user defined functions, categories of functions, nesting of functions, recursion, passing arrays to functions, passing strings to functions, scope, visibility and lifetime of variables, pointers as function arguments (call by reference).

Dynamic Memory Allocation-Introduction, malloc, calloc, free, realloc.

Unit-V

Preprocessor: Introduction, macro substitution, file inclusion, compiler control directives.

Files: Introduction, defining and opening a file, closing a file, input/output operations on files, random access to files, command line arguments.

Suggested Readings:

1. E. Balaguruswamy, Programming in ANSI C, Eighth Edition 2020, McGraw Hill Education.
2. B.W. Kernighan and Dennis M. Ritchie, The C Programming Language, Second Edition, Pearson education.

Reference Books:

1. B. A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach Using C, Third Edition, Cengage Learning 2016.
2. Pradip Dey and Manas Ghosh, Programming in C , Oxford University Press, Second Edition, 2011.
3. B. Gottfried, Programming with C, 3rd edition, Schaum’s outlines, McGraw Hill Education (India) Pvt Ltd.

L	T	P	C
1	0	4	3

B.Tech. II Semester
ME201ES: Engineering Graphics
 [Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

At the end of this course students are expected to

- Recognize the standards of Engineering Graphics, learn to generate Geometric Constructions, Conic Sections and construct Engineering Scales.
- Understand the procedure to develop orthographic projections of points, lines and planes.
- Learn the procedure to develop projection of solids and objects.
- Understand the procedure to generate the sections and developments of solids.
- Learn the procedure to develop Isometric projections, convert orthographic views to isometric views and vice versa using graphics instruments and AUTOCAD.

Course Outcomes

After successful completion of the course, students should be able to

- Apply the fundamental principles of Engineering Graphics to create engineering drawings of various geometric constructions, conic sections and engineering scales adhering to BIS Standards.
- Generate orthographic projections; front view, top view and side views of points and lines.
- Generate the orthographic projections of planes and solids
- Generate the sections of solids and developments of surfaces.
- Develop isometric projection convert orthographic views to isometric views and vice versa for practical engineering problems.

Unit-I: Introduction to Engineering Graphics

Principles of Engineering Graphics and their significance drawing instruments and their use conventions in Drawing, Lines, Lettering, Dimensioning and Geometrical construction. Conic sections including the Rectangular Hyperbola – General method only. Engineering curves: Cycloid, Epicycloid and Hypocycloid, Involute, Scales–Plain and Diagonal.

Unit-II: Orthographic Projections

Principles of Orthographic Projections–Conventions–Projections of points and lines –Inclined to one and both the planes.

Unit-III: Projections of Planes and Regular Solids

Projections of planes, regular geometric figures, Projections of regular solids - Simple position and inclined to one plane, Sections or Sectional views and true shapes of right regular Solids–Prism, Cylinder, Pyramid and Cone.

Unit-IV: Development of Surfaces & Intersections of Solids

Development of surfaces for right regular Solids–Prism, Cylinder, Pyramid and Cone. Intersection of Solids - Cylinder Vs Cylinder.

Unit-V: Isometric Projections

Principles of Isometric Projection – Isometric scale – Isometric views - Conventions – Isometric views of Lines, Plane figures, Simple compound solids - Isometric projection of Spherical parts. Conversion of Isometric views to Orthographic views and vice-versa – conventions

Introduction to AUTOCAD software package commands:

Introduction to CAD software package commands – free hand sketches of 2D – creation of 2D sketches of CAD package.

Suggested Readings:

1. N.D. Bhatt, Engineering Drawing, Charotar
2. Narayana, K.L. & P Kanniah, Text book on Engineering Drawing, Second edition, Scitech Publishers.
3. Basant Agrawal, Engineering Drawing/Mc Graw Hill

Reference Books:

1. K Venugopal and G. Sreekanjana, Engineering Drawing, second edition, New Age International.
2. N.S. Parthasarathy and Vela Murali, Engineering Drawing/Oxford
3. Shah, M.B. & Rana B.C., Engineering Drawing and Computer Graphics, Pearson
4. K Balaveera Reddy, etal, Computer Aided Engineering Drawing – CBS Publishers

L	T	P	C
3	0	0	0

B.Tech. II Semester
MC201ESC: Environmental Science
 [Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

- To understand the natural resources and their conservation.
- To understand the importance of ecosystem, biodiversity and ecological balance for sustainable development.
- To gain knowledge about environmental pollution, effects and controlling measures.
- To study about global environmental problems and global issues.
- To understand the environmental policies, regulations and sustainable development.

Course Outcomes

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

- Learn about different types of natural resources and take up the measures to protect the resources.
- Get the information about ecosystem, biodiversity and their usage and conservation.
- Get the information about the types of pollution, understand their effects and controlling measures.
- Gain the knowledge about current global environmental issues and initiations to be taken to protect the environment.
- Gain the knowledge about environmental acts, EIA, sustainable development and follow the rules and regulations.

Unit-I: Natural Resources

Classification - Renewable and Non-renewable resources.

Forest Resources - Uses, deforestation- causes, effects and preventive measures.

Water Resources - Uses and over utilization of ground water, rain water harvesting, dams - benefits and problems. Causes, effects and management of floods and drought.

Mineral Resources - Uses and Impacts of mining.

Energy Resources - Growing energy needs, renewable and non-renewable energy resources, use of alternate energy resources.

Unit-II: Ecosystem and Biodiversity

Ecosystem: Concept of ecosystem - Structure and functions of ecosystem. Food chain, food web and ecological pyramids - significance. Primary and secondary production - Energy flow models: universal and single channel. Biogeochemical Cycles: Carbon cycle and Nitrogen cycle.

Biodiversity: Definition, Levels of biodiversity, Values of biodiversity, Hotspots of biodiversity, Threats to biodiversity, Conservation of biodiversity: In-Situ and Ex-Situ conservation methods.

Unit-III: Environmental Pollution

Pollution - Definition and classification.

Air pollution: Definition, sources, causes, effects and control measures. Ambient air quality parameters, Case Study.

Water pollution: Definition, sources, causes, effects and control measures. Waste water treatment. Case study (Namami Ganga Project)

Soil pollution: Sources, Land degradation - Soil erosion – effects and control measures. Impacts of modern agriculture on soil. Biomagnification and Bioaccumulation (Minamata disease).

Noise pollution: Sources, effects and control measures.

Solid Waste: E-Waste and Municipal solid waste management.

Unit-IV: Global Environmental Issues and Global Efforts

Global warming: Greenhouse effect - definition, sources and effects of greenhouse gases. Ozone layer depletion -

Importance of ozone layer, Ozone depleting substances - sources and effects. Acid rain - causes and effects. Climate change - National Action Plan on Climate Change (NAPCC) – Government of India Initiatives. International conventions/protocols: The Earth summit, Kyoto Protocol and Montreal Protocol. Carbon credits - Emission trading, Green Chemistry Principles. Biodiesel-concept - transesterification and advantages.

Unit-V: Environmental Acts, EIA & Sustainable Development

Environmental Protection Act - Legal aspects: Air (Prevention and control of pollution) Act 1981, Water (Prevention and control of pollution) Act -1974, Wildlife (Protection) Act – 1972, Biodiversity Act - 2002. Environmental Impact Assessment (EIA) - Concept, structure and flow chart of EIA. Concept of sustainable development - Environmental education, Concept of green building, Ecological foot print, Low carbon life style, Life cycle assessment (LCA) and Clean development mechanism.

Project Work: Related to current environmental issues.

Suggested Readings:

1. Erach Bharucha, Textbook of Environmental Studies for Undergraduate Courses, University Grants Commission, Universities Press, 3rd Edition.
2. Kaushik A., Kaushik C.P., Text Book of Environmental Studies, New Age International Publishers, 4th Edition.

Reference Books:

1. Anji Reddy M, Textbook of Environmental Sciences and Technology, BS Publication.
2. Rajagopalan R., Environmental Studies, Oxford University Press, 3rd Edition.
3. Raghavan Nambiar K., Text Book of Environmental Studies, Scitech Publications, 2nd Edition.

L	T	P	C
0	0	3	1.5

B.Tech. II Semester
PH252BS: Applied Physics Lab
 [Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

The objectives of the course is to make the student

- To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
- To learn the usage of electrical and optical systems for various physical parameters.
- Apply the analytical techniques and graphical analysis to the experimental data.
- To understand the basic principles of Physics through experiments.

Course Outcomes

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

- Understand different principles of quantum mechanics, semiconductor physics, optoelectronic devices, principles of lasers and fiber optics, dielectric and magnetic materials.
- Apply the various procedures and techniques for the experiments.
- Use the different measuring devices to record the data with precision
- Apply the mathematical concepts/equations to obtain quantitative results

List of Experiments:

1. Photoelectric effect: To determine work function, threshold frequency of a given material.
2. Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.
3. Hall Effect: To determine Hall co-efficient of a given semiconductor.
4. Light emitting diode: Determination of Planck's constant by plotting V-I and P-I characteristics of light emitting diode.
5. LASER: To study the V-I and P-I characteristics of LASER Diode.
6. Solar Cell: To study the V-I Characteristics of solar cell.
7. Optical fiber: To determine the bending losses of optical fibers.
8. LCR Circuit: To determine the quality factor of LCR Circuit.
9. RC Circuit: To determine the time constant of RC circuit.
10. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying circular coil.

Note: Any 8 experiments are to be performed

Suggested Reading:

1. Madhusudhana Rao C.V., Vasanth Kumar V., Engineering Physics Lab manual, 4th edition, Scitech Publications (India), Pvt. Ltd.

L	T	P	C
0	0	3	1.5

B.Tech. II Semester
CS251ES: Programming for Problem Solving Lab
 [Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

- To work with an IDE to create, edit, compile, run and debug programs.
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files.

Course Outcomes

- To be able to formulate problems and write programs to implement usage of various operators and control statements in program development.
- Applying the concepts of arrays and pointers to solve the problems.
- Applying the concepts of strings and structures to solve the problems.
- Applying concept reusability and handling dynamic memory allocation.
- Apply various file handling techniques for better data management.

Expression Evaluation & Control Structures:

- a. Write the program for the simple, compound interest.
- b. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula $s = ut + (1/2)at^2$ where u and a are the initial velocity in m/sec ($= 0$) and acceleration in m/sec^2 ($= 9.8 m/s^2$)).
- c. Write a program to find the max and min from the three numbers.
- d. Write program that declares Class awarded for a given percentage of marks, where mark $<40\%$ = Failed, 40% to $<60\%$ = Second class, 60% to $<70\%$ = First class, $\geq 70\%$ = Distinction. Read percentage from standard input.
- e. Write a C program, which takes two integer operands and one operator from the user, performs the operation, and then prints the result. (Consider the operators $+$, $-$, $*$, $/$, $\%$ and use Switch Statement)
- f. Write a C program to find the roots of a Quadratic equation.
- g. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:


```

5 x 1 = 5
5 x 2 = 10
5 x 3 = 15
```
- h. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
- i. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
- j. Write a C program to generate all the prime numbers between 1 and n , where n is a value supplied by the user.
- k. Write a C program to construct a pyramid of numbers as follows:

```

1           *           1           1
1 2        * *        2 3         2 2
1 2 3      * * *      4 5 6       3 3 3
```

Arrays and its Applications:

- a. Write a C program to find the minimum, maximum and average in an array of integers.

- b. Write a C program that uses functions to perform the following:
 - i. Addition of Two Matrices
 - ii. Multiplication of Two Matrices

Pointers:

- a. Write a C program for reading elements using pointer into array and display the values using array.
- b. Write a C program for display values reverse order from array using pointer.
- c. Write a C program through pointer variable to sum of n elements from array.

Strings:

- a. Write a C program using functions to insert a sub-string into a given main string from a given position.
- b. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
- c. Write a C program to count the lines, words and characters in a given text.

Structures:

- a. Write a C program to add two complex numbers by Passing Structure to Function.
- b. Write a C program to Store Information of a Student Using Structure.
- c. Write a C program to demonstrate e-num

Functions and Dynamic Memory allocation functions:

- a. Write a C programs that use both recursive and non-recursive functions.
 - i. To find the factorial of a given integer.
 - ii. To find the GCD (greatest common divisor) of two given integers.
- b. Write a C program to implement dynamic memory allocation for an array using malloc (), calloc (), realloc() and free().

Files:

- a. Write a C program to display the contents of a file to standard output device.
- b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
- c. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

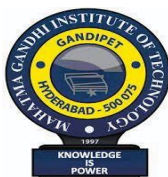
Reference Books:

1. E Balagurusamy, Programming in ANSI C , Mc Graw Hill, Eighth Edition, 2019.
2. B.A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach Using C, Third Edition, Cengage Learning 2016.
3. B.W. Kernighan and Dennis M. Ritchie, The C Programming Language, Second Edition, Pearson education, 1988.
4. B. Gottfried, Programming with C, Fourth edition, Schaum's outlines, McGraw Hill Education (India) Pvt Ltd, 2018.

B.Tech.
in
COMPUTER SCIENCE & ENGINEERING
(ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)
[CSE (AI&ML)]

Scheme of Instruction, Examination and Syllabi
of
III and IV Semesters

Academic Year: 2022-23



MAHATMA GANDHI INSTITUTE OF TECHNOLOGY

(An Autonomous Institution)

Affiliated to JNTUH; Accredited by NAAC with 'A' Grade; 6 U.G. Programs
Accredited by NBA

Kokapet (Village), Gandipet (Mandal), Hyderabad-500075, Telangana
email: principal@mgit.ac.in Website: www.mgit.ac.in Ph: 040-24193057 / 067

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)
B.Tech. in Computer Science & Engineering (AI&ML)
Scheme of Instruction and Examination

III Semester

S.No.	Course Code	Course Title	Instructions			Examination		Credits	
			Hours per work			Max. Marks			Duration of SEE in Hours
			L	T	P/D	CIE	SEE		
1	MA305BS	Mathematical and Statistical Foundations	3	0	0	30	70	3	3
2	CS302PC	Fundamentals of Data Structures	3	1	0	30	70	3	4
3	CS305PC	Python Programming	3	0	0	30	70	3	3
4	CS306PC	Discrete Mathematics	3	0	0	30	70	3	3
5	CS308PC	Computer Organization and Architecture	3	0	0	30	70	3	3
6	CS351PC	Data Structures Lab	0	0	3	30	70	3	1.5
7	CS355PC	Python Programming Lab	0	0	3	30	70	3	1.5
8	CS357PC	Introduction to IT Workshop	0	0	2	30	70	3	1
9	EN351HS	Finishing School-I	0	0	2	30	70	3	1
10	MC351HS	Gender Sensitization Lab	0	0	2	30	70	3	0
Total Hours/Marks/Credits			15	1	12	300	700	--	21

L: Lecture **T:** Tutorial **D:** Drawing **P:** Practical

CIE - Continuous Internal Evaluation **SEE** - Semester End Examination

L	T	P	C
3	0	0	3

III Semester Syllabus
MA305BS: Mathematical and Statistical Foundations
[Common to CSE (AI &ML) & CSE (DS)]

Course Objectives

To Learn

- To understand the basic Number Theory concepts useful for computer organization and security, coding and cryptography.
- To understand simple linear regression, the linear and nonlinear curve fitting of the given data.
- To understand the theory of probability distributions
- To gain the knowledge of the sampling theory, testing of hypothesis and making inferences
- To understand the Stochastic process and Markov chains.

Course Outcomes

After learning the contents of this course, the student must be able to

- Apply the number theory concepts to cryptography domain.
- Apply the concepts of probability and distributions to some case studies.
- Correlate the material of one unit to the material in other units.
- Resolve the potential misconceptions and hazards in each topic of study.

Unit – I: Greatest Common Divisors and Prime Factorization

Greatest common divisors, The Euclidean algorithm, The fundamental theorem of arithmetic, Factorization of integers and the Fermat numbers.

Congruences: Introduction to congruences, Linear congruences, The Chinese remainder theorem, Systems of linear congruences.

Unit – II: Simple Linear Regression

Introduction to Linear Regression, The Simple Linear Regression Model, Least Squares and the Fitted Model, Properties of the Least Squares Estimators, Inferences Concerning the Regression Coefficients, Prediction, Simple Linear Regression Case Study.

Unit – III: Random Variables and Probability Distributions

Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions, Statistical Independence.

Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

Continuous Probability Distributions: Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial

Fundamental Sampling Distributions: Random Sampling, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, Sampling Distribution of S^2 , t -Distribution, F -Distribution.

Unit – IV: Estimation & Tests of Hypotheses

Introduction, Statistical Inference, Classical Methods of Estimation, Estimating the Mean, Standard Error of a Point Estimate, Prediction Intervals, Tolerance Limits, Estimating the Variance, Estimating single mean, difference between two Means, single proportion, difference between two proportions.

Unit – V: Stochastic Process and Markov Chains

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

Suggested Readings:

1. Kenneth H. Rosen, Elementary number theory & its applications, sixth edition, Addison-Wesley, ISBN 978 0-321-50031-1
2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics for Engineers & Scientists, 9th Ed. Pearson Publishers.
3. S. D. Sharma, Operations Research, Kedarnath and Ramnath Publishers, Meerut, Delhi

Reference Books:

1. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications
2. T.T. Soong, Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons Ltd, 2004.
3. Sheldon M Ross, Probability and statistics for Engineers and scientists, Academic Press.

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III Semester Syllabus
CS302PC: Fundamentals of Data Structures
[Common to CSBS, CSE (AI &ML) & CSE (DS)]

Course Objectives

- Exploring linear data structures such as stacks, queues and linked lists.
- Introduces a variety of data structures such as hash tables and dictionaries. Exploring non-linear data structures such as trees and graphs.
- Introduces a variety of data structures such as search trees, heaps and tries.
- Introduces sorting and pattern matching algorithms

Course Outcomes

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.
- To impart knowledge on various string-matching algorithms and implement them.

Unit – I

Introduction to Data Structures: abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

Unit – II

Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching.

Hash Table Representation: hash functions, collision resolution-separate chaining, open addressing- linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

Unit – III

Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.

Unit – IV

Graphs: Graph Implementation Methods. Graph Traversal Methods.

Sorting: Heap Sort, External Sorting- Model for external sorting, Merge Sort.

Unit – V

Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

Suggested Readings:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C++, Varsha H. Patil, Oxford University Press.

Reference Books:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.

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III Semester Syllabus
CS305PC: Python Programming
[Common to CSE (AI &ML) & CSE (DS)]

Course Objectives

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object oriented programming

Course Outcomes

- Develop essential programming skills in computer programming concepts like data types, containers.
- Apply the basics of programming in the Python language.
- Solve coding tasks related Exceptions and Functions.
- Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming.
- Solve coding tasks related to GUI Programming.

Unit – I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

DataTypes, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.

Repetition Structures: Introduction, while loop, for loop, Input Validation Loops, Nested Loops.

Unit – II

Sequences: Introduction to Sequences: Strings, Lists, and Tuples, Mapping, Set Types and Dictionaries

String: Strings and Operators, Built-in Methods and Special Features of String, Related Modules.

Lists: Operators, Built-in Functions, List Type Built in Methods, Special Features of List, Related Modules

Tuples: Built-in Functions, Tuple Type Built in Methods, Special Features of Tuples, Related

Modules

Mapping and Set Type: Dictionaries, Dictionary Keys, Operators and Built-in Methods. Set type, Operator and Built in Methods. Related Modules.

Unit – III

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Functions: What are Functions, Defining and Creating functions, Function Arguments: Formal and Variable length, Calling functions, Recursive Functions and Variable Scope.

Modules: Modules, Standard Modules, Importing Modules, Namespaces and Packages.

Unit – IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using OOPs support

Design with Classes: Objects and Classes, Data modelling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism.

Unit – V

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs.

Suggested Readings:

1. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

Reference Books:

1. Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
2. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

e-Resources:

https://www.tutorialspoint.com/python3/python_tutorial.pdf

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III Semester Syllabus CS306PC: Discrete Mathematics

[Common to CSE, CSE (AI &ML) & CSE (DS)]

Course Objectives

- Introduces the elementary discrete mathematics for computer science and engineering.
- Topics include formal logic notation, methods of proof, induction, sets, relations, graph theory, permutations, and combinations, counting principles; recurrence relations and generating functions.

Course Outcomes

- Ability to understand logical inferences and first order logic.
- Ability to use sets, functions and relations.
- Ability to analyze and solve counting problems on finite and discrete structures.
- Ability to formulate recurrences relations to solve problems.
- Ability to apply graph theory in solving computing problems.

Unit-I

The Foundations: Logic and Proofs: Propositional Logic, Applications of Propositional Logic, Propositional Equivalence, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy.

Unit-II

Basic Structures, Sets, Functions, Sequences, Sums, Matrices and Relations Sets, Functions, Sequences & Summations, Cardinality of Sets and Matrices Relations, Relations and Their Properties, n-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings.

Unit-III

Induction and Recursion and Counting: Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness.

Counting: The Basics of Counting, the Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients and Identities, Generalized Permutations and Combinations, Generating Permutations and Combinations.

Unit-IV

Discrete Probability and Advanced Counting Techniques: An Introduction to Discrete Probability, Probability Theory, Bayes' Theorem, Expected Value and Variance. Advanced Counting Techniques: Recurrence Relations, Solving Linear Recurrence Relations. Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions.

Unit – V

Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring.

Trees: Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees.

Suggested Readings:

1. Discrete Mathematics and its Applications with Combinatorics and Graph Theory- Kenneth H.Rosen, 7th Edition, TMH.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joe L. Mott, Abraham Kandel, Theodore P. Baker, 2nd edition, Pearson Education.

References Books:

1. Discrete Mathematical Structures with Applications to Computer Science-J.P. Tremblay and R. Manohar, TMH,
2. Discrete Mathematics- Richard Johnsonbaugh, 7th edition, Pearson Education.
3. Discrete Mathematics with Graph Theory- Edgar G. Goodaire, Michael M. Parmenter.
4. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, 5th edition, Pearson Education.

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III Semester Syllabus

CS308PC: Computer Organization and Architecture

[Common to CSBS, CSE (AI & ML) & CSE (DS)]

Course Objectives

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It begins with basic organization, design and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, micro programmed control unit, pipe lining and vector processing, memory organization and I/O systems and multiprocessors.

Course Outcomes

- Understand the basics of instructions and their impact on processor design.
- Demonstrate an understanding of the design of the functional units of a digital computer system.
- Evaluate cost performance and design trade-offs in designing a memory unit
- Design a pipe line for consistent execution of instructions with minimum hazards.
- Recognize and manipulate representations of numbers stored in digital computers

Unit-I

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

Unit-II

Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

Unit-III

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating-point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

Unit-IV

Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Unit-V

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocess or arbitration, Interprocessor communication and synchronization, Cache Coherence.

Suggested Readings:

1. Computer System Architecture—M.Moris Mano, Third Edition, Pearson/PHI.

Reference Books:

1. Computer Organization—Car Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
Structured Computer Organization - AndrewS. Tanenbaum, 4th Edition, PHI/Pearson.

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III Semester Syllabus CS351PC: Data Structures Lab

[Common to CSE, CSE (AI&ML) & CSE (DS)]

Course Objectives

- It covers various concepts of C programming language.
- It introduces searching and sorting algorithms.
- It provides an understanding of data structures such as stacks and queues.

Course Outcomes

- Ability to develop C programs using basic elements like control statements, arrays.
- Ability to develop C programs using functions, pointers and strings.
- Ability to develop C programs using data structures like stacks, queues and linked lists.
- Ability to implement searching algorithms.
- Ability to implement sorting algorithms.

List of Experiments:

1. Write a program to implement stack using the following data structures using arrays
 - i) Stacks ii) Queues
2. Write a program to implement stack using the following data structures using linked list.
 - i) Stacks ii) Queues
3. Write a program that uses functions to perform the following operations on singly linked list.:
 - i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that uses functions to perform the following operations on doubly linked list.:
 - i) Creation ii) Insertion iii) Deletion iv) Traversal
5. Write a program that uses functions to perform the following operations on Circular linked list.:
 - i) Creation ii) Insertion iii) Deletion iv) Traversal
6. Write a program to implement the Binary search tree traversal methods.
7. Write a program to implement the graph traversal methods.
 - i) BFS ii) DFS
8. Write a program that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers:
 - i) Linear search ii) Binary search
9. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
 - i) Bubble sort ii) Selection sort iii) Insertion sort

Reference Books:

1. Data Structures: A Pseudo code Approach with C, 2nd Edition, R.F.Gilberg and B.A.Forouzan, Cengage Learning.

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III Semester Syllabus
CS355PC: Python Programming Lab
[Common to CSE (AI&ML) & CSE (DS)]

Course Objectives

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python

Course Outcomes

- Write, Test and Debug Python Programs
- Use Conditionals and Loops for Python Programs
- Use functions and represent Compound data using Lists, Tuples and Dictionaries
- Use various applications using python

List of Experiments:

- 1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
- 2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
- 3) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
- 4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
- 5) Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

```
*
**
***
****
```

- 6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
- 7) Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and *Not close* otherwise.
- 8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
- 9) Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program

should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.

- 10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.
- 11) In algebraic expressions, the symbol for multiplication is often left out, as in $3x+4y$ or $3(x+5)$. Computers prefer those expressions to include the multiplication symbol, like $3*x+4*y$ or $3*(x+5)$. Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
- 12) Write a program that generates a list of 20 random numbers between 1 and 100.
 - (a) Print the list.
 - (b) Print the average of the elements in the list.
 - (c) Print the largest and smallest values in the list.
 - (d) Print the second largest and second smallest entries in the list
 - (e) Print how many even numbers are in the list.
- 13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
- 14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in $[1,0,1,1,0,0,0,0,1,0,0]$ is 4.
- 15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list $[1,1,2,3,4,3,0,0]$ would become $[1,2,3,4,0]$.
- 16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, it is much shorter with lists and it is also easier to add new conversions if you use lists.
- 17) Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.
- 18) Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
- 19) Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.
- 20) Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise.
- 21) Write a program to implement various built in methods of tuples.
- 22) Write a function called *root* that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.
- 23) Write a function called *primes* that is given a number n and returns a list of the first n primes. Let the default value of n be 100.
- 24) Write a function called *merge* that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
 - (a) Do this using the sort method. (b) Do this without using the sort method.

- 25) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
- 26) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
- 27) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called *ftemps.txt*.
- 28) Write a class called *Product*. The class should have fields called *name*, *amount*, and *price*, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.
- 29) Write a class called *Time* whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours* that returns a string of hours, minutes, and seconds formatted analogously to the previous method.
- 30) Write a class called *Converter*. The user will pass a length and a unit when declaring an object from the class—for example, `c = Converter(9, 'inches')`. The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the *Converter* object created above, the user could call `c.feet()` and should get 0.75 as the result.
- 31) Write a Python class to implement `pow(x, n)`.
- 32) Write a Python class to reverse a string word by word.
- 33) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
- 34) Write a program to demonstrate `Try/except/else`.
- 35) Write a program to demonstrate `try/finally` and `with/as`.

Suggested Readings:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

Reference Books:

1. Think Python, Allen Downey, Green Tea Press.
2. Introduction to Python, Kenneth A. Lambert, Cengage.
3. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
4. Learning Python, Mark Lutz, O'Reilly.

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III Semester Syllabus
CS357PC: Introduction to IT Workshop
[Common to CSE (AI & ML) & CSE (DS)]

Course Objectives

The IT Workshop for engineers is a training lab course spread over 60 hours.

The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, Power Point and Publisher.

- PC Hardware introduces the students to a personal computer and its basic peripherals.
- The process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. The students should work on working PC to disassemble and assemble to working condition and install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.
- Hardware and software level troubleshooting process, tips and tricks would be covered.
- Internet & World Wide Web module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.
- Productivity tools module would enable the students in crafting professional word documents, excel spread sheets, power point presentations and personal web sites using the Microsoft suite of office tools and LaTeX.

Course Outcomes

- Understand and Identify the PC hardware and basic peripherals.
- Analyze and Practice of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers.
- Understand the Hardware and software level troubleshooting process.
- Explore the usage of Internet and WWW
- Understand the need of documentation tools
- Generate templates for generation report using Latex

PC Hardware:

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Hardware Troubleshooting:

Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Task 6: Software Troubleshooting:

Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

Internet & World Wide Web:

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install an antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD:

Task 1 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter : Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

MS Excel Orientation:

The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text.

Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP .

Task 3: Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

MS Power Point:

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentation.

Topic covered during this week includes: - PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

Task 2: Second week helps students in making their presentations interactive. Topic covered during this week includes: Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Concentrating on the in and out of Microsoft power point and presentations. Helps them learn best practices in designing and preparing power point presentation.

Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

Reference Books:

1. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, WILEY Dreamtech
3. Introduction to Information Technology, IITL Education Solutions limited, Pearson Education.
4. PC Hardware - A Handbook – Kate J. Chase PHI (Microsoft)
5. LaTeX Companion – Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme – ISCO Press, Pearson Education.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan – CISCO Press, Pearson Education.

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III Semester Syllabus
EN351HS: Finishing School-I
(Common to all Branches)

Course Overview

In view of the growing importance of English as a tool for global Communication and the consequent emphasis on training students to acquire language skills, this syllabus has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

Course Objectives

The main objective of this finishing school curriculum is to provide content for developing the LSRW skills of language learning and to facilitate proficiency in both receptive and productive skills, among students.

Methodology:

- Every Session will have activities on all the four skills-Listening, Speaking, Reading and Writing.
- To personalize the learning a variety of case studies and structured problem solving activities will be given to small groups and the teachers will facilitate peer reviews.
- Continuous grading, peer review and positive reinforcement will be emphasized
- Vocabulary exercises will also be a part of every session
- All sessions are designed to be student-centric and interactive.

Unit-I: Fundamentals of Communication

Unit Overview:

This is an introductory module that covers the fundamentals of communication. This module is intended to enable the students to communicate using greetings and small sentences/queries.

Learning Outcomes:

The students should be able to:

- Respond to questions
- Engage in informal conversations.
- Speak appropriately in formal situations
- Write formal and informal emails/letters

Competencies:

- Greeting appropriately
- Introducing themselves, a friend
- Situational Dialogue writing
- Responding to simple statements and questions both verbally and in writing
- Writing an email with appropriate salutation, subject lines, introduction and purpose of mail.

- Using appropriate vocabulary for both formal and informal situations.
- JAM sessions.

Sessions:

1. Introduction to Formal and Informal Conversations (Listening Activity)
2. Informal Conversations
3. Informal Conversations - Writing
4. Formal Conversations
5. Formal Conversations – Writing
6. Grammar-Prepositions
7. Adjectives and Degrees of Comparison
8. Word formation: Prefixes and Suffixes

Unit–II: Rational Recap**Unit Overview:**

The module enables the participants to organize their communication, structure their speaking and writing, explain their thoughts/ideas, and summarize the given information.

Learning Outcomes:

The students should be able to:

- Classify content and describe in a coherent form
- Recognize and list the key points in a topic/message/article.
- Compare and contrast using appropriate structure
- Explain cause and effect
- Use appropriate transitions in their presentations and written assignments

Competencies:

- Organizing the communication based on the context and audience
- Structuring the content based on the type of information.
- Explaining a technical/general topic in detail.
- Writing a detailed explanation/process
- Recapitulating

Sessions:

1. Introduction to Mind maps
2. Classification
3. Sequencing
4. Description and Enumeration

Unit-III: Narrations and Dialogues**Unit Overview:**

The Module is intended to develop the desired level of language competence that enables them to narrate and participate in casual dialogues.

Learning Outcomes:

The students should be able to

- Narrate a message/story/incident, both verbally and in writing.

- Describe an event/a session/ a movie/ an object / image
- Understand Vocabulary in context

Competencies:

- Framing proper phrases and sentences to describe in context
- Reading Stories and articles and summarizing.
- Speaking fluently with clarity
- Listening for main ideas and reformulating information in his/her own words
- Drawing and write appropriate conclusions, post reading a passage.
- Speaking Reading and Writing descriptive sentences and paragraphs
- Using appropriate tenses, adjectives and adverbs in conversations and written tasks

Sessions:

Grammar: Verb, Tenses

1. Recalling and Paraphrasing
2. Describing Events
3. Describing Objects/ Places
4. Story Telling
5. Describing Hypothetical events

Unit-IV: Technical Expositions and Discussions**Unit Overview:**

The module enables the students to build strategies for effective interaction and help them in developing decisive awareness and personality, maintaining emotional balance.

Learning Outcomes:

The students should be able to:

- Participate in Professional discussions by providing factual information, possible solutions, and examples.

Competencies:

- Comprehending key points of a topic and identifying main points including supporting details.
- Construct a logical chain of arguments and decisive points.
- Writing a review about a product by providing reasons, causes and effects

Sessions:

Based on Case Studies

1. Compare and Contrast
2. Cause and Effect
3. Problem and Solution

Unit-V: Drawing Conclusions**Unit Overview:**

This module is intended to provide necessary inputs that enable the students to draw conclusions out of a discussion and provide reports.

Learning Outcomes:

Students should be able to:

- Provide logical conclusions to the topics under discussion.
- Prepare, present, and analyze reports.

Competencies:

- Reasoning skills - Coherent and logical thinking
- Reporting and Analyzing skills.
- Analyzing the points discussed.
- Connecting all points without gaps.
- Connectives
- Communicating the decisions

Sessions:

1. Report Writing
2. Reasoning
3. Analyzing
4. Generalization and Prediction
5. Précis writing

Reference Books:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007.
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007., Cengage Learning Pvt. Ltd., New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. Mc Murrey & Joanne Buckley. 2012., Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.
10. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd., 2nd Edition.

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III Semester Syllabus **MC351HS: Gender Sensitization Lab**

(An Activity-based Course)

[Common to CSE, IT, CSBS, CSE (AI &ML) & CSE (DS)]

Course Objectives

This course aims:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Course Outcomes

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

Course Description

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with

race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Unit-I: Understanding Gender

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood, Growing up Male.

Unit-II: Gender Roles and Relations

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary.

Unit-III: Gender and Labour

Division and Valuation of Labour-Housework: The Invisible Labor- “My Mother doesn’t Work.” “Share the Load.”-Work: Its Politics and Economics - Fact and Fiction. Unrecognized and Unaccounted work. -Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming.

Unit-IV: Gender - Based Violence

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing-Coping with Everyday Harassment- Further Reading: “Chupulu”.

Domestic Violence: Speaking Out -Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-“I Fought for my Life....”.

Unit – V: Gender and Culture

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of **English Literature** or Sociology or Political Science or **any other qualified faculty who has expertise in this field from engineering departments.**

- Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on “Gender”.

Suggested Readings:

- The Textbook, “Towards a World of Equals: A Bilingual Text Book on Gender” written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government in 2015.

Assessment and Grading:

- Discussion & Classroom Participation: 20%.
- Project/Assignment: 30%.
- End Term Exam: 50%.

IV Semester

S.No.	Course Code	Course Title	Instructions			Examination			Credits
			Hours per work			Max. Marks		Duration of SEE in Hours	
			L	T	P/D	CIE	SEE		
1	MS401HS	Business Economics and Financial Analysis	3	0	0	30	70	3	3
2	CS402PC	Principles of Operating Systems	3	0	0	30	70	3	3
3	CS404PC	Introduction to Database Management Systems	3	1	0	30	70	3	4
4	CS406PC	Object Oriented Programming using Java	3	1	0	30	70	3	4
5	CS410PC	Formal Language and Automata Theory	3	0	0	30	70	3	3
6	MC401HS	Constitution of India	3	0	0	30	70	3	0
7	CS452PC	Principles of Operating Systems Lab	0	0	2	30	70	3	1
8	CS454PC	Introduction to Database Management Systems Lab	0	0	2	30	70	3	1
9	CS455PC	Java Programming Lab	0	0	2	30	70	3	1
10	EN452HS	Finishing School-II	0	0	2	30	70	3	1
Total Hours/Marks/Credits			18	2	8	300	700	--	21

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

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IV Semester Syllabus

MS401HS: Business Economics and Financial Analysis

[Common to CSE, IT, CSE (AI&ML) & CSE (DS)]

Course Objectives

- Students will understand various forms of Business and the impact of economic variables on the business, concepts of Business economics and its significance.
- Gain the knowledge on various market dynamics namely Demand, elasticity of demand, and demand forecasting.
- To disseminate the knowledge on production function, laws of production, Market structures, while dealing with the concept of cost and breakeven analysis.
- To acquaint the students regarding Accounting and various books of accounts
- To enable the students to analyze a company's financial statements through ratios and come to a reasoned conclusion about the financial situation of the company.

Course Outcomes

- Students will have ability to start a suitable business organization with available resources.
- Analyze various aspects of Demand, Elasticity of demand and Demand Forecasting.
- Will be associated with different market structures, production theories, and cost variables and pricing objectives and methods.
- Will learn preparation of Financial Statements.
- Will analyze financial well-being of the business while using ratios.

Unit – I: Introduction to Business and Economics

Economics: Significance of Economics, Micro and Macro Economic Concepts, National Income - Concepts and Importance, Inflation, Business Cycle - Features and Phases.

Business: Structure of Business Firm, Types of Business Entities – Sole Proprietorship – Partnership – Cooperative Societies - Limited Liability Companies, Sources of Capital – Conventional sources and Non-Conventional Sources of Finance.

Business Economics: Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

Unit – II: Demand and Supply Analysis

Demand Analysis: Demand - Meaning, Determinants of Demand, Law of Demand, Exceptions of Law of Demand, Demand Function, Changes in Demand – Increase and decrease in Demand - Extension and Contraction in Demand

Elasticity of Demand: Elasticity – Meaning, Types of Elasticity – Price Elasticity – Income Elasticity – Cross Elasticity–Advertising Elasticity of Demand, Factors affecting Elasticity of Demand, Measurement and Significance of Elasticity of Demand, Elasticity of Demand in decision making

Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting – Survey methods, Statistical methods

Supply Analysis: Supply – Meaning, Determinants of Supply, Supply Function & Law of Supply.

Unit – III: Production, Cost, Market Structures & Pricing

Production Analysis: Production – Meaning, Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Cobb-Douglas production function

Cost analysis: Cost–Meaning, Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Pricing: Pricing -Meaning, Objectives of pricing, pricing methods – Cost based pricing methods – Demand based pricing methods – Competition based pricing methods – Strategy based pricing methods - Product Life Cycle based Pricing, Break Even Analysis (simple problems), Cost Volume Profit Analysis.

Unit – IV: Financial Accounting

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts along with adjustments– Trading account – Profit and loss account – Balance sheet (simple problems)

Unit – V: Financial Analysis through Ratios

Concept of Ratio Analysis, Importance, Liquidity Ratios- Current Ratio – Quick Ratio – Absolute Liquid Ratio, Profitability Ratios – Gross Profit Ratio – Net Profit Ratio – Operating Ratio, Turnover Ratios – Stock Turnover Ratio – Debtors Turnover Ratio – Creditors Turnover Ratio, Leverage Ratios – Debt-to-Assets Ratio - Debt-Equity Ratio - Proprietary Ratios and interpretation (simple problems).

Suggested Readings:

1. D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Ghosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

Reference Books:

1. P. L. Mehta, Managerial Economics, Analysis, Problems & Cases, 8th Edition, 2001, Sultan Chand & Sons.
2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

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IV Semester Syllabus
CS402PC: Principles of Operating Systems
[Common to CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

- To understand the OS role in the overall computer system and study different OS and compare their features.
- To understand the scheduling policies of OS and introduces system call Interface for process management.
- To understand process concurrency and synchronization
- To understand the different memory management techniques
- To understand the concepts of input/output, file management and Introduces system call for file management

Course Outcomes

- Ability to work in different Computing Environments.
- Learn about minimization of turnaround time, waiting time and response time and also maximization of throughput by keeping CPU as busy as possible.
- Ability to design and solve synchronization problems.
- Acquires the knowledge to optimize the memory usage.
- Ability to change Access control to protect files.

Unit – I

Operating System – Introduction: Operating system objectives, User view, System view, Operating system definition, Computer System Architecture, OS Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments.

System Structures: Operating System services, User and OS Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation, OS Structure.

Unit – II

Process and CPU Scheduling –Process concept: The Process, Process State, PCB, Threads. Process Scheduling-Scheduling Queues, Schedulers, Context Switch, and Operations on Processes.

Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems using pipes, FIFOs, message queues, shared memory.

System call interface for process management-fork(), exit(), wait(), waitpid(), exec().

Unit – III

Process Management and Synchronization - The Critical Section Problem, Peterson's solution, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Monitors.

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

Unit – IV

Memory Management and Virtual Memory: – Memory Management Strategies-Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.

Virtual Memory Management-Background, Demand Paging, Copy-on-Write, Page Replacement, Page Replacement Algorithms-FIFO, Optimal, LRU, Allocation of Frames, Thrashing,

Unit – V

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management.

System Calls-Usage of open(), create(), read(), write(), close(), lseek(), stat(), ioctl() system calls.

Study of Different Operating Systems: Windows, Unix and Android.

Suggested Readings:

1. Abraham Silberchatz, Peter B. Galvin ,Operating System Principles-, Greg Gagne 9th Edition, John Wiley
2. Operating Systems – Internals and Design Principles, W. Stallings, 7th Edition, Pearson.

Reference Books:

1. Crowley, TMH, Operating System A Design Approach-
2. Andrew S, Modern Operating Systems, Tanenbaum 2nd edition, Pearson/PHI
3. W.R. Stevens, Advanced programming in the UNIX environment, Pearson education.

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IV Semester Syllabus

CS404PC: Introduction to Database Management Systems

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

Course Objectives

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- To understand the relational database design principles.
- To apply the concurrency control, recovery, and indexing for the real time data
- To become familiar with database storage structures and access techniques

Course Outcomes

- Design a database using ER modelling.
- Develop complex queries using SQL.
- Apply normalization techniques on databases.
- Explain the ACID properties of transactions and apply the serializability tests.
- Solve problems using various indexing and hashing techniques..

Unit- I

Introduction: Purpose of Database Systems, View of Data, Database Languages, Database Models, Database Architecture, Database System Applications.

Introduction to Database design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data.

Unit-II

Relational Algebra and Calculus: Relational Algebra, Relational calculus – Tuple relational Calculus, Domain relational calculus.

SQL: Queries, Constraints, Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Introduction to Views, Destroying /Altering Tables and Views, Triggers.

Unit-III

Functional Dependencies -Introduction, Basic Definitions, Trivial, Non Trivial functional dependencies, Closure of set of dependencies, Closure of Attributes

Schema Refinement: Problems caused by redundancy, decompositions, Properties of decomposition, Normalization- FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

Unit-IV

Transaction Management and Recovery: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log-Based Recovery

Unit-V

Storage and Indexing: Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure-Insertion , Deletion and Searching.

Suggested Readings:

1. Raghu Ramakrishnan, Johannes Gehrke, Data base Management Systems, McGraw Hill Education (India) Private Limited, 3rd Edition.
2. A. Silberschatz, Henry. F. Korth, S. Sudarshan, Data base System Concepts, McGraw Hill Education(India) Private Limited, 6th edition.

Reference Books:

1. R Elmasri, Shamkant B.Navathe, Database Systems, 6th edition, Pearson Education.
2. Peter Rob & Carlos Coronel, Database System Concepts, Cengage Learning.
3. M. L. Gillenson and others, Introduction to Database Management, Wiley Student Edition.
4. Lee Chao, Auerbach publications, Taylor & Francis Group.
5. C. J. Date, Database Development and Management, Introduction to Database Systems, Pearson Education.

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IV Semester Syllabus

CS406PC: Object Oriented Programming using Java

[Common to CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

- To introduce and understand Object-Oriented Programming concepts, and apply them in solving problems.
- To introduce the principles of Inheritance and Polymorphism; and demonstrate how they relate to the design of Abstract classes.
- To introduce the implementation of Packages and Interfaces.
- To introduce the concepts of Exception handling and Multithreading.
- To introduce the design of Graphical User Interface using Applets and Swing controls.

Course Outcomes

- Able to model and solve real world problems using OOP techniques.
- Able to understand the use of Abstract classes.
- Able to solve problems using java Collection framework and I/O classes.
- Able to develop Multi-threaded applications with synchronization.
- Able to develop desktop application with rich graphical interface.

Unit – I

Object-Oriented Thinking- Introduction to Object-Oriented concepts, Java buzzwords, An Overview of Java, Data types, Variables and Arrays, operators, expressions, control statements, Introducing classes: Class fundamentals, Declaring objects, introducing Methods, Constructors, and this keyword, method overloading, String handling.

Inheritance– Inheritance basics, using super, method overriding, dynamic method dispatch, using abstract class, using final with inheritance and Object class.

Unit – II

Packages- Defining a Package, CLASSPATH, Access protection, importing packages.

Interfaces- defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces, extending interfaces.

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

Unit – III

Multithreading- Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.

Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, The Console class, Serialization, Enumerations, autoboxing, generics.

Unit – IV

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes- ArrayList, LinkedList, HashSet, TreeSet, Accessing a Collection via an Iterator, Using an Iterator, The for-each alternative, Map interfaces and classes, Comparators, Collection Algorithms, Arrays, The Legacy Classes: Stack, Vector, HashTable, Dictionary, Properties.

More Utility classes: String Tokenizer, Random, Scanner.

Unit – V

Applets – Applets and Applications, Simple applet, passing parameters to applets, Security Issues.

GUI Programming –java.awt – Components, Containers, limitations of AWT, MVC Architecture.

Swing Applications- Creating a Swing Applet, Painting in Swing- an example

Event Handling- The Delegation event model- Event, Event sources, Event Listeners, Event classes, Handling Mouse and Keyboard events, Adapter classes, Inner classes, Anonymous Inner classes.

Understanding Layout Managers- FlowLayout, BorderLayout, GridLayout, CardLayout, GridBagLayout.

Suggested Readings:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

Reference Books:

1. J. Nino and F.A. Hosch, An Introduction to programming and OO design using Java, John Wiley & Sons.
2. Y. Daniel Liang, Introduction to Java programming, Pearson Education.
3. P. Radha Krishna Object Oriented Programming through Java, University Press.
4. S. Malhotra, S. Chudhary, Programming in Java, 2nd edition, Oxford Univ. Press.
5. R. A. Johnson, Cengage Learning Java Programming and Object-oriented Application Development.

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IV Semester Syllabus
CS410PC: Formal Languages and Automata Theory
[Common to CSE (AI&ML) & CSE (DS)]

Course Objectives

- To provide introduction to some of the central ideas of theoretical computer science from the perspective of formal languages.
- To introduce the fundamental concepts of formal languages, grammars and automata theory.
- To classify machines by their power to recognize languages.
- To employ finite state machines to solve problems in computing.
- To understand deterministic and non-deterministic machines.
- To understand the differences between decidability and undecidability.

Course Outcomes

- Able to understand the concept of abstract machines and their power to recognize the languages.
- Able to employ finite state machines for modeling and solving computing problems.
- Able to design context free grammars for formal languages.
- Able to distinguish between decidability and undecidability.
- Able to gain proficiency with mathematical tools and formal methods.

Unit – I

Introduction to Finite Automata: Structural Representations, Automata and Complexity, the Central Concepts of Automata Theory – Alphabets, Strings, Languages, Problems.

Deterministic Finite Automata: Definition of DFA, How a DFA Process Strings, The language of DFA.

Nondeterministic Finite Automata: Formal Definition, an application: Text Search, Conversion of NFA to DFA.

Finite Automata with Epsilon-Transitions: Formal Definition, epsilon-closure, conversion of NFA with ϵ -transitions to DFA.

Moore and Mealy machines : Definition of Moore and Mealy machines, conversion of Mealy to Moore machine and vice-versa.

Unit – II

Regular Expressions: Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Conversion of Finite Automata to Regular Expressions.

Pumping Lemma for Regular Languages: Statement of the pumping lemma, Applications of the Pumping Lemma.

Closure Properties of Regular Languages: Closure properties of Regular languages, Decision Properties of Regular Languages, Equivalence and Minimization of Automata.

Unit – III

Context-Free Grammars: Definition of Context-Free Grammars, Derivations Using a Grammar, Leftmost and Rightmost Derivations, the Language of a Grammar, Sentential Forms, Parse Tree, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages.

Push Down Automata: Definition of the Pushdown Automaton, the Language of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata.

Unit – IV

Normal Forms for Context- Free Grammars: Eliminating useless symbols, Eliminating Unit productions, Eliminating ϵ -productions, Chomsky Normal form and Greibach Normal form.

Pumping Lemma for Context-Free Languages: Statement of pumping lemma, Applications.

Closure Properties of Context-Free Languages: Closure properties of CFL's, Decision Properties of CFL's.

Unit – V

Turing Machines: Introduction to Turing Machine, Types of Turing machines, Formal Description, Instantaneous description, the language of a Turing machine, halting problem.

Undecidability: Undecidability, A Language that is Not Recursively Enumerable, An Undecidable Problem That is RE, Undecidable Problems about Turing Machines, Recursive languages, Properties of recursive languages, Post's Correspondence Problem, Modified Post Correspondence problem, Other Undecidable Problems, Counter machines, Universal Turing machine.

Suggested Readings:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, 3rd Edition, Pearson Education.
2. K.L.P Mishra and N. Chandrashekar, Theory of Computer Science – Automata, Languages and computation, 2nd Edition, PHI.

Reference Books:

1. John C Martin, Introduction to Languages and The Theory of Computation, TMH.
Daniel I.A. Cohen, John Wiley, Introduction to Computer Theory,
2. P. K. Srimani, Nasir S. F. B, A Text book on Automata Theory, Cambridge University Press.
3. Michael Sipser, Introduction to the Theory of Computation, 3rd Edition, Cengage Learning.
4. Kamala Krithivasan, Rama R, Introduction to Formal languages Automata Theory and Computation, Pearson.

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IV Semester Syllabus

MC401HS: Constitution of India

[Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

- Students will get to know about the history of Indian Constitution
- Students will get to know about President election and his Powers
- Students will get to know about Council of Ministers and their election Procedure and their Powers and Responsibilities
- Students will get know about Judicial System in India
- Students will get know about Panchayat-raj System in India

Course Outcomes

- This enables the Students to know about the Rights of Citizen.
- This enables the Students to know about Fundamental Duties of People.
- This enables the Students to Know the Directive principles of State Policy.
- This enables the Students to know about Functioning of Parliament and its Powers.
- This enables the Students to know about various Constitutional bodies in India.

Course Content

1. Meaning of the constitution, law and constitutionalism
2. Historical perspective of the Constitution of India
 - Drafting Committee
3. Salient features and characteristics of the Constitution of India
 - Preamble
 - Salient Features
 - Major Sources of Indian Constitution
4. Scheme of the fundamental rights
 - Article 13 to 32
 - Scheme of the Fundamental Right to Equality
 - Scheme of the Fundamental Right to certain Freedom
 - Scope of the Right to Life and Personal Liberty
5. The scheme of the Fundamental Duties and its legal status
 - List of Fundamental Duties
 - Justifiability of Fundamental Duties
6. The Directive Principles of State Policy – Its importance and implementation
 - Categories - Gandhian, Socialist and Liberal Principles

- Significance of Directive Principles of State Policy
 - Relation between Fundamental rights and Directive Principles of State Policy
7. Federal structure and distribution of legislative and financial powers between the Union and the States
 - Union List
 - State List
 - Concurrent List
 - Residuary Powers
 8. Parliamentary Form of Government in India.
 9. The constitutional powers and status of the President of India vs the constitutional powers and status of the Council of ministers headed by the Prime Minister
 10. Amendment of the Constitution and its Procedure
 - Procedure of Amendment to Constitution of India
 - Important Amendments
 11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
 12. Local Self Government – Constitutional Scheme in India
 - Urban local Self Government
 - Rural local Self Government
 13. Important Constitutional Bodies
 - Election Commission of India
 - Finance Commission of India
 - Union Public Service Commission
 - C-AG

Suggested Readings:

1. Subhash Kashyap, Our Constitution, National Book Trust, 5th Edition, Reprint- 2017.
2. V. N Shukla, The Constitution of India, Law literature Publication, 11th Edition, 2020.

Reference Books:

1. M P Jain, Indian Constitutional Law, Lexis Nexis, 8th Edition, 2018.
2. Samaraditya Pal, Indian Constitution-Origin & Evolution, Lexis Nexis, 1st Edition, 2019.

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IV Semester Syllabus

CS452PC: Principles of Operating Systems Lab

[Common to CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

- To provide an understanding of the design aspects of operating system concepts through simulation
- Introduce basic Unix commands, system call interface for process management,
- interprocess communication and I/O in Unix

Course Outcomes

- Simulate and implement operating system concepts such as scheduling, deadlock
- Simulate and implement process management, file management and memory management.
- Able to implement C programs using Unix system calls

List of Experiments:

1. Hands on UNIX/LINUX Commands.
2. Shell programming for file handling.
3. Shell Script programming using the commands grep, awk, and sed.
4. Study pthreads and implement the following: Write a program which shows the performance improvement in using threads as compared with process.(Examples like Matrix Multiplication, quick sort, Merge sort)
5. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, fcntl, seek, stat, opendir, readdir)
6. Write programs using the Process system calls of UNIX/LINUX operating system (fork, exit, wait, waitpid, exec)
7. Implement the following CPU Scheduling algorithms with Pthreads
a) FCFS b) SJF c) Round Robin d) priority
8. Write a C program to implement the Producer – Consumer problem using semaphores using UNIX/LINUX system calls.
9. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.
10. Write C programs to simulate the following memory management techniques with Pthread library a) Paging b) Segmentation
11. Write C programs to illustrate the following IPC mechanisms
a) Pipes b) FIFOs c) Message Queues d) Shared Memory

Reference Books:

1. William Stallings, Operating Systems – Internals and Design Principles, Fifth Edition–2005, Pearson Education/PHI
2. Crowley, Operating System - A Design Approach- TMH.
3. Andrew S Tanenbaum, Modern Operating Systems, 2nd edition, Pearson/PHI
4. Kernighan and Pike, UNIX Programming Environment, PHI/Pearson Education
5. U. Vahalia, UNIX Internals: The New Frontiers, Pearson Education.

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IV Semester Syllabus

CS454PC: Introduction to Database Management SystemsLab

[Common to CSB, CSE (AI&ML) & CSE (DS)]

Course Objectives

- Introduce ER data model, database design and normalization
- Learn SQL basics for data definition and data manipulation

Course Outcomes

- Apply the built-in functions and write simple queries on various databases.
- Create, insert and manipulate data using SQL commands.
- Develop complex queries using joins & nested queries.
- Add constraints on databases and implement DCL, TCL and advanced SQL commands.
- Develop programs using cursors, triggers, exceptions, procedures and functions in PL/SQL.

List of Experiments

1. Database Design with E-R Model
2. Relational Model (Practicing DDL,DML, DCL commands)
3. Applying constraints on Relations
4. Queries using - Aggregate functions, Order By, GROUP BY, HAVING Clause
5. Number Functions, String Functions, Date Functions
6. Nested Queries, Querying (using ANY, ALL, IN, Exists, NOT EXISTS, UNION, INTERSECT etc.)
7. Creation and dropping of Views.
8. Working with Join operations
9. Triggers (Creation of insert trigger, delete trigger, update trigger)
10. Procedures and Functions, Packages, Exceptions
11. Usage of Cursors

References Books:

1. S.Shah and V. Shah, The X Team, Oracle for Professionals, SPD.
2. Shah, Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, PHI.
3. M. L. Gillenson, Fundamentals of Database Management Systems, Wiley Student Edition.

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IV Semester Syllabus

CS455PC: Java Programming Lab

[Common to CSE, IT, CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives

- To write programs using abstract classes.
- To write multithreaded programs.
- To write programs for solving real world problems using java collection framework.
- To write GUI programs using swing controls in Java.
- To introduce java compiler and eclipse platform.
- To impart hands on experience with java programming.

Course Outcomes

- Able to write programs using abstract classes.
- Able to write multithreaded programs.
- Able to write GUI programs using swing controls in Java.
- Able to write programs for solving real world problems using java collection frame work.

Note:

1. Use LINUX and MySQL for the Lab Experiments. Though not mandatory, encourage the use of Eclipse platform.
2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

List of Experiments:

1. Use Eclipse or Net bean platform and acquaint with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.
2. Write a Java program that implements Quick sort algorithm for sorting a list of names in ascending order.
3. Write a Java program that implements Bubble sort algorithm for sorting in descending order and also shows the number of interchanges occurred for the given set of integers.
4. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named printArea (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method printArea () that prints the area of the given shape.
5. Write a Java program that implements a multi-thread application that has three threads. First thread generates random integer every 1 second and if the value is even, second thread

computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

6. Write a Java program that correctly implements the producer – consumer problem using the concept of interthread communication.
7. Write a Java program for the following: Create a doubly linked list of elements. Delete a given element from the above list. Display the contents of the list after deletion.
8. Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).
9. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a NumberFormatException. If Num2 were Zero, the program would throw an ArithmeticException. Display the exception in a message dialog box.
10. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.
11. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with “Stop” or “Ready” or “Go” should appear above the buttons in selected color. Initially, there is no message shown.
12. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas. Write a java program to display the table using Labels in Grid Layout.
13. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
14. Develop an applet in Java that displays a simple message.
15. Develop an applet in Java that receives an integer in one text field, and computes its factorial value and returns it in another text field, when the button named “Compute” is clicked.

Reference Books:

1. P. J. Deitel and H. M. Deitel, Java for Programmers, 10th Edition Pearson education.
2. Bruce Eckel, Thinking in Java, Pearson Education.
3. D. S. Malik and P. S. Nair, Java Programming, Cengage Learning.
4. Core Java, Volume 1., 9th edition, Cay S. Horstmann and G Cornell, Pearson.

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IV Semester Syllabus
EN452HS: Finishing School- II
(Common to all Branches)

Course Overview

In view of the growing importance of English as a tool for global Communication and the consequent emphasis on training students to acquire language skills, this syllabus has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

Course Objectives

The main objective of this finishing school curriculum is to provide content for developing the LSRW skills of language learning and to facilitate proficiency in both receptive and productive skills, among students.

Methodology:

- Students will be given Reading/Listening exercises that they would have to do as a prerequisite for the class room intervention
- Every Session will have activities on all the four skills. Listening, Speaking, Reading and Writing
- Vocabulary exercises will also be part of every session
- Students will be asked to summarize their takeaways in every class in three sentences.
- The students will be given a self study plan for language enhancement and will be given extra reading and writing exercises as and when necessary.
- To personalize learning, a variety of case studies and structured problem solving activities will be given in small groups and the trainers will facilitate peer reviews.

Unit-I: Discussions and Debates

Module Overview:

The module enables the students to build strategies for effective group interaction. It focuses on developing decisive awareness and positive personality while maintaining emotional balance.

Learning Outcomes:

The students should be able to:

- Participate in group discussions by providing factual information, real time solutions, and examples.
- Debate on a topic by picking up the key points from the arguments offered.

Competencies:

- Analytical and Probing Skills
- Interpersonal Skills

- Identifying key points of the debate.
- Problem solving ability
- Constructing a logical chain of arguments and presenting winning view points.

Sessions:

1. Six Thinking Hats
2. Initiation Techniques
3. Generating points
4. Summarization Techniques

Unit-II: Powerful Presentations**Unit Overview:**

Presentations need to be clear and logical. This Module is designed to introduce students to an ideal structure for a presentation

Learning Outcomes:

Students should be able to:

- Prepare, present, and analyze reports
- Analyze the points discussed
- Connect all points logically with coherence
- Connectives
- Communicate the decisions
- Provide logical conclusions

Sessions:

1. Persuasion skills
2. Cultivate appropriate body language and group dynamics
3. Debating Structure and Content
4. Case Study based Group Discussions

Unit-III: Effective Technical Writing**Unit Overview:**

Organizing the writing in a logical order, using headings, linkers and sequence markers. This module is designed to give the students inputs on how to organize using Information Mapping. The students are also given inputs to correct spelling, language and Punctuation errors, as part of editing.

Learning Outcomes:

The Students should be able to choose appropriate words and tone to present accurate, specific, and factual written documents

Competencies:

- Reporting an incident
- Writing/Presenting an essay
- Language and Vocabulary

Sessions:

1. Information Mapping

2. Report writing
3. Memos
4. SoP (Statement of Purpose)
5. MoM (Minutes of the Meeting)

Unit-IV: Reading for Content and Context

Unit Overview:

This course is designed to develop and improve reading and study skills needed for employability. Topics include identifying main idea and supporting details, determining author's purpose and tone, distinguishing between fact and opinion, identifying patterns of organization in a paragraph or passage and the transition words associated with each pattern. Also recognizing the relationship between sentences, puzzling out meanings in context, identifying logical inferences and conclusions.

Learning Outcomes:

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

1. Compose a summary of a given text.
2. Apply reading skills appropriate to different genres

Competencies

- Distinguish facts from opinions.
- Make inferences
- Identify author's purpose, point of view, tone, and perspective.
- Comprehend the use of figurative language.
- Synthesize information gathered from reading in order to give informed opinion.

Sessions:

1. Skimming and Scanning Techniques
2. Recognition of author's purpose
3. Awareness of stylistic differences
4. Evaluation and Discernment of fact and opinion

Unit-V: Critical Reading Skills

Unit Overview:

Research shows that good reading skills can lead to well written assignments. In this unit, students will learn reading strategies to understand and retain information, organization of reading passages, and strategies for learning and retaining vocabulary. Building on these basic strategies, students will develop skills to critically analyze texts. In addition, students will practice and develop paraphrasing and summarizing skills. Students' feedback is integral to the learning process.

Learning Outcomes:

- Recognition of propaganda techniques

- Present vocabulary building methods
- Use comprehension and vocabulary strategies to improve reading skills.

Competencies:

The students will develop enhanced ability to apply the following critical thinking skills when reading:

- a. Understand the meaning of new vocabulary through:
 1. Context clues, e.g., synonyms, antonyms, examples, definitions, and restatements, etc.
 2. Roots and affixes
- b. Analyze text (simple outlining and note taking) summarize, draw conclusions and apply information to personal experiences.

Sessions

1. Contextual Vocabulary-One-word substitutes
2. Homophones, Homonyms and Homographs
3. Idioms and Phrases
4. Synonyms, Antonyms and Phrasal verbs
5. Note making and Inference
6. Main idea identification
7. Précis Writing.

Reference Books:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan, Pearson 2007.
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007, Cengage Learning Pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. Mc Murrey & Joanne Buckley. 2012., Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.
10. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd., 2nd Edition.

MAHATMA GANDHI INSTITUTE OF TECHNOLOGY (Autonomous)
B.Tech. in Computer Science & Engineering (AI&ML)
Scheme of Instruction and Examination
(Choice Based Credit System)

For the batches to be admitted with effect from the academic year **2021-22**

V Semester

S.No	Course Code	Course Title	Instruction			Examination		Credits	
			Hours Per Week			Max. Marks			Duration of SEE in Hours
			L	T	P/D	CIE	SEE		
1	CS503PC	Design and Analysis of Algorithms	3	0	0	30	70	3	3
2	CS505PC	Machine Learning	3	0	0	30	70	3	3
3	CS508PC	Compiler Design	3	0	0	30	70	3	3
4	CS510PC	Computer Networks	3	0	0	30	70	3	3
5	--	Professional Elective - I	3	0	0	30	70	3	3
6	--	Professional Elective - II	3	0	0	30	70	3	3
7	MC503ES	Essence of Indian knowledge tradition Part-I	3	0	0	30	70	3	0
8	CS553PC	Machine Learning Lab	0	0	3	30	70	3	1.5
9	CS557PC	Computer Networks Lab	0	0	3	30	70	3	1.5
10	EN553HS	Finishing Schools-III (Advanced Communication Skills Lab)	0	0	2	30	70	3	1
11	MC501HS	Intellectual Property Rights	3	0	0	30	70	3	0
Total Hours/Marks/Credits			21	0	8	300	700	-	22

VI Semester

S.No.	Course Code	Course Title	Instruction			Examination		Credits	
			Hours Per Week			Max. Marks			Duration of SEE in Hours
			L	T	P/D	CIE	SEE		
1	CS603PC	Artificial Intelligence	3	1	0	30	70	3	4
2	CS607PC	DevOps	3	1	0	30	70	3	4
3	CS609PC	Natural Language Processing	3	1	0	30	70	3	4
4	--	Professional Elective – III	3	0	0	30	70	3	3
5	--	Open Elective - I	3	0	0	30	70	3	3
6	MC602ES	Cyber security	3	0	0	30	70	3	0
7	EN654HS	Finishing Schools-IV (Quantitative Aptitude & Analytical Ability)	0	0	2	30	70	3	1
8	CS653PC	Artificial Intelligence and Natural Language Processing Lab	0	0	3	30	70	3	1
9	CS655PC	DevOps Lab	0	0	3	30	70	3	1
10	--	Professional Elective - III Lab	0	0	2	30	70	3	1
11	MC601ESC	Environmental Science	3	0	0	30	70	3	0
Total Hours/Marks/Credits			18	3	8	270	630	-	22

L: Lecture **T:** Tutorial **D:** Drawing **P:** Practical **CIE** - Continuous Internal Evaluation **SEE** - Semester End Examination

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VII Semester

S.No.	Course Code	Course Title	Instruction			Examination		Credits	
			Hours Per Week			Max. Marks			Duration of SEE in Hours
			L	T	P/D	CIE	SEE		
1	CS701PC	Neural Networks & Deep Learning	3	0	0	30	70	3	3
2	CS705PC	Reinforcement Learning	2	0	0	30	70	3	2
3	--	Professional Elective - IV	3	0	0	30	70	3	3
4	--	Professional Elective - V	3	0	0	30	70	3	3
5	--	Open Elective - II	3	0	0	30	70	3	3
6	CS753PC	Deep Learning Lab	0	0	2	30	70	3	1
7	CS755PC	Industrial Oriented Mini Project/ Summer Internship	0	0	0	30	70	3	2*
8	CS756PC	Seminar	0	0	2	-	100	3	1
9	CS758PC	Project Stage - I	0	0	6	100	-	3	3
Total Hours/Marks/Credits			14	0	10			---	21

VIII Semester

S.No.	Course Code	Course Title	Instruction			Examination		Credits	
			Hours Per Week			Max. Marks			Duration of SEE in Hours
			L	T	P/D	CIE	SEE		
1	MS802HS	Organizational Behavior	3	0	0	30	70	3	3
2	--	Professional Elective - VI	3	0	0	30	70	3	3
3	--	Open Elective - III	3	0	0	30	70	3	3
4	CS852PC	Project Stage - II	0	0	14	30	70	3	7
Total Hours/Marks/Credits			9	0	14	120	280		16

L: Lecture **T:** Tutorial **D:** Drawing **P:** Practical **CIE** - Continuous Internal Evaluation **SEE** - Semester End Examination

Grand Total of Credits

Semester	I	II	III	IV	V	VI	VII	VIII	Total Credits
Credits	19	18	21	21	22	22	21	16	160

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***Note:** Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit a report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

MC - Environmental Science – Should be Registered by Lateral Entry Students Only.
 MC – Satisfactory/Unsatisfactory.

Professional Elective-I

CS515PE	Graph Theory
CS516PE	Introduction to Data Science
CS517PE	Web Programming
CS518PE	Image Processing

Professional Elective-II

CS519PE	Data Warehousing and Business Intelligence
CS522PE	IT Operations - 1
CS523PE	Information Retrieval Systems
CS524PE	Pattern Recognition
CS525PE	Computer Vision and Robotics

Professional Elective -III

CS618PE	Internet of Things
CS619PE	IT Operations - 2
CS622PE	Mobile Application Development
CS623PE	Data Mining
CS624PE	Cryptography and Network Security

Courses in PE - III and PE - III Lab must be in 1-1 correspondence.

Professional Elective -IV

CS716PE	Cloud Computing
CS721PE	Expert Systems
CS722PE	Game Theory
CS723PE	Mobile Computing

Professional Elective-V

CS728PE	BlockChain Technologies
CS730PE	Social Network Analysis
CS731PE	Augmented Reality & Virtual Reality
CS732PE	Ad-hoc & Sensor Networks

Professional Elective-VI

CS823PE	Speech and Video Processing
CS824PE	Robotics Process Automation
CS825PE	Cognitive Computing
CS826PE	Semantic Web

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List of Open Electives offered:	
Open Elective-I	
CS521OE	Data Structures
CS522OE	Operating Systems
CS523OE	Database Management Systems
Open Elective-II	
CS621OE	Computer Networks
CS622OE	Software Engineering
CS623OE	Java Programming
Open Elective-III	
CS721OE	Python Programming
CS722OE	Internet of Things
CS723OE	Introduction to Machine Learning

L	T	P	C
3	0	0	3

V Semester Syllabus
CS503PC: DESIGN AND ANALYSIS OF ALGORITHMS
[Common to CSE, CSE (AI & ML), CSE (DS) & IT]

Prerequisites:

1. A course on “Computer Programming and Data Structures”.
2. A course on “Advanced Data Structures”.

Course Objectives

To Learn

- Introduces the notations for analysis of the performance of algorithms.
- Introduces the data structure of disjoint sets.
- Describes major algorithmic techniques (divide-and-conquer, backtracking, dynamic Programming, greedy, branch and bound methods) and mention problems for which each technique is appropriate
- Describes how to evaluate and compare different algorithms using worst-, average-, and bestcase analysis.
- Explains the difference between tractable and intractable problems, and introduces the Problems that are P, NP and NP complete

Course Outcomes

After learning the contents of this paper, the student must be able to

- Acquire the knowledge of algorithm analysis and its notations that are applied on the problems solved by divide and conquer paradigm.
- Use greedy approach to solve an appropriate problem for optimal solution.
- Apply dynamic programming approach to solve suitable problems
- Apply the concept of back tracking, branch and bound paradigm for real time problems.
- Analyze the complexity of problems and differentiate that in terms of P and NP problems with examples.

Unit-I

Introduction: Algorithm, Performance Analysis-Space complexity, Time complexity, Asymptotic Notations-Big oh notation, Omega notation, Theta notation and little oh notation.

Divide and conquer: General method, applications-Binary search, Quick sort, Merge sort, Strassen’s matrix multiplication.

Unit-II

Sets and Disjoint Set Unions: Introduction, Union and Find Operations with algorithms.

Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem Minimum cost spanning trees-Prim’s and Kruskal’s Algorithm, Single source shortest path problem.

Unit- III

Dynamic Programming: General method, applications-Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Traveling sales person problem, Reliability design.

Unit- IV

Backtracking: General method, applications, n-queen’s problem, sum of sub sets problem, graph coloring Hamiltonian cycles.

Branch and Bound: General method, applications - 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution, travelling sales person problem.

Unit- V

NP-Hard and NP-Complete Problems: Basic concepts, Nondeterministic algorithms, the classes NP - Hard and NP-Complete, Cook’s theorem, NP-Hard Graph Problems-Clique Decision Problem (CDP), Node cover decision problem.

Suggested Readings:

1. Ellis Horowitz, Satraj Sahni and Sanguthevar Rajasekharam, Fundamentals of Computer Algorithms, Galgotia Publications Pvt. Ltd., Second Edition, 2007.
2. Aho, Ullman and Hopcroft, Design and Analysis of algorithms, Pearson education, Reprint 2002.

Reference Books:

1. R.C.T. Lee, S.S. Tseng, R.C. Chang and T.T. Sai, Introduction to Design and Analysis of algorithms, A strategic approach, Mc. Graw Hill, 2005.
2. Algorithm Design: Foundations, Analysis and Internet Examples, M.T. Goodrich and R.Tamassia, John Wiley and sons
3. Introduction to Algorithms, 3rd Ed., T. H. Cormen, C.E. Leiserson, R. L. Rivest, and Clifford Stein, PHI Pvt. Ltd., Pearson Education.

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3	0	0	3

V Semester Syllabus
CS505PC: MACHINE LEARNING
[Common to CSBS, CSE (AI &ML) & CSE (DS)]

Prerequisites:

1. Data Structures
2. Knowledge on statistical methods

Course Objectives

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

Course Outcomes

- Understand the concepts of computational intelligence like machine learning
- Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
- Understand the Neural Networks and its usage in machine learning application.

UNIT - I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning
 Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.

Decision Tree Learning – Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT - II

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT - III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

Computational learning theory – Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

Instance-Based Learning- Introduction, k -nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT- IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Reinforcement Learning – Introduction, the learning task, Q -learning, non-deterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT - V

Analytical Learning-1- Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

Analytical Learning-2-Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

Combining Inductive and Analytical Learning – Motivation, inductive-analytical approaches to learning, using prior knowledge to initialize the hypothesis.

Suggested Readings:

1. Machine Learning – Tom M. Mitchell, - MGH

Reference Books:

1. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis.

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V Semester Syllabus CS508PC: COMPILER DESIGN

Prerequisites

1. A course on “Formal Languages and Automata Theory”.
2. A course on “Computer Organization and architecture”.
3. A course on “Computer Programming and Data Structures”.

Course Objectives

- Introduce the major concepts of language translation and compiler design and impart the knowledge of practical skills necessary for constructing a compiler.
- Topics include phases of compiler, parsing, syntax directed translation, type checking use of symbol tables, code optimization techniques, intermediate code generation, code generation and data flow analysis.

Course Outcomes

- Demonstrate the ability to design a compiler given a set of language features.
- Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
- Acquire skills in using lex tool & yacc tool for developing a scanner and parser.
- Design and implement LL and LR parsers
- Design algorithms to do code optimization in order to improve the performance of a program in terms of space and time complexity.
- Design algorithms to generate machine code.

UNIT - I

Introduction: The structure of a compiler, the science of building a compiler, programming language basics

Lexical Analysis: The Role of the Lexical Analyzer, Input Buffering, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata, From Regular Expressions to Automata, Design of a Lexical-Analyzer Generator, Optimization of DFA-Based Pattern Matchers.

UNIT - II

Syntax Analysis: Introduction, Context-Free Grammars, Writing a Grammar, Top-Down Parsing, Bottom-Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using Ambiguous Grammars and Parser Generators.

UNIT - III

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's.

Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Type Checking, Control Flow, Switch-Statements, Intermediate Code for Procedures.

UNIT - IV

Run-Time Environments: Stack Allocation of Space, Access to Nonlocal Data on the Stack, Heap Management, Introduction to Garbage Collection, Introduction to Trace-Based Collection.

Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization, Register Allocation and Assignment, Dynamic Programming Code-Generation.

UNIT - V

Machine-Independent Optimization: The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs.

Suggested readings:

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman

References Books:

1. Lex & Yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Compiler Construction, Loudon, Thomson.

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V Semester Syllabus

CS510PC: COMPUTER NETWORKS

[Common to CSE, CSBS, CSE (AI&ML) & CSE(DS)]

Prerequisites

1. A course on “Programming for problem solving”.
2. A course on “Data Structures”.

Course Objectives

- The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
- Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols of the various layers.

Course Outcomes

- Gain the knowledge of the basic computer network technology.
- Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Identify and analyze various routing algorithms, congestion control algorithms.
- Outline the transport layer protocols like TCP and UDP.
- List and examine the applications of HTTP, WWW, DNS, Email, FTP and the underlying protocols.

UNIT - I

Network Hardware: Local Area Networks, Metropolitan Area Networks, Wide Area Networks, Internetwork.

Network software: Protocol Hierarchies, Design Issues for the Layers, Connection-Oriented and Connectionless Services.

Reference Models: OSI, TCP/IP Reference models, Comparison of OSI and TCP/IP Models

Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission media: Magnetic Media, Twisted pairs, Coaxial Cable, Fiber Optics, Unguided Transmission Media: Radiowaves, Microwaves, Infrared.

UNIT - II

Data link layer: Design issues, Framing: Character Count, Character Stuffing, Bit Stuffing

Error Detection and Correction: Block Codes, Simple Parity Check, LRC, Hamming Distance, Checksum, Hamming Code, CRC

Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel.

Sliding Window protocols: Pipelining, Piggybacking, A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat,

Example data link protocols: HDLC, PPP

Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols.

Wireless LANs, Connecting devices at the data link layer.

UNIT - III

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Link State Routing,

Congestion Control Algorithms: Approaches to Congestion Control, Traffic aware routing, Admission Control, Traffic throttling, Load shedding.

Quality of Service: Traffic Shaping, Packet scheduling, Admission Control, Integrated services, Differentiated Services, Internetworking,

Network layer in the Internet: IPv4 protocol, IP Addresses, IPv6 protocol, Internet Control Protocols: ICMP, ARP, RARP, BOOTP, DHCP,

Internetwork Routing: OSPF, BGP, Internet Multicasting.

UNIT - IV

Transport Layer: Transport Services: Services provided to Upper layer, Transport service primitives, Berkeley Sockets

Elements of Transport protocols: Addressing, Error and Flow Control, Multiplexing, Crash Recovery, Connection management.

Internet Transport Protocols: TCP: Service Model, TCP Protocol, Segment header, TCP Connection establishment and Release, TCP Connection management, TCP Sliding Window, Timer management, TCP Congestion Control.

UDP: Protocol, UDP Header

UNIT - V

Application Layer: Domain name system- DNS Name Space, Resource records, Name Servers. SNMP, Electronic Mail: Architecture and Services, User Agent, Message Formats, Message Transfer, Final Delivery.

World Wide Web: Architectural Overview, Static Web pages, Dynamic web pages and Web applications, HTTP, Mobile Web.

Streaming audio and video: Digital Audio, Digital Video, Streaming Stored media, Streaming Live media, Real Time Conferencing.

Suggested Reading:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI,2011.
2. Data Communications and Networking – Behrouz A. Forouzan. Fifth Edition TMH, 2017.

Reference Books:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. “Data and Computer Communications” by William Stallings 9 th Edition, Pearson Education 2010.
3. “TCP/IP Illustrated” by W. Richard Stevens,Addison-Wesley Professional;2 nd edition 2011.

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V Semester Syllabus
CS515PE: GRAPH THEORY (PE – I)

Prerequisites

1. An understanding of Mathematics in general is sufficient.

Course Outcomes

- Know some important classes of graph theoretic problems;
- Be able to formulate and prove central theorems about trees, matching, connectivity, colouring and planar graphs;
- Be able to describe and apply some basic algorithms for graphs;
- Be able to use graph theory as a modelling tool.

UNIT - I

Introduction-Discovery of graphs, Definitions, Subgraphs, Isomorphic graphs, Matrix representations of graphs, Degree of a vertex, Directed walks, paths and cycles, Connectivity in digraphs, Eulerian and Hamilton digraphs, Eulerian digraphs, Hamilton digraphs, Special graphs, Complements, Larger graphs from smaller graphs, Union, Sum, Cartesian Product, Composition, Graphic sequences, Graph theoretic model of the LAN problem, Havel-Hakimi criterion, Realization of a graphic sequence.

UNIT - II

Connected graphs and shortest paths - Walks, trails, paths, cycles, Connected graphs, Distance, Cut-vertices and cut-edges, Blocks, Connectivity, Weighted graphs and shortest paths, Weighted graphs, Dijkstra's shortest path algorithm, Floyd-Warshall shortest path algorithm.

UNIT - III

Trees- Definitions and characterizations, Number of trees, Cayley's formula, Kirchoff's matrix-tree theorem, Minimum spanning trees, Kruskal's algorithm, Prim's algorithm, Special classes of graphs, Bipartite Graphs, Line Graphs, Chordal Graphs, Eulerian Graphs, Fleury's algorithm, Chinese Postman problem, Hamilton Graphs, Introduction, Necessary conditions and sufficient conditions.

UNIT - IV

Independent sets coverings and matchings – Introduction, Independent sets and coverings: basic equations, Matchings in bipartite graphs, Hall's Theorem, Konig's Theorem, Perfect matchings in graphs, Greedy and approximation algorithms.

UNIT - V

Vertex Colorings- Basic definitions, Cliques and chromatic number, Mycielski's theorem, Greedy coloring algorithm, Coloring of chordal graphs, Brooks theorem, Edge Colorings, Introduction and Basics, Gupta-Vizing theorem, Class-1 and Class-2 graphs, Edge-coloring of bipartite graphs, Class-2 graphs, Hajos union and Class-2 graphs, A scheduling problem and equitable edge-coloring.

TEXT BOOKS:

1. J. A. Bondy and U. S. R. Murty. Graph Theory, volume 244 of Graduate Texts in Mathematics. Springer, 1st edition, 2008.
2. J. A. Bondy and U. S. R. Murty. Graph Theory with Applications.

REFERENCE BOOKS:

1. Lecture Videos: <http://nptel.ac.in/courses/111106050/13>.
2. Introduction to Graph Theory, Douglas B. West, Pearson.
3. Schaum's Outlines Graph Theory, Balakrishnan, TMH.
4. Introduction to Graph Theory, Wilson Robin j, PHI.
5. Graph Theory with Applications to Engineering and Computer Science, Narsing Deo, PHI.
6. Graphs - An Introductory Approach, Wilson and Watkins.

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V Semester Syllabus
CS516PE: INTRODUCTION TO DATA SCIENCE (PE – I)

Course Objectives

- Learn concepts, techniques and tools they need to deal with various facets of data science practice, including data collection and integration.
- Understand the basic types of data and basic statistics.
- Identify the importance of data reduction and data visualization techniques.

Course Outcomes

After completion of the course, the student should be able to

- Understand basic terms what Statistical Inference means.
- Identify probability distributions commonly used as foundations for statistical modelling. Fit a model to data.
- Describe the data using various statistical measures.
- Utilize R elements for data handling.
- Perform data reduction and apply visualization techniques.

UNIT - I

Introduction: Definition of Data Science- Big Data and Data Science hype – and getting past the hype

- Datafication - Current landscape of perspectives - Statistical Inference - Populations and samples - Statistical modeling, probability distributions, fitting a model – Over fitting. **Basics of R:** Introduction, R-Environment Setup, Programming with R, Basic Data Types.

UNIT - II**Data Types & Statistical Description**

Types of Data: Attributes and Measurement, What is an Attribute? The Type of an Attribute, The Different Types of Attributes, Describing Attributes by the Number of Values, Asymmetric Attributes, Binary Attribute, Nominal Attributes, Ordinal Attributes, Numeric Attributes, Discrete versus Continuous Attributes. Basic Statistical Descriptions of Data: Measuring the Central Tendency: Mean, Median, and Mode, Measuring the Dispersion of Data: Range, Quartiles, Variance, Standard Deviation, and Inter- quartile Range, Graphic Displays of Basic Statistical Descriptions of Data.

UNIT - III

Vectors: Creating and Naming Vectors, Vector Arithmetic, Vector sub setting, **Matrices:** Creating and Naming Matrices, Matrix Sub setting, Arrays, Class. **Factors and Data Frames:** Introduction to Factors: Factor Levels, Summarizing a Factor, Ordered Factors, Comparing Ordered Factors, Introduction to Data Frame, subsetting of Data Frames, Extending Data Frames, Sorting Data Frames.

Lists: Introduction, creating a List: Creating a Named List, Accessing List Elements, Manipulating List Elements, Merging Lists, Converting Lists to Vectors

UNIT - IV

Conditionals and Control Flow: Relational Operators, Relational Operators and Vectors, Logical Operators, Logical Operators and Vectors, Conditional Statements. **Iterative Programming in R:** Introduction, While Loop, For Loop, Looping Over List. **Functions in R:** Introduction, writing a Function in R, Nested Functions, Function Scoping, Recursion, Loading an R Package, Mathematical Functions in R.

UNIT - V

Data Reduction: Overview of Data Reduction Strategies, Wavelet Transforms, Principal Components Analysis, Attribute Subset Selection, Regression and Log-Linear Models: Parametric Data Reduction, Histograms, Clustering, Sampling, Data Cube Aggregation. **Data Visualization:** Pixel-Oriented

Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

TEXT BOOKS:

1. Doing Data Science, Straight Talk from The Frontline. Cathy O’Neil and Rachel Schutt, O’Reilly,2014
2. Jiawei Han, Micheline Kamber and Jian Pei. Data Mining: Concepts and Techniques, 3rd ed.The Morgan Kaufmann Series in Data Management Systems.
3. K G Srinivas, G M Siddesh, “Statistical programming in R”, Oxford Publications.

REFERENCE BOOKS:

1. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbach, Pearson Education.
2. Brian S. Everitt, “A Handbook of Statistical Analysis Using R”, Second Edition, 4 LLC, 2014.
3. Dalgaard, Peter, “Introductory statistics with R”, Springer Science & Business Media, 2008.
4. Paul Teetor, “R Cookbook”, O’Reilly, 2011.

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V Semester Syllabus
CS517PE: WEB PROGRAMMING (PE – I)
[Common to CSE (AI &ML) & CSE (DS)]

Course Objectives

The student should be able to:

- Understand the technologies used in Web Programming.
- Know the importance of object-oriented aspects of Scripting.
- Understand creating database connectivity using JDBC.
- Learn the concepts of web-based application using sockets.

Course Outcomes

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

- Design web pages.
- Use technologies of Web Programming.
- Apply object-oriented aspects to Scripting.
- Create databases with connectivity using JDBC.
- Build web-based application using sockets.

UNIT - I

SCRIPTING: Web page Designing using HTML, Scripting basics- Client side and server side scripting. Java Script- Object, names, literals, operators and expressions- statements and features- events - windows -documents - frames - data types - built-in functions- Browser object model - Verifying forms.-HTML 5-CSS3- HTML 5 canvas - Web site creation using tools.

UNIT – II

JAVA: Introduction to object-oriented programming-Features of Java – Data types, variables and arrays –Operators – Control statements – Classes and Methods – Inheritance. Packages and Interfaces – Exception Handling – Multithreaded Programming – Input/ Output – Files – Utility Classes – String Handling.

UNIT – III

JDBC: JDBC Overview – JDBC implementation – Connection class – Statements - Catching DatabaseResults, handling database Queries. Networking– Inet Address class – URL class- TCP sockets – UDPsockets, Java Beans –RMI.

UNIT – IV

APPLETS: Java applets- Life cycle of an applet – Adding images to an applet – Adding sound to an applet. Passing parameters to an applet. Event Handling. Introducing AWT: Working with Windows Graphics and Text. Using AWT Controls, Layout Managers and Menus. Servlet – life cycle of a servlet.The Servlet API, Handling HTTP Request and Response, using Cookies, Session Tracking. Introduction to JSP.

UNIT – V

XML AND WEB SERVICES: Xml – Introduction-Form Navigation-XML Documents- XSL – XSLT- Web services-UDDI-WSDL-Java web services – Web resources.

TEXT BOOKS:

1. Harvey Deitel, Abbey Deitel, Internet and World Wide Web: How To Program 5th Edition.
2. Herbert Schildt, Java - The Complete Reference, 7th Edition. Tata McGraw- Hill Edition.
3. Michael Morrison XML Unleashed Tech media SAMS.

REFERENCE BOOKS:

1. John Pollock, Javascript - A Beginners Guide, 3rd Edition -- Tata McGraw-Hill Edition.
2. Keyur Shah, Gateway to Java Programmer Sun Certification, Tata McGraw Hill, 2002.

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V Semester Syllabus
CS518PE: IMAGE PROCESSING (PE – I)
[Common to CSE (AI &ML) & CSE (DS)]

Prerequisites

1. Students are expected to have knowledge in linear signals and systems, Fourier Transform, basic linear algebra, basic probability theory and basic programming techniques; knowledge of Digital Signal Processing is desirable.
2. A course on “Computational Mathematics”
3. A course on “Computer Oriented Statistical Methods”

Course Objectives

The student should be able to:

- Provide a theoretical and mathematical foundation of fundamental Digital Image Processing concepts.
- The topics include image acquisition; sampling and quantization; preprocessing; enhancement; restoration; segmentation; and compression.

Course Outcomes

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

- Demonstrate the knowledge of the basic concepts of two-dimensional signal acquisition, sampling, and quantization.
- Demonstrate the knowledge of filtering techniques.
- Demonstrate the knowledge of 2D transformation techniques.
- Demonstrate the knowledge of image enhancement, segmentation, restoration and compression techniques.

UNIT - I

Digital Image Fundamentals: Digital Image through Scanner, Digital Camera. Concept of Gray Levels. Gray Level to Binary Image Conversion. Sampling and Quantization. Relationship between Pixels. Imaging Geometry. 2D Transformations-DFT, DCT, KLT and SVD.

UNIT - II

Image Enhancement in Spatial Domain Point Processing, Histogram Processing, Spatial Filtering, Enhancement in Frequency Domain, Image Smoothing, Image Sharpening.

UNIT - III

Image Restoration Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT - IV

Image Segmentation Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region Oriented Segmentation.

UNIT - V

Image Compression Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Source Encoder and Decoder, Error Free Compression, Lossy Compression.

TEXT BOOK:

1. Digital Image Processing: R.C. Gonzalez & R. E. Woods, Addison Wesley/ Pearson Education, 2nd Ed, 2004.

REFERENCE BOOKS:

1. Fundamentals of Digital Image Processing: A. K. Jain, PHI.
2. Digital Image Processing using MATLAB: Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins: Pearson Education India, 2004.
3. Digital Image Processing: William K. Pratt, John Wiley, 3rd Edition, 2004.

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V Semester Syllabus

CS519PE: DATA WAREHOUSING AND BUSINESS INTELLIGENCE (PE – II)

[Common to CSE (AI &ML) & CSE (DS)(PE-I)]

Course Objectives

The student should be able to:

- This course is concerned with extracting data from the information systems that deal with the day-to-day operations and transforming it into data that can be used by businesses to drive high-level decision making
- Students will learn how to design and create a data warehouse, and how to utilize the process of extracting, transforming, and loading (ETL) data into data warehouses.

Course Outcomes

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

- Understand architecture of data warehouse and OLAP operations.
- Understand Fundamental concepts of BI and Analytics
- Application of BI Key Performance indicators
- Design of Dashboards, Implementation of Web Analytics
- Understand Utilization of Advanced BI Tools and their Implementation.
- Implementation of BI Techniques and BI Ethics.

UNIT - I

DATA WAREHOUSE: Data Warehouse-Data Warehouse Architecture- Multidimensional Data Model-Data cube and OLAP Technology-Data Warehouse Implementation -DBMS schemas for Decision support - Efficient methods for Data cube computation.

UNIT - II

Business Intelligence: Introduction – Definition, Leveraging Data and Knowledge for BI, BI Components, BI Dimensions, Information Hierarchy, Business Intelligence and Business Analytics. BI Life Cycle. Data for BI - Data Issues and Data Quality for BI.

UNIT - III

BI Implementation - Key Drivers, Key Performance Indicators and Performance Metrics, BI Architecture/Framework, Best Practices, Business Decision Making, Styles of BI-vent-Driven alerts-A cyclic process of Intelligence Creation. The value of Business intelligence -Value driven and Informationuse.

UNIT - IV

Advanced BI – Big Data and BI, Social Networks, Mobile BI, emerging trends, Description of different BI-Tools (Pentaho, KNIME)

UNIT - V

Business intelligence implementation-Business Intelligence and integration implementation-connecting in BI systems-Issues of legality- Privacy and ethics- Social networking and BI.

TEXT BOOKS:

1. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER, Elsevier.
2. Rajiv Sabherwal “Business Intelligence” Wiley Publications, 2012.

REFERENCE BOOKS:

1. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business Intelligence Systems, 9th Edition, Pearson Education, 2009.
2. David Loshin, Business Intelligence - The Savy Manager's Guide Getting Onboard with Emerging IT, Morgan Kaufmann Publishers, 2009.
3. Philo Janus, Stacia Misner, Building Integrated Business Intelligence Solutions with SQLServer, 2008 R2 & Office 2010, TMH, 2011.
4. Business Intelligence Data Mining and Optimization for decision making [Author: Carlo-Verellis] [Publication: (Wiley)]
5. Data Warehousing, Data Mining & OLAP- Alex Berson and Stephen J. Smith- Tata McGraw-Hill Edition, Tenth reprint 2007
6. Building the Data Warehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd.
7. Data Mining Introductory and Advanced topics –MARGARET H DUNHAM, PEA.

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V Semester Syllabus
CS522PE: IT Operations - 1(PE – II)
[Common to CSE, CSBS, CSE (AI &ML) & CSE (DS)]

Prerequisites:

1. Understanding of Networks and Machine Learning

Course Objectives

The student should be able to:

- To gain understanding on IT Industry Services.
- To gain ability to recognize situations in production management to quantitative methods in Operations Management decision making.

Course Outcomes

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

- Define IT industry services, activities and Infrastructure.
- Interpret the various roles of IT operations, Corporate Etiquette.
- Illustrate service management of IT and ITIL Basics.
- Understand the basics of AIML & AIOPS

UNIT-I:

Evolution of Technologies & IT-ITES Industry- Overview of the IT Industry, services & activities, IT Production Support and Projects, Skills of Production support engineer

Transmission Media- Telephone lines, Cable Television Lines, satellites antennas, routers, Infrastructure - Data Centers, computers, Computer Networks, Database Management Devices, and a Regulatory system, Support the delivery of business systems and IT-enabled processes.

Introduction to Application Management Services- Services of enterprise application management, increase efficiency, service-oriented culture, cycle time of processes, ensuring uninterrupted IT and business continuity through resilient, reliable and predictable operations.

UNIT-II:

Introduction to IT Operations & Incident Analysis- Infrastructure & configurations, Governance and Disaster Recovery. Roles of IT Operations. IT Operations: IT Monitoring, Ticketing Systems & its life cycle, Shift Operations, Incident Management, Problem Management, Change Management, Escalations.

UNIT-III:

ITIL Basics: Introduction to IT Service Management: Value, Value co-Creation, Service Providers, Service Consumers, Stakeholders, Products, Services, Configuring resources for value creation, service Offerings, Service relationship, Utility & Warranty, Service Management, ITIL guiding Principles.

UNIT-IV:

Introduction to Cloud & Support- Definition, History, Market size, growth roadmap, Cloud Types, Cloud Service Models, Key Players, Key Offerings of Cloud MSPs. Introduction to AWS, AWS Global Infrastructure, Databases types, Sage Maker, DR/BCP Options.

Introduction to AI/ML & AIOPS- History of AI, Structured & Unstructured Data, AI Terminologies, Supervised & Unsupervised Learning, Basic algorithms, Differences between AI/Machine Learning/Deep

Learning, Implications of Artificial Intelligence, and Introduction to Augmented Intelligence led IT Operations includes AIOps platform combines big data and machine learning functionality.

UNIT-V:

Information Security: Introduction to Information Security, Password Management, Email Usage, Internet Usage, Software Compliance & Data Storage. System Threats, Security Violations.

Common Tools: Overview and Introduction of Microsoft 365 entire suite of tools/Applications, Troubleshooting PC problems in Real life Problems.

Corporate Etiquette & Communication: Active Listening Skills, Effective Executive Speaking Skills Verbal Spoken Communication, Telephone Etiquette, Email Etiquette, Meeting Excellence.

Textbooks/References:

- 1.Intelligent Automation by Pascal Bornet, Ian Barkin & Jochen Wirtz
- 2.IT Operations Management, ServiceNow EBook

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V Semester Syllabus
CS523PE: INFORMATION RETRIEVAL SYSTEMS (PE – II)
[Common to CSE (AI &ML) & CSE (DS)]

Prerequisites

1. Data Structures.

Course Objectives

The student should be able to:

- To learn the important concepts and algorithms in IRS
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems

Course Outcomes

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

- Ability to apply IR principles to locate relevant information large collections of data
- Ability to design different document clustering algorithms
- Implement retrieval systems for web search tasks.
- Design an Information Retrieval System for web search tasks.

UNIT - I

Introduction to Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Relationship to Database Management Systems, Digital Libraries and Data Warehouses.

Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities.

UNIT - II

Cataloging and Indexing: History and Objectives of Indexing, Indexing Process, Automatic Indexing, Information Extraction.

Data Structure: Introduction to Data Structure, Stemming Algorithms, Inverted File Structure, N-Gram Data Structures, PAT Data Structure, Signature File Structure, Hypertext and XML Data Structures, Hidden Markov Models.

UNIT - III

Automatic Indexing: Classes of Automatic Indexing, Statistical Indexing, Natural Language, Concept Indexing, Hypertext Linkages.

Document and Term Clustering: Introduction to Clustering, Thesaurus Generation, Item Clustering, Hierarchy of Clusters.

UNIT - IV

User Search Techniques: Search Statements and Binding, Similarity Measures and Ranking, Relevance Feedback, Selective Dissemination of Information Search, Weighted Searches of Boolean Systems, Searching the INTERNET and Hypertext.

Information Visualization: Introduction to Information Visualization, Cognition and Perception, Information Visualization Technologies.

UNIT - V

Text Search Algorithms: Introduction to Text Search Techniques, Software Text Search Algorithms, Hardware Text Search Systems.

Multimedia Information Retrieval: Spoken Language Audio Retrieval, Non-Speech Audio Retrieval, Graph Retrieval, Imagery Retrieval, Video Retrieval.

TEXT BOOK:

1. Information Storage and Retrieval Systems – Theory and Implementation, Second Edition, Gerald J. Kowalski, Mark T. Maybury, Springer

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and Algorithms, Prentice Hall, 1992.
2. Information Storage & Retrieval By Robert Korfhage – John Wiley & Sons.
3. Modern Information Retrieval By Yates and Neto Pearson Education.

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V Semester Syllabus
CS524PE: PATTERN RECOGNITION (PE – II)

Prerequisites

1. Students are expected to have knowledge basic linear algebra, basic probability theory and basic programming techniques;
2. A course on “Computational Mathematics”
3. A course on “Computer Oriented Statistical Methods”

Course Objectives

The student should be able to:

- This course introduces fundamental concepts, theories, and algorithms for pattern recognition and machine learning.
- Topics include: Pattern Representation, Nearest Neighbor Based Classifier, Bayes Classifier, Hidden Markov Models, Decision Trees, Support Vector Machines, Clustering, and an application of hand-written digit recognition.

Course Outcomes

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

- Understand the theory, benefits, inadequacies and possible applications of various machine learning and pattern recognition algorithms
- Identify and employ suitable machine learning techniques in classification, pattern recognition, clustering and decision problems.

UNIT - I:

Introduction: What is Pattern Recognition, Data Sets for Pattern Recognition, Different Paradigms for Pattern Recognition. Representation: Data Structures for Pattern Representation, Representation of Clusters, Proximity Measures, Size of Patterns, Abstractions of the Data Set, Feature Extraction, Feature Selection, Evaluation of Classifier, Evaluation of Clustering.

UNIT - II:

Nearest Neighbor Based Classifier: Nearest Neighbor Algorithm, Variants of the NN Algorithm use of the Nearest Neighbor Algorithm for Transaction Databases, Efficient Algorithms, Data Reduction, Prototype Selection. Bayes Classifier: Bayes Theorem, Minimum Error Rate Classifier, Estimation of Probabilities, Comparison with the NNC, Naïve Bayes Classifier, Bayesian Belief Network.

UNIT - III:

Hidden Markov Models: Markov Models for Classification, Hidden Markov Models, Classification using HMMs. Decision Trees: Introduction, Decision Tree for Pattern Classification, Construction of Decision Trees, Splitting at the Nodes, Overfitting and Pruning, Examples of Decision Tree Induction.

UNIT - IV:

Support Vector Machines: Introduction, Learning the Linear Discriminant Functions, Neural Networks, SVM for Classification. Combination of Classifiers: Introduction, Methods for Constructing Ensembles of Classifiers, Methods for Combining Classifiers.

UNIT - V:

Clustering: Why is Clustering Important, Hierarchical Algorithms, Partitional Clustering, Clustering Large Data Sets. An Application-Hand Written Digit Recognition: Description of the Digit Data, Preprocessing of Data, Classification Algorithms, Selection of Representative Patterns, Results.

TEXT BOOK:

1. Pattern Recognition: An Algorithmic Approach: Murty, M. Narasimha, Devi, V. Susheela, Spinger Pub, 1st Ed.

REFERENCE BOOKS:

1. Machine Learning - Mc Graw Hill, Tom M. Mitchell.
2. Fundamentals Of Speech Recognition: Lawrence Rabiner and Biing- Hwang Juang. Prentice-Hall Pub.

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V Semester Syllabus

CS525PE: COMPUTER VISION AND ROBOTICS (PE – II)

[Common to CSE (AI & ML) & CSE (DS)]

Prerequisites

1. UG level Course in Linear Algebra and Probability.

Course Objectives

The student should be able to:

- To understand the Fundamental Concepts Related To sources, shadows and shading.
- To understand the Geometry of Multiple Views.

Course Outcomes

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

- Implement fundamental image processing techniques required for computer vision.
- Implement boundary tracking techniques.
- Apply chain codes and other region descriptors, Hough Transform for line, circle, and ellipsedetections.
- Apply 3D vision techniques and Implement motion related techniques.
- Develop applications using computer vision techniques.

UNIT - I

CAMERAS: Pinhole Cameras.

Radiometry – Measuring Light: Light in Space, Light Surfaces, Important Special Cases.

Sources, Shadows, And Shading: Qualitative Radiometry, Sources and Their Effects, Local Shading Models,

Application: Photometric Stereo, Interreflections: Global Shading Models.

Color: The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

UNIT - II

Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates.

Edge Detection: Noise, Estimating Derivatives, Detecting Edges.

Texture: Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

UNIT - III

The Geometry of Multiple Views: Two Views

Stereopsis: Reconstruction, Human Stereopsis, Binocular Fusion, Using More Cameras **Segmentation by Clustering:**

What Is Segmentation? Human Vision: Grouping and Gestalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

UNIT - IV

Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness

Segmentation and Fitting Using Probabilistic Methods: Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice.

Tracking with Linear Dynamic Models: Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples

UNIT - V

Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations.

Geometric Camera Calibration: Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into Account, Analytical Photogrammetry, An Application: Mobile Robot Localization.

Model-Based Vision: Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment.

TEXT BOOKS:

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning(Indian Edition), 2009.

REFERENCE BOOKS:

1. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier(Academic Press), 4th edition, 2013.
2. R. C. Gonzalez and R. E. Woods “Digital Image Processing” Addison Wesley 2008.
3. Richard Szeliski “Computer Vision: Algorithms and Applications” Springer-Verlag London Limited 2011.

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V Semester Syllabus
MC503ES: Essence of Indian Knowledge Tradition Part-1

Course Objective:

- The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional knowledge Systems connecting society and nature. Holistic life style of yogic science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions. Part-I focuses on introduction to Indian Knowledge Systems, Indian perspective of modern scientific world- view, and basic principles of Yoga and holistic health care system.

Course Outcome:

- Ability to understand, connect up and explain basics of Indian traditional knowledge in modern scientific perspective.

Course Contents

- Basic structure of Indian Knowledge System: अ ा Tदिशव4ा T -8वा द,8उपवा द (आया वद, धनवद, गNववा द, 3थTपÆ िाद) द्वा दT ा ग (िा शाा T, क3/4, िा न7^a, ा Tकरण, 3/4ा िा तष, छा द) 8 उपTडा ग (धमशाT™, मीमT ा सT, पा रण, तकशाT™)
- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case studies

REFERENCE BOOKS:

- Knowledge traditions and practices of India, CBSE Publication.
- V. Sivaramakrishnan (Ed.), Cultural Heritage of India-course material, Bharatiya Vidya Bhavan,Mumbai. 5th Edition, 2014.
- Swami Jitatmanand, Modern Physics and Vedantharatiya Vidya Bhavan.
- Swami Jitatmanand, Holistic Science and Vedantharatiya Vidya Bhavan.
- FritzoF Capra, Tao of Physics.
- FritzoF Capra, The Wave of life.
- VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation,Velliarnad, Arnakulam.
- Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata.
- GN Jha (Eng. Trans.), Ed. RN Jha, Yoga-darshanam with Vyasa Bhashya, VidyanidhiPrakashan, Delhi 2016
- RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakashan,Delhi 2016.
- P B Sharma (English translation), Shodashang Hridayan

Pedagogy:

Problem based learning, group discussions, collaborative mini projects.

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V Semester Syllabus CS553PC: MACHINE LEARNING LAB

Objectives

The student should be able to:

- The objective of this lab is to get an overview of the various machine learning techniques and can able to demonstrate them using python.

Course Outcomes

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

- Understand complexity of Machine Learning algorithms and their limitations;
- Understand modern notions in data analysis-oriented computing;
- Be capable of confidently applying common Machine Learning algorithms in practice and implementing their own;
- Be capable of performing experiments in Machine Learning using real-world data.

List of Experiments

- The probability that it is Friday and that a student is absent is 3 %. Since there are 5 school days in a week, the probability that it is Friday is 20 %. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)
- Extract the data from database using python
- Implement k-nearest neighbours classification using python
- Given the following data, which specify classifications for nine combinations of VAR1 and VAR2 predict a classification for a case where VAR1=0.906 and VAR2=0.606, using the result of k- means clustering with 3 means (i.e., 3 centroids)

VAR1	VAR2	CLASS
1.713	1.586	0
0.180	1.786	1
0.353	1.240	1
0.940	1.566	0
1.486	0.759	1
1.266	1.106	0
1.540	0.419	1
0.459	1.799	1
0.773	0.186	1

- The following training examples map descriptions of individuals onto high, medium and low credit-worthiness.
 - medium skiing design single twenties no -> highRisk
 - highgolf trading married forties yes -> lowRisk
 - low speedway transport married thirties yes -> medRisk
 - medium football banking single thirties yes -> lowRisk
 - highflying media married fifties yes -> highRisk
 - low football security single twenties no -> medRisk
 - medium golf media single thirties yes -> medRisk
 - medium golf transport married forties yes -> lowRisk high
 - skiing banking single thirties yes -> highRisk
 - low golf unemployed married forties yes -> highRisk
 Input attributes are (from left to right) income, recreation, job, status, age-group, home-owner. Find the unconditional probability of `golf` and the conditional probability of `single` given `medRisk` in the dataset?
- Implement linear regression using python.
- Implement Naïve Bayes theorem to classify the English text
- Implement an algorithm to demonstrate the significance of genetic algorithm
- Implement the finite words classification system using Back-propagation algorithm

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V Semester Syllabus

CS557PC: COMPUTER NETWORKS LAB

[Common to CSE, CSE (AI &ML) & CSE (DS)]

Course Objectives

The student should be able to:

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology and observe its performance
- To analyze the traffic flow and the contents of protocol frames.

Course Outcomes

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

- Implement data link layer framing methods
- Analyze error detection and error correction codes.
- Implement and analyze routing and congestion issues in network design.
- Implement Encoding and Decoding techniques used in presentation layer
- To be able to work with different network tools

List of Experiments

1. Write a program to implement framing.
 - i. Fixed framing, ii. Variable framings
2. Write a program to implement stuffing techniques.
 - i. Bit-stuffing ii. Character stuffing
3. Write a program to implement checksum
4. Write a program to compute CRC code for the polynomial CRC-12
5. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
6. Write a program to implement classful addressing.
7. Write a program to implement classless addressing.
8. Write a program to implement Dijkstra's algorithm to compute the shortest path through a network
9. Write a program to divide a given network into n-sub networks.
10. Implement distance vector routing algorithm for obtaining routing tables at each node.
11. Write a program to implement Link state routing
12. Write a program for congestion control using Leaky bucket algorithm
13. Implement data encryption and data decryption.

Suggested Reading:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI,2011.
2. Data Communications and Networking – Behrouz A. Forouzan. Fifth Edition TMH, 2017..

Reference Books:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. "Data and Computer Communications" by William Stallings 9 th Edition, Pearson Education 2010.
3. "TCP/IP Illustrated" by W. Richard Stevens, Addison-Wesley Professional; 2nd edition 2011.

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EN553HS: *Advanced Communication Skills Lab*
[Common to CSBS, CSE (AI&ML) & CSE (DS)]

Course Objectives:

This Lab focuses on using multi-media instruction for language development to meet the various needs of the students. The objectives of the course are as follows:

- To improve students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- To enable them to communicate their ideas relevantly and coherently in writing.
- To facilitate placement activities for the students.
- To make the students participate in both oral as well as written presentation skills.
- To equip the students to be efficient in Group Discussions, Presentation Skills and Interview Skills.

Course Outcomes:

Students will be able to:

- Acquire English language vocabulary and use it contextually
- Listen and speak effectively in English language
- Develop proficiency in academic reading and writing skills
- Increase possibilities of job prospects in their respective domain
- Communicate confidently in formal and informal contexts

INTRODUCTION:

Advanced English Communication Skills Lab is considered essential as the students need to prepare themselves for their careers which may require them to listen, speak, read and write in English both for their professional and interpersonal communication in the globalized context. This course would enable students to use English effectively and perform the following:

1. Gathering ideas and information to organize ideas relevantly and coherently.
2. Participating in group discussions.
3. Facing interviews.
4. Writing project/research reports/technical reports.
5. Making oral presentations.
6. Writing formal letters.
7. Transferring information from non-verbal to verbal texts and vice-versa.
8. Taking part in social and professional communication.

Unit – I

Inter-personal Communication – Building General, Technical and Business English Vocabulary – Formal meeting–planning and circulating agenda–opening the meeting–during the meeting–closing the meeting–responding appropriately and relevantly – using the right body language-general-technical-business- vocabulary, analogy.

Unit – II

Reading Comprehension: Reading for facts-skimming-scanning-guessing meanings from context, inferring meaning, critical reading, effective online navigation, sample passages from TOEFL/GRE/IELTS.

Unit – III

Writing Skills: Planning for writing, structure and presentation of different types of writing - letter writing/resume writing, email netiquette, project report writing – feasible/business/ periodical/academic reports.

Unit – IV

Presentation Skills: Brief speeches-introduction to a structured talk– oral presentations (individual and group) /PPTs, gambits of presentation skills – use of tag questions, summarising after a brief talk, opening/during/concluding a presentation.

Unit – V

Group Discussion and Interview Skills: Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation - concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and mock interviews.

Text Books:

1. Effective Technical Communication by M Ashraf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5th Edition.

References:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning Pvt. Ltd. New Delhi.
5. English Vocabulary in Use Series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. Mc Murrey & Joanne Buckley, 2012, Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, AyshaVishwamohan, Tata Mc Graw-Hill 2009.
10. How to Write and Speak Better, Reader's Digest, 2003
11. Cambridge IELTS 16 Academic student's book with answers, 2017
12. TOEFL Reading & Writing Workout, The Princeton Review.
13. GRE Reading Comprehension: Detailed Solutions to 325 questions. Vibrant Publishers, 2017
14. How to prepare for Group Discussions and Interviews by Harimohan Prasad and Rajneesh Prasad, Tata Mc graw Hill.
15. Keep Talking, Frederick Klippel, Cambridge University Press, South Asian edition (6 May 2010),
16. Objective English, Edgar Thorpe & Showick Thorpe, Pearson; 5th edition (1 August 2013).

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V Semester Syllabus

MC501HS: Intellectual Property Rights

(Common to CSE, CSBS, CSD, CSE (AI&ML)& IT)

Course Objectives: The objectives of the course are:

- To enable the students to have an overview of Intellectual Property Rights
- To provide comprehensive knowledge to the students regarding Trademarks Registration process and law related to it.
- To disseminate knowledge on Copyrights, its related rights and recent developments.
- To make the students understand Patent Regime in India and abroad.
- To understand the framework of Trade secrets

Course Outcomes: After completion of the course students will be able to:

- Gain knowledge on Intellectual property rights and their importance.
- Understand Indian and international Trademark Law and procedure for registration of Trademarks.
- Acquire knowledge on Copyright Law, and the privileges awarded to the copyright owners.
- Familiarized with the process of acquiring the patent and relevant laws.
- Learn the importance of trade secrets for business sustainability.

UNIT – I

Introduction to Intellectual property

Introduction of IPR-Meaning of intellectual property, types of intellectual property-trademarks, copyrights, patents, trade secrets, importance of intellectual property rights, International organizations-WTO-WIPO-USPTO-INTA, International Conventions, agencies and treaties- Paris Convention-Berne Convention- Madrid Protocol-NAFTA-PCT-GATT-TRIPS.

UNIT – II

Trademarks

Trademarks: Purpose and functions of Trademarks-Categories of marks, acquisition of Trademark rights - Protectable matter - Selecting and evaluating Trademark- Trademarks registration process – Trademark Infringement - Remedies for infringement in Trademarks-New developments in Trademark Law- International Trademarks Law.

UNIT III

Copyright

Copyrights-Fundamental of Copyright Law -Requirements of Copy right ability- Originality of material, fixation of material, Authorship works, exclusions from copyright protection- Rights of Copyright Owner-Right of reproduction of copyrighted work, right to do derivative works ,right to distribute copies of the copyrighted work, right to perform the work publicly, right to display the copyrighted work, – Copyright Ownership issues – Joint Works, Works made for Hire, Specially commissioned works, Copyright Registration - Notice of Copyright – Copyright Infringement -

Remedies for infringement in Copyrights- New developments in Copyright Law- International Copyright Law.

UNIT IV:

Patents: Concept of Patent - Classification – Utility Patents – Design Patents and Plant Patents, Patent searching process-Types of Patent Applications-Patent Registration Process, Ownership, Transfer, Assignment and Licensing of Patent-Patent Infringement, Remedies for Infringement of Patents, New developments in Patent Law- International Patent Law.

UNIT – V:

Trade Secrets & Law of Unfair Competition

Trade Secrets: Trade secret law, determination of trade secret status, measures for protecting trade secret status- Liability for misappropriations of trade secrets, protection for submissions, trade secret litigation. New developments in Trade secrets Law- International Trade Secrets.

Law of Unfair competition: Passing off, Misappropriation, right of publicity, dilution of trademarks, product disparagement, false advertising.

Text Books:

1. Deborah. E. Bouchoux, Intellectual property, 4 e, Cengage learning India Pvt.Ltd., 2013
2. Prabuddha Ganguli, Intellectual property right, 8e, Tata McGraw Hill Publishing company, 2016
3. Dr.B.L.Wadehra, Law Relating to Intellectual Property, 5 e, Universal Law Publishing Co. 2011.

References

1. Richard Stim, Intellectual Property, 3e Cengage learning India Pvt.Ltd., 2017
2. Vinod.V.Sopele, Asoka K.Ghosh, Managing Intellectual Property, 2 e, 2010
3. Ananth Padmanabhan, Intellectual Property Rights – Infringement and Remedies, Lexis Nexis Publishers, 2012

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VI Semester Syllabus CS603PC: ARTIFICIAL INTELLIGENCE

Prerequisites:

1. A course on “Computer Programming and Data Structures”
2. A course on “Advanced Data Structures”
3. A course on “Design and Analysis of Algorithms”
4. A course on “Mathematical Foundations of Computer Science”
5. Some background in linear algebra, data structures and algorithms, and probability will all be helpful

Course Objectives

To Learn

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes

After learning the contents of this paper, the student must be able to

- Ability to formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a given problem.
- Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

UNIT - I

Problem Solving by Search-I: Introduction to AI, Intelligent Agents

Problem Solving by Search –II: Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment .

UNIT - II

Problem Solving by Search-II and Propositional Logic

Adversarial Search: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

Propositional Logic: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

UNIT - III

Logic and Knowledge Representation

First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, 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.

UNIT - IV

Planning

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

Planning and Acting in the Real World: Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT - V

Uncertain knowledge and Learning

Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

TEXT BOOK:

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rdEdn, E. Rich and K.Knight (TMH)
2. Artificial Intelligence, 3rdEdn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, ShivaniGoel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

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VI Semester Syllabus

CS607PC: Dev Ops

Course Objectives

The main objectives of this course are to:

- Describe the agile relationship between development and IT operations.
- Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability.
- Implement automated system update and DevOps lifecycle.

Course Outcomes

- Identify components of Devops environment.
- Describe Software development models and architectures of DevOps.
- Apply different project management, integration, testing and code deployment tool.
- Investigate different DevOps Software development models.
- Assess various Devops practices.
- Collaborate and adopt Devops in real-time projects.

UNIT - I

Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT - II

Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.
DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT - III

Introduction to project management: The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT - IV

Integrating the system: Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT - V

Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development

Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

TEXT BOOKS:

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN- 10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

REFERENCE BOOK:

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley; ISBN-10.

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VI Semester Syllabus

CS609PC:NATURAL LANGUAGE PROCESSING

Prerequisites

1.Data structures, finite automata and probability theory.

Course Objectives

- Introduce to some of the problems and solutions of NLP and their relation to linguistics and statistics.

Course Outcomes

- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- Able to design, implement, and analyze NLP algorithms
- Able to design different language modeling Techniques.

UNIT - I

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches

UNIT - II

Syntax Analysis: Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues

UNIT - III

Semantic Parsing: Introduction, Semantic Interpretation, System Paradigms, Word Sense Systems, Software.

UNIT - IV

Predicate-Argument Structure, Meaning Representation Systems, Software.

UNIT - V

Discourse Processing: Cohension, Reference Resolution, Discourse Cohension and Structure

Language Modeling: Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modeling

TEXT BOOKS:

- 1.Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and ImedZitouni, Pearson Publication
- 2.Natural Language Processing and Information Retrieval: TanvierSiddiqui, U.S. Tiwary

REFERENCE BOOK:

1. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, Pearson Publications

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VI Semester Syllabus

CS618PE: INTERNET OF THINGS

(Professional Elective – III)

[Common to CSE(for PE-II), CSBS & CSE (AI &ML)]

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 Programming Raspberry Pi with Python.
- To introduce the hardware and working principles of various sensors used for IoT

Course Outcomes: On successful completion of the course, the student will:

- Understand the concepts of Internet of Things.
- Design IoT applications in different domain and be able to analyze their performance.
- Able to know the Language features of Python.
- Able to know about working of Raspberry Pi
- Able to know the working of various Sensors.

Unit I:

Introduction to Internet of Things

Introduction, Definition and Characteristics of IoT, Physical Design of IoT- Things in IoT, IoT Protocols, Logical Design of IoT- IoT Functional Blocks, IoT communication models, IoT Communication APIs. **IoT Enabling Technologies** — Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Deployment Templates- IoT Level-1, IoT Level-2, IoT Level-3, IoT Level-4, IoT Level-5, IoT Level-6.

Unit II:

Domain Specific IoT

Introduction , Home Automation- Smart Lighting, Smart Appliances, Intrusion Detection, Smoke/Gas Detectors, Smart Cities- Smart Parking, Smart lighting, Smart roads, Structural Health Monitoring, Surveillance, Emergency Response, Environment- Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring, Forest Fire Detection, River Floods Detection, Energy- Smart Grids, Renewable Energy Systems, Prognostics, Retail- Inventory Management, Smart Payments, Smart Vending Machines, Logistics- Route Generation & Scheduling, Fleet Tracking, Shipment Monitoring, Remote Vehicle Diagnostics, Agriculture- Smart Irrigation, Green House Control, Industry- Machine Diagnosis & Prognosis, Indoor Air Quality Monitoring, Health & Lifestyle- Health & Fitness Monitoring, Wearable Electronics. IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software Defined Networking, Network Function Virtualization

Unit III:

IoT Systems - Logical Design using Python- Introduction, Python Data Types & Data Structures-

Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, **Control Flow-** if, for, while, range, break/continue, pass

Functions, Modules, Packages, File Handling, Date/Time Operations, Classes, Python Packages of Interest for IoT- JSON, XML, HTTP Lib, URL Lib, SMTP Lib

Unit IV:

IoT Physical Devices and Endpoints - What is an IoT Device- Basic building blocks of an IoT Device, **Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces** - serial,SPI,I2C, **Programming Raspberry Pi with Python-** Controlling LED with Raspberry Pi, interfacing an LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi.

Unit V:

Buzzer- Function of a Buzzer, Two Kinds of Buzzer, **Relays-** What is a Relay, Its Working, Relay Uses, Why Relay is used in Motor Control, Relay Module.

Sensors: What is an IoT Sensor, **IoT Sensors Types-** Pressure Sensors, Light Sensors, Temperature & Humidity Sensors, **Working with Camera Module.**

Text Books:

1. Internet of Things-A Hands-on Approach, Arshdeep Bahgaand Vijay Madiseti, Universities Press, 2015, ISBN:9788173719547
2. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

Reference Books:

1. Getting Started with RaspberryPi, Matt Richardson & Shawn Wallace, O'Reilly(SPD), 2014, ISBN:9789350239759
2. RaspberryPi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895
3. A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series in Sensors) 1st Edition, Kindle Edition by [Volker Ziemann](#) 2018.

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VI Semester Syllabus

CS619PE: IT OPERATIONS -2 (Professional Elective – III)

[Common to CSBS, CSE (AI &ML) & CSE (DS)]

Course Objectives:

- Learn concepts of virtualization and Big Data Tools.
- To understand SRE principles, Service now workflows and management.

Course Outcomes

Students would be able to

- Demonstrate the concepts of virtualization.
- Discuss the different methods and tools of Big Data.
- Review the principles and practices of SRE.
- Interpret and understand the case studies of Service now and RPA.

UNIT-1:

Introduction to Cloud: Introduction to Virtualization, Types of hardware Virtualization, Desktop virtualization: Software virtualization – Memory virtualization - Storage virtualization – Data virtualization – Network virtualization. Layers in cloud architecture, Types of Cloud Services, VMware Virtualization, CloudSim Simulator.

UNIT-2:

Big Data & Data Science: Introduction, Trends of Computing for Big Data, Big Data Overview, Big Data Tools – HADOOP, Advanced Analytical Theory and methods, High-performance Networking for Big Data.

UNIT-3:

Site Reliability Engineering (SRE): Introduction, Overview of Agile, ITSM. SRE Principles and Practices, Service Level Objectives, Error Budgets. Toil Management, Monitoring and Service Level Indicators, CI-CD Tools and Automation.

UNIT-4:

Introduction to Service NOW: Core Configuration, User Administration, Manage Data, Process Applications, Workflows, Case Studies.

UNIT-5:

Robotic Process Automation: Robotic Automation Process, Process Flow, Inputs and outputs, Error Management, Case Management.

Textbooks/References:

1. Intelligent Automation by Pascal Bornet, Ian Barkin&JochenWirtz
2. IT Operations Management, ServiceNow EBook David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Centre, Auerbach
3. Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
4. Cloud Computing (Principles and Paradigms), Edited by RajkumarBuyya, James Broberg, AndrzejGoscinski, John Wiley & Sons, Inc. 2011
5. Business Analytics: The Science of Data - Driven Decision Making, U Dinesh Kumar, John Wiley & Sons.
6. Introducing Data Science: Big Data, Machine Learning, and More, Using PythonTools, Davy Cielen, John Wiley & Sons.

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VI Semester Syllabus
CS622PE: MOBILE APPLICATION DEVELOPMENT
 (Professional Elective – III)
 [Common to CSBS, CSE (AI & ML) & CSE (DS)]

Prerequisites

- Acquaintance with JAVA programming.
- A Course on DBMS.

Course Objectives

The student should be able to:

- To demonstrate their understanding of the fundamentals of Android operating systems.
- To improve their skills of using Android software development tools.
- To demonstrate their ability to develop software with reasonable complexity on mobile platform.
- To demonstrate their ability to deploy software to mobile devices.
- To demonstrate their ability to debug programs running on mobile devices.

Course Outcomes

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

- Student understands the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- Student will be able to develop, deploy and maintain the Android Applications.

UNIT - I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools

Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT - II

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s Layouts – Linear, Relative, Grid and Table Layouts

User Interface (UI) Components – Editable and non-editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers

Event Handling – Handling clicks or changes of various UI components

Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT - III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS

Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity

Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT - IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

UNIT - V

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.

REFERENCE BOOK:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

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VI Semester Syllabus CS623PE: DATA MINING (Professional Elective – III)

Prerequisites

- A course on “Database Management Systems”
- Knowledge of probability and statistics

Course Objectives

- It presents methods for mining frequent patterns, associations, and correlations.
- It then describes methods for data classification and prediction, and data–clustering approaches.
- It covers mining various types of data stores such as spatial, textual, multimedia, streams.

Course Outcomes

- Ability to understand the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.
- Apply preprocessing methods for any given raw data.
- Extract interesting patterns from large amounts of data.
- Discover the role played by data mining in various fields.
- Choose and employ suitable data mining algorithms to build analytical applications
- Evaluate the accuracy of supervised and unsupervised models and algorithms.

UNIT - I

Data Mining: Data–Types of Data–, Data Mining Functionalities– Interestingness Patterns– Classification of Data Mining systems– Data mining Task primitives –Integration of Data mining system with a Data warehouse–Major issues in Data Mining–Data Preprocessing.

UNIT - II

Association Rule Mining: Mining Frequent Patterns–Associations and correlations – Mining Methods– Mining Various kinds of Association Rules– Correlation Analysis– Constraint based Association mining. Graph Pattern Mining, SPM.

UNIT - III

Classification: Classification and Prediction – Basic concepts–Decision tree induction–Bayesian classification, Rule–based classification, Lazy learner.

UNIT - IV

Clustering and Applications: Cluster analysis–Types of Data in Cluster Analysis–Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Outlier Analysis.

UNIT - V

Advanced Concepts: Basic concepts in Mining data streams–Mining Time–series data—Mining sequence patterns in Transactional databases– Mining Object– Spatial– Multimedia–Text and Web data – Spatial Data mining– Multimedia Data mining–Text Mining– Mining the World Wide Web.

TEXT BOOKS:

- 1.Data Mining – Concepts and Techniques – Jiawei Han &MichelineKamber, 3rd Edition Elsevier.
- 2.Data Mining Introductory and Advanced topics – Margaret H Dunham, PEA.

REFERENCE BOOK:

- 1.Ian H. Witten and Eibe Frank, Data Mining: Practical Machine Learning Tools and Techniques (Second Edition), Morgan Kaufmann, 2005.

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VI Semester Syllabus
CS624PE: CRYPTOGRAPHY AND NETWORK SECURITY
(Professional Elective - III)
[Common to CSE (AI & ML) & CSE (DS)]

Course Objectives

The student should be able to:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.
- Understand the basic categories of threats to computers and networks
- Describe public-key cryptosystem.
- Describe the enhancements made to IPv4 by IPSec
- Understand Intrusions and intrusion detection
- Discuss the fundamental ideas of public-key cryptography.
- Generate and distribute a PGP key pair and use the PGP package to send an encrypted e- mail message.
- Discuss Web security and Firewall

Course Outcomes

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

- Student will be able to understand basic cryptographic algorithms, message and web authentication and security issues.
- Ability to identify information system requirements for both of them such as client and server.
- Ability to understand the current legal issues towards information security.

UNIT - I

Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security **Cryptography Concepts and Techniques:** Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT - II

Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.

Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT - III

Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), **Message authentication codes:** Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.

Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

UNIT - IV

Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

UNIT - V

E-Mail Security: Pretty Good Privacy, S/MIME **IP Security:** IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange

Case Studies on Cryptography and security: Secure Multiparty Calculation, Virtual Elections, Single sign On, Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability.

TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: AtulKahate, McGraw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: ForouzanMukhopadhyay, McGraw Hill, 3rd Edition.
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

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VI Semester Syllabus
CS624OE: DATA STRUCTURES (Open Elective - I)
(Offered by CSE)

Prerequisites:

1. Any programming language
- 2.

Course Objectives

The student should be able to:

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as trees and graphs
- Understand the concepts of heaps and tries.
- Introduces sorting and pattern matching algorithms

Course Outcomes

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

- Understand basic data structures such as arrays, linked lists, stacks and queues.
- Describe the hash function and concepts of collision and its resolution methods.
- Understand, design and implement the general tree data structures with their applications.
- Solve problem involving graphs, trees and heaps.
- Implement and know the application of algorithms for sorting and pattern matching.

Unit I :

Introduction: Data structures-definition and types,Static and Dynamic representation of data structure and comparison.
Stack:definition, operations on stacks, Notations-Infix, Prefix and Postfix representation. Infix to Postfix conversion example. Evaluation of Postfix expression example.

Unit II :

Hashing: Hash Functions, collision resolution techniques- Separate Chaining, Open Addressing-Linear probing, Quadratic Probing, Double Hashing.Rehashing, Extensible Hashing.

Dictionaries: Linear list representation, skip list representation, operations - insertion, deletion and searching.

Unit III :

Trees: Basic terminology, Types of trees: Binary Tree, Complete and Full Binary Tree, Extended Binary Trees, Threaded Binary Trees. **Search Trees:** Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, Splay Trees-Insertion.

Unit IV:

Graphs-Basic terminology, Representation of graphs,**Graph Traversals**-Breadth First Search, Depth First Search with algorithms.

Sortings: Heap Sort, External Sorting- Model for external sorting, Merge Sort.

Unit V :

Pattern matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries

Text Books:

1. Horowitz and Sahani, Fundamentals of Data Structures, Galgotia Publications Pvt Ltd Delhi India.
2. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, Data Structures Using C and C++, PHI Learning Private Limited, Delhi India.

Reference Books:

1. Richard F. Gillberg & Behrouz A. Forouzan, Data Structures, A Pseudo code Approach with C, Second Edition, Cengage Learning, India Edition, 2005.
2. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, Data Structures Using C and C++, PHI Learning Private Limited, Delhi India.
3. Seymour Lipschutz, Schaum's Outlines, Data Structures, Special Second Edition, Tata McGraw-Hill,.

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V Semester Syllabus

CS625OE: Operating Systems(OpenElective – I)

(Offered by CSE)

Course Objectives

The student should be able to:

- To understand the OS role in the overall computer system and study different OS and compare their features.
- To understand the scheduling policies of OS and introduces system call Interface for process management.
- To understand process concurrency and synchronization.
- To understand the different memory management techniques.
- To understand the concepts of input/output, file management and Introduces system call for file management.

Course Outcomes

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

- Define the fundamental components of a computer operating system and the interactions among them.
- Analyse the performance of CPU scheduling algorithms.
- Ability to design and solve synchronization problems using semaphores and monitors.
- Illustrate memory management techniques and deadlock handling methods.
- Ability to change Access control to protect files..

Unit – I

Operating System – Introduction: Operating system objectives, User view, System view, Operating system definition, Computer System Architecture, OS Operations, **System Structures:** Operating System services, System Calls, Types of System Calls, System Programs, OS Structure.

Unit – II

Process and CPU Scheduling –Process concept: The Process, Process State, PCB, Threads. Process Scheduling- Scheduling Queues, Schedulers, Context Switch, and Operations on Processes.

Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems using pipes, FIFOs, message queues, shared memory. System call interface for process management- fork(), exit(), wait(), waitpid(), exec().

Unit – III

Process Management and Synchronization- The Critical Section Problem, Peterson’s solution, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Monitors.

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

Unit – IV

Memory Management and Virtual Memory: – Memory Management Strategies- Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of Page Table.

Virtual Memory Management-Background, Demand Paging, Copy-on-Write, Page Replacement, Page Replacement Algorithms-FIFO, Optimal, LRU, Allocation of Frames, Thrashing.

Unit – V

File System Interface and Operations -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management.

System Calls-Usage of open(), create(), read(), write(), close(), lseek(), stat(), ioctl() system calls.Study of Different Operating Systems: Windows, Unix and Android.

Text Books

1. Abraham Silberchatz, Peter B. Galvin ,Operating System Principles-, Greg Gagne 9th Edition, John Wiley, 2014.
2. Operating Systems – Internals and Design Principles, W. Stallings, 7th Edition, Pearson, 2012.

Reference Books

1. Crowley, TMH, Operating System A Design Approach-
2. Andrew S, Modern Operating Systems, Tanenbaum 2nd edition, Pearson/PHI W.R. Stevens, Advanced programming in the UNIX environment, Pearson education.
3. Operating Systems-A Concept based Approach by Dhamdhare, TMH, 2nd Edition.

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V Semester Syllabus

CS626OE: Database Management Systems(Open Elective-1)

(Offered by CSE)

Prerequisites:

1. Data structures

Course Objectives:

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- To understand the relational database design principles.
- To apply the concurrency control, recovery, and indexing for the real time data
- To become familiar with database storage structures and access techniques

Course Outcomes:

- Design a database using ER modelling.
- Develop complex queries using SQL.
- Apply normalization techniques on databases.
- Explain the ACID properties of transactions and apply the serializability tests.
- Solve problems using various indexing and hashing techniques..

Unit I

Introduction: Purpose of Database Systems, View of Data, Database Languages, Database Models, Database Architecture, Database System Applications.

Introduction to Data base design: Database Design and ER diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

Unit II

Relational Model: Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data

SQL: Queries, Constraints, Form of Basic SQL Query, UNION, INTERSECT, and EXCEPT, Nested Queries, Aggregate Operators, NULL values Complex Integrity Constraints in SQL, Introduction to Views.

Unit III

Functional Dependencies -Introduction, Basic Definitions, Trivial, Non Trivial functional dependencies, Closure of set of dependencies, Closure of Attributes

Schema Refinement: Problems caused by redundancy, decompositions, Properties of decomposition, Normalization- FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal form.

Unit IV

Transaction Management and Recovery: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols.

Unit V

Storage and Indexing: Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure- Insertion, Deletion and Searching.

Text Books:

1. Raghu Ramakrishnan, Johannes Gehrke ,Data base Management Systems, , McGraw Hill Education (India) Private Limited, 3rd Edition.
2. A. Silberschatz, Henry. F. Korth, S. Sudarshan, Data base System Concepts, McGraw Hill Education(India) Private Limited, 6th edition.

REFERENCE BOOKS:

1. R Elmasri, ShamkantB.Navathe, Database Systems, 6th edition, Pearson Education.
2. M. L. Gillenson and others, Introduction to Database Management, Wiley Student Edition.
- 3.C. J. Date, Database Development and Management, Introduction to Database Systems, Pearson Education.

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VI-Semester
MC602ES: CYBER SECURITY
(Common to all Branches)

Course objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes:

The students will be able

- To understand various cyber-attacks and cybercrimes.
- Knowledge about cyber laws and cyber forensics.
- Summarize cybercrimes in mobile and wireless devices, how to protect them
- Knowledge about IPR issues in cyber space and cyber terrorism.
-

UNIT-I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, IP spoofing, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Comprehensive Cyber Security Policy.

UNIT-II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT-III

Cyber crime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations.

UNIT-IV

Cyber Security: Organizational Implications: Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cybercriminals.

UNIT-V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains-medical, financial, etc.

TEXTBOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley, India 2012.
2. B.B.Gupta, D.P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. Mark F. Grady, Francesco Parisi, “The Law and Economics of Cyber security”, Cambridge University Press, 2006.
2. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press, 2016.
3. Introduction to Cyber Security, Chwan - Hwa (John) Wu, J. David Irwin, CRC Press T&F Group.

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VI Semester
MA654BS:Finishing School-IV
(Quantitative Aptitude & Analytical Ability)
(Common to CSE, IT, CSB, CSM & CSD)

Course Objectives:

This is a foundation course and aims to enhance employability skills in students.

- Students will be introduced to higher order thinking skills and problem-solving on the following areas - Arithmetic ability, Numerical ability and General reasoning.
- Students will be trained to work systematically with speed and accuracy while solving problems.

Course Outcomes:

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

- Solve questions on the above-mentioned areas using shortcut and smart methods
- Understand the fundamental concepts of Aptitude skills
- Perform calculations with speed and accuracy

UNIT 1: QUANTITATIVE APTITUDE - NUMERICAL ABILITY

- Number system
- Divisibility Rules
- Square root
- Cube root
- Problems on numbers
- LCM and HCF

UNIT 2: QUANTITATIVE APTITUDE- ARITHMETIC ABILITY-I

- Percentage
- Ratio proportions
- Averages
- Profit, loss and discounts
- Simple and Compound interest

UNIT3: QUANTITATIVE APTITUDE- ARITHMETIC ABILITY-II

- Pipes and Cisterns
- Ages
- Time- Work-Speed-Distance
- Clocks & Calendars
- Venn diagrams
- Tables and graphs

UNIT 4: REASONING ABILITY – GENERAL REASONING-I

- Coding decoding
- Directions
- Series completions - Letter, Number & Element Series
- Seating arrangements
- Symbols and Notations

UNIT 5: REASONING ABILITY- GENERAL REASONING -II

- Analogies
 - Alphabet Analogy
 - Numerical Analogy
- Classification
 - Alphabet Classification
 - Word Classification
 - Miscellaneous Classification
- Alphabet test
 - Arranging words in Alphabetical Order
 - Problems based on Letter-Word
 - Problems based on Alphabetical Quibble
- Blood Relations

REFERENCES:

1. R.S. Aggarwal - Quantitative Aptitude for Competitive Examinations.
2. Arun Sharma - Quantitative Aptitude for CAT.
3. Arihant Publications - Fast Track Objective Arithmetic.
4. Sarvesh K.-Quantitative aptitude
5. A New Approach to Reasoning Verbal & Non-Verbal, Book by B.S. Sijwalii and InduSijwali
6. A Modern Approach to Logical Reasoning, Book by AgarwalaVikas and R.S. Aggarwal

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VI Semester Syllabus
CS653PC: ARTIFICIAL INTELLIGENCE AND
NATURAL LANGUAGE PROCESSING LAB

Course Objectives

The student should be able to:

- Become familiar with basic principles of AI toward problem solving, knowledge representation, and learning.
- Knowledge on basic Language processing features, design an innovative application using NLP components

Course Outcomes

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

- Apply basic principles of AI in solutions that require problem solving, knowledge representation, and learning.
- Show sensitivity to linguistic phenomena and an ability to model them with formal grammars.
- Understand and carry out proper experimental methodology for training and evaluating empirical NLP systems
- Able to design, implement, and analyze NLP algorithms

List of Experiments (AI)

- 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

List of Experiments (NLP)

1. Word Analysis
2. Word Generation
3. Morphology
4. N-Grams
5. N-Grams Smoothing
- 6.

TEXT BOOKS:

1. Artificial Intelligence: A Modern Approach Third Edition Stuart Russell and Peter Norvig, 2010. Pearson Education, Inc. ISBN: 978-0-13-604259-4
2. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
3. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O'Reilly Media, 2009.

REFERENCE BOOK:

1. Breck Baldwin, —Language Processing with Java and Ling Pipe Cookbook, Atlantic Publisher, 2015.

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VI Semester Syllabus CS655PC: DEVOPS LAB

Course Objectives

The student should be able to:

- Describe the agile relationship between development and IT operations.
- Understand the skill sets and high-functioning teams involved in
- DevOps and related methods to reach a continuous delivery capability
- Implement automated system update and DevOps lifecycle

Course Outcomes

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

- Identify components of Devops environment
- Apply different project management, integration, testing and code deployment tool
- Investigate different DevOps Software development, models
- Demonstrate continuous integration and development using Jenkins.

List of Experiments:

1. Write code for a simple user registration form for an event.
2. Explore Git and GitHub commands.
3. Practice Source code management on GitHub. Experiment with the source code written in exercise 1.
4. Jenkins installation and setup, explore the environment.
5. Demonstrate continuous integration and development using Jenkins.
6. Explore Docker commands for content management.
7. Develop a simple containerized application using Docker.
8. Integrate Kubernetes and Docker
9. Automate the process of running containerized application developed in exercise 7 using Kubernetes.
10. Install and Explore Selenium for automated testing.
11. Write a simple program in JavaScript and perform testing using Selenium.
12. Develop test cases for the above containerized application using selenium.

TEXT BOOKS:

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

REFERENCE BOOKS / LEARNING RESOURCES:

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley
2. EdurekaDevOps Full Course - https://youtu.be/S_0q75eD8Yc

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VI Semester Syllabus
INTERNET OF THINGS LAB
(PE – III LAB)

VI Semester Syllabus
CS618PE: Internet of Things Lab
(Professional Elective-II)

Course Objectives:

- Will be able to write and test on a Raspberry Pi, but not limited this only.
- Will be able to do some Python programs on Raspberry Pi

Course Outcomes: On successful completion of the course, the student will:

- Able to understand the applications areas of IOT.
- Able to realize the revolution of Internet and Mobile devices, cloud and Sensors networks.
- Working with Raspberry Pi.

List of Experiments:

1. Start Raspberry Pi and try various Linux commands in command terminal window:
ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.
2. Run some python programs on Pilike:
 - Read your name and print Hello message with name
 - Read two numbers and print their sum, difference, product and division. Word and character count of a given string
 - Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input
 - Print a name 'n' times, where name and n are read from standard input, using for and while loops.
 - Handle Divided by Zero Exception.
 - Print current time for 10 times with an interval of 10 seconds. Read a file line by line and print the word count of each line.
3. Light an LED through Pythonprogram
4. Get input from two switches and switch on correspondingLEDs
5. Flash an LED at a given on time and off time cycle, where the two times are taken froma file.
6. Flash an LED based on cron output (acts as analarm)
7. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to aload.
8. Working with Camera Module.
9. a. A Python program to check the presence of light using **LDR Sensor Module** on Pi
 b. A Python program to measure the intensity of light using **LDR Sensor Module** on Pi

Text Books:

1. InternetofThings-AHands-onApproach,ArshdeepBahgaandVijayMadiseti, Universities Press, 2015, ISBN:9788173719547
2. A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series in Sensors) **1st** Edition, Kindle Edition by [Volker Ziemann](#).

Reference Books:

1. Getting Started with RaspberryPi, Matt Richardson & Shawn Wallace, O'Reilly(SPD), 2014, ISBN: 9789350239759
2. RaspberryPi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895
3. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

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VI Semester Syllabus
IT OPERATIONS PAPER-2 (PE – III LAB)
[Common to CSBS, CSE (AI & ML) & CSE (DS)]

Course Objectives

- Basic Programming Knowledge
- Use of Eclipse IDE.

Course Outcomes

- Students would be able to
- Hands on learning on virtual machines and various scenarios on cloud sim.
 - Interpret the various case studies on Service Now.

List of Experiments:

1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the Virtual Machine created using virtual box and execute Simple Programs
3. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
4. Install Hadoop single node cluster and run simple applications like wordcount.
5. Case Studies on ServiceNOW.
 - a. Project Management in ServiceNow from Initiation to Closure.
 - b. Resource Management in ServiceNow.
 - c. Time Card Management in ServiceNow against Resources and Projects.
and R.S. Aggarwal

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VI Semester Syllabus
MOBILE APPLICATION DEVELOPMENT LAB
(PE – III Lab)
[Common to CSBS, CSE (AI &ML) & CSE (DS)]

Course Objectives

The student should be able to:

- To learn how to develop Applications in android environment.
- To learn how to develop user interface applications.
- To learn how to develop URL related applications.

Course Outcomes

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

- Student understands the working of Android OS Practically.
- Student will be able to develop user interfaces.
- Student will be able to develop, deploy and maintain the Android Applications

List of Experiments

1. Create an Android application that shows Hello + name of the user and run it on an emulator.
(b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use
(a) Linear Layout (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a “Back” button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.
9. Create an admin application for the user table, which shows all records as a list and the admin can select any record for edit or modify. The results should be reflected in the table.
10. Develop an application that shows all contacts of the phone along with details like name, phone number, mobile number etc.
11. Create an application that saves user information like name, age, gender etc. in shared preference and retrieves them when the program restarts.
12. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.
13. Create an application that shows the given URL (from a text field) in a browser.

TEXT BOOKS:

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

REFERENCE BOOK:

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

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**VI Semester Syllabus
DATA MINING LAB
PE – III LAB)**

Prerequisites

- A course on “Database Management System.

Course Objectives

The student should be able to:

- The course is intended to obtain hands-on experience using data mining software.
- Intended to provide practical exposure of the concepts in data mining algorithms.

Course Outcomes

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

- Apply preprocessing statistical methods for any given raw data.
- Gain practical experience of constructing a data warehouse.
- Implement various algorithms for data mining in order to discover interesting patterns from large amounts of data.
- Apply OLAP operations on data cube construction.

LIST OF EXPERIMENTS:

Experiments using Weka&Pentaho Tools

1. Data Processing Techniques:

- | | | |
|-------------------|--|------------------------|
| (i) Data cleaning | (ii) Data transformation – Normalization | (iii) Data integration |
|-------------------|--|------------------------|
2. Partitioning - Horizontal, Vertical, Round Robin, Hash based
 3. Data Warehouse schemas – star, snowflake, fact constellation
 4. Data cube construction – OLAP operations
 5. Data Extraction, Transformations & Loading operations
 6. Implementation of Attribute oriented induction algorithm
 7. Implementation of apriori algorithm
 8. Implementation of FP – Growth algorithm
 9. Implementation of Decision Tree Induction
 10. Calculating Information gain measures
 11. Classification of data using Bayesian approach
 12. Classification of data using K – nearest neighbor approach
 13. Implementation of K – means algorithm
 14. Implementation of BIRCH algorithm
 15. Implementation of PAM algorithm
 16. Implementation of DBSCAN algorithm

TEXT BOOKS:

1. Data Mining – Concepts and Techniques - JIAWEI HAN &MICHELINE KAMBER, Elsevier.
2. Data Warehousing, Data Mining &OLAP- Alex Berson and Stephen J. Smith- Tata McGraw-Hill Edition, Tenth reprint 2007.

REFERENCE BOOK:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, AnujKarpatne, Introduction to Data Mining, Pearson Education.

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VI Semester Syllabus
CRYPTOGRAPHY AND NETWORK SECURITY LAB
(PE – III Lab)
[Common to CSE (AI &ML) & CSE (DS)]

Course Objectives

The student should be able to:

- Explain the objectives of information security
- Explain the importance and application of each of confidentiality, integrity, authentication and availability
- Understand various cryptographic algorithms.

Course Outcomes

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

- Understand basic cryptographic algorithms, message and web authentication and security issues.
- Identify information system requirements for both of them such as client and server.
- Understand the current legal issues towards information security.

List of Experiments:

1. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value 'Hello world'. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
 - a. Ceaser cipher b. Substitution cipher c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA.

TEXT BOOKS:

1. Cryptography and Network Security - Principles and Practice: William Stallings, Pearson Education, 6th Edition
2. Cryptography and Network Security: AtulKahate, McGraw Hill, 3rd Edition

REFERENCE BOOKS:

1. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
2. Cryptography and Network Security: ForouzanMukhopadhyay, McGraw Hill, 3rd Edition
3. Information Security, Principles, and Practice: Mark Stamp, Wiley India.
4. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning

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VI Semester Syllabus
MC601ESC:ENVIRONMENTAL SCIENCE
[Common to CSE, CSE (AI &ML) & CSE (DS)]

Course Objectives

The student should be able to:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes

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

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT - I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS).Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects.Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).**Towards Sustainable Future:** Concept of Sustainable

Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

- 1 Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission.
- 2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

- 1.Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
- 2.Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
- 3.Environmental Science by Daniel B. Botkin& Edward A. Keller, Wiley INDIA edition.
- 4.Environmental Studies by AnubhaKaushik, 4th Edition, New age international publishers.
- 5.Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
- 6.Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

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VII Semester Syllabus

CS701PC: NEURAL NETWORKS AND DEEP LEARNING

Course Objectives

To Learn

- To introduce the foundations of Artificial Neural Networks
- To acquire the knowledge on Deep Learning Concepts
- To learn various types of Artificial Neural Networks
- To gain knowledge to apply optimization strategies.

Course Outcomes

After learning the contents of this paper, the student must be able to

- Ability to understand the concepts of Neural Networks
- Ability to select the Learning Networks in modeling real world systems
- Ability to use an efficient algorithm for Deep Models
- Ability to apply optimization strategies for large scale applications.

UNIT-I

Artificial Neural Networks Introduction, Basic models of ANN, important terminologies, Supervised Learning Networks, Perceptron Networks, Adaptive Linear Neuron, Back-propagation Network. Associative Memory Networks. Training Algorithms for pattern association, BAM and Hopfield Networks.

UNIT-II

Unsupervised Learning Network- Introduction, Fixed Weight Competitive Nets, Maxnet, Hamming Network, Kohonen Self-Organizing Feature Maps, Learning Vector Quantization, Counter Propagation Networks, Adaptive Resonance Theory Networks. Special Networks-Introduction to various networks.

UNIT - III

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

UNIT - IV

Regularization for Deep Learning: Parameter norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier

UNIT - V

Optimization for Train Deep Models: Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second- Order Methods, Optimization Strategies and Meta-Algorithms

Applications: Large-Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing

TEXT BOOKS:

1. Deep Learning: An MIT Press Book By Ian Goodfellow and Yoshua Bengio and Aaron Courville
2. Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.

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VII Semester Syllabus CS705PC: REINFORCEMENT LEARNING

Course Objectives

The main objectives of this course are to:

- Knowledge on fundamentals of reinforcement learning and the methods used to create agents that can solve a variety of complex tasks.

Course Outcomes

- Understand basics of RL.
- Understand RL Framework and Markov Decision Process.
- Analyzing through the use of Dynamic Programming and Monte Carlo.
- Understand TD(0) algorithm, TD(λ) algorithm.

UNIT - I

Basics of probability and linear algebra, Definition of a stochastic multi-armed bandit, Definition of regret, Achieving sub linear regret, UCB algorithm, KL-UCB, Thompson Sampling.

UNIT - II

Markov Decision Problem, policy, and value function, Reward models (infinite discounted, total, finite horizon, and average), Episodic & continuing tasks, Bellman's optimality operator, and Value iteration & policy iteration

UNIT - III

The Reinforcement Learning problem, prediction and control problems, Model-based algorithm, Monte Carlo methods for prediction, and Online implementation of Monte Carlo policy evaluation

UNIT - IV

Bootstrapping; TD(0) algorithm; Convergence of Monte Carlo and batch TD(0) algorithms; Model-free control: Q-learning, Sarsa, Expected Sarsa.

UNIT - V

n-step returns; TD(λ) algorithm; Need for generalization in practice; Linear function approximation and geometric view; Linear TD(λ). Tile coding; Control with function approximation; Policy search; Policy gradient methods; Experience replay; Fitted Q Iteration; Case studies.

TEXT BOOKS:

1. "Reinforcement learning: An introduction," First Edition, Sutton, Richard S., and Andrew G. Barto, MIT press 2020.
2. "Statistical reinforcement learning: modern machine learning approaches," First Edition, Sugiyama, Masashi. CRC Press 2015.

REFERENCE BOOKS:

1. "Bandit algorithms," First Edition, Lattimore, T. and C. Szepesvári. Cambridge University Press. 2020.
2. "Reinforcement Learning Algorithms: Analysis and Applications," Boris Belousov, Hany Abdulsamad, Pascal Klink, Simone Parisi, and Jan Peters First Edition, Springer 2021.
3. Alexander Zai and Brandon Brown "Deep Reinforcement Learning in Action," First Edition, Manning Publications 2020.

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VII Semester Syllabus
CS716PE: CLOUD COMPUTING
(PROFESSIONAL ELECTIVE – IV)
[Common to CSE, IT, CSE (AI & ML) & CSE (DS- PE-5)]

Prerequisites:

1. Courses on Computer Networks, Operating Systems, Distributed Systems.

Course Objectives

- To know the basics of cloud computing and its advantages.
- To analyze the components of cloud computing and its business perspective.
- To understand various cloud service/deployment models.
- To evaluate the various cloud development tools
- To study various cloud service provider services, .

Course Outcomes

Students would be able to

- Ability to understand the fundamentals of cloud computing.
- Understand the architecture of cloud computing model.
- Ability to understand various service and deployment models of cloud.
- Understand the concept of virtualization and its types.
- Understanding cloud service providers and cloud based applications, .

UNIT – I

Cloud Computing Fundamentals: Motivation for Cloud Computing, Basic Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models, Three service Offering Models, Requirements for Cloud Services - Cloud Ecosystem, Cloud Application - Virtualization-approaches and types

UNIT – II

Cloud Computing Architecture and Management: Cloud architecture Layers, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Networking Technologies, Applications on the Cloud, Managing the Cloud application, Migrating Application to Cloud- Phases of Cloud Migration - Approaches for Cloud Migration

UNIT – III

Cloud Deployment Models: Private Cloud, Public cloud, Community Cloud and Hybrid Cloud – Characteristics, Suitability, Issues, Advantages and Disadvantages.

Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service - Characteristics, Suitability, Pros and Cons and Summary.

UNIT – IV**Virtualization technology**

Virtual Machine Technology - Types of virtualization - System virtual machines- Virtual machines and elastic computing, Virtual machine migration - Virtualization Applications In Enterprises- Security through virtualization, Desktop virtualization, Server consolidation, Automating infrastructure management, Pitfalls Of Virtualization.

UNIT – V

Cloud Service Providers and Applications: Amazon Web Services, Amazon Elastic Compute Cloud, Google Cloud Platform, Google App Engine, Microsoft Azure, Windows Azure, IBM Cloud Models – Cloud Security issues – Case studies in Cloud Computing and its applications.

Suggested Reading:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014.
2. “Enterprise Cloud Computing Technology Architecture Applications”, Gautam Shroff, Cambridge University Press; 1 edition, [ISBN: 978-0521137355], 2010.

Reference Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O’Reilly, SPD, rp 2011.

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VII Semester Syllabus
CS721PE: EXPERT SYSTEMS
(Professional Elective – IV)

Course Objectives

- Understand the basic techniques of artificial intelligence.
- Understand the Non-monotonic reasoning and statistical reasoning.

Course Outcomes

- Apply the basic techniques of artificial intelligence.
- Discuss the architecture of an expert system and its tools.
- Understand the importance of building an expert systems.
- Understand various problems with an expert systems.

UNIT - I

Introduction to AI programming languages, Blind search strategies, Breadth-first – Depth-first – Heuristic search techniques Hill Climbing – Best first – A Algorithms AO* algorithm – game tress, Min- max algorithms, game playing – Alpha-beta pruning.

UNIT - II

Knowledge representation issues predicate logic – logic programming Semantic nets- frames and inheritance, constraint propagation; Representing Knowledge using rules, Rules-based deduction systems.

UNIT - III

Introduction to Expert Systems, Architecture of expert systems, Representation and organization of knowledge, Basics characteristics, and types of problems handled by expert systems.

UNIT - IV

Expert System Tools: Techniques of knowledge representations in expert systems, knowledge engineering, system-building aids, support facilities, stages in the development of expert systems.

UNIT - V

Building an Expert System: Expert system development, Selection of the tool, Acquiring Knowledge, Building process. Problems with Expert Systems: Difficulties, common pitfalls in planning, dealing with domain experts, difficulties during development.

TEXT BOOKS:

1. Elain Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw-Hill, New Delhi.
2. Waterman D.A., “A Guide to Expert Systems”, Addison Wesley Longman.

REFERENCE BOOKS:

1. Stuart Russel and other Peter Norvig, “Artificial Intelligence – A Modern Approach”, Prentice- Hall.
2. Patrick Henry Winston, “Artificial Intelligence”, Addison Wesley.
3. Patterson, Artificial Intelligence & Expert System, Prentice Hall India, 1999.
4. Hayes-Roth, Lenat, and Waterman: Building Expert Systems, Addison Wesley.
5. Weiss S.M. and Kulikowski C.A., “A Practical Guide to Designing Expert Systems”, Rowman & Allanheld, New Jersey.

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VII Semester Syllabus
CS722PE : GAME THEORY
(Professional Elective – IV)

Course Objectives

- The course will explain in depth the standard equilibrium concepts (such as Nash equilibrium, Subgame-Perfect Nash Equilibrium, and others) in Game Theory.

Course Outcomes

- After completion of the course, the student should be able to
- Understand the basic concepts of game theory and solutions
 - Understand different types of equilibrium interpretations
 - Understand and analyze knowledge and solution concepts
 - Analyze extensive games with perfect information

UNIT - I

Introduction- Game Theory, Games and Solutions Game Theory and the Theory of Competitive Equilibrium, Rational Behavior, The Steady State and Deductive Interpretations, Bounded Rationality Terminology and Notation. Nash Equilibrium- Strategic Games, Nash Equilibrium Examples Existence of a Nash Equilibrium, Strictly Competitive Games, Bayesian Games: Strategic Games with Imperfect Information.

UNIT - II

Mixed, Correlated, and Evolutionary Equilibrium - Mixed Strategy Nash Equilibrium, Interpretations of Mixed Strategy Nash Equilibrium, Correlated Equilibrium, Evolutionary Equilibrium, Rationalizability and Iterated Elimination of Dominated Actions -Rationalizability Iterated Elimination of Strictly Dominated Actions, Iterated Elimination of Weakly Dominated Actions.

UNIT - III

Knowledge and Equilibrium -A Model of Knowledge Common Knowledge, Can People Agree to Disagree? Knowledge and Solution Concepts, The Electronic Mail Game.

UNIT - IV

Extensive Games with Perfect Information -Extensive Games with Perfect Information Subgame Perfect Equilibrium Two Extensions of the Definition of a Game The Interpretation of a Strategy, Two Notable Finite Horizon Games, Iterated Elimination of Weakly Dominated, Strategies Bargaining Games - Bargaining and Game Theory, A Bargaining Game of Alternating Offers Subgame Perfect Equilibrium Variations and Extensions.

UNIT - V

Repeated Games - The Basic Idea Infinitely Repeated Games vs. Finitely Repeated Games, Infinitely Repeated Games: Definitions Strategies as Machines Trigger Strategies: Nash Folk, Theorems Punishing for a Limited Length of Time: A Perfect Folk Theorem for the Limit of Means Criterion Punishing the Punisher: A Perfect Folk Theorem for the Overtaking Criterion, Rewarding Players Who Punish: A Perfect Folk Theorem for the Discounting Criterion The Structure of Subgame Perfect Equilibria Under the Discounting Criterion Finitely Repeated Game.

TEXT BOOKS:

1. A course in Game Theory, M. J. Osborne and A. Rubinstein, MIT Press
2. Game Theory, Roger Myerson, Harvard University Press
3. Game Theory, D. Fudenberg and J. Tirole, MIT Press

REFERENCE BOOKS:

1. Theory of Games and Economic Behavior, J. von Neumann and O. Morgenstern, New York: John Wiley & Sons.
2. Games and Decisions, R.D. Luce and H. Raiffa, New York: John Wiley and Sons.
3. Game Theory, G. Owen, 2nd Edition, New York: Academic Press.

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VII Semester Syllabus
CS723PE: MOBILE COMPUTING
(Professional Elective – IV)

Prerequisites

1. Computer Networks, Distributed Systems / Distributed Operating Systems

Course Objectives

The student should be able to:

- To make the student understand the concept of mobile computing paradigm, its novel applications and limitations, the typical mobile networking infrastructure through a popular GSM protocol, the issues and solutions of various layers of mobile networks.

Course Outcomes

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

- Understand the concept of mobile computing paradigm, its novel applications and limitations.
- Analyze and develop new mobile applications
- Understand the protocols and platforms related to mobile environment
- Classify data delivery mechanisms

UNIT - I

Introduction: Mobile Communications, Mobile Computing – Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices.

GSM – Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS, CSHSD, DECT.

UNIT –II

(Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11) **Mobile Network Layer:** IP and Mobile IP Network Layers, Packet Delivery and Handover Management, Location Management, Registration, Tunneling and Encapsulation, Route Optimization, DHCP.

UNIT - III

Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks.

Database Issues: Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models, Query processing, Data Recovery Process & QoS Issues.

UNIT - IV

Data Dissemination and Synchronization: Communications Asymmetry, Classification of Data Delivery Mechanisms, Data Dissemination, Broadcast Models, Selective Tuning and Indexing Methods, Data Synchronization – Introduction, Software, and Protocols

UNIT - V

Mobile Ad hoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, Mobile Agents, Service Discovery. **Protocols and Platforms for Mobile Computing:** WAP, Bluetooth, XML, J2ME, JavaCard, PalmOS, Windows CE, SymbianOS, Linux for Mobile Devices, Android.

TEXT BOOKS:

1. Jochen Schiller, “Mobile Communications”, Addison-Wesley, Second Edition, 2009.
2. Raj Kamal, “Mobile Computing”, Oxford University Press, 2007, ISBN: 0195686772

REFERENCE BOOK:

1. Asoke K Talukder, Hasan Ahmed, Roopa Yavagal Mobile Computing: Technology, Applications and Service Creation, McGraw Hill Education.

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VII Semester Syllabus
CS728PE: BLOCK CHAIN TECHNOLOGIES
Professional Elective – IV
(COMMON TO CSBS, CSE(AI&ML))

Prerequisites:

1. Knowledge insecurity and applied cryptography.
2. Knowledge in distributed databases

Course Objectives

- To Introduce block chain technology and Crypto currency.

Course Outcomes

Students would be able to

- Learn about research advances related to one of the most popular technological areas today.
- Understand Extensibility of Block chain concepts.
- Understand and Analyze Blockchain Science.
- Understand Technical challenges, Business model challenges.

UNIT-I

Introduction: Block chain or distributed trust, Protocol, Currency, Cryptocurrency, How a Cryptocurrency works, Crowd funding.

UNIT-II

Extensibility of Block chain concepts, Digital Identity verification, Block chain Neutrality, Digitalart, Blockchain Environment.

UNIT-III

Block chain Science: Grid coin, Folding coin, Blockchain Genomics, Bitcoin MOOCs.

UNIT-IV

Currency, Token, Tokenizing, Campus coin, Coin drop as a strategy for Public ad option, Currency Multiplicity, Demurrage currency.

UNIT-V

Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations.

Suggested Reading:

1. Melanie Swan, Block chain Blueprint for Economy, O'reilly.

Reference Books:

1. Building Block chain Apps, Michael Juntao Yuan, Pearson Education
2. Daniel Drescher, Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition
3. Bradley Lakeman, Blockchain Revolution: Understanding the Crypto Economy of the Future. A Non-Technical Guide to the Basics of Cryptocurrency Trading and Investing, ISBN: 1393889158.

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VII Semester Syllabus
CS730PE: SOCIAL NETWORK ANALYSIS
(Professional Elective – V)

Prerequisites

1. A course on “Web Technologies”.
2. A course on “Computer Networks”.
3. A course on “Data Warehousing and Data Mining”.

Course Objectives

The student should be able to:

- It introduces the concepts of social media
- It provides the mechanisms for social network analysis
- Includes the concepts that allow for better visualization and analysis of widely used services such as email, Wikis, Twitter, flickr, YouTube, etc.

Course Outcomes

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

- Ability to construct social network maps easily
- Gain skills in tracking the content flow through the social media
- Use Node XL to perform social network analysis

UNIT - I:

Introduction: Social Media and Social Networks. **Social Media:** New Technologies of Collaboration.

Social Network Analysis: Measuring, Mapping, and Modeling collections of Connections.

UNIT - II:

NodeXL, Layout, Visual Design, and Labeling, Calculating and Visualizing Network Metrics, Preparing Data and Filtering, Clustering and Grouping.

UNIT - III:**CASE STUDIES - I:**

Email: The lifeblood of Modern Communication. **Thread Networks:** Mapping Message Boards and Email Lists.

Twitter: Conversation, Entertainment and Information.

UNIT - IV:

CASE STUDIES - II: Visualizing and Interpreting Facebook Networks, WWW Hyperlink Networks

UNIT-V:**CASE STUDIES - III:**

You Tube: Contrasting Patterns of Content Interaction, and Prominence. **Wiki Networks:** Connections of Creativity and Collaboration.

TEXT BOOKS:

1. Hansen, Derek, Ben Sheiderman, Marc Smith, Analyzing Social Media Networks with NodeXL: Insights from a Connected World, Morgan Kaufmann, 2011.
2. Avinash Kaushik, Web Analytics 2.0: The Art of Online Accountability, Sybex, 2009.

REFERENCE BOOK:

1. Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting and Using Metrics, 1st Edition, MGH, 2011.

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VII Semester Syllabus
CS731PE : AUGMENTED REALITY AND VIRTUAL REALITY
(Professional Elective – V)

Course Objectives

The student should be able to:

- The objective of this course is to provide a foundation to the fast-growing field of AR and make the students aware of the various AR devices.
- To give historical and modern overviews and perspectives on virtual reality. It describes the fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

Course Outcomes

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

- Describe how AR systems work and list the applications of AR.
- Understand and analyze the hardware requirement of AR.
- Describe how VR systems work and list the applications of VR.
- Understand the design and implementation of the hardware that enables VR systems to be built.

UNIT - I:

Introduction to Augmented Reality: What Is Augmented Reality - Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality Augmented Reality Concepts- How Does Augmented Reality Work? Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.

UNIT - II:

AR Devices & Components: AR Components – Scene Generator, Tracking system, monitoring system, display, Game scene. AR Devices – Optical See- Through HMD, Virtual retinal systems, Monitor bases systems, Projection displays, Video see-through systems.

UNIT - III:

Introduction to Virtual Reality: Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality

UNIT - IV:

Representing the Virtual World: Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR, Case Study: GHOST (General Haptics Open Software Toolkit) software development toolkit.

UNIT - V:

Visual Perception & Rendering: Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information, Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates.

TEXT BOOKS:

1. Allan Fowler-AR Game Development, 1st Edition, A press Publications, 2018, ISBN 978- 1484236178
2. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016), ISBN-10: 9332578494

REFERENCE BOOKS:

1. Virtual Reality, Steven M. LaValle, Cambridge University Press, 2016.
2. Understanding Virtual Reality: Interface, Application and Design, William R Sherman and Alan B Craig, (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002.
3. Developing Virtual Reality Applications: Foundations of Effective Design, Alan B Craig, William R Sherman and Jeffrey D Will, Morgan Kaufmann, 2009.
4. Designing for Mixed Reality, Kharis O'Connell Published by O'Reilly Media, Inc., 2016, ISBN: 9781491962381.
5. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0.
6. Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005.

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VII Semester Syllabus
CS732PE : AD-HOC & SENSOR NETWORKS
(Professional Elective - V)

Prerequisites

1. A course on “Computer Networks”
2. A course on “Mobile Computing”

Course Objectives

The student should be able to:

- To understand the concepts of sensor networks
- To understand the MAC and transport protocols for ad hoc networks
- To understand the security of sensor networks
- To understand the applications of adhoc and sensor networks

Course Outcomes

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

- Ability to understand the state-of-the-art research in the emerging subject of Ad Hoc and Wireless Sensor Networks
- Ability to solve the issues in real-time application development based on ASN.
- Ability to conduct further research in the domain of ASN.

UNIT - I

Introduction to Ad Hoc Networks – Characteristics of MANETs, Applications of MANETs and Challenges of MANETs.

Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topology- based routing algorithms-**Proactive**: DSDV; **Reactive**: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-**Location Services**-DREAM, Quorum-based; **Forwarding Strategies**: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

UNIT - II

Data Transmission - Broadcast Storm Problem, **Rebroadcasting Schemes**-Simple-flooding, Probability-based Methods, Area-based Methods, Neighbor Knowledge-based: SBA, Multipoint Relaying, AHBP. **Multicasting**: **Tree-based**: AMRIS, MAODV; **Mesh-based**: ODMRP, CAMP; **Hybrid**: AMRoute, MCEDAR.

UNIT - III

Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT - IV

Basics of Wireless, Sensors and Lower Layer Issues: Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

UNIT - V

Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

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VII Semester Syllabus
CS724OE: Computer Networks (Open Elective-II)
(Offered by CSE)

Course Objectives

The student should be able to:

- Familiarize the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Identify the Error detection and correction techniques in Data Link Layer.
- Analyze the knowledge of routing algorithms.
- Understand the connection management of TCP&UDP Protocols.
- Ability to understand the concepts of DNS & Electronic Mail.

Course Outcomes

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

- Gain the knowledge of the functions of each layer in the OSI and TCP/IP reference model.
- Gain the knowledge of Error detection and correction techniques.
- Gain the knowledge of routing algorithms.
- Gain the knowledge of TCP&UDP connection management.
- Gain the knowledge of DNS & Electronic Mail.

UNIT – I

Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.
 Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.

UNIT-II

Data link layer: Design issues, framing, Error detection and correction. Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-free channel, A simplex stop and wait protocol for noisy channel. Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocol using Selective Repeat, Example data link protocols. Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carrier sense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT - III

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

UNIT - IV

Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP and UDP protocols.

UNIT - V

Application Layer –Domain Name System, SNMP, Electronic Mail; the World WEB, HTTP, Streaming audio and video.

TEXT BOOK:

1. Computer Networks -- Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan. Third Edition TMH.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. “Data and Computer Communications” by William Stallings 9th Edition, Pearson Education 2010.
3. “TCP/IP Illustrated” by W. Richard Stevens, Addison-Wesley Professional; 2nd edition 2011.

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VII Semester Syllabus
CS725OE: SOFTWARE ENGINEERING (Open Elective-II)
(Offered by CSE)

Course Objectives

The student should be able to:

- To understanding of software process models such as waterfall and evolutionary models.
- To understanding of software requirements and SR document.
- To understanding of different software architectural styles.
- To understanding of software testing approaches such as unit testing and integration testing.
- To understanding on quality control and how to ensure good quality software.

Course Outcomes

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

- Ability to identify the minimum requirements for the development of application.
- Ability to develop, maintain, efficient, reliable and cost effective software solutions.
- Ability to write manual test cases.

UNIT- I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, Software myths.

A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI).

Process models: The waterfall model, Incremental process models, Evolutionary process models.

UNIT- II

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, the software requirements document.

Requirements engineering process: Feasibility studies, Requirements elicitation and analysis, Requirements validation.

UNIT- III

Design Engineering: Design process and Design quality, Design concepts, the design model.

Creating an architectural design: software architecture, Architectural styles and Architectural Design.

Performing User interface design: Golden rules, User interface design steps.

UNIT- IV

Testing Strategies: A Strategic Approach to Software Testing, Test Strategies for Conventional Software: Unit Testing, Integration Testing, Validation Testing, System Testing, Art of Debugging.

UNIT- V

Quality Management: Software Quality, Formal Technical Reviews, SQA Tasks, Goals, Metrics, Software Reliability.

TEXT BOOKS:

1. Software engineering A practitioner's Approach, Roger S Pressman, sixth edition McGraw Hill International Edition.
2. Software Engineering, Ian Sommerville, seventh edition, Pearson education.

REFERENCE BOOKS:

1. Software Engineering, an Engineering approach-James F. Peters, Witold Pedrycz, John Wiley.
2. Software Engineering principles and practice -Waman S Jawadekar, The Mc Graw-Hill Companies, 2008.
3. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

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VII Semester Syllabus
CS726OE: JAVA PROGRAMMING (Open Elective-II)
(Offered by CSE)

Course Objectives:

- To understand object-oriented programming concepts using Java.
- To implement the concepts of packages and interfaces
- To introduce the concepts of exception handling and multithreading
- To describe various data manipulation operations using collection framework
- To develop Graphical User Interface applications using applets and swing controls

Course Outcomes:

- Able to solve real world problems using OOP techniques.
- Able to implement the concepts of packages and interfaces
- Able to develop multithreaded applications with synchronization
- Able to solve problems using java collection framework
- Able to design GUI based applications

UNIT – I

Object-Oriented Thinking- Introduction to Object-Oriented concepts, Java buzzwords, An Overview of Java, Data types, Variables and Arrays, operators, expressions, control statements, Introducing classes: Class fundamentals, Declaring objects, introducing Methods, Constructors, and this keyword, method overloading, String handling.

Inheritance– Inheritance basics, using super, method overriding, dynamic method dispatch, using abstract class, using final with inheritance and Object class.

UNIT – II

Packages- Defining a Package, CLASSPATH, Access protection, importing packages.

Interfaces- defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces, extending interfaces, default interface methods, use static methods in an interface

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

UNIT – III

Multithreading- Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.

Stream based I/O (java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, generics.

UNIT – IV

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set. Collection algorithms, Arrays, The Legacy Classes, **More Utility classes**, String Tokenizer, Random, Scanner.

UNIT – V

GUI Programming with Swing – Introduction to AWT, components, containers. Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

Event Handling- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events. **A Simple Swing Application**, Applets – Applets and HTML,

Security Issues, Applets and Applications, passing parameters to applets, Creating a Swing Applet, Painting in Swing, A Paint example.

Text Books:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd 2014.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education 2000.

Reference Books:

1. Y. Daniel Liang, Introduction to Java programming, Pearson Education 2013.
2. P. Radha Krishna Object Oriented Programming through Java, University Press 2007.
3. S. Malhotra, S. Chudhary, Programming in Java, 2nd edition, Oxford Univ. Press 2013.

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VII Semester Syllabus
CS753PC: DEEP LEARNING LAB

Course Objectives

The student should be able to:

- To Build the Foundation of Deep Learning.
- To Understand How to Build the Neural Network.
- To enable students to develop successful machine learning concepts.

Course Outcomes

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

- Upon the Successful Completion of the Course, the Students would be able to:
- Learn the Fundamental Principles of Deep Learning.
- Identify the Deep Learning Algorithms for Various Types of Learning Tasks in various domains.
- Implement Deep Learning Algorithms and Solve Real-world problems.

LIST OF EXPERIMENTS:

1. Setting up the Spyder IDE Environment and Executing a Python Program
2. Installing Keras, Tensorflow and Pytorch libraries and making use of them
3. Applying the Convolution Neural Network on computer vision problems
4. Image classification on MNIST dataset (CNN model with Fully connected layer)
5. Applying the Deep Learning Models in the field of Natural Language Processing
6. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes
7. Applying the Autoencoder algorithms for encoding the real-world data
8. Applying Generative Adversial Networks for image generation and unsupervised tasks.

TEXT BOOKS:

1. Deep Learning by Ian Goodfellow, Yoshua Bengio and Aaron Courville, MIT Press.
2. The Elements of Statistical Learning by T. Hastie, R. Tibshirani, and J. Friedman, Springer.
3. Probabilistic Graphical Models. Koller, and N. Friedman, MIT Press.

REFERENCES:

1. Bishop, C.M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
3. Golub, G.H., and Van Loan, C.F., Matrix Computations, JHU Press, 2013.
4. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw Hill Education, 2004.

EXTENSIVE READING:

1. <http://www.deeplearning.net>
2. <https://www.deeplearningbook.org/>
3. <https://developers.google.com/machine-learning/crash-course/ml-intro>
4. www.cs.toronto.edu/~fritz/absps/imagenet.pdf
5. <http://neuralnetworksanddeeplearning.com/>

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VIII Semester Syllabus
MS802HS: ORGANIZATIONAL BEHAVIOUR
(Common to CSE(DS), CSE (AI&ML))

Course Objective: The objectives of the course are:

- To understand the perception and attribution concepts in organizational and external environmental context.
- To discuss the concepts and theories of personality, attitudes and Motivation
- To understand the decision making and communication process in interpersonal and their intrapersonal context.
- To familiarize the students with the basic understanding of individual behavior and explore issues of power and empowerment.
- To discuss the concepts of High performance, Learning and Leadership.

Course Outcomes: After the completion of the subject, the student will be able to

- Analyze the concepts of perception and attribution of individuals and groups in organizations in terms of the key factors that influence organizational behavior
- Acquire knowledge of personality and attitudes of individuals in applying motivational theories to resolve problems of employees.
- Apply group dynamics and skills required for working in groups and identify the processes used in developing communication and decision making to overcome stress and conflicts.
- Analyze organizational behavioral issues in the context of, power, and empowerment issues.
- Acquire the knowledge of learning concepts and leadership styles to achieve high performance levels

Unit I:

Introduction, Perception and Attribution

Introduction to OB - Definition, Nature and Scope – Environmental and organizational context – Impact of IT, globalization, Diversity, Ethics, culture, reward systems and organizational design on Organisational Behaviour

Cognitive Process I: Perception and Attribution: Meaning of Perception, Nature and importance of Perception — Sensation versus Perception - Perceptual selectivity and organization – Social perception.

Attribution: Meaning - Attribution Theories – Fritz heider’s theory of attribution; Jones & Davis correspondent inference theory; Kelley’s Covariation Model; and Weiner’s Three-Dimensional Model - Locus of control –Attribution Errors – Impression Management – Types - Strategies of Impression Management.

Unit II:**Personality, Attitudes and Motivation**

Cognitive Process II: Personality and Attitudes - Personality as a continuum –Meaning of personality, Personality Traits - Johari Window and Transactional Analysis.

Attitudes: Nature and Dimension of Attitudes - Job satisfaction and organizational commitment.

Motivation: Motivational needs and processes- Work-Motivation Approaches Theories of Motivation– the content theories of motivation: Maslow’s hierarchy of needs; Herzberg’s two factor theory of motivation; Alderfer’s ERG theory – The process theories of work motivation: Vroom’s expectancy theory of motivation; the Porter-Lawler’s model -Motivation across cultures -Positive organizational behaviour: Optimism - Emotional intelligence - Self-Efficacy.

Unit III:**Communication, Decision-Making, Stress and Conflict**

Dynamics of OB - I: Communication: Meaning and types - interactive communication in organizations – barriers to communication and strategies to improve the flow of communication.

Decision Making: Participative decision-making techniques –creativity and group decision making.

Dynamics of OB – II: Stress and Conflict: Meaning and types of stress –Meaning and types of conflict - Effect of stress and intra-individual conflict -strategies to cope with stress and conflict.

Unit IV:**Power and Empowerment**

Dynamics of OB-III Power: Meaning -Types of power – Legitimate power, Coercive power, Expert power, Informal power and Referent power.

Empowerment – Benefits, Process, Determinants, Techniques of Empowerment; Groups Vs. Teams – Nature of groups –dynamics of informal groups – Dysfunctions of groups and teams –Teams in modern work place.

Unit V:**High performance, Learning and Leadership**

Leading High performance: Job design and Goal setting for High Performance-Quality of Work Life- Socio technical Design and High-performance work practices -Behavioural performance management

Learning: Reinforcement and Punishment as principles of Learning – Process of Behavioural modification

Leadership: Definition of leadership – Traits of effective leaders- Leadership behaviour Vs Traits – Leadership skills – Leadership theories: Trait theories; Behavioural theories; Contingency approaches to leadership – Leadership Styles- Autocratic Leadership style, Democratic Leadership style, Free rein Leadership style, Activities and skills of Great leaders.

Text Books:

1. Luthans, Fred: Organizational Behavior, McGraw-Hill, 10th Edition, 2009
2. Robbins, P. Stephen, Timothy A. Judge: Organizational Behavior, PHI/Pearson, 12th Edition, 2009.
3. Pareek Udai: Behavioral Process at Work: Oxford & IBH, New Delhi, 2009.

Reference Books:

1. Schermerhorn: Organizational Behavior Wiley, 9th Edition, 2008.
2. Michael A Hitt: Organizational Behavior, Wiley, 2008
3. Aswathappa: Organizational Behavior, Himalaya, 2009

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VIII Semester Syllabus
CS823PE: SPEECH AND VIDEO PROCESSING
(Professional Elective – VI)

Course Objectives

The main objectives of this course are to:

- Knowledge on speech and video processing techniques.

Course Outcomes

- Describe the mechanisms of human speech production systems and methods for speech feature extraction.
- Understand basic algorithms of speech analysis and speech recognition.
- Explain basic techniques in digital video processing, including imaging characteristics and sensors.
- Apply motion estimation and object tracking algorithms on video sequence..

UNIT - I:

Speech Processing Concepts: The speech production mechanism, Discrete time speech signals, Pole-Zero modelling of speech, relevant properties of the fast Fourier transform for speech recognition, convolution, linear and nonlinear filter banks, spectral estimation of speech using DFT. Linear Prediction analysis of speech.

UNIT - II:

Speech Recognition: Real and Complex Cepstrum, application of cepstral analysis to speech signal, feature extraction for speech, static and dynamic feature for speech recognition, robustness issues, discrimination in the feature space, feature selection, MFCC, LPCC, Distance measures, vector quantization models. Gaussian Mixture model, HMM.

UNIT - III:

Basics of Video Processing: Video formation, perception and representation: Principle of color video, video cameras, video display, pinhole model, CAHV model, Camera motion, Shape model, motion model, Scene model, two-dimensional motion models. Three-Dimensional Rigid Motion, Approximation of projective mapping.

UNIT - IV:

Motion Estimation Techniques: Optical flow, motion representation, motion estimation criteria, optimization methods, pixel-based motion estimation, Block matching algorithm, gradient Based, Intensity matching, feature matching, frequency domain motion estimation, Depth from motion. Motion analysis applications: Video Summarization, video surveillance.

UNIT - V:

Object Tracking and Segmentation: 2D and 3D video tracking, blob tracking, kernel based counter tracking, feature matching, filtering Mosaicing, video segmentation, mean shift based, active shape model, video shot boundary detection. Interframe compression, Motion compensation

TEXT BOOKS:

1. Fundamentals of Speech recognition – L. Rabiner and B. Juang, Prentice Hall signal processing series.
2. Digital Video processing, A Murat Tekalp, Prentice Hall.
3. Discrete-time speech signal processing: principles and practice, Thomas F. Quatieri, Coth.
4. Video Processing and Communications, Yao Wang, J. Osternann and Qin Zhang, Pearson Education.

REFERENCE BOOKS:

1. “Speech and Audio Signal Processing”, B.Gold and N. Morgan, Wiley.
2. “Digital image sequence processing, Compression, and analysis”, Todd R. Reed, CRC Press
3. “Handbook of Image and Video processing”, Al Bovik, Academic press, second Edition

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VIII Semester Syllabus
CS824PE: ROBOTIC PROCESS AUTOMATION
(Professional Elective – VI)

Course Objectives

- Aim of the course is to make learners familiar with the concepts of Robotic Process Automation.

Course Outcomes

- Describe RPA, where it can be applied and how it's implemented.
- Identify and understand Web Control Room and Client Introduction.
- Understand how to handle various devices and the workload.
- Understand Bot creators, Web recorders and task editors.

UNIT - I

Introduction to Robotic Process Automation & Bot Creation Introduction to RPA and Use cases – Automation Anywhere Enterprise Platform – Advanced features and capabilities – Ways to create Bots.

UNIT - II

Web Control Room and Client Introduction - Features Panel - Dashboard (Home, Bots, Devices, Audit, Workload, Insights) - Features Panel – Activity (View Tasks in Progress and Scheduled Tasks) - Bots (View Bots Uploaded and Credentials).

UNIT - III

Devices (View Development and Runtime Clients and Device Pools) - Workload (Queues and SLA Calculator) - Audit Log (View Activities Logged which are associated with Web CR) - Administration (Configure Settings, Users, Roles, License and Migration) - Demo of Exposed API's – Conclusion – Client introduction and Conclusion.

UNIT - IV

Bot Creator Introduction – Recorders – Smart Recorders – Web Recorders – Screen Recorders - Task Editor – Variables - Command Library – Loop Command – Excel Command – Database Command - String Operation Command - XML Command.

UNIT - V

Terminal Emulator Command - PDF Integration Command - FTP Command - PGP Command - Object Cloning Command - Error Handling Command - Manage Windows Control Command - Workflow Designer - Report Designer.

TEXT BOOKS:

1. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots. with the leading RPA tool – UiPath Kindle Edition.

REFERENCES:

1. Robotic Process Automation A Complete Guide - 2020 Edition Kindle Edition.

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VIII Semester Syllabus
CS825PE: COGNITIVE COMPUTING
(Professional Elective – VI)

Prerequisites

- Probability theory

Course Objectives

- To provide an understanding of the central challenges in realizing aspects of human cognition.
- To provide a basic exposition to the goals and methods of human cognition.
- To develop algorithms that use AI and machine learning along with human interaction and feedback to help humans make choices/decisions.
- To support human reasoning by evaluating data in context and presenting relevant findings along with the evidence that justifies the answers.

Course Outcomes

- Understand what cognitive computing is, and how it differs from traditional approaches.
- Plan and use the primary tools associated with cognitive computing.
- Plan and execute a project that leverages cognitive computing.
- Understand and develop the business implications of cognitive computing.

UNIT - I

Introduction to Cognitive Science: Understanding Cognition, IBM's Watson, Design for Human Cognition, Augmented Intelligence, Cognition Modeling Paradigms: Declarative/ logic-based computational cognitive modeling, connectionist models of cognition, Bayesian models of cognition, a dynamical systems approach to cognition.

UNIT - II

Cognitive Models of memory and language, computational models of episodic and semantic memory, modeling psycholinguistics.

UNIT - III

Cognitive Modeling: Modeling the interaction of language, memory and learning, Modeling select aspects of cognition classical models of rationality, symbolic reasoning and decision making.

UNIT - IV

Formal models of inductive generalization, causality, categorization and similarity, the role of analogy in problem solving, Cognitive Development Child concept acquisition. Cognition and Artificial cognitive architectures such as ACT-R, SOAR, Open Cog, Copy Cat, Memory Networks.

UNIT - V

Deep QA Architecture, Unstructured Information Management Architecture (UIMA), Structured Knowledge, Business Implications, Building Cognitive Applications, Application of Cognitive Computing and Systems.

TEXT BOOKS:

1. The Cambridge Handbook of Computational Psychology by Ron Sun (ed.), Cambridge University Press.
2. Formal Approaches in Categorization by Emmanuel M. Pothos, Andy J. Wills, Cambridge University Press.

REFERENCE BOOKS:

1. Judith S. Hurwitz, Marcia Kaufman, Adrian Bowles Cognitive Computing and Big Data Analytics, Wiley
2. Vijay V Raghavan, Venkat N. Gudivada, Venu Govindaraju, Cognitive Computing: Theory and Applications: Volume 35 (Handbook of Statistics), North Holland.

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VIII Semester Syllabus
CS826PE: SEMANTIC WEB
(Professional Elective – VI)

Course Objectives

- To learn Web Intelligence.
- To learn Knowledge Representation for the Semantic Web.
- To learn Ontology Engineering.
- To learn Semantic Web Applications, Services and Technology.

Course Outcomes

After completion of the course, the student should be able to

- Understand the characteristics of Semantic Web.
- Apply SOAP and UDDI to web services.
- Handle multiple web services using Orchestration.
- Create documents using XML.
- Construct and use Ontologies.

UNIT - I

Introduction: Introduction to Semantic Web, the Business Case for the Semantic Web, XML and Its Impact on the Enterprise.

UNIT - II

Web Services: Uses, Basics of Web Services, SOAP, UDDI, Orchestrating Web Services, Securing Web Services, Grid Enabled and Semantic Web of Web Services.

UNIT - III

Resource Description Framework: Features, Capturing Knowledge with RDF.

XML Technologies: XPath, The Style Sheet Family: XSL, XSLT, and XSL FO, X Query, X Link, X Pointer, XInclude, XMLBase, XHTML, X Forms, SVG.

UNIT - IV

Taxonomies and Ontologies: Overview of Taxonomies, Defining the Ontology Spectrum, Topic Maps, Overview of Ontologies, Syntax, Structure, Semantics, and Pragmatics, Expressing Ontologies Logically, Knowledge Representation.

UNIT - V

Semantic Web Application: Semantic Web Services, e-Learning, Semantic Bioinformatics, Enterprise Application Integration, Knowledge Base. Semantic Search Technology: Search Engines, Semantic Search, Semantic Search Technology, Web Search Agents, Semantic Methods, Latent Semantic Index Search, TAP, Swoogle.

TEXT BOOK:

1. Thinking on the Web - Berners Lee, Godel and Turing, Wiley Interscience.

REFERENCE BOOKS:

1. The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management by Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, Wiley Publishing, Inc.
2. Semantic Web Technologies, Trends and Research in Ontology Based Systems, J.Davies, R. Studer, P.Warren, John Wiley & Sons.
3. Semantic Web and Semantic Web Services - Liyang Lu Chapman and Hall/CRC Publishers, (Taylor & Francis Group)
4. Information Sharing on the semantic Web - Heiner Stuckenschmidt; Frank Van Harmelen, Springer Publications.
5. Programming the Semantic Web, T.Segaran, C.Evans, J.Taylor, O'Reilly, SPD.

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VIII Semester Syllabus
CS821OE: Python Programming (Open Elective – III)
(Offered by CSE)

Course Objectives

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes

- Students would be able to
- Develop essential programming skills in computer programming concepts like data types, containers.
 - Apply the basics of programming in the Python language.
 - Solve coding tasks related Exceptions and Functions.
 - Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming.
 - Solve coding tasks related to GUI Programming.

Unit – I

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.

Repetition Structures: Introduction, while loop, for loop, Input Validation Loops, Nested Loops.

Unit – II

Sequences: Introduction to Sequences: Strings, Lists, and Tuples, Mapping, Set Types and Dictionaries

String: Strings and Operators, Built-in Methods and Special Features of String. Related Modules.

Lists: Operators, Built-in Functions, List Type Built in Methods, Special Features of List, Related Modules

Tuples: Built-in Functions, Tuple Type Built in Methods, Special Features of Tuples, Related Modules

Mapping and Set Type: Dictionaries, Dictionary Keys, Operators and Built-in Methods. Set type, Operator and Built in Methods. Related Modules.

Unit – III

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Functions: What are Functions, Defining and Creating functions, Function Arguments: Formal and Variable length, Calling functions, Recursive Functions and Variable Scope.

Modules: Modules, Standard Modules, Importing Modules, Namespaces and Packages.

Unit – IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using OOps support

Design with Classes: Objects and Classes, Data modelling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism.

Unit – V

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs.

Suggested Reading:

1.Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage, 2016.

2.Python Programming: A Modern Approach, VamsiKurama, Pearson, 2018.

Reference Books:

1.Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press, 2019.

2.Introduction to Programming Using Python, Y. Daniel Liang, Pearson, 2017.

3.Core Python Programming, Wesley J.Chun, Second Edition ,Pearson 2007.

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VIII Semester Syllabus
CS822OE: Internet of Things (Open Elective-III)
(Offered by CSE)

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 Programming Raspberry Pi with Python.
- To introduce the hardware and working principles of various sensors used for IoT

Course Outcomes

- Students would be able to
- Understand the concepts of Internet of Things.
 - Design IoT applications in different domain and be able to analyze their performance.
 - Able to know the Language features of Python.
 - Able to know about working of Raspberry Pi
 - Able to know the working of various Sensors.

Unit I:

Introduction to Internet of Things—Introduction, Definition and Characteristics of IoT, Physical Design of IoT- Things in IoT, IoT Protocols, Logical Design of IoT- IoT Functional Blocks, IoT communication models, IoT Communication APIs. IoT Enabling Technologies —Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems.

Unit II:

Domain Specific IoT—Introduction , Home Automation, Smart Cities, Environment- Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle, IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT- Software Defined Networking, Network Function Virtualization

Unit III:

IoT Systems - Logical Design using Python- Introduction, Python Data Types & Data Structures, Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Control Flow- if, for, while, range, break/continue, pass, Functions, Modules, Packages, File Handling, Date/Time Operations, Classes, Python.

Unit IV:

IoT Physical Devices and Endpoints - What is an IoT Device-Basic building blocks of an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces - serial,SPI,I2C,Programming Raspberry Pi with Python- Controlling LED with Raspberry Pi, interfacing an LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi.

Unit V:

Buzzer- Function of a Buzzer, Two Kinds of Buzzer, Relays- What is a Relay, Its Working, Relay Uses, Why Relay is used in Motor Control, Relay Module.

Sensors: What is an IoT Sensor, IoT Sensors Types- Pressure Sensors, Light Sensors, Temperature & Humidity Sensors.

Suggested Reading:

1. MInternetofThings-AHands-onApproach,ArshdeepBahgaandVijayMadiseti, Universities Press, 2015, ISBN:9788173719547, N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

Reference Books:

1. Getting Started with RaspberryPi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN:9789350239759.
2. A Hands-On Course in Sensors Using the Arduino and Raspberry Pi (Series in Sensors) 1st Edition, Kindle Edition by Volker Ziemann.
3. RaspberryPi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895.

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VIII Semester Syllabus
CS823OE: Introduction to Machine Learning (Open Elective-III)
(Offered by CSE)

Prerequisites

1. Data Structures
2. Knowledge on statistical methods

Course Objectives

- This course explains machine learning techniques such as decision tree learning, Bayesian learning etc.
- To understand computational learning theory.
- To study the pattern comparison techniques.

Course Outcomes

- Students would be able to
- Understand the concepts of computational intelligence like machine learning
 - Ability to get the skill to apply machine learning techniques to address the realtime problems in different areas
 - Understand the Neural Networks and its usage in machine learning application

UNIT-I

Introduction - Well-posed learning problems, designing a learning system, Perspectives and issues in machine learning

Concept learning and the general to specific ordering – introduction, a concept learning task, concept learning as search, find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, remarks on version spaces and candidate elimination, inductive bias.

Decision Tree Learning–Introduction, decision tree representation, appropriate problems for decision tree learning, the basic decision tree learning algorithm, hypothesis space search in decision tree learning, inductive bias in decision tree learning, issues in decision tree learning.

UNIT-II

Artificial Neural Networks-1– Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back-propagation algorithm.

Artificial Neural Networks-2- Remarks on the Back-Propagation algorithm, An illustrative example: face recognition, advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.

UNIT-III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum Likelihood and least squared error hypotheses, maximum likelihood hypotheses for predicting probabilities, minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, an example: learning to classify text, Bayesian belief networks, the EM algorithm.

Computational learning theory–Introduction, probably learning an approximately correct hypothesis, sample complexity for finite hypothesis space, sample complexity for infinite hypothesis spaces, the mistake bound model of learning.

Instance-Based Learning- Introduction, k-nearest neighbour algorithm, locally weighted regression, radial basis functions, case-based reasoning, remarks on lazy and eager learning.

UNIT- IV

Genetic Algorithms – Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning, parallelizing genetic algorithms.

Learning Sets of Rules – Introduction, sequential covering algorithms, learning rule sets: summary, learning First-Order rules, learning sets of First-Order rules: FOIL, Induction as inverted deduction, inverting resolution.

Reinforcement Learning–Introduction, the learning task, Q–learning, nondeterministic, rewards and actions, temporal difference learning, generalizing from examples, relationship to dynamic programming.

UNIT-V

Analytical Learning-1: Introduction, learning with perfect domain theories: PROLOG-EBG, remarks on explanation-based learning, explanation-based learning of search control knowledge.

Analytical Learning-2: Using prior knowledge to alter the search objective, using prior knowledge to augment search operators.

Combining Inductive and Analytical Learning: Motivation, inductive - analytical approaches to learning, using prior knowledge to initialize the hypothesis.

Suggested Reading:

1.Machine Learning–Tom M. Mitchell,-MGH

REFERENCE BOOK:

1.Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis