Autonomous Programme Structure (Modified) of
F. Y. B. Tech. (Common to All Programmes)
A. Y.: 2019-2020

F. Y. B. Tech. Semester –I									
Course Code	Course Title	Teaching Scheme Hours / Week			Examination Scheme			Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Practical / Oral		
BS 1101	Engg. Mathematics - I	3	1	0	50	50	0	100	4
BS 1102	Physics - I	2	1	0	50	50	0	100	3
BS 1103	Chemistry- I	2	1	0	50	50	0	100	3
ES 1101	Basic Electrical and Electronics Engg. - I	3	0	0	50	50	0	100	3
ES 1102	Fundamentals of Programming Language - I	1	0	0	25	0	0	25	1
ES 1103	Engg. Graphics	2	0	0	25	25	0	50	2
ES 1104	Environmental Studies	2	1	0	50	50	0	100	3
BS 1104	Physics and Chemistry Lab - I	0	0	2	25	0	0	25	1
ES 1105	Basic Electrical and Electronics Engg. Lab - I	0	0	2	0	0	25	25	1
ES 1106	Fundamentals of Programming Language - I	0	0	2	0	0	25	25	1
ES 1107	Engg. Graphics Lab	0	0	2	0	0	25	25	1
NC 1101	Value Education	1	0	0	0	0	0	0	0
	Total	**16**	**4**	**8**	**325**	**275**	**75**	**675**	**23**
	Grand Total	**28**			**675**			**675**	**23**

Cummins College of Engineering, Karvenagar, Pune-411052

DEAN ACADEMICS
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg For Women, Karvenagar, Pune-52.

APPROVED BY
Governing Body Members
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

BS1101 ENGINEERING MATHEMATICS - I

Teaching Scheme:	Examination Scheme:
Lectures: 3 Hrs/Week	In-Semester : 50 Marks
Tutorial: 1 Hr/Week	End-Semester: 50 Marks
Credits: 4	

Course Objectives:

Mathematics is a necessary path to scientific knowledge which opens new perspective of mental activity. Our aim is to provide sound knowledge of engineering mathematics to make the students think mathematically and strengthen their thinking power to analyze and solve engineering problems in their respective areas.

Course Outcomes:

1. Solve the system of Linear equations by using the matrix method and apply it to check Linear Dependence, Independence of the vectors.
2. Calculate eigen values, eigen vectors and apply it to diagonalize a matrix.
3. Analyze roots of algebraic equations by applying De Moivre's theorem and analyze the function of complex numbers .
4. Compute power series expansions by using higher order derivatives.
5. Calculate partial derivatives and use to analyze maxima, minima of a given function.

Unit – I: Matrices **(07)**

Matrices, Rank of the matrix, Echelon Form, Normal form, Inverse of the matrix,System of Linear Equations, Linear Dependence and Independence, Linear

Transformations, Rotation and Translation Matrices.

Unit – II: Applications of matrices **(06)**

Eigen Values, Eigen Vectors , Cayley Hamilton Theorem , Diagonalization and applications in finding powers of matrix.

Unit–III: Complex numbers and its applications **(08)**

Argand diagrams, De moivre's theorem and its applications, Hyperbolic Functions, Separation of real and imaginary parts of functions of complex numbers, Inverse Hyperbolic Functions, Logarithm of Complex Numbers.

Unit – IV: Differential calculus **(05)**

Successive Differentiation, Method of finding nth order derivative of functions, Leibnitz theorem, Taylor's series, Maclaurin's Series.

Unit – V: Partial Differentiation **(07)**

Partial Differentiation, chain rule, composite functions, Euler's theorem on homogeneous functions,Total derivatives .

Unit – VI: Jacobian and its applications **(08)**

Jacobian, Chain rule, Partial derivatives using Jacobian, Errors and Approximations, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

Text Books:

1. B.S. Grewal, **'Higher engineering Mathematics'**, *Khanna publishers, Delhi(*40th edition),(2008).
2. B. V. Ramana, **'Higher Engineering Mathematics ',** *Tata McGraw Hill Publications* (2007)
3. Erwin Kreyszig ,**'Advanced Engineering Mathematics'** *Wiley Eastern Ltd.*(8th Student Edition)(2004).

Reference Books:

1. C.R.Wylie, L.C. Barrette, **'Advanced Engineering Mathematics',** *McGraw Hill Publi-*

*cations, New Delhi.(*6th edition)(2003)
2. Peter V. O'neil,'**Advanced Engineering Mathematics'** ,Thomson Brooks / Cole, *Singapore (*5th edition) (2007).

BS1102 PHYSICS – I

Teaching Scheme

Lectures: 2 Hrs per week

Tutorial: 1 Hr per week

Credits: 3

Examination Scheme:

In-Semester : 50 Marks

End-Semester: 50 Marks

Course Objective:

1. To introduce undergraduate students Of engineering to the principles, notions, basic physical ideas, mathematical relations and applications of Classical Physics, specifically pertaining to the theories of Electromagnetic Radiation, Optics, Special Relativity
2. To point out some of the contexts in which Classical Physics fails to account for certain experimental observation thereby requiring Quantum Physics to take over

Course Outcomes:

By taking this course, the learner will be able to –

1: **Use** the laws of Electrostatics and Electromagnetic Radiation to determine the electric field dueto static and dynamic charge distributions.
2: Apply the laws of physical optics in situations involving interference, diffraction and polarization patterns.
3: Justify the use of the principles of special relativity in situations involving elementary particles.
4: Judge the relevance of quantum mechanical principles and methods in finding out interferometric behavior and allowed energy states of particles with arbitrary spins.

Unit – I: Electromagnetic Radiation and Interference: (4)

Expression for the electric field beyond Coulomb's law; The dipole radiator; Physics of interference – Two dipole radiator

Unit – II: Diffraction and Polarization: (4)

The resultant amplitude due to *n* equal oscillators; Diffraction Grating; The electric vector of light; Birefringence; Polarisers

Unit – III: Capacitance and Dielectrics: (4)

Electrostatic energy; Capacitance of a Parallel-Plate Capacitor; The dielectric constant; The polarization vector

Unit – IV: Special Relativity: (4)

The Lorentz transformation; Slowing of clocks; Contraction of length; Relativistic energy

Unit – V: Quantum Behaviour – I: Particles and Waves: (4)

Experiments with bullets, waves and electrons; The uncertainty principle

Unit – VI: Quantum Behaviour – I: The Magnetism of Matter: (4)

The Precession of atomic magnets; Angular momentum in Quantum Mechanics; The magnetic energy of atoms; Quantized magnetic states

Text Book:

R. P. Feynman, R. B. Leighton and M. Sands, **'The Feynman Lectures on Physics'**, *Pearson Education* (2006)

Reference Books:

1. J. Walker, D. Halliday, R, Resnick, **'Principles of Physics'**, Wiley *Student Edition* (10th Edition)

2. H. Young and Roger Freedman, **'University Physics'**, Pearson Addison Wesley (12th Edition)

BS1103 CHEMISTRY- I

Teaching Scheme: **Examination Scheme:**

Lectures: 2 Hrs/Week In-Semester: **50** Marks

Tutorial: 1 Hr/Week End-Semester: **50** Marks

Credits: 3

Course Objectives:

The Chemistry course is designed such that the learners develop a sound background of fundamental concepts and principles relevant in the engineering context. The course facilitates undergraduates to learn bonding theories, methods of analysis and evaluate role of chemical substances. They analyze chemical processes related to engineering applications. Also the course inculcates basic problem solving skills involving chemistry principles.

Course Outcomes:

1. State laws, formulae, definitions and properties.
2. Comprehend synthesis procedures and analytical methods in qualitative and quantitative estimation.
3. Apply principles of fundamental chemistry for solving problems.
4. Analyze chemical processes for engineering applications based on chemical reactions and evaluate the role of chemical substances.
5. Critique the effect of different parameters on the properties of chemical substance.

Unit – I: Chemical Bonding **(05)**

Types of bonds - primary & secondary types with examples, hybridization based on valence bond theory, VSEPR theory, molecular orbital theory with respect to bonding in homo and hetero nuclear diatomic molecules.

Unit – II: Water Analysis and purification **(06)**

Chemical Analysis of water hardness, alkalinity and effect of hard water in boilers, Internal

treatment of boiler feed water, water softening techniques (Permutit and Ion exchange method) and membrane based processes.

Unit – III: Electro chemistry **(06)**

(a) Fundamentals of an electrochemical cell, EMF of cell, reference and indicator electrodes, conductance in solution and conductometric titration.

(b) Battery Technology

Primary & secondary cell, battery characteristics, Ni-Cd cell, Lithium-ion battery, rechargeable batteries, Fuel cell technology.

Unit – IV: Instrumental methods of Analysis-I **(04)**

Basic principles,instrumentation and applications of pHmetry, Potentiometry, Chromatography

Unit – V: Coordination Chemistry **(05)**

Introduction,Classification of ligands, naming coordination compounds, Werner and Sidgwick theory, VBT, CFT for Td and Oh complexes. Applications and comparison of VBT & CFT.

Unit – VI: Photochemistry **(04)**

Photochemical reactions, Laws of Photochemistry and quantum yield, energy transfer in photochemical reaction, applications.

Text Books:

1. Arun Bahl & G.D. Tuli,**Essentials of Physical Chemistry,***S.Chand Publications* (2014)
2. S.S. Dara **'Engineering Chemistry'** *S. Chand Publications (2010)*
3. Puri, Sharma, Kalia **'Principles of Inorganic Chemistry'**: *Milestone Publications* (2009)
4. B.S. Chauhan **'Engineering Chemistry'** :*Univ Sc Press.*(third edition)2009
5. Shashi Chawla **'A Text Book Of Engineering Chemistry'**: *Dhanpat Rai & Co.*(2015)

6. Jain and Jain '**A Text Book Of Engineering Chemistry**' *Dhanpat Rai & Co.*
7. Gurdeep Chatwal **'Instrumental methods of Chemical Analysis'** *Himalaya publ.house*

Reference Books:

1. Steven S. Zumdahl, **‘Chemistry concepts and applications’,** *Cengage learning publication* (2009)
2. Ram D. Gupta,**'Hydrogen fuel'***C.R.C.Publications*(2009)
3. Puri, Sharma, Pathania **'Principles of Physical Chemistry'** *: Vishal Publ. Co.*(2015)
4. Robert D. Braun*' **Instrumental methods of analysis'** Pharmamed press* (2010)

ES1101 Basic Electrical and Electronics Engineering - I

Teaching Scheme: **Examination Scheme:**

Lectures: 3 Hrs/Week In-Semester: 50 Marks

Credits: 3 End-Semester:50Marks

Course Objectives:

1. To make students familiar with the fundamental concepts of electric and magnetic circuits.
2. To educate the students about the realization of basic theoretical concepts & laws in real physical world.
3. To educate the students about the construction and applications of diode
4. To educate the students about the construction and applications of BJT

Course Outcomes:

After completion of course, students will be able to

1) Determine energy consumption for electro-thermal and electro-mechanical systems as well as analyze the temperature effect on resistance
2) Analyze given magnetic circuit and find circuit parameters
3) Analyze given DC circuit and calculate its parameters
4) Calculate average value and RMS value of sinusoidal and non-sinusoidal AC waveforms.
5) Analyze I-V characteristics of semiconductor diodes and transistors and design simple analog circuits using these devices

Unit – I: Introduction to electrical systems (05)

Review of basic electrical terms, Effect of temperature on resistance, Resistance temperature coefficient, insulation resistance, Work, Power and energy calculations for thermal, mechanical and electrical systems.

Unit – II: DC Networks (07)

Kirchoff's laws, Mesh and Nodal Analysis, Thevenin , Norton and Superposition Theorems, maximum power transfer therom, Network Simplifications using star-delta / delta-star transformations.

Unit – III: Electromagnetism and Magnetic Circuits (06)

Magnetic field due to electric current, Force on a current carring conductor, Electromagnetic induction, direction and magnitude of induced EMF, magnetomotive force and magnetic field strength, relative and absolute permeability, reluctance, series and parallel magnetic circuits, magnetic materials and B-H curve, self and mutual inductance, coupling coefficient,energy stored in magnetic circuits.

Unit – IV: Electrostatics and AC fundamentals (06)

A. Electrostatic field, electric flux density, electric field strength, permittivity. Capacitor and capacitance, dielectric strength and breakdown voltage, capacitors in series and parallel,composite capacitors, energy stored in capacitors, charging and discharging of capacitors and time constant

B. Generation of alternating emf, waveform terms and definitions, average value and rms values for sinusoidal and non sinusoidal currents and voltages, phasor representation of an alternating quantity

Unit – V: Diodes and rectifiers (06)

Overview of Semiconductor physics and p-n junction theory, Junction diode, construction and characteristic of p-n junction diode, zener diode, LED, photodiode, Half wave, full wave and bridge rectifiers, need of capacitor filter, rectifier operation with capacitor filter, zener diode as a voltage regulator, block diagram of Regulated power supply

Unit – VI: Junction Transistor Amplifiers (06)

Bipolar junction transistor, Construction of BJT, Types of biasing:-fixed bias and self bias circuit, BJT characteristics for-CE,CB,CC configurations, relationship between α and β, load line for a transistor, application of transistor as a switch and amplifier.

Text Books:

1. Hughes, **'Electrical and Electronic Technology'**, *pearson education*, (9^{th} edition), (2009)

Reference Books:

1. D. P. Kothari and I.J. Nagrath, '**Basic Electrical Engineering**', *McGraw-Hill*, (3^{rd} edition), (2010)
2. A. E. Fitzgerald, A.Grabiel,'**Basic Electrical engineering**',*McGraw-Hill*, (5^{th} edition), (2009)
3. Floyd, '**Electronic Devices and Circuits**', *pearson education, (*7^{th} edition),(2008)

ES 1102 Fundamentals of Programming Languages - I

Teaching Scheme:
Lectures: 1 Hr/Week
Credits: 1

Examination Scheme:
In-Semester: 25 Marks

Course Objectives:

1. Learn the fundamentals of building blocks of computer.
2. Understand how to formulate the programming language statements from description of a problem in English.
3. Understanding of decision and iteration interpretation in a programming language.
4. Understand basic building blocks of simple website.

Course Outcomes:

Students will be able to

1. Write algorithm based on given problem statement
2. Draw flow chart for a given problem statement
3. Write the code for simple problem statement
4. Debug the code snippets manually

Unit – I: Introduction to Programming (02)

Introduction to computer, Anatomy of a computer: Hardware and software, Operating system, Types of programming languages: Machine language, Assembly language, High level languages, Selection of language, Algorithm: As a program, As a flow-chart, Pseudo code

Unit – II: Writing First C Program (02)

Structure of a C program, Writing C program, Introduction to library functions in C, Files generated in C program, Comments, Indentation

Unit – III: Variables and Operations (03)

C language variables: Numeric, Character, Declaring and Initializing variables, Constants: Integer, Floating point, Character, String Operators: Arithmetic, Relational, Equality, Logical, Unary, Conditional, Bitwise, Assignment, Comma, sizeof, Operator precedence variable scope: Local and Global scope, Type casting and conversion

Unit – IV: Control flow in C Language (03)

Conditional branching statements: if statements, if-else Statement, Switch case, Iterative statements: while loop, do-while loop, for loop, Nested loops, break and continue statements

Unit – V: Arrays (02) Introduction to Arrays, Accessing Array elements, Internal representation of Arrays in C, Working with one-dimensional array, Introduction to two-dimensional arrays

Unit – VI: Introduction to Website Development (02)

Introduction to blogging and WordPress : Creating a simple website, Content creation, Pages and Blogs, Page linking, Comments, Adding contents like Multimedia, Presentations, Themes

Text Books:

1. Reema Thareja, **'Introduction to C programming',** *Oxford University Press* (2nd edition), (2015)
2. Pradeep Day, '**Computer Fundamentals and programming in C'**, *Oxford University Press*, (2nd edition) (2013)

Reference Books:

1. B Kernighan, D Ritchie, '**C programming Language'**, *Prentice Hall Software Series*, (2nd edition) (1988)

ES1103 Engineering Graphics

Teaching Scheme: **Examination Scheme:**

Lectures: 2 Hrs/Week In-Semester: 25 Marks

Credits: 2

End-Semester: 25Marks

Course Objectives:

a) To apply theory of projections and standard conventions in engineering drawing.

b) To understand the methods to draw various engineering curves.

c) To develop the visualization and interpretation skills, for the physical objects.

d) To develop free hand sketching skills.

Course Outcomes:

After completing the course students will be able to draw

a) Orthographic projections of an object.

b) Engineering curves by applying the given method.

c) Isometric views and development of surfaces of the given object.

4. Free hand sketches of simple machine elements.

Unit – I: Introduction to Engineering Drawing (02)

Layout and sizes of drawing sheets, drawing instruments, types of lines used in drawing practice, dimensioning systems, representation of tolerances, standard codes by B.I.S (SP-46).

Unit – II: Curves in Engineering Practice (05)

Construction of ellipse, parabola, hyperbola, involute, cycloid, archimedean spiral, helix on cone and cylinder.

Unit – III: Orthographic Projections (08)

Theory of projections, methods of obtaining orthographic views,sectional orthographic projections.

Unit – IV: Isometric Projections (08)

Isometric axes, Isometric scale, isometric projections and views, construction of isometric view from given orthographic views.

Unit – V: Development of lateral surfaces of solids (05)

Parallel line development, radial line development, methods to transfer points for development of prisms, pyramids, cylinder and cone.

Unit – VI: Free hand sketching (02)

Free hand sketching of front view and/or top view of standard machine elements –thread forms, hexagonal headed bolt and nut, screws, shaft and keys, spring, welded and riveted joint.

Text Books:

1. N. D. Bhatt and V. M. Panchal,**'Engineering drawing, plane and solid geometry'**, *Charotor Publication House.*

a) R. K. Dhawan,**'A text book of Engineering Drawing'**, *Pearson Education Inc*.

b) P.S. Gill, **'Engineering Graphics'**, *Kataria and sons Publications.*

c) M.L.Dabhade, **'Engineering Graphics'**, *Vision Publications.*

Reference Books:

a) Warren J. Luzzader, **'Fundamentals of Engineering Drawing'**, *Prentice Hall of India, New Delhi.*

b) Fredderock E. Giesecke, Alva Mitchell, **'Principles of Engineering Graph-**

ics',*Maxwell McMillan Publishing.*

c) Dhananjay A. Jolhe, **'Engineering Drawing'**, *Tata McGrawHill Publishing Co. Ltd.*

ES 1104 Environmental Studies

Teaching Scheme:

Lectures: 2Hrs/Week

Tutorial: 1Hr/Week

Credits: 3

Examination Scheme:

In-Semester: 50 Marks

End-Semester: 50 Marks

Course Objectives:

1. It is an interdisciplinary approach to understand environment.
2. It enhances the ability to understand Environmental Problems.
3. Understand the relevance and importance of natural resources in the sustenance of life on earth and living standard.
4. To develop the ability and understand role of Individual in Environmental Protection

Course Outcomes:

A student should be able to obtain/develop:

1. Develop an understanding of environmental pollutions and hazards due to engineering/technological activities and general measures to control them.
2. Analyse the relationships between environmental laws across multiple sectors (local, state, national and international) Comprehend the importance of ecosystem and biodiversity.
3. Develop an understanding of different natural resources including renewable and non-renewable resources.

4. Identify suitable controlling measures for different types of solid wastes.

5. Improve fundamental knowledge of the inter-relationships between the built environment and natural environment.

6. Discuss an action plan for sustainable alternatives that integrate science, humanities and social perspective

Unit – I: Introduction (05)

Concept of environment and multidisciplinary nature of environmental studies:

a) Definition of Environment, multidisciplinary nature of Environmental Studies, scope, importance of Environment, Public awareness for Environment

b) Concept, Ecosystem characteristics:-Biotic abiotic, functional attributes

c) Energy flow in ecosystem: - Universal and single channel energy flow model, Nutrient Cycling:- Nitrogen cycle, carbon cycle, phosphorus cycle,

d) Concept of biodiversity

Unit – II: Integrated built environment (05)

d) Concept of integrated built environment – natural & man-made.

e) Eco-friendly materials in construction - Introduction, sources, Classification,properties and materials.

f) Principles of Building Planning: - Aspect, prospect, grouping, privacy, roominess, sanitation, orientation, circulation, elegance, economy.

g) Building bye laws (concept):- Building line, control line, set back distance, F.S.I., Built up area.

h) Concept of green building, advantages of green building, Introduction LEED rating system.

Unit – III: Renewable and Non- Renewable resources and it's Conservation (04)

f) Natural resources: Types of Renewable- Forest, water - causes of depletion, Conservation

g) Non-renewable resources, types, method of harnessing energy

Unit – IV: Environmental Pollution (05)

g) Introduction, Classification of pollution - Air and water - sources, causes, effects & remedial measures.

h) Solid waste generation, Collection of solid wastes, processing techniques, E- waste generation and methods of disposal.

i) Role of an individual in prevention of pollution.

Unit – V: Social Issues and Environment (05)

g) Unsustainable to sustainable development, urban problems related to energy, Climate change, global warming, acid rain, ozone layer depletion

h) Water conservation and Rain water harvesting

i) Introduction to Environmental Impact Assessment - Definition, introduction of methods with the help of a case study

j) Environment Protection Act, Forest Conservation Act, Public awareness.

Unit – VI: Smart City (03)

Concept and features of smart city, challenges of urbanization, selection process, strategy

Text books:

5. D.L. Manjunath, 'Environmental Studies', Pearson Education.

6. ErachBharucha, 'Text Book of Environmental Studies', UGC, Universities Press

Reference books:

5. D.K. asthana ,MeeraAsthana, ‘A Text Book Of Environmental Studies’,S.Chand.

6. Dr. J.P. Sharma, ‘Environmental Studies’,University Science Press.

7. Dr. Suresh K. Dhalmeja,‘Environmental Studies’,S.K.Kataria& Sons.

8. Anubha Kaushik, C.P.Kaushik, ‘Perspectives in Environmental Studies’,

New Age International Publishers.

9. Shah, Kale, Patki, ‘Building planning and Built environment’,

Tata McGraw Hill

10. Bukhootsow, ‘Energy policy and planning’,B- Prentice Hall of India New Delhi

BS1104 Physics and Chemistry Lab – I

Teaching Scheme	Examination Scheme
Practical: 2 Hrs/Week	In-Semester: 25
Credits: 1	

1: **Record** the observations as per the least counts of measuring instruments and carry out plotting and necessary calculations pertaining to the optical, electromagnetic and thermal systems.
2: Analyze the plotted data and experimental findings with the corresponding theoretical physical models pertaining to the optical, electromagnetic and thermal systems.
3: Analyze the sources of errors and arrive at conclusions pertaining to the behavior of optical, electromagnetic and thermal systems
4: Determine quality parameters of water such as hardness, alkalinity etc
5: Use of instrumental techniques in quantitative estimations like conductometry, pH metry, potentiometry.
6: Select appropriate quantitative analysis for estimation of different parameters of the substance.
7: Interpret the significance of a technique and specific role of reagent in qualitative and quantitative analysis.

List of Experiments:

Physics
1. Michelson Interferometer
2. Specific heat of substance
3. Hall Effect
4. Balmer Series and Emission Spectra
5. Zeeman Effect (Demo)

Chemistry
1. Qualitative & quantitative Analysis of alkali /alkaline earth metals using Flame Photometry.
2. Colorimetric verification of Beer-Lambert's law.
3. Determination of molecular weight of polymer using Ostwald Viscometer.
4. Proximate analysis of coal.

ES 1105 Basic Electrical and Electronics Engineering Lab-I

Teaching Scheme:	**Examination Scheme:**
Practical: 2 Hrs./Week	Practical Exam: 25 marks
Credits: 1	

Course Outcomes:

After completion of course, students will be able to

1. Perform basic domestic wiring
2. Apply circuit laws to find the parameters of given electrical network
3. Build a basic regulated DC power supply
4. Analyse the performance of Transistor in CE configuration
5. Write techinical report of conducted experiment

List of experiments:

1. Study of different electrical and electronics components and instruments.
2. To perform electrical wiring to control lamps using one way and two-way switches.
3. Determination of Temperature Rise of a Medium Resistance
4. Verification of kirchoff's laws & superposition theorems
5. Verification of Thevenin's theorem.
6. Performance analysis of half wave,full wave rectifier with center tap transformer and bridge rectifier with and without filter.
7. Performance analysis of three terminal IC voltage regulator
8. Determination of frequency responce of CE amplifier.

ES 1106 Fundamentals of Programming Languages Lab - I

Teaching Scheme:
Practical: 2 Hrs/Week
Credits: 1

Examination Scheme:
Practical: 25 Marks

Course Objectives:
Familiarize students with

1. Learn basics of C programming.
2. Learn to write C program for a given logical solution.
3. Learn to make validation checks at required places.
4. Learn to apply programming concepts to solve problems.

Course Outcomes:
Students will be able to

1) Write algorithm based on given problem statement
2) Apply appropriate programming constructs
3) Write program for simple problem statement
4) Test program for different inputs

Section 1 (any 08 assignments)

1. A) Write a C program to accept the length of three sides of a triangle and to test and print the type of triangle - equilateral, isosceles, right angled or none of these.

   B) Find out area, perimeter of a given trigonometric figure
2. Write a C Program to display the table of any given number
3. Write a C Program to reverse a given number
4. Write a C Program to find whether a given number is Armstrong number or not.
5. Write a C Program to calculate Simple Interest
6. Write a C Program to convert temperature from Celsius to Fahrenheit
7. Write a C program to display all the prime numbers between 1 to n
8. Write a C program to generate a series (like Fibonacci)
9. Write a C Program to display the numbers divisible by 7 in a given range(e.g. 11 to 90)
10. Write a C Program to accept a number and convert every digit into word and display it
11. Write a C Program for finding roots of Quadratic Equation
12. Write a C Program to find the greatest possible length which can be used to measure exactly the lengths 4m 95cm, 9m and 16m 65cm (Hint HCF)

Section 2 (any 02 assignments)

1. The traffic light at three different road crossings change after every 48, 72 and 108 sec, if they all change simultaneously at 8:20:00 hrs., then at what time will they again change simultaneously? (Hint : LCM)
2. The average of 25 results is 18. The average of first twelve of them is 14 and the average of last twelve of them is 17. Find the thirteenth result. (Hint Average).
3. The taxi fare is Rs. 14 for the first kilometer and Rs. 2 for each additional kilometer. What will be the

fare for 10 kilometers?(Hint: Arithmetic Progression)

4. Roma's mathematics test had 75 problems, i.e. 10 arithmetic, 30 algebra and 35 geometry problems. Although she answered 70% of the arithmetic, 40 %of algebra and 60% of geometry problems correctly she did not pass because she got less than 60% of the questions right. How many more questions she would have needed to solve to earn 60% of passing grade?(Hint Percentage.)
5. A radio is purchased for Rs. 490/- and sold for Rs.465.50. Find the loss percentage(Hint: Profit and Loss)
6. In how many ways can a cricket 11 be chosen out of a batch of 15 players?(Hint Permutation and Combination)
7. Write a C Program to accept a number and convert every digit into word and display it

Section 3 (study assignment)

Design and develop a small application using Wordpress

Text Books:

1. Reema Thareja, **'Introduction to C programming',** *Oxford University Press* (2nd edition), (2015)
2. Pradeep Day, '**Computer Fundamentals and programming in C'**, *Oxford University Press*, (2nd edition) (2013)

Reference Books:

1. B Kernighan, D Ritchie, '**C programming Language'**, *Prentice Hall Software Series*, (2nd edition) (1988)

ES1107 Engineering Graphics Lab

Teaching Scheme:

Practical: 2 Hrs/Week

Credit: 1

Examination Scheme:

Practical: 25 Marks

Course Objectives:

Students will be able to

1. Apply theory of projections and standard conventions in engineering drawing.
2. Understand the methods to draw various engineering curves.
3. Develop the visualization and interpretation skills for the physical objects.
4. Develop free hand sketching skills.

Course Outcomes:

After completing the course students will be able to

Identify applications of engineering curves and draw the curves.

Understand and draw orthographic projections and isometric views of an object.

Draw the development of lateral surfaces of solids.

Create free hand sketches of the machine elements.

I: Introduction to Engineering Drawing (01)

Drawing sheet layouts, drawing instruments, standard codes by B.I.S (SP-46)

II: Assignments and Drawing Sheets (12)

- Engineering Curves.
- Orthographic Projections
- Isometric Projections

- Development of surfaces of solids.
- Free hand sketching.

III: Introduction to computer aided drafting package (02)

Features and applications of computer aided drafting packages, basic operations, and various commands for drawing, dimensioning, editing, saving and plotting the drawings.

NC 1201 Value Education

Teaching Scheme: **Examination Scheme:**

Lectures: 1 Hr /Week In-Semester: Nil

Tutorial: Nil End-Semester: Nil

Credits: Nil

Course Objectives:

1. To make understand importance of values in human behavior.
2. To understand adjustments required in one self and others to uphold values in society.
3. To understand importance of values in Family Life.
4. To understand ethics required by professionals in work place.

Course Outcomes:

1. Students will appreciate importance of values in all walks of life.
2. To develop women professional with strong ethics and above all be a good human being.
3. To help students to develop their own value system and action plan based on it.
4. To understand the impact of the Moral role of students in nation building and being a responsible citizen.
5. Understand effects of Global issue like Terrorism, Environment, different cultures etc.

Unit – I: Values and Self Development (03)

Value Education – Definition - relevance to present day - Concept of Human Values - self introspection - Self esteem.

Unit – II: Family values (03)

Components, structure and responsibilities of family - Neutralization of anger - Adjustability- Threats of family life - Status of women in family and society - Caring for needy and el-

derly -

Time allotment for sharing ideas and concerns.

Unit – III: Ethical values (03)

Professional ethics - Mass media ethics- Advertising ethics -Influence of ethics on family life -
psychology of children and youth – Leadership qualities - Personality development.

Unit – IV: Social values (03)

Faith, service and secularism - Social sense and commitment -Students and Politics -Social awareness, Consumer awareness, Consumer rights and responsibilities - Redressal mechanisms

Unit – V: Effect of international affairs on values of life/ Issue of Globalization (03)

Modern warfare -Terrorism. Environmental issues - mutual respect of different cultures, religions
and their beliefs.

Text Books:

1. Chakraborty, S.K., **'Values and Ethics for Organizations Theory and Practice'**, *Oxford
University Press, New Delhi*, (2001)

Reference Books:

1. T. Anchukandam and J. Kuttainimathathil (Ed) 'Grow Free Live Free', ***Krisitu Jyoti***

F. Y. B. Tech. Semester –II									
Course Code	Course Title	Teaching Scheme Hours / Week			Examination Scheme			Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Practical / Oral		
BS 1201	Engg. Mathematics - II	3	1	0	50	50	0	100	4
BS 1202	Physics - II	2	1	0	50	50	0	100	3
BS 1203	Chemistry - II	2	1	0	50	50	0	100	3
ES 1201	Basic Electrical and Electronics Engg. - II	3	0	0	50	50	0	100	3
ES 1202	Fundamentals of Programming Language - II	1	0	0	25	0	0	25	1
ES 1203	Basic Mechanical Engg.	3	0	0	50	50	0	100	3
ES 1204	Engg. Mechanics	2	1	0	50	50	0	100	3
BS 1204	Physics and Chemistry Lab - II	0	0	2	25	0	0	25	1
ES 1205	Basic Electrical and Electronics Engg. Lab - II	0	0	2	0	0	25	25	1
ES 1206	Fundamentals of Programming Language - II	0	0	2	0	0	25	25	1
ES 1207	Engg. Mechanics Lab	0	0	2	0	0	25	25	1
ES 1208	Workshop Practice – I	0	0	2	0	0	25	25	1
	Total	**16**	**4**	**10**	**350**	**300**	**100**	**750**	**25**
	Grand Total	**30**			**750**			**750**	**25**

MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

DEAN ACADEMICS
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg. For Women, Karvenagar, Pune-52

APPROVED BY
Governing Body Members
MKSSS's Cummins College of Engineering for Women
Karvenagar, Pune-411052

BS1201 Engineering Mathematics-II

Teaching Scheme: **Examination Scheme:**

Lectures: 3 Hrs/Week In-Semester: 50 Marks

Tutorial: 1 Hr /Week End-Semester: 50 Marks

Credits: 4

Course Objectives:
Mathematics is a necessary path to scientific knowledge which opens new perspective of mental activity. Our aim is to provide sound knowledge of engineering mathematics to make the students think mathematically and strengthen their thinking power to analyse and solve engineering problems in their respective areas.

Course Outcomes: Students will be able to
1. Solve first order first degree DE, apply it to model and solve simple engineering problems like R-C circuit, conduction of heat etc.
2. Apply Beta, Gamma, Error function and Leibnitz's rule of DUIS to solve integration of univariate function
3. Identify the characteristics of the given function and trace the curve.
4. Integrate multivariate functions over the given region and apply the knowledge to find area, volume, mass, density etc.
5. Obtain Fourier series of given periodic function; Find nth harmonics for given data.

Course Contents:

Unit – I: First order first degree Differential Equation (07)

Definition, Order and degree of Differential Equation, Formation of differential equation, solutions of differential equation, Exact differential equation, Linear differential equation and equations reducible to these types.

Unit – II: Applications of Differential Equations (05)

Applications of differential equations to engineering problems: simple electrical circuits, applications of chemical engineering, applications of mechanical engineering and applications of physics.

Unit – III: Integral Calculus (07)

Special Functions:-Gamma Function, Beta Function, Error function. Differentiation Under integral sign (Leibnitz's rule). Curve tracing of Cartesian form, polar form.

Unit – IV: Multiple Integrals (08)
Transformation of Co-Ordinate systems Spherical, Polar and Cylindrical, Double and Triple integrals with limits, Double and Triple integrals without limits. Dirichlet's theorem.

Unit – V: Applications of Multiple Integrals (06)

Area of cartesian curves, Area of polar curves, Volume of solid, Mass of plane lamina, Mass of solid.

Unit – VI: Fourier Series and Harmonic Analysis (09)

Definition of Fourier series, Dirichlet's conditions, full range Fourier series, half range Fourier Sine series, half range Fourier Cosine Series, Practical Harmonic analysis and applications to problems in Engineering.

Text Books:

1. B.S. Grewal, 'Higher engineering Mathematics', Khanna publishers, Delhi (40th edition), 2008 .

2. B. V. Ramana, 'Higher Engineering Mathematics ',Tata McGraw Hill Publications, (2007)

Reference Books:

1. C.R.Wylie, L.C. Barrette, 'Advanced Engineering Mathematics', McGraw Hill Publications, New Delhi.(6th edition),(2003)

2. Peter V. O'neil, 'Advanced Engineering Mathematics', Thomson Brooks / Cole, Singapore (5th edition), (2007).

3. Erwin Kreyszig, 'Advanced Engineering Mathematics' ,Wiley Eastern Ltd.(8th Student Edition), (2004).

BS 1202 PHYSICS– II

Teaching Scheme:

Lectures: 2Hrs/Week

Tutorial: 1Hr/Week

Credits: 3

Examination Scheme:

In-Semester: 50 Marks

End-Semester: 50 Marks

Course Objective:

The objective of this course is to provide an 'algorithmic' introduction of the basic principles of Quantum Physics to the first year students of engineering. Throughout the course, the applications of Quantum Physics will be discussed by emphasizing the laws of combining 'probability amplitudes'. This will be done through several case studies and experimental situations.

Course Outcomes:

By taking this course, the learner will be able to –

1: **Apply** the laws of combining probability amplitudes for obtaining intensity distributions of ensembles of identical microscopic systems.
2: Differentiate between domain – specific nature of probability amplitudes in elementary quantum mechanical situations.
3: Justify the use of the laws of combining probability amplitudes in situations involving photons and two – state and multi – state quantum systems.

Unit – I: Probability Amplitudes: (4)

The laws for combining amplitudes; The two-slit interference patter; Scattering from a crystal

Unit – II: Identical Particles: (4)

Bose particles and Fermi particles; Case studies involving use of the exclusion principle

Unit – III: The Dependence of Amplitudes on Time: (4)

Stationary states; Potential energy and energy conservation; The precession of a spin-half particle

Unit – IV: The Hamiltonian Matrix: (4)

Resolving state vectors; How state changes with time; Hamiltonian Matrix

Unit – V: Two-state Systems and Single Qubit Logic Gates: (4)

Experiments with bullets, waves and electrons; The uncertainty principle

Unit – VI: Band Theory of Solids and Semiconductor Physics: (4)

States for an electron in a lattice; Electrons and holes in semiconductors; The Hall effect; Rectification at a semiconductor junction; The transistor

Text Book:

R. P. Feynman, R. B. Leighton and M. Sands, **'The Feynman Lectures on Physics'**, *Pearson Education* (2006)

Reference Books:

1. J. Walker, D. Halliday, R, Resnick, **'Principles of Physics'**, Wiley *Student Edition* (10^{th} Edition)
2. H. Young and Roger Freedman, **'University Physics'**, Pearson Addison Wesley (12^{th} Edition)

BS-1203 Chemistry II

Teaching Scheme:

Lectures: 2 Hrs/Week

Tutorial: 1 Hr/Week

Examination Scheme:

In-Semester: 50 Marks

End-Semester: 50 Marks

Credits: 3

Course Objectives:

The Chemistry course is designed for the learners to develop a sound background of fundamental concepts and principles relevant in the engineering context. The course facilitates undergraduates to evaluate the role of chemical substances in different methods of preparation and analysis.They analyze chemical processes related to engineering applications. Also the course inculcates basic problem solving skills involving chemistry principles.

Course Outcomes:

By taking this course, the students will be able to

CO1: Apply spectral and analytical techniques for chemical analysis.

CO2: State laws, definitions and identify physical parameters affecting composition of systems.

CO3:Elucidate on structure and synthesis of materials.

CO4: Evaluate types, factors, mechanisms related to corrosion and its preventive methods.

CO5: Analyze materials for their properties and applications such as fuel or speciality materials.

Unit – I: Instrumental methods of Analysis II (04)

Basic principles, theory, instrumentation and applications of Uv-Vis Spectrophotometry; Flamephotometry.

Unit – II: Polymer Chemistry (07)

Basic terms, molecular weight determination, types of polymerization and its mechanism (free radical and ionic), compounding of plastics, Speciality polymers, Recycling of polymers

Unit – III: Chemistry of fuels (09)

Calorific value, Bomb & Boys' calorimeter, Proximate and Ultimate analysis of coal, Crude

oil: refining, knocking, alternate fuels, rocket propellants, Combustion: calculation of air required for combustion.

Unit – IV: Corrosion **(04)**

Dry and wet corrosion mechanism, types, factors affecting corrosion, Protection against corrosion: Cathodic and anodic protection, powder coating and metallic coatings.

Unit – V: Phase Rule **(03)**

Gibbs Phase Rule, one Component system- Water system, Sulphur system, Two component system- (Pb-silver alloy). Applications and limitations of phase rule.

Unit – VI: Nanomaterials **(03)**

Introduction to nanomaterials, synthesis by top down and bottom up methods, properties and typical applications of nanomaterials.

Text Books:

1. Arun Bahl and G.D. Tuli, **'Essentials of Physical Chemistry'**, (2014/2016)
2. S.S. Dara **'Engineering Chemistry'** *S.Chand Publications* (2010)
3. Puri, Sharma, Kalia **'Principles of Physical Chemistry'** *Milestone Publication* (2009)
4. B.S. Chauhan **'Engineering Chemistry'** *Univ Sc Press.*(2015)
5. Shashi Chawla **'A Text Book Of Engineering Chemistry'** *Dhanpat Rai & Co.* (2015)
6. S.K. Kulkarni **'Nanotechnology: principles and practices'** (2014)
7. Gurdeep Chatwal **'Instrumental methods of Chemical Analysis'** *Himalaya publishing house* (1996)

Reference Books:

1. Ram D. Gupta,**'Hydrogen as a fuel'** *C.R.C.Publication* (2009)
2. Puri,Sharma,Pathania **'Principles of Physical Chemistry'** *Vishal Publishing Co.* (2015-16)
3. **Robert D. Braun 'Instrumental methods of analysis'** ***Pharmamed press*** **(2010)**

ES 1201 Basic Electrical and Electronics Engineering – II

Teaching Scheme:
Lectures: 3 Hrs/Week
Credits: 3

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks

Pre-requisite : Semiconductor physics

Course Objectives:

1. To make students familiar with the fundamental concepts of AC circuits
2. To familiarize the students with three phase supply
3. To develop a clear understanding of operation and application of transformer
4. To make students familiar with Digital Circuits
5. To introduce Basics operational amplifier (IC 741) and its applications

Course Outcome:

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

1. Analyze and determine parameters of single phase AC circuit.
2. Quantify parameters of single phase transformer related to its operation and use .
3. Develop applications of logic gates for building combinational and sequential circuits.
4. Build simple linear and non-linear circuits using operational amplifier.
5. Analyze characteristics of different power devices and transducers.

Unit I: **AC Circuits** **(08)**

Behavior of pure R,L,C in ac circuits,Series and parallel RL, RC and RLC circuits, concept of Impedance and admittance, power triangle and power factor.Resonance in series and parallel RLC circuit, Three phase voltage generationand waveform, star and delta balanced systems. Relationship between phase and line quantities, phaser diagram, power in a three phase circuit.

Unit II : Single phase Transformers **(07)**

1 Φ transformer: concept, types, working, ideal transformer, practical transformer, equivalent circuit, phasor diagram, efficiency and regulation calculations. Introduction to three phase transformer.

Unit III: Digital Electronics **(07)**

Binary number systems and binary arithmetic, basic gates, implementation of basic gates using universal gates, Boolean algebra, standard representation of logic functions (SOP and POS forms), Introduction of Combinational logic circuits like multiplexer ,demultiplexer ,half adder and full adder, Introduction of Sequential logic circuits like flip- flops (SR, D), counters and shift registers.

Unit IV: OPAMP **(07)**

Introduction to operational amplifiers, opamp configurations, modes and parameters, Negative feedback concept and applications like comparators, summing amplifiers, integrators and differentiators.

Unit V: POWER DEVICES **(07)**

Construction, characteristics and turn on mechanism of SCR, two transistor analogy of SCR, concept of line and forced commutation. Introduction to phase control concept. Construction, characteristics of IGBT and MOSFET.

Unit VI: Transducers **(06)**

Introduction to Transducers, selection of transducers, classification of transducers. Types of transducers such as LVDT, RTD, Thermistor and strain gauge.

Text Books:-

Hughes,"Electrical & Electronic Technology", *Pearson Education, 9th Edition*

Reference Books:-

1. AP Malvino & Donald Leach,"Digital Principles and Applications", *McGraw Hill Education, 4th edition*

2. Floyd ,"Electronic Devices and Circuits", *Pearson Education India, 8th edition*

3. H.S. Kalsi "Electronic Instrumentation",*TMH publication,2nd edition*

4. Jacob Millman & C C Halkais, Chetan parikh,"Integrated Electronics", *TMH, 2nd edition*

5. D.P. Kothari and I.J. Nagrath, "Basic Electrical Engineering", *Tata McGraw- Hill, 3rd Edition.*

ES 1202 Fundamentals of Programming Languages - II

Teaching Scheme:
Lectures: 1 Hr/Week
Credits: 1

Examination Scheme:
In-Semester: 25 Marks

Course Objectives:
Familiarize students with

1. Understand role of functions and it's utility in programming.
2. Understand the use of pointers in memory management.
3. Understand the utility of need and utility of user defined data types.
4. Learn and explore mobile application development environment.

Course Outcomes:
Students will be able to

1. Write program using functions
2. Write code for effective memory management
3. Write code using appropriate user defined data types for various applications
4. Write code with user defined functions similar to inbuilt functions

Unit – I: Functions in C **(03)**
Concept of Function, Function declaration, Function definition, Function Call, Return statement, Passing parameters: Call by value, Recursion

Unit – II: Strings **(02)**
Introduction, Reading Strings, Writing Strings, Strings Operations: Counting characters in String, Converting into upper case and lower case, Concatenation, Appending, Comparing, Reverse

Unit – III: Introduction to Pointers in C **(02)**
Understanding Computer memory, Introduction to Pointers, Declaring pointer variable, Function Call by reference, Pointer and Arrays, Role of Pointers in Passing an Array to a Function, Pointers and Strings

Unit – IV: Structures **(02)**
Introduction to Structures: Declaring Structure and Structure Variables, Initializing Structure, Accessing members of Structure

Unit – V: Unions, Enumeration Data types **(02)**
Declaring Union and its members, Accessing members of Union, Enumeration Types

Unit – VI: Mobile application Development **(02)**
Introduction, Web apps vs. Native apps, Introduction to mobile operating System like Android / IOS / Windows, Features and architecture of Mobile Operating System, Generating GUI and views, Layouts and Application Components, Creating simple mobile application.

Text Books:

1. Reema Thareja, **'Introduction to C programming',** *Oxford University Press* (2nd edition), (2015)
2. Pradeep Day, '**Computer Fundamentals and programming in C'**, *Oxford University Press*, (2nd edition) (2013)

Reference Books:

1. B Kernighan, D Ritchie, '**C programming Language'**, *Prentice Hall Software Series*, (2nd edition) (1988)

ES1203 Basic Mechanical Engineering

Teaching Scheme:

Lectures: 3Hrs/Week

Credits: 3

ExaminatioScheme:

In-Semester: 50 Marks

End-Semester: 50 Marks

Course Objectives:

a) To provide an overview of mechanical engineering systems (Power plant, Manufacturing plant, Maintenance systems, transmission systems).

b) To enable students to understand terminology used in Mechanical engineering with its significance.

c) To make student understand concept of Mechatronics System.

Course Outcomes:

a) The student will be able to differentiate between major areas like Design, Manufacturing and Thermal in mechanical industries while addressing a problem.

b) The student will be able to select an appropriate sector while finding solution to a problem.

c) The student will be aware of avenues available while choosing career opportunities in mechanical engineering Industry.

d) Understand the underlying principle of energy conversion systems and power plants, power producing and Power absorbing devices.

e) Students will be able to identify Mechatronics System and its components.

Unit – I: Introduction to basic mechanical engineering (06)

Industry overview-Comparison between process, product and service industry. Work environment for Mechanical industries, role of a mechanical engineer, ethics, professional hazards and safety concerns in mechanical industry. Typical manufacturing method of a product.

Unit – II: Introduction to thermal engineering (08)

Thermodynamic system, properties, states, process, cycle, first law of thermodynamics, application of first law to open and closed systems,second law of thermodynamics, conceptual difference between heat engine, heat pump and refrigerator, significance of efficiency and co-efficient of performance. Numerical on appropriate topics.

Unit – III: Power producing devices and power absorbing devices (08)

Power producing devices-Internal combustion engines and turbines, power plants.

Power absorbing devices-Centrifugal pumps, reciprocating units, vapour compression refrigeration, air conditioning systems.

Energy management system-fluctuations in demand-supply of energy,need of power grid, concept of energy audit.

Unit – IV: Introduction to design engineering

Introduction to engineering materials, elements and principles of engineering design, basic procedure, Basic requirement, standards in design, aesthetic and ergonomic considerations in design.

Basic machine elements, shaft, key, coupling, bearing, clutch and brake.

Mechanical drives, belt, chain and gear.

Unit – V: Introduction to manufacturing (08)

Operation on different machine tools, lathe, Milling, Drilling.

Joining of metals, welding-gas and arc, TIG, MIG, Soldering, brazing.

Hot and cold working-Forging, rolling, extrusion.

Unit – VI: Introduction to Mechatronics (06)

Definition(S) of Mechatronics, Mechatronics system Components, Levels of Mechatronics system, Examples of Mechatronics (products and systems in manufacturing), Advantages of Mechatronics with Traditional Systems.

Text Books:

a) C.P. Aurora, '**Thermodynamics'**, *Tata McGraw Hill education*, (2001).

b) BasantAgarwal, C.M Agarwal, '**Basic Mechanical Engineering'**, *Wiley Ind. Pvt. Ltd*.

c) V B Bhandari, **'Design of Machine Elements'**, *Tata McGraw Hill*, (2nd edition), (2007).

d) S. K.HajraChoudhury, S.K.Bose, A.K.HajraChoudhury, **'Elements of workshop technology, volume I and II',** *Media promoters and publishers pvt. Ltd*(7th edition).

e) W.Bolton, '**Mechatronic-a multidisciplinary approach',** *Prentice Hall*, (4th edition), (2009).

f) Class room notes.

Reference Books:

a) Moran, Shapiro, Boettner, Bailey, '**Principles of engineering thermodynamics'**, *Wiley*, (7^{th} edition).

b) Rayner Joel, '**Basic engineering thermodynamics'**, *Addison-Wesley*, (5^{th} edition).

c) Y. A. Cengel and M. A. Boles, '**Thermodynamics, an Engineering Approach**', (4th edition).

d) S.S. Rattan, '**Theory of Machine'**, *McGraw Hill*, (4^{th} edition).

e) B.S. Raghuwanshi, '**A course in workshop technology'**, *DhanpatRai&co*.

f) Kalpakjian, Schmid, **'Manufacturing engineering and technology**', *Pearson*, (4^{th} edition).

7. Nptel course112105127/1, 112105127/2

ES 1204 Engineering Mechanics

Teaching Scheme:

Lectures: 2Hrs/Week

Tutorial: 1Hr/Week

Credits: 3

Examination Scheme:

In-Semester: **50** Marks

End-Semester: **50** Marks

Course Objectives:

1. To develop the ability of students to analyze any problem in a simple and logical manner.
2. To make the students understand the fundamental principles of mechanics which are the foundation of much of today's engineering.
3. To develop logical thinking of the students for application in engineering.
4. To provide an introduction to the basic quantities of mechanics.

Course Outcomes:

A student should be able to obtain/develop:

1. An ability to apply knowledge of mathematics, science and engineering

2. A recognition of the need for, and an ability to engage in, life-long learning.

3. Application of Newton's laws of motion

4. Knowledge of kinematic & kinetic analysis.

Unit – I: Introduction to Statics (06)

1. Fundamental concepts and principle (The parallelogram law of addition of forces, the principle of transmissibility, Newton's laws of motion**,** Newton's law of gravitation). Introduction to a force in a plane, Types of force system, resolution & composition of forces, Methods of composition to find resultant, moment of force, Varignon's theorem, couple, equivalent force couple system.
2. Introduction to force in a space, problems on resultant of concurrent force system
3. Equilibrium- Introduction to concept of equilibrium, Conditions of equilibrium, Free body diagram, equilibrium under different forces, equilibrium of concurrent parallel & general forces in a plane.

Unit – II: Introduction to type of Supports and Beam (05)

1. Types of supports (Fixed, roller, hinged support)

   Types of loads on a beam (point load, uniformly distributed load, uniformly varying load)
   Types of beams (simple beam, cantilever beam, compound beam)

2. Problems on Reactions & analysis of beams
3. Centroid- Definitions (Center of gravity of two dimensional body, center of mass, centroid), procedure to find centroid of regular plane lamina.

Unit – III: Introduction to Friction (03)

Definition and classification of friction, coefficient of static and kinetic friction ,angle of friction, angle of repose, problems on block friction and ladder friction

Unit – IV: Rectilinear Motion (05)

2) Variables in Rectilinear motion- Time, Position, Displacement, Distance travelled, Velocity, Acceleration

   Equations of motion for constant acceleration & motion under gravity, variable acceleration, relative motion based on kinematic equations.

3) Application of Newton's second law of motion for rectangular co-ordinate system (D' Alembert's principle)

Unit – V: Curvilinear Motion (05)

1) Equation of motion in rectangular components, Normal & Tangential components, Radial & Transverse components.

2) Projectile motion- Definition and derivation (time of flight, horizontal range, angle of projection, maximum height, trajectory),Projectile on horizontal plane only

Unit – VI: Work Energy Principle (04)

1. Introduction and definition of Work, power, energy, conservative & non- conservative forces, Conservation of energy, work-energy principle.

2. Problems on Work done by different forces (External force, Frictional force, Gravitational force, Spring force).

Text books:

1. A Nelson, '**Engineering Mechanics Statics and Dynamics**', *Mc Graw Hill Education.*

2. R.S. Khurmi, '**A Textbook of Engineering Mechanics**', *S. Chand & Company Ltd.*

Reference books:

- Beer & Johnson, '**Vector mechanics for engineers**', *Mc Graw hill publication.*
- I. H. Shames & G.K.M. Rao, '**Engg. Mechanics'**, *Pearson.*
- R. C. Hibbler, '**Engg. Mechanics statics & dynamics**', *Pearson publication*
- **S. Timosenko, DPT.young & J.V.Rao, 'Engineering mechanics',** ***Tata Mc Graw hill education pvt. Ltd. New delhi.***

BS 1204 Physics Chemistry Lab – II

Teaching Scheme:

Lectures: 2Hrs/Week

Tutorial: 1Hr/Week

Practical: 2 Hrs/Week

Credits: 1

Examination Scheme:

In-Semester: **25** Marks

1: **Record** the observations as per the least counts of measuring instruments and carry out plotting and necessary calculations pertaining to solid state physics, atomic and molecular system.
2: Analyze the plotted data and experimental findings with the corresponding theoretical physical models pertaining to solid state physics, atomic and molecular system.
3: Analyze the sources of error and arrive at conclusions pertaining to the behavior of solid state physics, atomic and molecular system.
4: Determine the molecular weight of a given polymer by viscometry.
5: Evaluate a solid fuel sample for its quality by proximate analysis.
6: Implement spectral analysis for a given chemical compound.

List of Experiments:

Physics

1. Michelson Interferometer
2. Specific heat of substance
3. Hall Effect
4. Balmer Series and Emission Spectra
5. Zeeman Effect (Demo)

Chemistry

1. Qualitative & quantitative Analysis of alkali /alkaline earth metals using Flame Photometry.
2. Colorimetric verification of Beer-Lambert's law.
3. Determination of molecular weight of polymer using Ostwald Viscometer.
4. Proximate analysis of coal.

ES 1205 Basic Electronics and Electrical Engineering Lab- II

Teaching Scheme: **Examination Scheme:**

Laboratory: 2 Hrs/Week End-Semester:25 Marks

Credits: 1

Pre-requisite : Instruments ,Electronics and electrical components,semiconductor physics.

Course Objectives:

3. To make students familiar with the fundamental concepts of single phase AC circuits
4. To make students familiar with three phase supply
5. To demonstrate working of single phase transformer
6. To explain combinational logic circuits
7. To introduce Basics operational amplifier (IC 741) and its applications

Course Outcome:

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

3. Apply fundamental concepts of single phase and three phase AC circuits.
4. Test performance parameters of single phase transformers.
5. Implement basic analog and digital circuits.
6. Verify characteristics of SCR and transducer.

List of Practicals:-

1. Performance analysis of L-C-R series circuit .
2. Load test on single phase transformer for determination of voltage regulation.
3. Performance analysis of 3 phase AC circuit.
4. Analysis of summing amplifier and difference amplifier using OPAMP.
5. Design and implementation of half adder and full adder circuits.
6. Illustrate effect of variation of displacement on output voltage of LVDT.
7. Verification of static characteristics of SCR.
8. Soldering Techniques (any small circuit like clippers, clamper, circuits using basic gates).

ES 1206 Fundamentals of Programming Languages Lab - II

Teaching Scheme:
Practical: 2 Hrs/Week
Credits: 1

Examination Scheme:
Practical: 25 Marks

Course Objectives:
Familiarize students with

1. Learn and acquire art of computer programming.
2. Learn advanced C programming features.
3. Learn to write C program for a given logical solution.
4. Learn to apply programming concepts to solve simple problems using arrays, functions and structures.

Course Outcomes:
Students will be able to

1. Write program using functions for given problem statement.
2. Write code using sequential memory management
3. Apply appropriate user defined data types for given statement.
4. Write program with user defined functions similar to library functions.

Section 1 (any 07 assignments)

1. Write a C program to swap 2 integers using user defined functions (call by value, call by reference).
2. Write a program in C to compute the factorial of the given positive integer using recursive function.
3. Write functions to convert feet to inches, convert inches to centimeters, and convert centimeters to meters. Write a program that prompts a user for a measurement in feet and converts and outputs this value in meters. Facts to use: 1 ft = 12 inches, 1 inch = 2.54 cm, 100 cm = 1 meter.
4. Write a menu driven program to perform following operations using Array of integers like (accept, display, print alternate number, sum of all numbers, search a number).
5. Write a program in C to sort n integers using bubble sort.
6. Write a menu driven program to perform string operations using library functions.
7. Write a menu driven program to perform string operations using user defined functions.
8. Define an integer pointer array of 10 integers. Initialize them to any integer values from the keyboard. Find the sum, average, minimum, and maximum of these 10 integers. Sort the 10 integers in descending order.
9. Write a program in C to compute addition / subtraction / multiplication of two matrices. Use functions to read, display and add / subtract / multiply the matrices.
10. For a class an examination is conducted and the results for the students of all the 5 subjects are recorded. Write C program to display the record of students. On the basis of the record compute

11. Write a menu-based program in C that uses a set of functions to perform the following operations:

    i. reading a complex number
    ii. writing a complex number
    iii. addition of two complex numbers
    iv. Iv.subtraction of two complex numbers
    v. multiplication of two complex numbers
    vi. Represent the complex number using a structure.

12. Write a C program to create an employee database using structure and perform operations such as accept, display, search by name, search by number, update a record.

Section 2 (any 02 assignments)

1. A string is provided from the user. Calculate the total number of characters in the string and the total number of vowels in the string with the number of occurrence in the string

2. College library has n books. Write C program to store the cost of books in array in ascending order.
   Books are to be arranged in descending order of their cost

3. Write a recursive function to obtain the first 25 numbers of a Fibonacci sequence. In a Fibonacci sequence the sum of two successive terms gives the third term. Following are the first few terms of the Fibonacci sequence:1 1 2 3 5 8 13 21 34 55 89

4. A factory has 3 division and stocks 4 categories of products. An inventory table is updated for each division and for each product as they are received. There are three independent suppliers of products to the factory:

   (a) Design a data format to represent each transaction

   (b) Write a program to take a transaction and update the inventory

   (c) If the cost per item is also given write a program to calculate the total inventory values.

5. Write a program that compares two given dates. To store date use structure say date that contains three members namely date, month and year. If the dates are equal then display message as "Equal" otherwise "Unequal".

6. Create a structure to specify data of customers in a bank. The data to be stored is: Account number, Name, Balance in account. Assume maximum of 200 customers in the bank.

   (a) Write a function to print the Account number and name of each customer with balance below Rs. 100.

   (b) If a customer request for withdrawal or deposit, it is given in the form: Acct. no, amount, code (1 for deposit, 0 for withdrawal) Write a program to give a message, “The balance is insufficient for the specified withdrawal”

7. An automobile company has serial number for engine parts starting from AA0 to FF9. The other characteristics of parts to be specified in a structure are: Year of manufacture, material and quantity manufactured.

Section 3 (study assignment)

Students should design and develop a small Android application for mobile.

Text Books:

1. Reema Thareja, **'Introduction to C programming',** *Oxford University Press* (2nd edition), (2015)
2. Pradeep Day, '**Computer Fundamentals and programming in C'**, *Oxford University Press*, (2nd edition) (2013)

Reference Books:

1. B Kernighan, D Ritchie, '**C programming Language'**, *Prentice Hall Software Series*, (2nd edition) (1988)

ES1207 Engineering Mechanics Lab

Teaching Scheme:

Lectures: 2 Hrs/Week

Tutorial: 1 Hr/Week

Credits: 1

Examination Scheme:

In-Semester: 25 Marks

No. of Experiments:

Part A-Experiments (any 7 experiments)

1. Verification of law of polygon of forces.
2. Verification of Varignon's theorem.
3. Verification of Lami's theorem.
4. Support reactions of simple beam.
5. To determine forces in space force system.
6. Study of Curvilinear motion.
7. Determination of coefficient of restitution.
8. To compare coefficient of friction of various pair of surfaces in contact.

Part B- Graphical analysis -(Any one)

1. To find resultant of force system.
2. To find support reactions of simple beam.

ES 1208 Workshop Practice I

Teaching Scheme:

Practical: 2 Hr/Week

Credit: 1

Examination Scheme:

Practical/Oral Examination: 25 marks

Course Objectives:

1. To provide knowledge and skill to use tools, machines, equipment, and measuring instruments, which are used in manufacturing industries.
2. To educate students for Safe handling of machines and tools in manufacturing environment

Course Outcomes:

1. The student will be able to apply concept related to workshop safety & use of measuring instruments during process of manufacturing.
2. The student will be able suitably select basic manufacturing practices for making of component.
3. The students will be able to manufacture/produce given product from raw material using different manufacturing methods.

Unit – I: Introduction to Workshop Safety and Measuring Instruments: (05)

- Safety precautions while working in shop, safety equipment's and their use.
- Brief introduction to instruments like – Steel rule, Calipers, VernierCaliper, Micrometer, etc. Least counts, common errors and care while using them, use of marking gauge, 'V'block and surface plate.
- Introduction & working of different tools used in workshop.

Unit – II: Manufacturing Practice:(Any Two Trades) (13)

- Fitting: Preparation of joints, markings, cutting and filling for making joints like V or T for making part of any component.
- Carpentry: Wood working consists of planning, marking, sawing, chiseling and grooving to make joint like lap, T, dovetail.
- Tin smithy: Making of small parts using sheet metal such as Tray, Funnel.
- Welding Joints: Introduction to use of MIG/ TIG, arc welding for making joints like Lap, Butt joint.

Unit – III: Information technology: (06)

- Identify the peripherals of computer components in a CPU and its functions
- Disassemble and assemble the PC back to working condition
- Loading of operating system.

Unit – IV: Plumbing (06)

- Hands on practice on Cutting, bending and external threading of GI pipes using Die
- Plumbing on PVC pipes.
- Different Joint preparation on GI & PVC Pipes

Text Books:

1. Choudhary, Hajara**'Elements of Workshop Technology**', Media Promotors& Publishers, (1997).
2. Raghuvanshi B.S. "Workshop Technology" Vol. I &II,DhanpatRai& Sons, (1998).
3. H.S. Bawa'Workshop Technology' Vol.-I by, TMH Publications, New Delhi, (2009).
4. Gupta and Kaushik "Workshop Technology: Vol. – I by, New Heights,(1999).

Reference Books:

1. Chapman W.A. J and Arnold E. '**Workshop Technology-part I**' Viva low priced Student, (1998).

Autonomous Programme Structure of
Second Year B. Tech. Computer Engineering
Academic Year 2017-2018

S. Y. B. Tech. Computer Engineering Semester – I										
Course Code	Course Title	Teaching Scheme Hours /Week			Examination Scheme				Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
CE 2101	Principles of Programming Languages	3	0	0	50	50	0	0	100	3
CE 2102	Data Structures and Algorithms I	3	1	0	50	50	0	0	100	4
CE 2103	Discrete Mathematics	3	1	0	50	50	0	0	100	4
CE 2104	Digital Systems and Computer Organization	3	1	0	50	50	0	0	100	4
CE 2105	Principles of Programming Languages Laboratory	0	0	4	25	0	25	0	50	2
CE 2106	Data Structures and Algorithms I Laboratory	0	0	4	25	0	0	25	50	2
HS 2101	Principles of Economics and Finance	3	0	0	50	50	0	0	100	3
AC 2101	Self Expression	0	0	2	0	0	0	0	0	No Credit
	Total	**15**	**3**	**10**	**300**	**250**	**25**	**25**	**600**	**22**
	Grand Total	**28**			**600**				**600**	**22**

AC 2101 – Audit Course : Self Expression

1. Dance
2. Drawing / Painting / Sketching
3. English Communication Skill
4. Film Appreciation
5. Origami
6. Theater

MKSSS's Cummins College of Engineering for Women
Karve Nagar
Pune-411052.

DEAN ACADEMICS
MKSSS's Cummins College of Engineering for Women
Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg. For Women, Karvenagar, Pune-52

APPROVED BY
Governing Body Members
MKSSS's Cummins College of Engineering for Women
Karvenagar, Pune-411052

CE 2101 PRINCIPLES OF PROGRAMMING LANGUAGES

Teaching Scheme
Lecture : 3 Hrs/week

Examination Scheme
In semester : 50 marks
End semester : 50 marks
Credits: 3

Prerequisite:
ES 1202 Fundamentals of Programming Languages - II

Course Objectives:
To facilitate the learners :
1) To understand and apply object-oriented principles for application development.
2) To develop programming applications using Java.
3) To understand design concepts for programming languages
4) To analyse various programming paradigms.

Course Outcome:
By taking this course, the learner will be able to :
1) Make use of object-oriented principles for effective programming.
2) Construct simple programs using object-oriented programming language Java.
3) Explore languages design concepts for programming languages
4) Classify different programming paradigms for application development.

Unit 1: INTRODUCTION (06)

Role of programming languages, need to study programming languages, characteristics of a good programming languages, introduction to various programming paradigms. Need of object-oriented paradigm, basic concepts of object oriented programming (OOP), benefits of OOP. General characteristics for OOP, concepts - object, classes, messages, methods. Class Identification, object-oriented as abstract data type. Data abstraction, encapsulation, polymorphism, inheritance, dynamic binding, abstract classes, interfaces, generic class, run time type identification

Unit 2: OBJECT-ORIENTED PROGRAMMING WITH JAVA (08)

Java history, Java features, Java and Internet, Java virtual machine, class, object, methods, constructors, this keyword. Garbage collection, finalize method, argument passing, function overloading, constructor overloading. Access Control, static, final, Arrays, inheritance, base class and derived class, protected members, constructor in derived class. Concept of polymorphism, abstract classes, overriding member functions, super keyword

Unit 3: INTERFACES, EXCEPTION HANDLING AND COLLECTIONS (08)

Interfaces, package, exception fundamentals, try, catch, throw, throws, finally, built-in exceptions, custom exceptions. Java collection framework overview, collection interfaces, collection classes : ArrayList, accessing collection via iterator. Basic input output in Java, Basics of AWT and Swing.

Unit 4: LANGUAGE DESIGN CONCEPTS (06)

Programming language design, programming language processing. Data types: primitive data types, composite data types, recursive data types, implementation and storage representation of data types. Type binding, binding and binding times, type checking, type conversion, expressions, statements

Unit 5: PROCEDURAL PROGRAMMING (06)

Introduction to procedures, parameter passing methods, lifetime of variables, scope rules: static and dynamic scope, nested scope, procedure call and return, recursive sub-program. Referencing

environment, activation records, storage management , desirable and undesirable characteristics of procedural programming

Unit 6:FUNCTIONAL PROGRAMMING (08)

Introduction to functional programming, lambda calculus, ambiguity, free and bound identifiers, reductions, typed lambda calculus, application of functional programming. Functional Programming with python, elements of functional Programming, function declaration, expression evaluation, type checking

Text Books:

1. Roosta S., "**Foundations of Programming Languages**", Thomson, Brooke/Cole, (India Edition) (2009)
2. Herbert Schilt, "**JAVA Complete Reference**", Tata McGraw Hill, (9th Edition), (2014)
3. David Mertz, " **Functional Programming in Python** ", O'Reilly , (1st Edition), (2015)
4. Sethi R., "**Programming Languages concepts & constructs"**, Pearson Education, (2nd Edition) (2007)

Reference Books:

1. Sebesta R., "**Concepts Of Programming Languages**", Pearson Education, (10th Edition)(2014)
2. Eckel B., "**Thinking in Java**", Pearson Education, (3rd Edition)
3. T. W. Pratt , "**Programming Languages**", Prentice-Hall Of India, (4th Edition),(2009)
4. Summerfield M, " **Programming In Python 3: A Complete Introduction To The Python Language",** Pearson Education. (2nd Edition) (2011).
5. Lutz M, " **Programming Python**", SPD/O'reilly, (4th Edition),(2015).
6. Allen Tucker, Robert Noonan, "**Programming Languages: Principles and Paradigms**", Tata McGraw Hill, (2nd edition),(2007)
7. Carlo Ghezzi, Mehdi Jazayeri, "**Programming Language Concepts**",3rd Ed, Wiley Publication ISBN : 978-81-265-1861-6.

CE 2102 DATA STRUCTURES AND ALGORITHMS I

Teaching Scheme
Lectures: 3 Hrs/Week
Tutorials: 1Hr/Week

Examination Scheme
In Semester : 50 Marks
End Semester : 50 Marks
Credits : 4

Prerequisite:

1. ES 1202 Fundamentals of Programming Language - II

Course Objectives:
To facilitate the learners:

1. To recall and understand the concepts of problem solving, algorithms and data structures.
2. To understand data representation, implementation and applications of linear data structures.
3. To learn, apply and analyze various data searching and sorting techniques.
4. To analyze algorithms using time and space complexity.

Course Outcomes:
By taking this course, the learner will be able to:

1. Apply appropriate linear data structure to construct efficient algorithms to approach the given problem .
2. Apply the concept of Linked list to solve given problem.
3. Distinguish between various linear data structures based on their representations and applications.
4. Solve examples using data searching and sorting techniques.
5. Analyse algorithms using time and space complexity.

Unit 1: Introduction to Algorithm, Data Structures and Analysis of Algorithms (07)
Concept of Problem Solving, Introduction to Algorithms, Characteristics of Algorithms, Pseudo code and Flowchart , Abstract Data Types (ADT), Set as an ADT. Introduction to Data Structures, Classification of Data Structures. Frequency Count, Analyzing Algorithm using Frequency count, Time complexity and Space complexity of an Algorithm, Asymptotic notations, Best, Worst and Average case analysis of an Algorithm.

Unit 2: Linear Data Structures Using Sequential Organization (06)
Concept of Sequential Organization, Concept of Linear Data Structures, Array as an ADT, Storage Representation of an Array – Row major and Column major, Introduction to Multidimensional Arrays. Concept of Ordered List , Application: Polynomial as an ADT using Array. Introduction to Strings and operations on Strings. Sparse Matrices

Unit 3: Linked List (08)
Concept of Linked List, Comparison of Sequential and Linked Organizations, Linked List using Dynamic Memory Management, Linked List as an ADT, Introduction to types of Linked List, Linked List operations. Time complexity analysis of Linked List operations. Application: Polynomial as ADT using Linked List.

Unit 4: Stacks (07)
Stack as an ADT, Representation and Implementation of Stack using Sequential and Linked Organization. Applications of Stack- Simulating Recursion using Stack, Arithmetic

Expression Conversion and Evaluation, Reversing a String. Time complexity analysis of Stack operations.

Unit 5: Queues (06)

Queue as an ADT, Representation and Implementation of Linear Queue, Circular Queue, Priority Queue, Double Ended Queue. Applications: Job scheduling, Queue simulation, Categorizing data. Time complexity analysis of Queue operations. Comparison of Linear Data Structures.

Unit 6: Sorting and Searching Techniques (08)

Need of Sorting and Searching, Sorting Order and Stability in Sorting. Concept of Internal and External Sorting. Bubble Sort, Insertion Sort, Selection Sort, Quick Sort and Merge Sort, Radix Sort, Shell Sort. Time complexity analysis of Sorting Algorithms. Linear Search, Binary Search, Time complexity analysis of Searching Algorithms.

Text Books:

1. E. Horwitz , S. Sahani, D. Mehta, **"Fundamentals of Data Structures in C++"**, *University Press*, (2nd edition) (2008).
2. R. Gilberg, B. Forouzan, **"Data Structures: A Pseudocode approach with C++"**, *Brooks* (1st Edition) (2001).

References:

1. Yedidyah Langsam, Moshe J Augenstein, Aron M Tenenbaum, **"Data Structures using C and C++"** , *Pearson Education*, (2nd edition) (2009).
2. A. Aho, J. Hopcroft, J. Ulman, **"Data Structures and Algorithms"**, *Pearson Education*, (2nd edition) (2008) .
3. Brassard and Bratley, **"Fundamentals of Algorithmics"**, *Prentice Hall India/Pearson Education*, (2nd edition) (2009).
4. Goodrich, Tamassia, Goldwasser, **"Data Structures and Algorithms in C++"**, *Wiley publication*, (2nd edition) (2011).
5. R. Gillberg, B. Forouzn, **"Data Structures: A Pseudocode approach with C"**, *Cenage Learning*, (2nd edition) (2003).
6. M. Weiss, **"Data Structures and Algorithm Analysis in C++"**, *Pearson Education*, (4th edition) (2002).

List of the Tutorial Assignments:

Every student should perform 12 to 14 tutorials which will cover topics of all units mentioned in the syllabus of Data Structures and Algorithms I. Tutorial assignments will enhance the understanding of the concepts of problem solving, algorithms and data structures. Students will perform practice exercise on data representation and corresponding implementation of the data structures. Students will get opportunity to develop their logic building abilities.

Following list of tutorials can be considered as guideline for designing tutorials:

1. Demonstration of C++ program implementation and execution using eclipse tool.
2. Design an algorithm for simple problems like GCD calculation, power calculation etc.
3. Calculate frequency count, time complexity of sample algorithmic constructs.
4. For given algorithms of array operation, write equivalent C++ code.
5. Practice exercise on sorting algorithms for set of predefined inputs.
6. Calculate time complexity of sorting algorithms using concept of frequency count.
7. Practice exercise on searching algorithms for set of predefined inputs.
8. Run through code of searching algorithms.
9. Create a linked list and write algorithms for traversal, delete a node, add a node operations on a list.
10. Create a doubly or circular linked list and write algorithms for traversal, delete a node, add a node operations on a list.

11. Solve brain teaser based on recursive code snippets.
12. Demonstration on debugging techniques.
13. Select appropriate data structures and design algorithmic solution to given application.
14. Solve puzzles based on queue data structure.

CE 2103 DISCRETE MATHEMATICS

Teaching Scheme
Lectures : 3 Hrs/Week
Tutorials : 1Hr/Week

Examination Scheme
In Semester : 50 Marks
End Semester : 50 Marks
Credits : 4

Course Objectives:
To facilitate the learners

1. To understand Discrete Mathematics concepts and its significance in Computer Engineering.
2. To understand set theory, logic and apply reasoning to solve problems.
3. To solve problems based on algebraic systems, functions and relations.
4. To learn the basic properties of graphs, trees and permutation, combination to find solutions of related applications.

Course Outcomes:
By taking this course, the learner will be able to

1. Apply concepts of propositional calculus for solving problems, formal proofs, reasoning and represent problems using concepts of predicate calculus.
2. Solve problems on sets, relations and functions.
3. Solve problems on groups, permutations and combinations.
4. Apply basic terminologies of graphs and trees to solve problems on paper.

Unit 1: Sets and Mathematical Induction (07)
Significance of Discrete Mathematics in Computer Engineering, Sets, Subset, Universal Set, Empty Set, Algebra of Sets and Duality, Operations on Sets, Finite and Infinite Sets, Un Countably Infinite Sets, Multi-Sets, Power Set, Venn Diagram, Principle of Inclusion and Exclusion, Principle of Mathematical Induction.

Unit 2: Logic and Propositional Calculus (06)
Propositions, Logical connectives, Conditionals and Bi-Conditionals, Tautology, Contradiction, Contingency, Truth Tables, Logical Equivalences, Algebra of Propositions, Logical Implications, Conjunctive and disjunctive Normal Forms, Rules of Inference, Predicates and Quantifiers, Nested Quantifiers.

Unit 3: Groups, Rings and Permutations and Combinations (08)
Algebraic Systems, Groups, Semi Groups, Monoids, Subgroups, Introduction to Isomorphism, Homomorphism and Automorphism of groups, Cosets and Normal Subgroups, Rings, Integral Domain and Field, Introduction to Permutations and Combinations.

Unit 4: Relations and Functions (08)
Introduction to Relations, Product Sets, Pictorial Representation of Relations, Composition of Relations, Closure of Relations, Properties of Binary Relations, Equivalence Relations and Partitions, Partial Ordering Relations, Hasse Diagram, Lattices, Chains and Anti-Chains, Warshall's Algorithm, Functions, Composition of Functions, Invertible Functions, Introduction to Discrete Numeric Functions, Generating Functions and Recurrence Relation.

Unit 5: Graph Theory (07)
Basic Terminology, Multi-Graphs and Weighted Graphs, Sub-Graphs, Isomorphic Graphs, Complete, Regular and Bipartite Graphs, Operations on Graph, Factors of a Graph, Paths and Circuits, Connectivity, Hamiltonian and Euler Paths and Circuits, Shortest Path in Weighted Graphs (Dijkstra's Algorithm), Planer Graph and Theorem, Graph Coloring Problem, Travelling Salesman Problem.

Unit 6: Trees **(06)**

Basic Terminologies in Trees and Properties of Trees, Binary Search Trees, Tree Traversal, Spanning Trees, Fundamental Circuits and Cut Sets, Minimal Spanning Trees, Kruskal's and Prim's Algorithms for Minimal Spanning Trees.

Text Books:

1. Kenneth H. Rosen, **"Discrete Mathematics and its Applications",** 7th Edition, 2012, *Tata McGraw-Hill*, ISBN 978-0-07-338309-5.
2. C. L. Liu and D. P. Mohapatra, **"Elements of Discrete Mathematics"**, 4th Edition, *Tata McGraw-Hill*, 2017, ISBN 978-1-25-900639-5.

References:

1. Norman L. Biggs, **"Discrete Mathematics"**, Second Edition, *Oxford University Press*, 2004, ISBN 0–19 –850717 – 8.
2. J. P.Tremblay and R.Manohar, "**Discrete Mathematical Structures with Applications to Computer Science"**, 1997, *Tata McGraw-Hill*, ISBN 0-07- 463113-6.
3. E. Goodaire and M. Parmenter, **"Discrete Mathematics with Graph Theory"**, third edition, *Pearson Education*, 2008, ISBN 81 – 7808 – 827 – 4.
4. B. Kolman, R. Busby and S. Ross, **"Discrete Mathematical Structures"**, 6th Edition, *Pearson Education*, 2009, ISBN 81-7808-556-9.
5. N. Deo, **"Graph Theory with application to Engineering and Computer Science"**, Eastern Economy Edition, *Prentice Hall of India*, 1990, 0 – 87692 – 145 – 4.
6. Seymour Lipsehutz and Marc Lars Lipson **"Discrete Mathematics"**, 3rd Special Indian Edition, ISBN-13: 978-0-07-060174-1.

List of the Tutorial Assignments:

Every student should perform 12-14 tutorials which will cover topics of all units mentioned in the Syllabus of Discrete Mathematics.

Following list of tutorials can be considered as a guideline for designing tutorials in such a way that all topics should be distributed and covered amongst all batches.

1. Problems on set, multi-set operations,Venn diagram. and algebra of sets.
2. Problems on Principle of Inclusion-Exclusion and Mathematical Induction.
3. Translating English statement into propositional logic and predicate logic.
4. Problems on groups.
5. Problems on permutation and combination.
6. Representation of relations and functions, closure of relations and equivalence relation.
7. Problems on partitions, posets, Hasse diagram and Lattices.
8. Problems on Warshall's Algorithm.
9. Problems on composition of functions, invertible functions, recurrence relation.
10. Problems on multi-graphs and weighted graphs, sub-graphs, isomorphic graphs.
11. Solve problems for shortest path in weighted graphs (Dijkstra’s algorithm) : (Paper pencil method)
12. Problems on minimal spanning trees, Kruskal’s and Prim’s algorithms for minimal spanning trees.

CE 2104 DIGITAL SYSTEMS AND COMPUTER ORGANIZATION

Teaching Scheme:
Lectures: 3 Hrs./Week
Tutorial: 1 Hr./Week

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks
Credits: 4

Prerequisite:

1. Basic Electrical and Electronics Engineering II (ES1201)

Forward Course Linkage(s):

1. Microprocessor Architectures (CE 2204)
2. Program Specific Elective – Embedded systems (PECE 3101)
3. Open Elective - High Performance Computing (OE 4101)

Course Objectives:

To facilitate the learners

1. To understand the basic digital circuits and logic design.
2. To apply techniques for designing combinational and sequential circuits.
3. To understand the functional components of a computer and its organization.
4. To understand design issues of instructions and instruction pipelining.
5. To understand and classify memory and input/output organizations.

Course Outcomes:

By taking this course, the learner will be able to

1. Make use of the knowledge of basic digital circuit elements and model the logic circuits.
2. Build simple combinational and sequential digital circuits.
3. Utilize the basic building blocks and their coordination in computer organization.
4. Classify the instruction pipeline organizational issues.
5. Interpret the memory and I/O organization concepts.

Unit – 1: COMBINATIONAL CIRCUITS (08)

Minimization of Product of Sum(POS) and Sum of Product(SOP) functions and realization using logic gates, Introduction to Numbers and Codes, BCD, Gray, Excess-3 and their applications, Code conversion, Integer and floating point number representation, Signed and unsigned numbers, arithmetic operations, Introduction to basic Arithmetic Logical Unit(ALU) and Floating Point Unit(FPU).

Unit – 2: COMBINATIONAL LOGIC DESIGN (06)

Realization of basic combinational functions like comparison, decoding, multiplexing, demultiplexing, Design of Half Adder and Full Adder, Design of Half Subtractor and Full subtractor, BCD Adder, Look ahead and carry generator, Introduction to Carry Propagation Adder, Carry Save Adder.

Unit – 3: SEQUENTIAL CIRCUITS DESIGN (07)

Flip flops (FFs) and their excitation tables, FF conversions, Shift registers, Applications of FFs, Asynchronous and Synchronous counters, Sequence generators and detectors using

Moore and Mealy, Introduction to Algorithmic State Machines (ASM) charts, notations, design of a simple controller using ASM.

Unit – 4: INTRODUCTION TO COMPUTER ORGANIZATION (07)

Introduction to Computer Organization, Function and structure of a computer, Functional components and their Interconnection, Register organization, Number and size of registers, General purpose registers, Design and Organizational issues of registers, Control Unit organization, Hardwired vs. microprogrammed organization.

Unit- 5: CHARACTERISTICS, FUNCTIONS AND PIPELINING OF INSTRUCTIONS (07)

Instruction cycle, type of instructions, types of operands, Instruction set design, machine instructions characteristics, design issues of instructions, Instruction pipelining, performance and hazards of pipelining, RISC, CISC.

Unit – 6: MEMORY AND INPUT/OUTPUT ORGANIZATION (07)

Memory devices and organization, ROM, RAM, EPROM, Flash memory. Cache memory organization, principles, cache design elements, performance characteristics, External memory devices and organization, hard disk, RAID, Introduction to buses, types of buses, bus organization, DMA organization, need, working principle.

Text Books:

1. R. P. Jain, '**Modern Digital Electronics**', *Tata McGraw-Hill*, (3rd Edition), (2003)
2. C. Hamacher, Z. Vranesic and S. Zaky, '**Computer Organization'**, *McGrawHill*, (2002)
3. W. Stallings, '**Computer Organization and Architecture - Designing for Performance'**, *Prentice Hall of India*,(8th edition), (2002)

References:

1. Anil Maini, '**Digital Electronics: Principles and Integrated Circuits'**, *Wiley India Ltd*, (2008)
2. Malvino, D. Leach, **'Digital Principles and Applications'**, *Tata Mc-Graw Hill*, (5th edition)
3. Stephan Brown, Zvonko Vranesic, **'Fundamental of Digital Logic with VHDL Design'**, Mc-Graw Hill, (2016)
4. John P Hays, **'Computer Architecture and Organization'**, *McGraw-Hill Publication*, (3rd Edition), (2001)
5. Tanenbaum, **'Structured Computer Organization'**, *Pearson*, (5th Edition)

Web References:

1. NPTEL series – nptel.ac.in/courses/117105080/ (Digital System Design by Prof. D. Roy Choudhary, Dept. of Computer Science and Engineering, IIT Kh.)
2. Online Chapters – WilliamStallings.com/COA/COA8e.html

List of Tutorial Assignments:

The subject Digital Systems and Computer Organization is a blend of two divergent subjects like Digital Electronics and Computer Organization. The list of tutorial topics tries to give demonstrations of circuit realizations on digital boards along with numerical problem solving. It also gives the demonstration of computer components and peripherals. The tutorial also aims to develop the research aptitude, soft skills and self-learning by different group activities, paper presentations, etc.

1. Solve SOP and POS examples using Boolean algebra and K-maps.
2. Demonstrate half adder and full adder using digital board.
3. Problem solving for number system and code conversions.
4. Problems on BCD operation to understand integer arithmetic.
5. Problem solving of Boolean expression using multiplexer/ demultiplexer.
6. Group activity on current trends / methods/ software tools used in digital electronics.
7. Design of flip flop conversion.
8. Problem solving on sequence detector using Moore and Mealy.
9. Demonstration of computer components and their interconnections.
10. Identify and explain the addressing modes of x 86 families.
11. & 12. Group-wise Presentations on recent trends in Microprocessor architectures by students.

CE 2105 PRINCIPLES OF PROGRAMMING LANGUAGES LABORATORY

Teaching Scheme
Lecture : 4 Hrs/week

Examination Scheme
In semester : 25 marks
Oral : 25 marks
Credits : 2

Course Objectives:
To facilitate the learners :
1) To explore the principles of object oriented programming
2) To apply object oriented programming concept for developing applications using Java
3) To apply Java collection framework for simple application development
4) To handle built-in and user defined exceptions
5) To explore functional language programming in python using simple examples

Course Outcome:
By taking this course, the learner will be able to :
1) Develop programming application using object oriented programming language Java
2) Make use of Java collection framework for effective programming.
3) Handle exceptions using inbuilt classes and user defined exceptions
4) Implement functional programming language concepts in python.

A large part of CE 2105 lab would be in understanding the syntax or semantics of languages which fall under various paradigms like Object Oriented (Java), and Functional and Scripting (Python). Main focus would be on Java programming whereas Python assignments are of introductory level as an example of programming paradigm. Assignment statements are in brief. Faculty members are encourage to expand problem statements with variations. Assignments can be framed and expanded in such a way that it explores concepts, language constructs, logic of solution and simple application.

List of assignments:

Group A: (Mandatory)

1. Design a user defined abstract data type ‘Complex' in Java. Write a program to perform arithmetic operations of two complex numbers
2. Implement the following concepts by constructing suitable classes in Java - a. Constructors b. Constructor Overloading c. Function Overloading d. Function Overriding e. Inheritance
3. Implement the following concepts by constructing suitable classes in Java - a. Abstract classes and abstract methods b. Interfaces
4. Create an application for a book shop and maintain the inventory of books that are being sold at the shop.
5. Write a Python program to count the number of articles in a given text.

Group B: (Any Four)

1. Create User defined exception to check the specific conditions for recruitment system and throw the exception if the criterion does not met in Java.
2. Create a student result database in Java. Calculate the grades of students. Decide a criteria for best student and short-list students who satisfies the criteria.
3. Find appropriate class hierarchy in banking application and implement it.
4. Find suitable class hierarchy in the human resource department of an organization and implement it.
5. Write a JAVA program to perform String operations.
6. Write a JAVA program to create an abstract data types like Stack/Set/Queue/List as an interface and implement its methods.
7. Write a Python program for sorting students marks.

Group C: (Any one)

1. Write a Python program that prompts a user to enter a list of words and store in another list only those words whose first letter occurs again within the word (e.g. Baboon). The program should display resulting list
2. Write a program in Python using functional paradigm for generating two sub-lists of even and odd numbers from given list. Perform addition of individual sub-list and display the result

CE 2106 DATA STRUCTURES AND ALGORITHMS I LABORATORY

Teaching Scheme
Practical : 4 Hrs/Week

Examination Scheme
In Semester : 25 Marks
Practical : 25 Marks
Credits : 2

Prerequisite:

1. ES 1202 Fundamentals of Programming Language - II
2. ES 1206 Fundamentals of Programming Language Laboratory - II

Course Objectives:
To facilitate the learners:

1. To develop algorithmic foundations to solve problems.
2. To select and use appropriate linear data structure for a given problem statement.
3. To analyze algorithms using time complexity.
4. To implement sorting and searching algorithms.

Course Outcome:
By taking this course, the learner will be able to:

1. Select linear data structures for given problem.
2. Develop the solution for the given problem using programming language.
3. Analyze solutions using time complexity.
4. Design a small application using linear data structure.

List of Assignments

The laboratory assignments are designed in a set of group A, B and C such that students will be able to design and implement solution for a given problem. Group A assignments are designed in such a way that students will choose appropriate data structures to implement solution of a given problem. All the units of the syllabus of Data Structures and Algorithms II are covered in group B assignments. Some assignments of group B are designed to make students able to implement Abstract Data Type of a data structure and use it for a given application. In group C assignments students will design an algorithmic solution for selected problem using concepts covered in the subject Data Structures and Algorithms II.
The laboratory assignments of group A and B are to be submitted by student individually using C++/JAVA object oriented programming language. Group C assignments may be performed in a group of 2 to 4 students from the same batch. For each assignment program code with sample output is to be submitted as a soft copy. Handwritten write up (Title, Objectives, Problem Statement, Algorithms, and Outcomes) of each assignment is to be submitted by students.

Group A: (Mandatory)

1. Shopkeeper keep a record for different items purchased by customers on a day. Select appropriate data structure and write a program to perform various operations on given information.
2. Design a system to maintain CSI student branch membership information. Choose appropriate data structure.
3. College Library maintains records of books. Write a program to implement sorting, searching operations on it. Use appropriate data structure.
4. Implement Queue as ADT using linked list or array. Use Queue ADT to simulate 'waiting list' operations of railway reservation system.

Group B: (At least six)

1. Implement permutation and combination based on word problem.

2. In a group of M persons, some people can speak English and some people can speak French. Write program to find union, intersection, difference of given sets.
3. Write a program to represent polynomial equation and perform operations to add and evaluate polynomials.
4. Write a program to perform add, multiply, transpose operations on matrices.
5. Write program to perform various operations on strings.
6. A mobile phone list stores name and contact number in ascending order. Write program to search a contact details of specified name.
7. Write a program to store first year CGPA of students. Use various sorting algorithms to sort data.
8. Implement Doubly Linked List as ADT .Use same ADT to simulate Browser URL application.
9. Implement Singly Linked List as ADT. Use same ADT to simulate deck of cards application.
10. A 'concordance List' is an alphabetical list of words that appear in the book . Implement concordance list using ordered Linked List with insertion function that restrict duplicate value to be inserted in the list.
11. Implement Singly Linked List as ADT. Use it to simulate banking operations.
12. Student's information along with their percentage is stored in linked list for every division. Generate a combine list of students which is sorted in descending order based on their percentage.

13. Implement Stack as ADT using linked list or array. Use same ADT to check given expression is well formed parenthesized.
14. Implement Stack as ADT using linked list or array. Use same ADT to evaluate given postfix expression.
15. Implement Priority Queue as ADT using linked list or array. Use ADT to simulate pizza parlor order management.
16. Operating system stores N jobs and processing time require to complete each job in data structure. Design a program to simulate the job execution sequence.

Group C:

Design a game OR Design a small application to manage library data / medical shop data/ College admission data / P.M.P.M.L. bus scheduling data etc. using appropriate data structures.

S. Y. B. Tech. Computer Engineering Semester – II										
Course Code	Course Title	Teaching Scheme Hours /Week			Examination Scheme				Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
BSCE 2201	Engineering Mathematics III	3	1	0	50	50	0	0	100	4
CE 2201	Data Structures and Algorithms II	3	1	0	50	50	0	0	100	4
CE 2202	Fundamentals of Computer Networks	3	1	0	50	50	0	0	100	4
CE 2203	Operating Systems	3	0	0	50	50	0	0	100	3
CE 2204	Microprocessor Architectures	3	1	0	50	50	0	0	100	4
CE 2205	Data Structures and Algorithms II Laboratory	0	0	4	25	0	0	25	50	2
CE 2206	Microprocessor Architectures Laboratory	0	0	2	25	0	0	0	25	1
CE 2207	Operating Systems Laboratory	0	0	4	25	0	25	0	50	2
	Total	**15**	**4**	**10**	**325**	**250**	**25**	**25**	**625**	**24**
	Grand Total	**29**			**625**				**625**	**24**

MKSSS's Cummins College of Engineering For Women
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DEAN ACADEMICS
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Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg. For Women, Karvenagar, Pune-52

APPROVED BY
Governing Body Members
MKSSS's Cummins College of Engineering for Women
Karvenagar, Pune-411052

BSCE- 2201 ENGINEERING MATHEMATICS III

Teaching Scheme
Lecture : 3 Hrs./week
Tutorials: 1Hr/week

Examination Scheme
In semester : 50 marks
End semester : 50 marks
Credits : 04

Prerequisite:

1. First order linear ordinary differential equations.
2. Basics of Vector Algebra
3. Integration – basic properties, standard results, Beta & Gamma Functions.
4. Partial Fractions.
5. Permutation & Combination. Basics of probability.

Course Objectives: Mathematics is a necessary path to scientific knowledge which opens new perspective of mental activity. Our aim is to provide sound knowledge of engineering mathematics to make the students think mathematically and strengthen their thinking power to analyze and solve engineering problems in their respective areas.

Course Outcome: Students will be able to

CO1. Solve Higher order Linear differential Equations, Simultaneous Differential Equations.
CO2. Calculate Divergence, Curl, Directional derivative, Solenoidal, Irrotational, Scalar potential, vector identities, Line integral.
CO3. Find Fourier Transform, Inverse Fourier Transform.
CO4. Find Z-transforms, Inverse Z – Transform**,** difference equation.
CO5. Calculate Moments, Mean, Variance, Covariance, Correlation, Probability Distributions, Compute Skewness, Kurtosis, Linear Regression.

Unit 1: Higher Order Linear Differential equation and application (07)
Higher order Linear differential Equation with constant coefficients, Cauchy's and Legendre's Differential Equations, Simultaneous Differential Equations, Modelling of electrical circuits.

Unit 2: Vector Calculus (07)
Physical interpretation of vector differentiation, vector differential operator, Gradient, Divergence, Curl, Directional derivative, Solenoidal, Irrotational and Conservative fields, Scalar potential, vector identities, Line integral.

Unit 3: Fourier Transform (07)
Complex exponential form of Fourier series, Fourier integral theorem, sine and cosine integrals, Fourier transform, Fourier Sine and Cosine transform , Inverse Fourier Transform, Discrete Fourier Transform.

Unit 4: Z – Transform (06)
Definition, standard properties, Z- Transform of standard sequences, Inverse Z – Transform using standard results, Inversion integral method, solution of difference equation to solve Computer Engineering Problems.

Unit 5: Probability (08)
Theorem of total probability, Theorem of Compound Probability, Baye's theorem, Moments, Mean, dispersion,Variance, Covariance ,Correlation, Random variables, Distributions – Binomial , Poisson, Normal .

Unit 6: Data Analytic **(07)**

Types of data: Concepts of population and sample, quantitative & qualitative data, cross-sectional and time-series data, discrete and continuous data, Skewness, Kurtosis, Linear Regression.

Text Books:

1. B. S. Grewal, **'Higher Engineering Mathematics** ', *Khanna Publications.*
2. B. V. Ramana, **'Higher Engineering Mathematics** ', *Tata McGraw Hill Publications* (2007)
3. C.R.Wylie, L.C. Barrette, '**Advanced Engineering Mathematics**', *McGraw Hill Publications, New Delhi.(*6th edition)(2003)

References:

1. Peter V. O'neil,**'Advanced Engineering Mathematics'** ,*Thomson Brooks / Cole, Singapore (*5th edition) (2007).
2. Erwin Kreyszig ,**'Advanced Engineering Mathematics'** *Wiley Eastern Ltd.* (8th Student Edition), (2004).
3. S.P.Gupta ' **Statistical Methods'**, S.Chand & sons

CE 2201 DATA STRUCTURES AND ALGORITHMS II

Teaching Scheme
Lectures : 3 Hrs/Week
Tutorials : 1 Hr/Week

Examination Scheme
In Semester : 50 Marks
End Semester : 50 Marks
Credits : 4

Prerequisite:
CE 2102 - Data Structures and Algorithms I

Course Objectives:
To facilitate the learners:

1. To learn and understand representation, implementation and applications of trees, search trees, graphs, multiway trees data structures.
2. To choose and apply data structures for developing solutions for solving problems in various domains.
3. To analyze algorithms using time complexity analysis.
4. To understand and apply the concepts of hashing and file handling.

Course Outcomes:
By taking this course, the learner will be able to

1. Apply appropriate non linear data structure to construct efficient algorithms to approach the problems.
2. Distinguish between various non linear data structure based on their representations and applications.
3. Apply the concept of Hashing techniques for solving a problem.
4. Make use of File handeling and Java collection Frameworks for solving a problem.

Unit 1: Trees (08)
Introduction to Non Linear Data Structure, Binary Trees,Types of Binary Trees,Properties of Binary Trees, Binary Tree as Abstract Data Type, Representation using Sequential and Linked Organization, Binary Tree creation , Recursive and Non Recursive Tree Traversals, Threaded Binary Tree and operations, Traversals of Inorder Threaded Binary Tree, Applications of Binary Trees.

Unit 2: Search trees (08)
Representation of Symbol Tables- Static Tree Table and Dynamic Tree Table, Binary Search Tree and its operations, Binary Search Trees as Abstract Data Type, Height Balanced Tree : AVL Tree and operations ,Red Black Tree.

Unit 3: Graphs (07)
Basic Terminologies, Storage Representation, Graph Traversals, Graph as Abstract Data Type, Spanning Trees, Minimum Spanning Trees, Kruskal's Algorithm, Prim's Algorithm, Dijkstra's Single Source Shortest Path Algorithm,Topological Sorting, Case Study : Data structures used in Google map.

Unit 4: Multiway trees and Heap (06)
Multiway search tree , B Tree and operations, B+ Tree,Applications of Btrees, Heap basic concepts, Realization of Heap, Heap as an Abstract Data Type, Heap implementation, Heap Sort, Heap as a Priority Queue.

Unit 5: Hashing (07)
General idea of Hashing, Hash Table, Hash function, Rehashing, Issues in Hashing, Collision Resolution Strategies: Linear Probing, Quadratic Probing, Double Hashing, Open addressing and Chaining.

Unit 6: File Organization and Java Collection Framework (06)

File Organization, Sequential File, Direct Access File and its Primitive operations, Java Collection Framework : Arraylist , Treeset, Hashset and Hashmap Class.

Text Books:

1. Sartaj Sahani, **"Data Structures, Algorithms and Applications in JAVA",** *Universities Press* (2nd edition), (2007).
2. Robert Lafore , **"Data Structures Algorithms in JAVA"**, *Techmedia*,(1st edition), (2006).
3. Ivor Horton, **"Beginning Java"**, *Wiley India Edition*,(Java 7 edition),(2012).
4. E. Horowitz, S. Sahni, D. Mehta, **"Fundamentals of Data Structures in C++"**, *Galgotia Publications* ,(2nd edition), (2008).

References:

1. Sartaj Sahani, **"Data Structures, Algorithms and Applications in C++",** *Universities Press* (2nd edition), (2007).
2. R. Gillberg, B. Forouzn, **"Data Structures: A Pseudo code approach with C++",** *Cenage Learning* (2nd edition) (2007).
3. Y. Langsam, M. Augenstein and A. Tenenbaum, **"Data structures using C and C++",** *Prentice Hall of India* (2nd edition), (2005) .
4. M. Weiss, **"Data Structures and Algorithm Analysis in C++",** *Pearson Education* (3rd edition), (2009).
5. A. Aho, J. Hopcroft, J. Ullman, **"Data Structures and Algorithms"**, *Pearson Education* (3rd Impression), (2008).

List of the Tutorial Assignments:

Every student should perform 12 to 14 tutorials which will cover topics of all units mentioned in the syllabus of Data Structures and Algorithms II. Students will perform practice exercise on data representation and corresponding implementation. Tutorial assignments will help students to enhance their ability of problem solving using appropriate data structures.

Following list of tutorials can be considered as guideline for designing tutorials:

1. Practice exercise on creating a binary tree and perform recursive and non recursive traversals of binary tree on given data.
2. Create a binary search tree for the given data and perform its inorder, preorder, postorder traversals.
3. Practice exercise on searching and deleting data values from given binary search tree. Analyze the time complexity of used algorithm.
4. Create a binary search tree for the given data and perform its inorder, preorder, postorder traversals.
5. Practice exercise on different rotations of AVL tree.
6. Construct AVL tree for the given numeric data elements. Perform the appropriate rotations whenever needed.
7. Simulate flight path data using graph data structure to find minimum cost path.
8. Practice assignment on converting a binary tree to threaded binary tree and its traversals.
9. Design a heap data structure for student data and find out minimum/maximum marks obtained in particular subject.
10. Use sequential file to maintain employee information. Write algorithm to add, delete and search employee information from the file.
11. Design a solution for company survey about its products in an area. Choose the appropriate algorithm to complete the survey within short time period and cover all

houses under that area. Give justification for your answer and also analyze your algorithm for time complexity.

12. Given the input data and hash function , show the result using following hashing methods
    a. Linear Probing b. Quadratic Probing c. Double hashing h2(x)=7-(x Mod 7)
13. Use different hashing functions to hash given values.
14. Construct a Btree of order 3 by inserting numbers of given data.

CE2202 FUNDAMENTALS OF COMPUTER NETWORKS

Teaching Scheme
Lectures : 3 Hrs/Week
Tutorials : 1Hr/Week

Examination Scheme
In Semester : 50 Marks
End Semester : 50 Marks
Credits : 4

Course Objectives:
To facilitate the learners

1. To learn and understand fundamental concept of networking.
2. To learn different methods for framing, flow control, error control.
3. To understand OSI model & TCP/IP protocol stack.
4. To learn various functions of physical & data link layer.

Course Outcomes:
By taking this course, the learner will be able to

1. **Build** the knowledge of fundamental concepts of networking to recognize various network standers and protocols.
2. **Build** the knowledge of design requirements of layered network architecture.
3. **Analyze** different error and flow control strategies.
4. **Experiment with** different line coding techniques, modulation techniques and switching techniques to build design requirements of physical layer.

Unit 1: Introduction to Computer Networks **(08)**

Concept of Data in Networking-Representation, Transmission, Data Flow, types of Connection- Point to Point ,Point to Multi Point , Network Standards, type of Networks-LAN,WAN,MAN, Ad-hoc Network, Networking Topologies: Bus, Mesh, Star, Ring and Hierarchical , The Internet-dial up,DSL service, Internet Standards, Internet administration.

Unit 2: Network Models **(06)**

Principles of protocol layering,The TCP/IP Protocol suite:Layers, description of each layer , encapsulation and decapsulation, addressing,multiplexing and demultiplexing, OSI Model, OSI verses TCP/IP suite.

Unit 3: Physical Layer **(08)**

Digital signals,Digital to digital conversion:line Coding techniques(unipolar,polar and bipolar), analog to digital conversion:(PCM, DM),Transmission modes:parallel,serial, introduction to Multiplexing and types: FDM, TDM,Transmission Media- Guided(Twisted pair cable, coaxial cable, Fiber Optic),Unguided media:propagation methods, types of waves (radio waves,microwaves and infrared waves) .Introduction to Switching-Circuit Switching, Packet Switching, Message Switching.

Unit 4: Logical Link Control Sublayer (LLC) **(08)**

Design issues, services, functions, Framing, Error Control and Flow Control, Error Control-Parity Bits, Hamming Code & CRC, Flow Control-Unrestricted Simplex Protocol, Stop and Wait, Sliding Window Protocol.

Unit 5: Medium Access Control Sublayer (MAC) **(08)**

Channel Allocation-Static and Dynamic, Multiple Access Protocols: CSMA, , IEEE

802.Standards and Frame Formats, CSMA/CD, CSMA/CA.

Unit 6: Connecting Devices and Virtual LAN (04)

Various Network Devices NIC, Switches, Hub, Routers, Repeaters, Bridge and Access Point. Virtual LANS : membership, configuration, communication between switches, advantages.

Text Books:

1. Fourauzan B., "Data Communications and Networking", 5th Edition, Tata McGraw- Hill, Publications, 2006.
2. William Stallings “Data and computer communication”, Pearson, 8th Edition, ISBN: 0-13-243310-9

References:

1. Kurose, Ross “Computer Networking a Top Down Approach Featuring the Internet”,6th edition (March 5, 2012), Pearson , ISBN-10: 0132856204.
2. Andrew S. Tenenbaum, “Computer Networks”, 5th Edition, PHI, ISBN 81-23-2175-8.

List of the Tutorial Assignments:

Every Student should perform 12-14 tutorials which will cover topics of all units mentioned in the syllabus of Fundamentals of Computer Network.

Tutorial assignments will help students learn and explore the subject in greater detail. Students will be able to recall and practically apply the concepts learnt. Students will emulate algorithms to get insight of the strategies used for flow control.

1. Basic concepts of Computer Networking.
2. Execute and understand basic Networking Commands.
3. Study and discuss various Network components, devices and Structured Cabling components.
4. Problems on Line Coding techniques- POLAR (RZ, NRZ)
5. Problems on Line Coding techniques- Polar Biphase: Manchester and Differential Manchester encoding
6. Problem solving on Error Control coding through Hamming code technique.
7. Problem solving based on CRC technique.
8. Problem solving on basic Flow Control strategies: Sliding Window protocol (Go Back N).
9. Problem solving on basic Flow Control strategies: Sliding Window protocol (Selective repeat).
10. Create Peer to Peer network and LAN network to share files within the created network.

CE 2203 OPERATING SYSTEMS

Teaching Scheme
Lectures : 3 Hrs/week

Examination Scheme
In Semester : 50 Marks
End Semester : 50 Marks
Credits : 3

Prerequisites:

1. Fundamentals of Programming Languages – II (ES 1202)
2. Digital Systems and Computer Organization (CE 2104)

Course Objectives:
To facilitate the learner -

1. To understand basic concepts of Operating Systems.
2. To understand process life-cycle and scheduling algorithms.
3. To analyze memory management strategies.
4. To understand File System concepts.
5. To learn operating system for managing resources such as I/O, CPU, memory etc.
6. To understand Inter-process Communication and deadlock concepts.

Course Outcomes:
By taking this course, the learner will be able -

1. To Build the basic knowledge of operating system.
2. To Apply the CPU scheduling algorithms using process concepts.
3. To Apply the memory management strategies.
4. To Apply the file attributes and different access modes on various types of file.
5. To Make use of the knowledge of storage devices for disk management.
6. To Apply the concepts of Inter-process Communication.

Unit 1: Introduction to Operating Systems (06)

Introduction to Operating System (OS), Evolution of OS, Functions of OS, Types of OS, OS Concepts, Process, Files, Shell and its types, Kernel and its types, System Calls, Virtual Machine, Case Study of UNIX Operating System.

Unit 2: Process and CPU Scheduling (08)

Process Concept, Operations On Processes, Creation, Termination, States, Transition and Context Switching, Scheduling Criteria, Scheduling Algorithm, First-Come First-Serve (FCFS), Shortest Job First (SJF), Round-Robin (RR), Introduction to Threads and Benefits, Case Study of Unix Process Management.

Unit 3: Memory Management (08)

Contiguous and Non-Contiguous Memory, Swapping, Paging, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms- First-In First-Out (FIFO), Least Recently Used (LRU), Optimal, Allocation of Frames and Trashing.

Unit 4: Introduction to the File System **(06)**

File Concepts, File Attributes, File Operations, File Types, File Sharing, File Structure, Mounting and Un-Mounting, Directory Overview, Types of Directories, Types of Users, Access Modes, Free space management, Case Study of UNIX File Structure.

Unit 5: I/O Management and Disk Scheduling **(06)**

I/O Devices, Organization of I/O Functions, Operating System Design Issues Related to I/O, I/O Buffering, Disk Scheduling - First Come-First Serve (FCFS), SCAN, Circular SCAN (C- SCAN), Shortest Seek Time First (SSTF).

Unit 6: Inter-Process Communication (IPC) **(08)**

Critical Section Problem, Hardware Support for Mutual Exclusion, Semaphores, Classical Problems of Synchronization, Monitors, Deadlocks, Methods of Handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock.

Text Books:

1. William Stallings, "Operating System-Internals and Design Principles ", Prentice Hall India,(5/e) ISBN: 81-297-0 1 094-3.
2. Silberschatz, Galvin, Gagnes, "Operating System Concepts", John Wiley & Sons, (6/e), ISBN: 9971-51-388-9.
3. Maurice J. Bach, “The Design of the Unix Operating System”, Pearson Education, ISBN: 81-7758-770-6.

References:

1.Evi Nemeth, Garth Snyder, Tren Hein, Ben Whaley, “Unix and Linux System Adminstration Handbook”, (4/e), ISBN: 978-81-317-6177-9. (2011).
2. Milan Milenkovic, “Operating Systems”, TMH,(2/e), ISBN: 0-07-044700-4.
3. Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall India, (2/e), ISBN: 81-203-2063-8.

CE 2204 MICROPROCESSOR ARCHITECTURE

Teaching Scheme:
Lectures: 3 hrs./Week
Tutorial: 1 hr./Week

Examination Scheme:
In-Semester: **50** Marks
End-Semester: **50** Marks
Credits: 4

Prerequisite:

1. Digital Systems and Computer Organization (CE 2104)

Course Objectives:

To facilitate the learners

1. To understand basic architecture of 8086 microprocessor.
2. To understand and analyze the basic interfacing techniques.
3. To understand pipelined and superscalar architecture of Pentium.
4. To understand, apply and analyze x86 microprocessor instructions to the assembly language programming.

Course Outcomes:

By taking this course, the learner will be able to

1. Demonstrate the knowledge of basic 8086 microprocessor concepts.
2. Select the different components and interfacing peripherals associated with microprocessor architectures.
3. Apply the programming concepts using x86 assembly level language.
4. Relate the advanced features of Pentium microprocessor.
5. Infer the advanced microprocessor architectures.

Unit – 1: BASIC MICROPROCESSOR ARCHITECTURE (06)

8086 Architecture, Pin diagram of 8086, Programmers' model of 8086, pin Diagram, Addressing Modes, Instruction Set, Memory architecture of 8086, Segmentation, even and odd memory banks, address mapping.

Unit – 2: BASIC INTERFACING TECHNIQUES (06)

Block diagram, control words, operating modes, programs of Parallel peripheral interface with 8255 (Programmable Peripheral Interface), Block diagram, control words, operating modes, programs of Serial peripheral interface with 8251 (USART), Block diagram, control words, operating modes, programs of Timing and control signals handling using 8253 (Programmable Interval Timer).

Unit – 3: SUPERSCALAR ARCHITECTURE IN PENTIUM MICROPROCESSOR (06)

Pentium Architecture, Pipeline stages, Superscalar pipeline issues, Instruction paring rules, Branch prediction, Memory organization with Instruction and Data caches Pentium programmers' model, Register set, Addressing modes and instructions (other than 8086).

Unit – 4: PROTECTED MODE ARCHITECTURE IN PENTIUM MICROPROCESSOR (06)

Real Mode vs. Protected mode, Memory management with segmentation and paging Protection mechanism in segmentation and paging, Virtual 8086 Mode (support registers, descriptors, privilege-level, protection, exclusive instructions, inter-privilege level, transfer control, Paging-support registers, Descriptor, linear to physical address translation, TLB, page level protection).

Unit – 5: MULTITASKING, INTERRUPTS, EXCEPTION AND INPUT/OUTPUT (06)

Multitasking, support registers, Descriptors, Task switching, Nested task, I/O handling in Pentium, I/O instructions, I/O Permission bit map, Interrupts and Exceptions structure in real, protected and virtual modes.

Unit–6: INTRODUCTION TO ADVANCED MICROPROCESSOR ARCHITECTURES (06)

Introduction to multicore architectures i3/i5/i7, Design Issues, Cache coherency Advanced Processor Architectures for Mobile Application, Embedded Application and Enterprise Application.

Text Books:

1. 8086 and peripherals – Intel Manual
2. Pentium Architecture – Intel Manual
3. Douglas Hall, **'Microprocessors & Interfacing'**, *McGraw Hill*, (Revised 2nd Edition), (2006)
4. James Antonakos, **'The Pentium Microprocessor'**, *Pearson Education,* (2nd Edition), (2004)

Reference Books:

1. Sivarama P. Dandamudi, **'Introduction to Assembly Language Programming For Pentium and RISC Processors'**, *Springer*,(2nd Edition), (2004)
2. Peter Abel, **'Assembly language programming'**, *Pearson Education*,(5th Edition),(2002)
3. John Uffenbeck, **'The 8086/88 Family: Design, Programming & Interfacing'**, *PHI,* (2nd Edition), (2002)
4. A. Ray, K.Bhurchandi, **'Advanced Microprocessors and peripherals: Architecture, Programming & Interfacing'**, *Tata McGraw Hill*, (2nd Edition), (2004)
5. Liu, Gibson, **'Microcomputer Systems:The8086/88Family'**,*PHI*,(2nd Edition),(2005)
6. Kip Irvine, **'Assembly language for IBM PC'**, *PHI*, (2nd Edition),(1993)

Web References:

1. NPTEL series – nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/
2. service.scs.carleton.ca/sivarama/org_book/org_book_web/slides/chap_1_versions/ch7_1.pdf

CE 2205 DATA STRUCTURE AND ALGORITHMS- II LABORATORY

Teaching Scheme
Practical : 4 Hrs/Week

Examination Scheme
In Semester : 25 Marks
Practical : 25 Marks
Credits : 2

Prerequisite:
CE2107 - Data Structures and Algorithm Laboratory I

Course Objectives:
To facilitate the learners

1. To choose and apply appropriate Data Structures for a given problem statement.
2. To design algorithmic solution for a given problem.
3. To analyze and compare algorithms.
4. To implement non linear data structures using Object Oriented Programming.

Course Outcome:
By taking this course, the learner will be able to

1. Develop a solution of the given problem using tree data structure.
2. Develop a solution of the given problem using graph data structure.
3. Apply hashing techniques to solve a given problem.
4. Make use of sequential file handling operations.
5. Design small application using non linear data structures.

List of Assignments

The laboratory assignments are designed in a set of group A, B and C such that students will be able to design and implement solution for a given problem. Group A assignments are designed in such a way that students will choose appropriate data structures to implement solution of a given problem. All the units of the syllabus of Data Structures and Algorithms II are covered in group B assignments. In group C assignments students will design an algorithmic solution for selected problem using concepts covered in the subject Data Structures and Algorithms II.

The laboratory assignments of group A and B are to be submitted by student individually using C++/JAVA object oriented programming language. Group C assignments may be performed in a group of 2 to 4 students from the same batch. For each assignment program code with sample output is to be submitted as a soft copy. Handwritten write up (Title, Objectives, Problem Statement, Algorithms, Outcomes) of each assignment is to be submitted by students.

Group A (Mandatory)

1. Create a Dictionary that stores keywords and its meanings, using appropriate data structure. Implement its operations such as add, delete, display, search and update its values.
2. Create a reasonably balanced tree to maintain names and telephone numbers of all the customers of a shopkeeper and perform operations on it. Test your program for at least 10 names.
3. A news paper delivery boy every day drops news paper in a society having many lanes and houses. Design a program to provide different paths that he could follow. Solve the problem by suggesting appropriate data structures. Design necessary class.
4. Write a program to create telephone book database of N clients. Make use of a hash table implementation to quickly look up client‘s telephone number.

Group B (At-least Six)

1. Create a binary tree and perform inorder ,preorder and postorder traversals.
2. Implement Binary Search Tree as Abstract Data Type and perform operations on it.
3. Write a program to create a binary tree if inorder and preorder or inorder and postorder any two traversals are given.
4. Create inorder threaded binary tree and perform its traversals.
5. Company wants to lease phone lines to connect its offices of different cities, with each other. Company charges different amounts of money to connect different pairs of offices. Solve the problem by suggesting appropriate data structures to connect all offices of a company with a minimum cost.
6. Write a modular program to implement primitive operations on Min/Max Heap.
7. Write a program to implement Symbol Table as an ADT.
8. Use sequential file to maintain student information. Write algorithm to add, delete and search student information from the file.
9. Implement hash table ADT and handle the collision using linear probing and chaining (with or without replacement). Perform operations on it.

Group C

Create a small application using appropriate data structures to process stock data / organization's data / college data.

CE 2206 MICROPROCESSOR ARCHITECTURES LABORATORY

Teaching Scheme:
Practical: 2 hrs./Week

Examination Scheme:
In Semester – 25 marks
Credit(s): 1

Prerequisite:

1. Digital Systems and Computer Organization (CE 2104)

Course Objectives:

To facilitate the learners

1. To understand and apply x86 instructions to write assembly language program.
2. To learn, apply and analyze microprocessor and peripherals interfacing techniques.
3. To learn and use the interfacing of assembly language and higher level language.
4. To able to solve moderately complex problems using modular assembly language programming.
5. To understand and use privileged instructions.

Course Outcomes:

By taking this course, the learner will be able to

1. Choose x86 instructions to write assembly language programs.
2. Build a small system using microprocessor interfacing techniques.
3. Solve a given problem using advanced assembly language methods.
4. Apply the modular programming using assembly level language.

The Microprocessor Architectures laboratory assignments are designed using assembly language programming as well as hardware interfacing techniques. The laboratory work also covers the assembly language interface with higher level language like 'C'. The students are introduced to advanced protected mode instructions.

Group A Assignments (Perform all assignments)

1. Write ALP to perform basic arithmetic operations and check the output in debugger.
2. Write ALP to accept a string and display it on the screen.
3. Write ALP to accept a signed number and check if it is positive or negative. Display appropriate message.
4. Write 8086 ALP to interface DAC and generate following waveforms on oscilloscope
   (i) Square wave – Variable Duty Cycle and frequency.
   (ii) Ramp wave – Variable direction
   (iii) Trapezoidal wave
   (iv) Stair case wave
   (v) Temple wave
   (vi) Sine wave – using look up table
5. Write 8086 ALP to program 8251 for serial communication between two 8251s.
6. Write 8086 ALP to program 8253 to observe outputs of different modes using counter display.
7. Write ALP using STRING instructions to accept a string from user and perform following operations
   (a) Convert a string to uppercase / lowercase

(b) Toggle the case of the string
(c) Concatenation of another string
(d) Find if it is palindrome
(e) Find a substring
(For this assignment make a group of 4 students, each one performing each task and then combine all functions to apply modular programming.)

Group B Assignments (Perform any two)

1. Write ALP to perform following using command line arguments to simulate TYPE or COPY command.
2. Write ALP to find the largest number from an array using PUBLIC/GLOBAL and EXTERN.
3. Write a C/ inline program for PC to PC communication.
4. Write ALP for Mouse interface.
5. Write inline code to perform file operations.
6. Write ALP for floating point operations.

Group C Assignments (Perform any one)

1. Write ALP for to read GDTR/LDTR and IDTR and display the table content pointed by GDTR and IDTR.
2. Write ALP to implement multitasking using Pentium programming.

Text Books:

1. 8086 and peripherals – Intel Manual
2. Pentium Architecture – Intel Manual
3. Douglas Hall, **'Microprocessors & Interfacing'**, *McGraw Hill*, (Revised 2nd Edition), (2006)
4. James Antonakos, **'The Pentium Microprocessor'**, *Pearson Education,* (2nd Edition), (2004)

Reference Books:

5. Sivarama P. Dandamudi, **'Introduction to Assembly Language Programming For Pentium and RISC Processors'**, *Springer*,(2nd Edition), (2004)
6. Peter Abel, **'Assembly language programming'**, *Pearson Education*,(5th Edition),(2002)
7. John Uffenbeck, **'The 8086/88 Family: Design, Programming & Interfacing'**, *PHI*, (2nd Edition), (2002)
8. A.Ray, K.Bhurchandi, **'Advanced Microprocessors and peripherals: Architecture, Programming & Interfacing'**, *Tata McGraw Hill*, (2nd Edition), (2004)
9. Liu, Gibson, **'Microcomputer Systems:The8086/88Family'**,*PHI*,(2nd Edition),(2005)
10. Kip Irvine, **'Assembly language for IBM PC'**, *PHI*, (2nd Edition),(1993)

Web References:

1. NPTEL series – nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/
2. service.scs.carleton.ca/sivarama/org_book/org_book_web/slides/chap_1_versions/ch7_1.pdf

CE 2207 OPERATING SYSTEMS LABORATORY

Teaching Scheme
Practical : 4 Hrs/week

Examination Scheme
In Semester : 25 Marks
Oral : 25 Marks
Credits : 2

Prerequisites:

1. Data Structures and Algorithms-I (CE2102)
2. Fundamentals of Programming Language Lab-II (ES1206)
3. Digital Systems and Computer Organization(CE2104)

Laboratory Objectives:
To facilitate the learners -

1. To understand the fundamentals of Operating Systems.
2. To understand shell scripting to automate operating system operations.
3. To understand the operations performed by Operating System as a resource manager.
4. To apply the concepts of Operating System for Process and Memory management.
5. To analyze various scheduling algorithms.
6. To understand the communication among the processes.

Laboratory Outcomes:
By taking this course, the learner will be able -

1. To choose Unix/Linux Commands for Shell Programming.
2. To make use of different CPU scheduling algorithms.
3. To apply Memory Management algorithms.
4. To apply various disk scheduling algorithms.
5. To examine the Inter-Process Communication concepts.

Every student should perform 9-10 assignments in this laboratory which will cover topics of all units mentioned in the syllabus of Operating Systems. Following is the list of assignments that can be considered as guideline for designing assignments and give basic knowledge of operating systems and its services. The choice of the assignments for each student is given in such a way that all topics should be distributed and covered amongst all batches.

List of Assignments:
Group A: (Mandatory)

1. Write a shell script to implement mount and un-mount commands to mount device and un-mount it.
2. Exploration of Unix/Linux Commands (File, Directory and Process commands).
3. Write a program to implement Banker's Algorithm for deadlock handling.
4. Write a program to implement Reader-Writer problem using semaphores.

Group B: (Any four)

5. Write a program to implement following Non- Pre-emptive scheduling algorithms : First Come First Serve (FCFS), Shortest Job First (SJF).
6 .Write a program to implement following Pre-emptive scheduling algorithms: Round-Robin (RR), Shortest Remaining Time First (SRTF)
7. Write a program to implement following memory allocation strategies: First Fit, Best Fit and Worst Fit.
8. Write a program to implement following Page replacement algorithms: a) First-In-First-Out (FIFO). b) Least Recently Used (LRU) c) Optimal page replacement.
9. Write a shell script for adding users / groups and modifying permissions of file / directory accordingly.
10. Write a program to implement following disk scheduling algorithms: First Come First Serve (FCFS), SCAN, Circular - SCAN(C-SCAN), Shortest Seek Time First (SSTF).

Group C: (Any one)

1. Installation of Linux Operating System.
2. Implement producer-consumer algorithm using multi-threading concept.

Autonomous Programme Structure of Third Year B. Tech. Computer Engineering Academic Year 2018-2019

T. Y. B. Tech. Computer Engineering Semester – I											
Course Code	Course Title	Teaching Scheme Hours /Week			Examination Scheme				Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
CE 3101	Computer Networks	3	1	0	50	50	0	0	100	4
CE 3102	Database Management Systems	3	1	0	50	50	0	0	100	4
CE 3103	Design and Analysis of Algorithms	3	0	0	50	50	0	0	100	3
OEHS 3101	Elective-I	3	0	0	50	50	0	0	100	3
PECE 3101	Programme Elective-I	3	0	0	50	50	0	0	100	3
CE 3104	Database Management Systems Laboratory	0	0	2	0	0	0	25	25	1
CE 3105	Computer Networks Laboratory	0	0	2	0	0	0	25	25	1
CE 3106	Programming Skills Development Laboratory-I	0	0	4	0	0	50	0	50	2
PECE 3102	Programme Elective-I Laboratory	0	0	2	25	0	0	0	25	1
AC 3101	Audit Course	0	0	2	0	0	0	0	0	0
	Total	**15**	**2**	**12**	**275**	**250**	**50**	**50**	**625**	**22**
	Grand Total	**29**			**625**				**625**	**22**

OEHS 3101: Elective-I

1. Entrepreneurship Development
2. Introduction to Digital Marketing
3. Intellectual Property Rights
4. Project Management

PECE 3101: Programme Elective-I
PECE 3102: Programme Elective-I Laboratory

1. Cloud Computing
2. Digital Signal Processing and Applications
3. Statistics for Computer Science
4. Operations Research

AC 3201 -- Audit Course: Employability Skills Development

DEAN ACADEMICS
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg. For Women, Karvenagar, Pune-52

APPROVED BY
Governing Body Members
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

CE 3101 COMPUTER NETWORKS

Teaching Scheme
Lecture: 3 Hrs./week
Tutorial: 1 Hrs / week

Examination Scheme
In Semester Exam : 50 Marks
End semester: 50 Marks
Credits: 4

Prerequisite: Fundamental of Computer Networks (CE 2202)

Forward Linkage:

- Wireless and Mobile Communication (PECE 3201 Elective III)

Course Objectives:
Facilitate the learners to:-

1. Apply and distinguish the fundamental concepts of networking standards, protocols and technologies.
2. Identify role of protocols at various layers in the protocol stack.
3. Select and Compare the appropriate network by understanding the given requirerments for a given system.
4. Identify fundamental concepts of wireless network, mobile network and network security.

Course Outcome:
By taking this course, the learner will be able to–

1. Analyze data flow between two communicating hosts using various protocols at Application, Transport and Network Layer.
2. Identify appropriate computer networking protocol for a given application.
3. Analyze the requirements for a given system to select an appropriate network.
4. Identify technologies and characteristics in mobile network , wireless network and network security.

Unit-1: Network Layer **(07)**

Design Issues, Routing Algorithms: Dijkstra's, Distance vector Routing, Link State Routing, Network Layer Protocols: Address Resolution Protocol, Reverse Address Resolution Protocol, Internet Control Messaging Protocol, Routing Protocols: Routing Information Protocol, Open Shortest Path First , Boarder Gateway Protocol, Unicast Routing Protocols, Multicast Routing Protocols.

Unit-2: The Network Layer in the Internet **(07)**

IP Protocol addressing: IPV4 address classes, Public and private IP addresses. IP sub-netting, IP super-netting, classless inter domain routing (CIDR), Overview of IPv6, IPV4 Vs IPV6.

Unit-3: Transport Layer **(08)**

Transport layer design issues, Protocol Overview, Header Structure, Transmission Control Protocol (TCP) functions such as Connection Management, Error control, Flow control, Congestion control, User Datagram Protocol (UDP) overview, typical applications support, TCP Vs UDP, introduction to Socket Programming, TCP and UDP Socket Primitives. Quality of Service (Quality of Service): Differentiated Service

Unit-4: Application Layer **(07)**

Hyper Text Transport Protocol (HTTP): Overview, header structure, connections, request and response messages, persistence and non-persistence HTTP. Cookies, Simple Mail Transport Protocol (SMTP): Overview and Working of MIME, POP3, File Transfer Protocol (FTP): Overview and Working, identifying protocols for given application with example.

Unit-5: Network Servers **(06)**

Client-Server Architecture, Peer -to- Peer Architecture, Introduction to various Types of Servers, Dynamic Host Configuration Protocol (DHCP): Header, Working, DHCP Server Configuration, Domain Name Server(DNS) : Working, Proxy Server : Need and Significance, working, configuration, Introduction to virtualization: Server Visualization, creating network and providing internet connectivity.

Unit-6: Wireless and Mobile Networks **(07)**

Introduction to wireless LAN, Introduction to mobile communication: 1G,2G,3G,4G,features, limitations of mobile computing, Introduction to Network Security: Security mechanism and Services, Introduction of cryptography, Network Perimeter Security concept: Firewall.

Text Books:

1. Andrew S Tanenbaum, David J Wetherall,**'Computer Networks'**, *Pearson,* (5th Edition), (2014).
2. Forouzan B **'Data Communication and Networking'**, *Tata McGraw Hill,* (5th Edition), (2013).

Reference Books:

1. Kurose, Ross **'Computer Networking a Top Down Approach Featuring the Internet'** *Pearson,* (6th Edition) , (2014).
2. Stallings W **'Data and Computer Communications'** *Prentice Hall Pvt.Ltd*. (8th Edition), (2009).
3. W. Richard Stevens, Bill Fenner, Andrew M. Rudoff **'Unix Network Programming Volume 1'**, *Addison-Wesley Publication*, (3rd Edition), (2003).
4. Geoffrey C. Fox, Jack Dongarra, and Kai Hwang,**'Distributed and Cloud Computing'** Morgan Kaufmann, (1st Edition),(2011).
5. Stallings W,**'Cryptography and Network Security: Principles and Practice'**, *Pearson*, (6th Edition), (2014).

CE 3105 Computer Networks Laboratory

Teaching Scheme:
Practical: 2 Hrs/week

Examination Scheme:
Practical : 25 Marks
Credits: 1

Course Objectives:

1. Configure the computing nodes with understanding of protocols and technologies.
2. To learn network programming.
3. Use modern tools for network traffic analysis and various networking configurations.
4. Learn Fundamental concepts of Virtualization.

Course Outcomes:

On completion of the course, student will be able to -

1. Configure switches and routers.
2. Demonstrate LAN and WAN protocol behavior using Modern Tools.
3. Analyze data flow between two communicating hosts using various protocols at Application, Transport and Network Layer.
4. Develop Client-Server Application.

Example List of Assignments:

Group A: (Mandatory)

1. Design an IP scheme for a WAN network (minimum 3 networks) using Cisco Packet Tracer tool.
2. Simulation of routing in the above network using Routing Information Protocol (RIP), by using CISCO packet tracer tool.
3. Write a program to analyze following packet formats captured through Wireshark for wired network. 1. Ethernet 2. IP 3.TCP 4.UDP (using Python).

Group B: (Any Four)

1. Installing and configuring DHCP server (windows server).
2. Write a program using TCP socket for wired network for following (using JAVA/ C)
   a. Say Hello to Each other b. File transfer
3. Write a program using UDP Sockets to enable file transfer (Script, Text, Audio and Video one file each) between two machines. (using JAVA / C).
4. Configuring Ftp server for file upload /download using Cisco Packet Tracer.
5. Write a program to demonstrate subnetting and find the subnet masks.(JAVA /Python).
6. Write a program for DNS lookup. Given an IP address input, it should return URL and vice-versa. (JAVA / Python).
7. Write a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol (JAVA).

Group C:

1. Creation and configuration of Virtual Machines- Create 2 local virtual machines on host and ping the Virtual Machine.

CE 3102 DATABASE MANAGEMENT SYSTEMS

Teaching Scheme
Lecture : 3 Hrs/week
Tutorials: 1 Hr/week

Examination Scheme
In semester : 50 marks
End semester : 50 marks
Credits : 4

Prerequisite: Data Structures and Algorithms II(CE 2201)

Forward Course Linkages:
- Data Mining Data Warehousing (PECE 3202)
- Big Data Analytics (PECE 4101)
- Business Intelligence(OE 4201)
- E-Business (OE 4202)

Course Objectives:
To facilitate the learners to-
1. Design database schema using an entity relationship diagram (ERD) and normalization.
2. Design queries using Structured Query Language (SQL) to retrieve the required data from the database.
3. Understand Transaction management in a Database management System.
4. Understand NoSQL Databases to handle unstructured data.
5. To introduce advanced database topics such as Special purpose databases, Distributed database systems, Big data, Data mining and Data Warehousing etc.

Course Outcomes
With successful completion of the course, the students will be able to–
1. Design the Entity Relationship diagram for the system / application considering its constraints and design issues.
2. Apply the knowledge of SQL to retrieve the required data from the database.
3. Make use of various Transaction management algorithms for scheduling concurrent transactions.
4. Apply the knowledge of NoSQL databases to handle unstructured data.
5. Survey advanced database topics such as Special purpose databases, Distributed databases, Big data, Data mining and Data Warehousing.

Unit 1 : Introduction to Database Management Systems (06)
Introduction to database management systems, Advantages of a Database Management Systems over file-processing systems, Data abstraction, Data Independence, Relational Model, Architecture
Introduction to NoSQL databases. Special purpose databases- e.g. Temporal, Spatial, In-memory, Multimedia databases etc.

Unit 2 : Database design and Structured Query Language (08)
Data Modeling: Entity Relationship Diagram (ERD), Components and conventions (entity, attributes, relationships) Primary key, Converting Entity Relationship Diagram into tables, Foreign key and other Integrity constraints. Extended Entity Relationship Diagram features.
Structured Query Language:
SQL - Data Definition Language (DDL) : SQL Data Types, Null values and Literals, Creating, Modifying and Deleting tables. Views and Indexes.
SQL - Data Manipulation Language (DML) : Insert, Update, Delete, Select (all clauses), Set Operations, Joins, Tuple Variables, Nested sub-queries, Query Processing.

SQL - Transaction Control Language (TCL) : Commit, Savepoint, Rollback
SQL - Data Control Language (DCL) : Grant, Revoke
PL/SQL (Programming Language SQL) : Stored Procedures and Functions, Cursors, Triggers.

Unit 3 : Normalization **(06)**

Converting ERD to tables (Weak entity set, multivalued attributes,EER features).
Normalization, Purpose of Normalization, Data Redundancy and Anomalies (Insert / Delete / Update), Normal Forms: 1NF, Functional dependency, decomposition of tables using Functional Dependency :Second Normal Form (2NF), Third Normal Form (3NF), Boyce Codd Normal Form (BCNF)

Unit 4 : Transaction management **(08)**

Transactions, ACID Properties of Transactions, Concept of Schedule, Serial Schedule, Serializability : Conflict serializability, View serializability, Cascaded Aborts, Recoverable and Non-recoverable Schedules. Concurrency Control: Need, Locking Methods, Deadlocks,Timestamping methods. Recovery methods : Shadow-Paging and Log-Based Recovery, Checkpoints

Unit 5 : NoSQL Databases **(08)**

Structured and unstructured data, NoSQL- Comparative study of SQL and NoSQL databases, Big data. BASE Properties, Types of NoSQL databases- Key-value store – JSON, Document Store - MongoDB, Column store - HBase and Graph based, MongoDB- MongoDB shell, Create, Retrieve, Update and Delete (CRUD) Operations, Indexing, Aggregation and MapReduce in MongoDB

Unit 6 : Advances in Databases **(06)**

Data warehousing: Data warehouse Architecture, schemas, data marts, Extract, Transform and Load (ETL) process
Data mining – Descriptive and predictive Data mining techniques
Introduction Business intelligence

Text Books:

1. Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, **'Database System Concepts'**, *McGraw Hill*, (6^{th} edition), (2013)
2. Jiawei Han, Micheline Kamber and Jian Pei, **'Data Mining – Concepts and Techniques'**, *Morgan Kaufmann Publishers*,(3^{rd} Edition), (2012)
3. Kristina Chodorow, Michael Dirolf, **'MongoDB: The Definitive Guide'** , *O'Reilly*, (2^{nd} Edition), (2013)
4. Ramez Elmasri and Shamkant B. Navathe, **'Database Systems'**,*Pearson*, (6^{th} Edition), (2013)

References:

1. Raghu Ramakrishnan and Johannes Gehrke, **'Database Management Systems'**, *McGraw Hill*, (3^{rd} Edition), (2003)
2. C. J. Date, **'An Introduction to Database Systems'**, *Pearson*, (8^{th} Edition), (2006)
3. Thomas Connally, Carolyn Begg, **'Database Systems'**, *Pearson*, (4^{th} Edition), (2012)

Tutorials

The tutorials aim to strengthen the database designing and query writing skills of the learners.

Example Assignments for Tutorials:

1. Design an Entity Relationship diagram (ERD) for a given system.
2. Convert the ERD to tables and Normalize the tables up to Third Normal Form (3NF).
3. Write Structured Query Language Data Definition Language (SQL DDL) commands for Creating the tables with appropriate integrity constraints, Altering the tables and Deleting/ Dropping the tables.
4. Write SQL queries for retrieving the required data from the tables using SELECT, GROUP BY and ORDER BY clauses.
5. Write SQL queries using different JOINs.
6. Write SQL queries using UNION, INTERSECTION, EXCEPT and SUBQUERIES.
7. Write SQL commands to create Database VIEWS and INDEX.
8. Write a Stored Procedure (using explicit cursor) for the given requirements.
9. Write MongoDB Queries using different variations of the FIND() function.
10. Write Queries using the aggregation framework of MongoDB.
11. Define the dimensions and measures for the given database to build the star schema for the given database.
12. Define data mining query for the given database.

CE 3103 Design and Analysis of Algorithms

Teaching Scheme:
Teaching: 3 Hrs/Week

Examination Scheme
In Sem: 50 Marks
End Sem: 50 Marks
Credits: 3

Prerequisite:

1. Data Structures and Algorithms II (CE 2201)

Course Objectives:

To facilitate the learners :-

1. Understand and apply methods of analysis of algorithms.
2. Learn and apply strategies for designing the algorithms.
3. Learn and apply the concept of computational complexity classes for the given problem.
4. Get acquainted to the concept of abstract algorithms design.

Course Outcomes:

By taking this course, the learner will be able to :–

1. Apply the knowledge of analyzing the algorithm.
2. Evaluate algorithm design techniques for solution of a problem.
3. Perceive the given problem solution from computational complexity classes point of view.
4. Build knowledge to understand the design requirements of abstract algorithms.

UNIT I: **Introduction** [7]

Basic steps to solve the problems, Performance analysis of recursive and non-recursive algorithms, Recurrences: substitution method, recursion-tree method, master method.

UNIT II: **Divide and Conquer & Greedy Strategy** [7]

Divide and Conquer: General Strategy, Control Abstraction, min/max problem, Binary Search, Quick Sort and Merge Sort.

Greedy Method: General strategy, control abstraction, Knapsack problem, Job sequencing with Deadlines, Minimal Spanning Tree algorithms.

UNIT III: **Dynamic Programming** [7]

Dynamic programming: General Strategy, Multi stage graphs, Optimal Binary Search Tree problem(OBST), Knapsack problem, Travelling Salesperson Problem.

UNIT IV: **Backtracking and Branch and Bound** [7]

Backtracking: General Strategy, Implicit and Explicit constraints, DFS State space tree formulation, Sum of subsets, 8 Queens problem, Hamiltonian Cycle problem, Maze problem.

Branch and Bound: General Strategy, BFS state space tree formulation, Traveling Salesperson Problem.

UNIT V: **Computational Complexity Classes** [7]

Basic Concepts of complexity classes, Non deterministic algorithms, The classes P and NP, NP Complete and NP Hard.

Decision problems: Clique Decision problem, Node cover Decision problem,Directed Hamiltonian Cycle Problem, Satisfiability problem, Travelling salesman problem, NP Hard problems

UNIT VI: **Abstract Algorithms** [7]

Introduction to Parallel Algorithms, Evolutionary algorithm: Genetic Algorithms and Tabu search

Text Books:

1. Horowitz and Sahani, "Fundamentals of Computer Algorithms", 2nd edition. Galgotia publication,, 2008, ISBN: 978 81 7371 6126

2. Gilles Brassard and Paul Bartley, "Fundamental of Algorithm.", PHI, 2010, ISBN-9788120311312 New Delhi

3. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm", 3rd edition, 2009,PHI

Reference Books:

1.Fayez Gebali, “Algorithms and Parallel Computing”, Willy, 2015, ISBN 9788126553891

2.Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, 2014, Pearson Education

3.A. V. Aho and J.D. Ullman, "Design and Analysis of Algorithms", Pearson Education, 2006, ISBN: 978 81 317 0205 5

4.Parag Himanshu Dave, Himanshu Bhalchandra Dave, “ Design And Analysis of Algorithms”, PEARSON Education, ISBN 81-7758-595-9

CE 3104 DATABASE MANAGEMENT SYSTEMS LABORATORY

Teaching Scheme
Practical : 02 Hours/Week

Examination Scheme
Practical: 25 Marks
Credits : 1

Course Objectives:
To facilitate learners to-

1. Implement/Execute Structured Query Language (SQL) queries.
2. Implement/Execute PL/SQL stored procedures and functions.
3. Implement/Execute MongoDB queries.
4. Develop 2tier database applications.

Course Outcomes:
On completion of the course, student will be able to–

1. Apply the knowledge of Structured Query Language (SQL) clauses to query the relational database.
2. Apply the knowledge of PL/SQL to solve the given business problem.
3. Apply the knowledge of NoSQL databases to query semi structured documents.
4. Solve the given database problem using database programming skills.

Example Assignments for Laboratory

Assignments Group A (Mandatory)

1. Design and Execute SQL Data Definition Language (DDL) statements to create tables and insert data into the tables. Make use of the Sequence feature.
2. Design and Execute at least 15 SQL queries for suitable database application using SQL Data Manipulation Language (DML) statements: Insert, Select, Update and Delete.
3. Design and execute at least 10 SQL queries for suitable database application using SQL DML statements: all types of Join, Sub-Query and View.
4. Create a 2 tier application using Java Database Connectivity (JDBC).
5. Create a MongoDB collection and Execute the MongoDB Queries using the find() function, SAVE method, logical operators.

Assignments Group B (Any 4)

1. Design and execute a Programming Language/ Structured Query Language (PL/SQL) stored procedure for returning a book in a library system. The procedure should calculate a fine as follows: Check the number of days (from date of issue), - If days are between 15 to 30 then fine amount will be Rs 5 per day. - If no. of days>30, per day fine will be Rs 50 per day & for days > 30, Rs. 5 per day. After submitting the book, status will change from I to R.
2. Write a PL/SQL stored procedure for calculating the income tax of employees of the company.
3. Write a PL/SQL stored procedure for populating the class secured by every student in the class.
4. Write a PL/SQL block of code that will merge the data from the old_Books table to the new Books table. If the data in the first table already exist in the second table then that data should be skipped.

5. Write a database trigger which will ensure that when data is inserted in the EMPLOYEE table, the department name is always in Upper case.
6. Write a database trigger which will ensure that when data in the Accounts table is updated, the old copy is preserved in the Transaction_Log table along with the date and userID.
7. Write a database trigger which will ensure that when data in the EMPLOYEE table is deleted, it is first copied in the Ex-employees table along with the date of deletion.
8. Write a PL/SQL function to calculate the number of distinction holders, first class holders, second class holders in the class.
9. Create a 2tier application using MongoDB as back end and Java as front end.
10. Implement aggregation and indexing with suitable example using MongoDB.
11. Implement Map reduce operation with suitable example using MongoDB.

Books/ Web references:

1. https://downloads.mysql.com/docs
2. Kristina Chodorow, Michael Dirolf, **'MongoDB: The Definitive Guide'** , *O'Reilly*, (2nd Edition)
3. http://docs.mongodb.org/manual/

CE 3105 Computer Networks Laboratory

Teaching Scheme:
Practical: 2 Hrs/week

Examination Scheme:
Practical : 25 Marks
Credits: 1

Course Objectives:

1. Configure the computing nodes with understanding of protocols and technologies.
2. To learn network programming.
3. Use modern tools for network traffic analysis and various networking configurations.
4. Learn Fundamental concepts of Virtualization.

Course Outcomes:

On completion of the course, student will be able to -

1. Configure switches and routers.
2. Demonstrate LAN and WAN protocol behavior using Modern Tools.
3. Analyze data flow between two communicating hosts using various protocols at Application, Transport and Network Layer.
4. Develop Client-Server Application.

Example List of Assignments:

Group A: (Mandatory)

1. Design an IP scheme for a WAN network (minimum 3 networks) using Cisco Packet Tracer tool.
2. Simulation of routing in the above network using Routing Information Protocol (RIP), by using CISCO packet tracer tool.
3. Write a program to analyze following packet formats captured through Wireshark for wired network. 1. Ethernet 2. IP 3.TCP 4.UDP (using Python).

Group B: (Any Four)

1. Installing and configuring DHCP server (windows server).
2. Write a program using TCP socket for wired network for following (using JAVA/ C)
   a. Say Hello to Each other b. File transfer
3. Write a program using UDP Sockets to enable file transfer (Script, Text, Audio and Video one file each) between two machines. (using JAVA / C).
4. Configuring Ftp server for file upload /download using Cisco Packet Tracer.
5. Write a program to demonstrate subnetting and find the subnet masks.(JAVA /Python).
6. Write a program for DNS lookup. Given an IP address input, it should return URL and vice-versa. (JAVA / Python).
7. Write a program to simulate Go back N and Selective Repeat Modes of Sliding Window Protocol (JAVA).

Group C:

1. Creation and configuration of Virtual Machines- Create 2 local virtual machines on host and ping the Virtual Machine.

CE 3106 PROGRAMMING SKILL DEVELOPMENT LABORATORY-I

Teaching Scheme
Practical : 4 Hrs/week

Examination Scheme
Oral : 50 Marks
Credits: 2

Prerequisites:

- Principles of Programming Languages Laboratory (CE2105)
- Data Structures and Algorithms-II (CE2202)

Course Objectives:

To facilitate the learners to

1. Explore Android tools.
2. Learn to develop mobile applications.
3. Create data-driven applications.
4. Design small system using Python or Android

Course Outcomes:

By taking this course, the learner will be able to

1. Analyze problems and select suitable Android development tools
2. Create mobile applications using basic components from Android Studio
3. Create data-driven mobile applications
4. Design python Application to handle the Data

Example list of Assignments

Group A (Mandatory)

1. Download, install and configure android development tools, plugins and SDK / Studio.
2. Design simple calculator using UI Widgets – button, textview, editview etc.
3. Develop an application that uses Layout Managers and event listeners.
4. Develop an application that change text formatting.
5. Design an application in Python using classes and objects.
6. Write python code that loads any dataset and perform basic operations, and plot the graph.

Group B (Any Three)

1. Write a mobile application that draws basic graphical primitives on the screen.
2. Develop a mobile application that makes use of database.
3. Develop a native mobile application that uses GPS location information.
4. Implement a mobile application that creates an alert upon receiving a message.
5. Write a mobile application that creates alarm clock.
6. Write a mobile application for multimedia Application.
7. Write a mobile application for Image transformation.
8. Implement MySQL/Oracle database connectivity using python and implement Database navigation operations (add, delete, edit,) using ODBC/JDBC.
9. Write a program for Socket programming using python .

Group C

1. Micro Project.

PECE 3101 Cloud Computing

Teaching Scheme
Lecture: 3 Hrs/week

Examination Scheme
In Semester: 50 marks
End Semester: 50 marks
Credits: 3

Prerequisites: Operating Systems (CE 2203)

Course Objectives:
To facilitate the learner to-

1. Understand the basic concepts related to cloud computing.
2. Analyze the underlying principles of different cloud service models.
3. Understand and apply the security techniques in cloud computing.
4. Get exposure to emerging trends in cloud computing.

Course Outcomes:
By taking this course, the learner will be able to-

1. Apply cloud computing concepts and the emerging trends to cloud based systems.
2. Analyze the cloud services and models.
3. Analyze various cloud platforms and tools for realization of different services.
4. Apply security concepts to the cloud environment.

Unit 1: Introduction (06)
Introduction to Cloud Computing, Cloud Economics, National Institute of Standards and Technology (NIST) Definition of Cloud Computing, Cloud Characteristics, Cloud Service Models, Cloud Deployment Models, Benefits, Challenges and Risks.

Unit 2: Infrastructure-as-a-Service (IaaS) (08)
Introduction to Infrastructure-as-a-Service (IaaS), NIST Cloud Computing Reference Architecture, Virtualization – Introduction, Taxonomy, Characteristics, Pros and Cons, Types of Service Level Agreement (SLA), Hypervisors - Xen, Kernel Virtual Machine (KVM), VMware, Containers, Case Study- Amazon Web Services (AWS).

Unit 3: Platform-as-a-Service (PaaS) (07)
Introduction to Platform-as-a-Service (PaaS), Data in Cloud: Relational Databases, NoSQL Databases, Big Data, Cloud File System: Hadoop Distributed File System (HDFS), HBase, Map-Reduce Model, Case Study- Google App Engine (GAE).

Unit 4: Recent Trends (06)
Inter-cloud / Federated Cloud, Internet of Things (IoT) and Cloud Computing, Mobile and Cloud Computing, Data Centers- Introduction, Cloud Applications.

Unit 5: Software-as-a-Service (SaaS) (08)

Introduction to Software-as-a-Service (SaaS), Multi-tenancy, Mashups, Service Oriented Architecture (SOA), Web Services based on Simple Object Access Protocol (SOAP) and REpresentational State Transfer (REST), SaaS Applications, Case Study- Salesforce.com.

Unit 6: Cloud Security (07)

Cloud Security Fundamentals, Cloud Security Challenges and Risks, Virtualization Security, Identity Management and Access Control, Secure Execution Environment and Communication.

Text books:

1. Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, '**Mastering Cloud computing**', *McGraw Hill Education*, (2013), ISBN 978-1-25-902995-0.
2. Gautam Shroff, '**Enterprise Cloud Computing**', *Cambridge University Press*, (2010), ISBN 978-0-521-13735-5.
3. Ronald Krutz and Russell Dean Vines, '**Cloud Security**', *Wiley India Pvt. Ltd.*, (2010), ISBN 978-81-265-2809-7.
4. Kailash Jayaswal, Jagannath Kallakurchi, Donald Houde, Dr. Deven Shah, '**Cloud Computing Black Book**', *DreamTech Press*, (2015), ISBN 978-93-5119-418-7.

Reference books:

1. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, '**Cloud Computing Concepts, Technology and Architecture**', *Prentice Hall*, (2013), ISBN 978-01-333-8751-3.
2. Barrie Sosinsky, '**Cloud Computing Bible**', *Wiley India Pvt. Ltd.*, (2015), ISBN 978-81-265-2980-3.
3. Rajkumar Buyya, James Broberg, Andrzej Goscinski, '**Cloud Computing Principles and Paradigms**', *Wiley India Pvt. Ltd.*, (2015), ISBN 978-81-265-4125-6.
4. Dr. Kumar Saurabh, '**Cloud Computing**', *Wiley India Pvt. Ltd.*, (2011), ISBN 978-81-265-2883-7.
5. Tim Mather, Subra Kumaraswamy, Shahed Latif, '**Cloud Security and Privacy**', *O'Reilly*, (2011), ISBN 13:978-81-8404-815-5.
6. A. Srinivasan, J. Suresh, '**Cloud Computing: A Practical Approach for Learning and Implementation**', *Pearson*, (2014), ISBN 978-81-317-7651-3.

Web References:

1. http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.500-291r2.pdf
2. https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf
3. http://searchdatacenter.techtarget.com/definition/data-center
4. http://www.sapdatacenter.com/article/data_center_functionality/
5. https://www.salesforce.com

PECE 3101 Digital Signal Processing and Applications

Teaching Scheme
Lecture: 3 Hrs/week
Tutorials: -

Examination Scheme
In semester: 25 marks
End semester: 50 marks
Credits : 3

Objectives:
To facilitate the learners

1. To learn, understand and analyze signals and systems
2. Understand linear time invariant systems.
3. Study transformed domain representation of signals and systems
4. Understand introduction to design of filters as DT systems and DSP applications in audio processing and image processing

Outcomes:
By taking this course, the learner will be able to

1. Apply Concepts of Signals & systems and Discrete-Time Signals & Systems to solve problems
2. Experiment with concept of Frequency analysis of signals
3. Make use of Fast Fourier Transform (FFT), Finite Impulse Response and Infinite Impulse Response algorithms for solving problems
4. Identify Digital Signal Processing cocepts learned in various applications and tools

Unit 1: Introduction to Signals and Systems [07]
Signals, Systems and Signal Processing, Basics elements of digital signal processing, advantages of digital over analog signal processing, Classification of signals, Concept of frequency in continuous time and discrete time signals, Analog to Digital and Digital to Analog conversion, sampling of analog signal, sampling theorem, Quantization, Coding

Unit 2: Discrete-Time Signals and Systems [07]
Discrete-Time signals and basic operations on signals, Discrete-Time systems and classification, Analysis of Discrete-Time linear time invariant systems , convolution, Introduction to Discrete-Time systems described by difference equations

Unit 3: Frequency analysis of signals [07]
Frequency Analysis of Discrete-Time signals, Properties of Fourier transform for discrete time signal, Discrete Fourier Transform and its properties, Linear filtering methods based on Discrete Fourier transform (overlap add, overlap save)

Unit 4: Fast Fourier Transform [07]
Efficient computation of discrete Fourier transform: Fast Fourier Transform (FFT) algorithms, Discrete Computation of Discrete Fourier Transform (DFT), Radix-2 Fast Fourier Transform algorithms, Decimation-In-Time (DIT) Fast Fourier Transform, Decimation-In-Frequency DIF Fast Fourier Transform, Inverse DFT using Fast Fourier Transform and applications

Unit 5: Implementation of discrete time systems [07]
Structure of realization of Discrete Time systems. Basic Structures for Finite Impulse Response (FIR) Systems, direct form realization, cascade form realization, Structure for Infinite Impulse

Response (IIR) systems: Direct-Form Structures, Cascade form Structure, Parallel-Form Structure, Filter as Discrete Time system: FIR, IIR, Digital filter realization

Unit 6: DSP applications and tools [07]

DSP in Speech Processing: Sound Quality Versus Data rate, High Fidelity Audio, Companding, Speech Synthesis and Recognition, DSP applications in Image Processing: Image Foundation and Display: Digital Image Structure, Other Image Acquisition and display, Brightness and Contrast Adjustments, Grey Scale Transforms

Text Books:

1. Proakis J., Manolakis D., **'Digital signal processing'**, *Pearson Education*, ISBN 9788131710005 (4th Edition) (2011)
2. Steven W. Smith, **'The Scientist and Engineer's Guide to Digital Signal Processing'**, *California Technical Publishing*, 2nd Edition, ISBN 0-9660176-6-8 (2nd Edition) (2014)

References:

1. Simon Haykin, Barry Van Veen, '**Signals and Systems'**, *John Willy and Sons* (6th Edition) (2014)
2. Babu R., '**Digital Signal Processing'**, 4th Edition, *Scitech Publications*, ISBN 978-81-8371-081-7 (6th Edition) (2010)
3. Mitra S., '**Digital Signal Processing: A Computer Based Approach'**, *Tata McGraw-Hill*, 1998, ISBN 0-07-044705-5 (3rd edition) (2014)
4. Ifeachor E. C., Jervis B. W., '**Digital Signal Processing: A Practical Approach'**, *Pearson-Education*, (2nd Edition) (2002)

Elective II- PECE 3101
Statistics for Computer Science

Teaching Scheme
Lectures: 3 Hr/Week

Examination Scheme
In Semester : 50 Marks
End Semester : 50 Marks
Credits : 3

Course Objectives
To facilitate the learners :-

1. To utilize fundamentals of statistics and descriptive statistics concepts.
2. To analyse multivariate data using multivariate, correlation and regression analysis.
3. To select and apply statistical quality control techniques using different statistical quality control charts.
4. To apply statistical inference techniques for dealing with uncertainty in decision making.

Course Outcomes
By taking this course, the learner will be able to –

1. Apply the methods of statistics on data and types of data.
2. Experiment with statistical multivariate analysis using variance, correlation and regression.
3. Apply statistical quality control techniques for given data.
4. Select statistical inferential techniques to draw inference.

Unit 1: Basic statistics (6 hrs)

Definition,collection and type of data, processing of data, classification,tabulation and graphical representation of data, limitation of statistics.
Types of averages: arithmetic mean, median, mode, geometric mean, harmonic mean, relationship among averages, variation, merits and limitations of variation, standard deviation

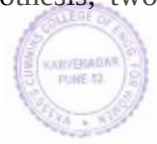
Unit 2 : Correlation and Regression (8 hrs)

Introduction, types of correlation, methods of studying correlation : scatter diagram, graphic method, Karl Pearson's coefficient of correlation, Rank correlation coefficient
Regression analysis : Introduction, uses of regression analysis, difference between correlation and regression analysis. Regression lines, regression equations, regression coefficient and it's properties.

Unit 3: Multivariate Analysis (8 hrs)

Partial regression, partial correlation, multiple correlation, multivariate regression, principal component analysis (PCA), introduction to cluster analysis.

Unit 4: Statistical Inference -Test of Hypothesis (8 hrs)
Introduction, procedure of testing hypothesis, types of hypothesis, two types of error in testing of hypothesis, two-nailed and one-nailed test



t-test, chi-square test, F-test, degrees of freedom, relation between t-test,chi-square and F-test.

Unit 5: Analysis of Variance (6 hrs)

Introduction, assumptions and techniques of analysis of variance, One-Factor analysis of variance, Two factor analysis of variance:Parameter estimation and testing hypotheses

Unit 6 : Statistical Quality Control (6 hrs)

Introduction, control charts : X chart, σ chart, R chart, role of acceptance sampling, OC curve
Case study : Educational and Psychological statistics.

Text Books:

1) “Statistical Methods”, S.P. Gupta, 41st Edition, 2011, ISBN :978-81-8054-862-8, Sultan Chand and Sons publication.
2) “Basic statistics”, B.L. Agarwal, 9th Edition, 2011, ISBN:978-81-224-2472-0, New Age publication.
3) “Statistics in Nutshell”, Sarah Boslaugh and Paul Andrew Watters, 2008, ISBN : 978-81-8404-568-0, SPD O'Reilly publication.

Reference Books:

1) “Statistical Data analytic” by Piegorsch W.W., Wiley publication, 2017
2) “Introduction to Statistical Quality Control” by D.C Montgomery, 4th ed.,Publication John Wiley & Sons, 2007.
3) “Introductory statistics”, Sheldon M. Ross, 2nd Edition, 2006, ISBN : 81312-00485, Elsevier publication.
4) "Applied multivariate statistical analysis", Richard A. Johnson, Dean W. Wichern, 6th edition, 2012, ISBN-978-81-203-4587-4, PHI Learning

PECE 3101 Operations Research

Teaching Scheme
Lectures: 3 Hrs /week

Examination Scheme
In Semester: 50 marks
End Semester: 50 Marks
Credits: 3

Prerequisite: Discrete Mathematics (20CE 303)

Course Objectives:
To facilitate the learners to :

1. Identify and characterize situations in which Linear Programming technique can be applied.
2. Derive feasible and optimal solution for Transportation and Assignment Problem.
3. Apply various methods to select and execute various optimal strategies of decision making and to win the game
4. Understand Queuing system model.

Course Outcomes :
By taking this course, the learner will be able to:

1. Apply Linear Programming technique for Operations Research problem
2. Solve Transportation and Assignment Problem
3. Evaluate different methods to compute value of game and decision making
4. Make use of Queuing theory to solve problems

Unit 1: Introduction to Operations Research (06)
A Quantitative Approach to Decision Making, History, Definitions, Features, Approach to Problem Solving. Overview of models and Modelling, Advantages of Model Building, Methods and Methodology, Advantages, Opportunities, features of solutions and Applications of Operations Research.

Unit 2: Linear Programming (08)
Structure of linear programming model, advantages, limitations, application areas, General mathematical model, Guidelines of model formulation, examples of linear programming model formulation, Graphical and Simplex method of Linear Programming.

Unit 3: Transportation and Assignment Problem (07)
Introduction, Mathematical formulation of transportation and assignment problem, initial basic feasible solution, testing for optimality, Modified distribution method, methods of solving assignment problem, unbalanced transportation and assignment problem. Case study : Dispatch model of Amazon and Swiggy

Unit 4: Decision Theory (07)

Introduction, steps in decision making, Types of decision making environments, Decision making under Uncertainty, Decision making under Risk.

Unit 5: Game Theory (07)

Introduction, Two-person Zero-Sum Games, Pure Strategy (Games with Saddle Point), Mixed Strategy (Games without Saddle point), The rules of Dominance.

Unit 6: Queuing Theory (07)

Introduction, The structure of queuing system, Performance measure of queuing system, Probability distributions in queuing systems, Classification of queuing models, Single server M/M/1:∞/FCFS exponential service queuing model.

Text books:

1. J K Sharma, 'Operations Research: Theory and Applications', Trinity Press, (5th Edition),(2013), ISBN: 978-9350-59336-3.
2. P Sankara Iyer, 'Operations Research', Sigma Series, Tata McGraw Hill Publication Private Limited, (4 th Reprint), (2012), ISBN: 978-0-07-066902-4.

Reference Books:

1. S D Sharma, 'Operations Research', Kedar Nath Ram Nath Publication, (15th Edition),(2009), ISBN: 978-81-224-2288-7.
2. Gupta Prem Kumar and Hira D.S., 'Problems in Operations Research', S Chand Publication, (2012), ISBN: 978-8121909686.
3. Hamdy A. Taha, 'Operations Research', Pearson Education, (8 th Edition), (2012), ISBN: 978-81-317-1104-0.

PECE 3102 Cloud Computing Laboratory

Teaching Scheme
Practical: 2 Hrs/week

Evaluation Scheme
In Semester: 25 Marks
Credits: 1

Course Objectives:
To facilitate the learners to-

1. Explore the underlying principles of Infrastructure-as-a-Service (IaaS), virtualization and containers.
2. Understand the use of Map-Reduce programming model of the Hadoop ecosystem.
3. Get exposure to the use of cloud Application Programming Interfaces (APIs) for developing sample application(s).
4. Study different cloud platforms and tools for various cloud service models.

Course Outcomes:
By taking this course, the learner will be able to-

1. Apply the hypervisor and container-based virtualization.
2. Experiment with Map-Reduce programming model by implementing sample programs.
3. Make use of CloudSim framework for understanding cloud computing infrastructure and services.
4. Choose relevant social networking and cloud Application Programming Interfaces (APIs), services.
5. Analyze the use of different cloud platforms and tools for various cloud service models.

Example list of assignments:

Teachers will appropriately adopt assignments on similar lines as the examples shown here.

Assignments Group A (Mandatory)

1. Explore the CloudSim platform for Cloud Modelling. For example: Create a data centre with one host and run one cloudlet on it using CloudSim.
2. Demonstrate the use of Docker container by exploring its related commands. Also, show the use of Fedora/Ubuntu images over the docker engine.
3. Using Hadoop ecosystem, implement Map-Reduce word count program for the given sample data.
4. Create a virtual machine using Kernel Virtual Machine (KVM) and explore commands for virtualization.

Assignments Group B (Any 4)

1. Explore the CloudSim platform for Cloud Modelling. For example: Create and configure the data centre and user base to show response time, request servicing time and data centre loading.
2. Demonstrate the use of MySQL image over the Docker engine.
3. Frame Python scripts to perform operations (for e.g. start/pause/stop) on the Virtual Machine using Libvirt and Operating System (OS) calls for virtualization.
4. Using Hadoop ecosystem, implement Map-Reduce program for the given log file data.
5. Demonstrate the use of Hive query language (HQL) for Map-Reduce to process the data using Hadoop ecosystem.
6. Explore and configure the Xen hypervisor or equivalent open source hypervisor.

7. Explore the use of API for cloud storage application (for e.g. DropBox API) with the Linux command line interface and Python script.
8. Create an application using Force.com API.
9. For a sample application, implement and consume web service using social networking APIs with Simple Object Access Protocol (SOAP).
10. For a sample application, implement and consume web service using cloud APIs with REpresentational State Transfer (REST).

Assignments Group C (Any 1)

1. Installation and configuration of an open source cloud platform.
2. Study of different cloud platforms such as GoogleApp Engine (GAE), Amazon Platform Services, Microsoft Azure services, Openstack and Rackspace.

PECE 3102 Digital Signal Processing Laboratory

Teaching Scheme **Examination Scheme**

2 Hrs/week **Term work– 25 Marks**

Credits: 1

Course Objectives:

To facilitate the learners to:

1. Experiment basics of Digital Signal Processing and Application
2. Understand and draw signals and perform operations on it
3. Experiment process of convolution and difference equation.
4. Understand representation of signal in frequency domain

Course Outcome:

By taking this course, the learner will be able to:

1. Experiment with digital representation of a given signal
2. Experiment with operations on signals
3. Experiment with concept of magnitude-phase plot
4. Build Fast Fourier Transform algorithms

Example list of Assignments:

Group A: (Mandatory)

1. Write a program to understanding MatLab programming environment
2. Write a program to generate Periodic and signals
3. Write a program to generate samples of Periodic and Aperiodic signals and verify Nyquist Theorem
4. Perform operations on discrete signals
5. Find the output of a given system for given input sequence using linear convolution

Group B: (Any Three)

1. Find the output of a given System described by given Difference Equation and initial condition for a given input sequence
2. Write a program to plot the magnitude and phase response of a given system (given: h(n): impulse response of system S) (Observe the frequency response, compare the frequency response of a system (filter) for different lengths h(n) i.e. filter coefficients)
3. Compute N point DFT using linear transformation matrix
4. Find FFT of a given signal

Group C: (Any One)

1. Design of IIR filter for given specifications using Bilinear Transformation (Program should work for different types of filter specifications i.e LPF, HPF, BPF etc and for different transfer functions of an analog filter)
2. Perform circular convolution of two sequences

PECE 3102 Statistics for Computer Science Laboratory

Teaching Scheme
Practical: 2 Hrs/week

Examination Scheme
In Semester: 25 Marks
Credits: 1

Course Objectives:

To facilitate the learners to -

1. Implement and analyze the basic and descriptive statistical operations for given problem.
2. Apply data representation knowledge for given data points.
3. Apply correlation, regression model, principal component analysis(PCA) model.
4. Design the solution for real life problems using the techniques of statistics.

Course Outcome:

By taking this course, the learner will be able to -

1. Implement basic and descriptive statistical operations on given data.
2. Apply different data representation methods for interpretation of given data.
3. Apply various models of regression, correlation, PCA on given data.
4. Develop small statistical application using different techniques.

Example list of Assignments:

Assignments can be done using open source tool and technology like R , Python or using Matlab

Group A: (Mandatory)

1.Getting started with software, installation, its objects and data types

2..Graphical presentation of data in different plot forms/diagrams.

3.Apply basic statistical operations, measure of location (Arithmetic mean, harmonic mean,geometric mean, median, mode).

4.Perform measure of dispersion , standard deviation, quartile deviation etc

Group B: (Any four)

1.Plot the diagram for the given data, develop the regression model that best describes the data, also predict output for the given value.

2.Perform correlation analysis (positive negative, zero) that describes the degree to which variables are linearly related to each other.

3.Perform test of hypothesis, one sample t-test, paired t-test, chi-squared goodness of fit test, on given data and see how to use them for statistical inference.

4.Perform data dimensionality reduction using principal component analysis.

5. Perform Cluster analysis on given data.

6. Perform analysis of variance (ANOVA) on data for evaluating hypothesis.

Group C: (Any one)

1.Study software tool to understand how to construct charts related to quality control.

2.Data analysis case study for readily available data set using the statistical techniques studied.

PECE 3102: Operations Research Elective-II Lab

Teaching Scheme
Practical: 02 Hrs/Week

Examination Scheme
In Semester: 25
Credits: 01

Course Objectives:

To facilitate the learners -

1. Identifying Linear Programming techniques as operation research tool
2. To derive a feasible and optimal solution for the Transportation and Assignment Problem.
3. To analyze various methods to select optimal strategies of decision making
4. To apply queuing system model for practical applications

Course Outcomes:

By taking this course, the learner will be able to -

1. Apply Linear Programming model to solve Operations Research problems
2. Solve Transportation and Assignment Problem
3. Analyze different strategies for decision making
4. Choose appropriate queuing models for practical application

Assignment statements

Group A

1. Exploring capabilities of Operations Research tools.
   Download and identify features of following tools
   a. https://www.solver.com/powerful-tools-operations-research-analysts
   b. https://support.sas.com/rnd/app/or/DA.html

2. Formulation of Linear Programming Problem
   A farmer owns 200 Cows that consume a minimum 90 Kg. of special feed daily. The feed is prepared as a mixture of Corn and soybean meal with following compositions

   The dietary requirements of the Cows are as follows:
   1. At most 1% calcium
   2. At least 30% protein
   3. At most 5% fibre

   Formulate the problem as a Linear programming Model
3. Solving Linear programming problem
   A chemical company produces four different chemicals (A, B, C and D) using two

different reaction processes (1 and 2). For each hour that Process 1 is run, it yields 400 lbs. of A, 100 lbs. of B and 100 lbs. of C. For each hour that Process 2 is run, it yields 100 lbs. of A, 100 lbs. of B and 100 lbs. of D. The marketing department has specified that the daily production should be (1) no more than 500 lbs. of B and 300 lbs. of C, and (2) at least 800 lbs. of A and 100 lbs. of D.

a) Formulate the above as linear program, sketch the feasible region and compute the values of all variables at each of its extreme points.

b) Suppose it costs $4 to run Process for 1 hr., and $2 to run Process 2 for 1 hr. Sketch an isocost line on your graph. Graphically find the optimal production plan, and the optimal cost. Which constraints are active and which ones inactive at the optimum? Compute the slack or excess values for each constraint at the optimum.

c) Repeat (b) but for costs of $5 per hr. for Process 1 and $1 per hr. for Process 2.

d) Suppose that the costs are as in (c) and that each lb. of the chemicals A, B, C and D sell respectively for 1, 5, 5 and 4 cents. What is the optimum solution? If there is more than one optimum solution, characterize the complete set of optimum solutions. What is the optimum value of the objective?

4. Solving Linear programming problem using simplex method and test the results with the help of tools of 1st assignment

$$\textbf{Minimize} \quad Z = -3X_1 + X_2 - 3X_3 - 4X_4$$

$$st \quad X_1 + 7X_2 + 3X_3 + 7X_4 \leq 46$$

$$3X_1 - X_2 + X_3 + 2X_4 \leq 8$$

$$2X_1 + 3X_2 - X_3 + X_4 \leq 10$$

$$X_1, X_2, X_3, X_4 \geq 0$$

Group B

1. Florenzo Foods has a contract to provide cattle feed for four different cattle breeders.

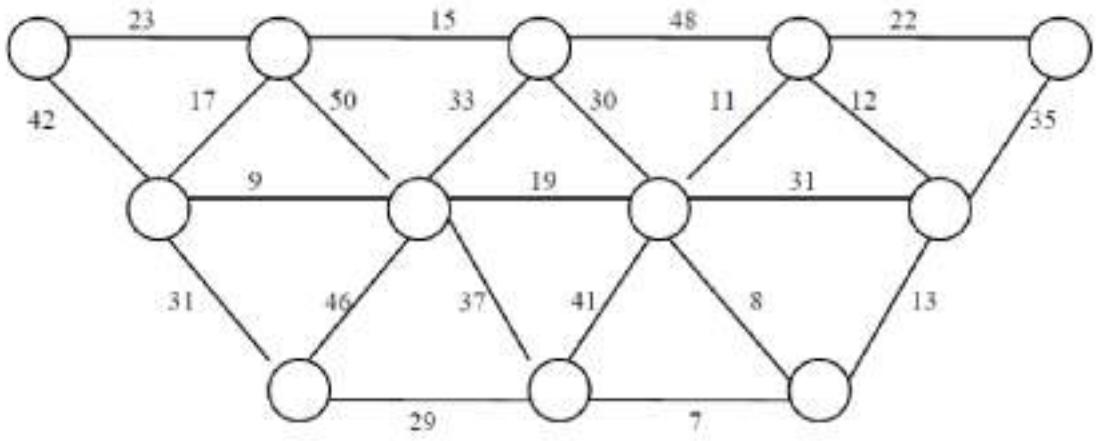
At the end of the week the Breeders A, B, C and D require 1,200; 1,600; 1,000; and 2,600 pounds of feed respectively to be delivered to them. Florenzo has three plants that manufacture feed and each of these has a capacity of 2,400 pounds per week. The cattle feed sells for $20 per pound, and the manufacturing costs are $2 per pound at plant 1 and $3 per pound at plants 2 and 3 which are older plants. Florenzo has already committed to run each plant at full capacity this week, i.e., each of them will produce 2,400 pounds, and any excess feed left over at a plant at the end of the week will incur a cost of $1 per pound for storage. Transportation costs in $ per pound are given in the table below.

	Breeder A	Breeder B	Breeder C	Breeder D
Plant 1	6	7	1	6
Plant 2	5	4	3	1
Plant 3	1	5	7	2

Florenzo is interested in maximizing total profits over the week.

1. Formulate this problem as a balanced transportation problem.
2. Use Excel Solver to solve the resulting LP. What is the value of the optimal total profit?

2. Find the minimum spanning tree for the following Transportation network



3. Exercise and case problems on Decision making
4. Exercise and case problems on Game theory

Group C

1. Exercise to determine the performance measures for M/M/1 queuing model.

T. Y. B. Tech. Computer Engineering Semester – II										
Course Code	Course Title	Teaching Scheme Hours /Week			Examination Scheme				Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
CE 3201	Theory of Computation	3	1	0	50	50	0	0	100	4
CE 3202	Artificial Intelligence and Machine Learning	3	0	0	50	50	0	0	100	3
CE 3203	Software Design and Architecture	3	1	0	50	50	0	0	100	4
PECE 3201	Programme Elective-II	3	0	0	50	50	0	0	100	3
PECE 3202	Programme Elective-III	3	0	0	50	50	0	0	100	3
CE 3204	Seminar	0	0	4	25	0	25	0	50	2
CE 3205	Artificial Intelligence and Machine Learning Laboratory	0	0	4	0	0	0	50	50	2
PECE 3203	Programme Elective-III Laboratory	0	0	2	0	0	25	0	25	1
AC 3201	Audit Course	0	0	2	0	0	0	0	0	0
	Total	**15**	**2**	**12**	**275**	**250**	**50**	**50**	**625**	**22**
	Grand Total	**29**			**625**				**625**	**22**

PECE 3201: Programme Elective-II

1. Wireless and Mobile Communication
2. Software Testing and Quality Assurance
3. Human Computer Interaction
4. Multimedia Systems
5. Swayam Online Course

PECE 3202: Programme Elective-III
PECE 3203: Programme Elective-III Laboratory

1. Data Mining and Data Warehousing
2. Embedded and Real-Time Systems
3. Linux Internals
4. Image Processing

AC 3201 -- Audit Course: Employability Skills Development

DEAN ACADEMICS
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg. For Women, Karvenagar, Pune-52

APPROVED BY
Governing Body Members
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

CE 3201 THEORY OF COMPUTATION

Teaching Scheme
Lectures: 03 Hrs/Week
Tutorial : 01 Hrs/Week

Examination Scheme
In Semester: 50 marks
End Semester: 50 Marks
Credits: 4

Prerequisites:
1. Data Structures and Algorithms II (CE 2201)
2. Discrete Mathematics (CE 2103)

Course Objectives:
To facilitate the learners -
1. Recall and understand the basics of mathematical concepts, formal languages and machines.
2. Understand and design different computational models like finite automata, regular expression, push down automata, context free grammar, turing machine for a given language.
3. Apply inter conversion between equivalent representations of a language.
4. Learn classification of a given problem into appropriate complexity class.

Course Outcomes:
By taking this course, the learner will be able to -
1. Make use of fundamentals of mathematical concepts, formal languages and automata theory.
2. Construct different computation models like finite automata, regular expression, push down automata, context free grammar, turing machine for a given language.
3. Evaluate capabilities of Computational model by inter-conversion.
4. Classify a problem into appropriate complexity class.

Unit 1: Introduction (06)
Finite and infinite set. Basic concepts of symbol, alphabet, string. Formal Language Definition, Problems. Finite representation of languages. Concept of Basic Machine and Finite State Machine introduction.
Regular Expression (RE): definition and operators, Regular Set, Algebraic Laws of Regular Expressions, Closure Properties of Regular Languages, Regular expression examples.

Unit 2: Finite Automata (08)
Finite Automata (FA) - (Deterministic FA, Non-deterministic FA, Є-NFA): Definition , Transition Function and language acceptance, Transition graph, Construction of FA.
Conversion of NFA with Є moves to NFA without Є moves, Conversion of NFA without Є moves to DFA, Direct Conversion of NFA with Є to DFA, Inter-conversion of RE and FA, Construction of RE equivalent to FA using Arden's Theorem. Construction of FA equivalent to RE (RE to Є-NFA, Є-NFA to DFA). Pumping Lemma for Regular languages, Limitations of FA.

Unit 3: Context Free Grammar (07)
Grammar- Definition, representation of grammar. Context Free Grammar (CFG) - Definition, Derivation – Leftmost, Rightmost, sentential form, parse tree, ambiguous grammar and removing

ambiguity from grammar, Simplification of CFG, Normal Forms - Chomsky normal form, Greibach normal form, Closure properties of Context Free Languages (CFL), Decision properties of CFL, Chomsky hierarchy. Regular grammar- Definition, left linear, right linear grammar, Applications of grammar.

Unit 4: Push Down Automata (07)

Definition, Notations – Transition Table form, Types of PDA (Deterministic PDA and Non Deterministic PDA), acceptance by final state, acceptance by empty stack, Construction of PDA (DPDA, NPDA), Instantaneous Description of PDA. Equivalence of PDA and CFG - Grammar to PDA conversion, Applications of PDA.

Unit 5: Turing Machine (07)

Turing machines (TMs) - Formal Definition, TM Instantaneous Description, Transition Function, Languages of TM, Turing Machine and halting, Deterministic Turing Machines (DTM) , Construction of DTM. Universal Turing Machine (UTM), Church -Turing hypothesis, Comparison between FA, PDA and TM. Turing Machine Halting Problem.

Unit 6: Introduction to Undecidability (07)

A Language that is not recursively enumerable, Enumerating the binary strings, diagonalization Language, An undecidable problem that is RE, Recursive language, Complements of Recursive and RE languages, universal language, Undecidability of the universal language, classes P, NP and NP-Complete Problem

Text Books:

1. Hopcroft J., Motwani R., Ullman J., "Introduction to Automata Theory, Languages and Computations", Third edition, 2008, Pearson Education Asia. ISBN: 9788131720479
2. John C Martin. "Introduction to Language and Theory of Computation", Third edition, 2012, Tata McGraw- Hill, ISBN: 978007660489

Reference Books:

1. Daniel Cohen., “Introduction to Computer Theory”, Second edition, 2011, Wiley Publications (India) ISBN: 9788126513345
2. H.R. Lewis, C. H. Papadimitrou, ”Elements of the Theory of Computation”, Second edition, 2006, Prentice Hall Inc. ISBN: 8131703878
3. Michael Sipser, ”Introduction to The Theory of Computation”, Third edition, 2017 Thomson Course Technology, ISBN: 9781131525296
4. Vivek Kulkarni, “Theory of Computation”, Oxford university edition, 2013, ISBN 13:9780198084587

Web References:

1. NPTEL :: Computer Science and Engineering – Theory of Computation http://nptel.ac.in/courses/106101061

Example List of Tutorials:

1. Identify Complexity (n2, log n etc.)for a given code
2. Design of Regular Expression from Language
3. Design Deterministic Finite Automata
4. NFA design and NFA to DFA conversion
5. RE to NFA with null moves and NFA with null moves to NFA without null moves
6. Formal language to CFG and CFG to language conversion
7. Simplification of CFG and Chomsky Normal Form
8. Design of Push down Automata
9. Design of Turing Machine
10. Classification of a problem into appropriate complexity classes by reduction

CE 3202 Artificial Intelligence and Machine Learning

Teaching Scheme	Examination Scheme
Lectures: 3 Hr/Week	In Semester : 50 Marks
	End Semester : 50 Marks
	Credits : 3

Course Objectives:

To facilitate the learners to-

1. Learn overview of classic Artificial Intelligence and basics of machine learning.
2. Understand various intelligent searches and knowledge representation.
3. Understand types of learning as well as machine learning.
4. Study applications in Artificial Intelligence and Machine Learning.

Course Outcomes:

By taking this course, the learner will be able to –

1. Build fundamental knowledge of AI, its applications and solve classical AI problems using different AI Techniques
2. Apply intelligent search algorithms on AI problems.
3. Make use of Knowledge Management techniques of AI for reasoning.
4. Apply the appropriate supervised / unsupervised Machine Learning (ML) method to solve the given problem.
5. Examine different topics with various methods of expert system, pattern recognition, natural language processing, nature inspired computing.

Unit 1: Introduction to AI (07)

Definitions of Artificial Intelligence, Artificial Intelligence Problems, Topics of Artificial Intelligence: Learning Systems, Knowledge Representation and Reasoning, Planning, Knowledge Acquisition, Intelligent Search, Logic Programming, Soft Computing, Management of Imprecision and Uncertainty, Production Systems: Traveling Salesman Problem, Water-Jug Problem, State Space Representation, State Space Search, Tic-Tac-Toe as a State Space, Branches of Artificial Intelligence.

Unit 2: Heuristic Search Techniques (07)

Generate-and-Test, Search Techniques: Depth First Search, Breadth First Search, Best First Search Algorithm, Hill Climbing, Simulated Annealing, A* Algorithm, Problem Reduction, AND–OR Graphs, The AO* Algorithm, Towers of Hanoi Problem, Constraints Satisfaction: crypt-arithmetic problem, mini-max algorithm.

Unit 3: Knowledge Management (07)

Knowledge Management, Types of Knowledge: Declarative Knowledge, Procedural Knowledge, Knowledge Representation, Approaches to Knowledge Representation, Issues in Knowledge Representation, First-order Logic: Basic Predicate Representations, Conversion of WFF to Clause Form, Resolution, Unification, Resolution Examples, Reasoning, monotonic and non-monotonic reasoning.

Unit 4: Learning **(07)**

Types of Learning: Rote Learning, Learning by General Problem Solving, Concept Learning, Learning by Analogy, Learning problems and designing the learning systems, Machine Learning: Types of Problems in Machine Learning, Aspects of Inputs to Training, Learning Systems, Intelligent Agents.

Unit 5: Machine Learning methods and models **(07)**

Introduction to Supervised, Unsupervised, semi-supervised Learning, Ensemble Learning, discovery based Learning, Learning by problem solving, Reinforcement Learning, Support vector Machine, Artificial Neural Network : Perceptron, multi-layer perceptron, back propagation Neural Network, Self-organizing map.

Unit 6: Applications in Artificial Intelligence and Machine Learning **(07)**

Game Playing, Expert Systems, Natural Language Processing, Image Understanding & Computer Vision, Pattern Recognition, Virtual Reality, Nature Inspired Computing.

Text Books:

1. Vinod Chandra S. S., Anand Hareendran S., 'Artificial Intelligence and machine learning', PHI, (2014), ISBN 978-81-203-4934-6.
2. Kulkarni P., Joshi P., 'Artificial Intelligence: Building Intelligent Systems', PHI Learning, (2015), ISBN 978-81-203-5046-5.

Reference Books:

1. Peter, Norvig, 'Artificial Intelligence: A Modern Approach', Pearson, (3 rd edition), (2014), ISBN-0-13-103805-2.
2. Elaine Rich, Kevin Knight and Nair, 'Artificial Intelligence’, Tata McGraw – Hill, (3rd edition), (2012), ISBN-978-0-07-008770-5.
3. Bratko I., 'Prolog Programming for Artificial Intelligence', Pearson Education, (3rd edition), (2004).
4. Tom M. Michell, 'Machine Learning', McGraw Hill Education, Indian edition (2013), ISBN-13: 978-1-25-909695-2.
5. Ethem Alpaydin, 'Introduction to Machine Learning', PHI, (2006), ISBN-81-203-2791-8.

CE 3203 Software Design And Architecture

Teaching Scheme
Lectures: 3 Hrs/Week
Tutorial: 1 Hr/Week

Examination Scheme
In Semester: 50 marks
End Semester: 50 marks
Credits: 4

Prerequisite: Data structures and Algorithms II (CE 2201)

Course Objectives:
To facilitate the learner to -

1. Develop familiarity with the basic concepts of software architecture and quality attributes of a system.
2. Model the software requirements of a system using Unified Modeling Language (UML) to understand the architectural, structural and behavioral aspects of the system.
3. Understand and apply various design patterns in creating an object oriented design.
4. Get exposure to the various software testing techniques and methods.

Course Outcomes:
By taking this course, the learner will be able to -

1. Analyze the concepts of software architecture and quality attributes to realize the solution of a system.
2. Build structural and behavioral models using Unified Modeling Language (UML).
3. Apply various design patterns to understand reusability in object oriented design.
4. Apply various software testing techniques at unit level, suitable to different problem areas.

Unit 1: Introduction to Software Architecture (06)
Software Development Life Cycle (SDLC), Software Requirement Specification (SRS), What is Software Architecture, Why Software Architecture is important.

Unit 2: Design Using Unified Modeling Language (UML) (08)
Importance of modeling, Use case Diagrams, Activity Diagrams, Class Diagrams, Sequence Diagrams.

Unit 3: Quality Attributes (08)
Understanding Quality Attributes, Quality Attribute Scenarios and Tactics - Performance, Security, Usability.

Unit 4: Creational and Structural Design Patterns (07)

What is Design Pattern, Classification of Design Patterns, Elements of Design Pattern, Creational Design Patterns - Singleton, Factory Method, Structural Design Patterns - Proxy, Adapter.

Unit 5: Behavioral Design Patterns (06)

Observer, Iterator, Model View Controller (MVC), Mediator.

Unit 6: Software Testing (07)

Introduction, Verification and Validation, White Box testing - Structural Testing – Unit / Code functional testing, Code coverage testing, Code complexity testing, Black Box testing - Equivalence Class Partitioning, Boundary Value Analysis.

Text books:

1. Len Bass, Paul Clements, Rick Kazman, **'Software Architecture in Practice'**, *Pearson Education,* (3rd Edition)(2013).
2. Grady Booch, James Rumbaugh, Ivar Jacobson, **'The Unified Modeling Language User Guide'**, *Pearson Education,* (2nd edition)(2008).
3. Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, '**Design Patterns-Elements of Reusable Object-Oriented Software',** *Pearson Education,* (2002).
4. Srinivasan Desikan, Gopalaswamy Ramesh, '**Software Testing Principles and Practices'**, *Pearson Education*, ISBN 81-7758-121-X (2013).

Reference books:

1. Len Bass, Paul Clements, Rick Kazman, **'Software Architecture in Practice'**, *Pearson Education,* (2nd Edition) (2006).
2. Mary Shaw and David Garlan, **'Software Architecture – Perspectives on an Emerging Discipline'**, *Prentice Hall of India,* (1996).
3. Richard N. Taylor, Nenad M. and Eric M. Dashofy, **'Software Architecture: Foundations, Theory and Practice'**, *Wiley,* (2006).
4. Jim Arlow and Ila Neustadt, **'UML 2 and the Unified Process –Practical Object-Oriented Analysis and Design',** *Pearson Education,* (2nd edition) (2006).
5. Iien Burnstein, '**Practical Software Testing',** *Springer (India) private limited,* (2005).

Example List of Tutorials:

1. Study architectural styles and submit a report on these styles.
2. A case study of any website or any other large system and its architecture for quality attributes requirements such as Performance, Security, Usability and Availability.
3. Design a Software Requirement Specification (SRS) document for a given system.
4. Draw Use case diagrams for capturing and representing requirements of a given system.
5. Draw Activity diagrams to display the business flows for a given system.
6. Draw Class diagrams to identify and describe key concepts like classes, relationships and other classifiers like interfaces.
7. Draw Sequence diagrams to show message exchanges in a given system.
8. Identify suitable design patterns for a given application.
9. Apply various Black Box testing methods for unit testing of a sample application.
10. Apply various White Box testing methods for unit testing of a sample application.

CE 3204 SEMINAR

Teaching Scheme
Practical : 4 Hrs./week

Examination Scheme
In semester : 25 marks
Oral : 25 marks
Credits : 2

Course Objectives:
To facilitate the learners :-

1. To identify the topic based on current engineering trends/ social problems/ new technologies.
2. To explore the basic principles of communication (verbal and non verbal) and active, empathetic listening, speaking and writing techniques.
3. To produce relevant technical documents by following best practices of technical writing.
4. To understand the basic principles of presentation, technical writing techniques for seminar.

Course Outcome:
By taking this course, the learner will be able to :

1. Select appropriate/reserach topic and write a technical report and present it to audience.
2. Be familiar and use the basic technical writing concepts and terms such as audience analysis, jargon, format, visuals and presentation.
3. Improve skills to read, understand and interpret material on technology.
4. To enhance technical communication and presentation skills.

General Guidelines for Seminar:

- Seminar is an individual student activity.
- The area/domain must be selected under the guidance of institute guide.
- Each student will select a topic in the current/new trends of Computer Engineering and Technology beyond the scope of syllabus avoiding the repetition in consecutive years.
- Student should do - literature survey based on IEEE/ACM/Springer/Digital Library papers or technical Magazines/books, specify knowledge area, brief technical knowledge about the topic.
- Each student will make a seminar presentation based on the domain topic using audio/video aids for a duration of 20-25 minutes.
- Student have to submit the technical seminar report in the department.

Guidelines for assessment:

- Internal guide will evaluate students on understanding of topic, punctuality and Timely Completion of Report, Paper presentation/Publication and Attendance.
- An external examiner(s) panel will be assessing the seminar work based on these parameters - Understanding of Topic, flow of Contents, Presentation, report, Paper presentation/Publication, Question and Answers, Active Participation.

References:

1. Research papers from reputed journals/transactions- references necessary for the Project.
2. Reference books/Magazines for conceptual technical support.

CE 3205 Artificial Intelligence and Machine Learning Laboratory

Teaching Scheme
Practical: 4 Hr/Week

Examination Scheme
Practical: 50 Marks
Credits : 2

Course Objectives:
To facilitate the learners to-
1. Experiment Artificial Intelligence and machine learning concepts from syllabus.
2. Experiment AI searches like A*, Min-max algorithm.
3. Understand monotonic and non-monotonic knowledge representation.
4. Experiment classification and clustering algorithms.

Course Outcomes:
By taking this course, the learner will be able to-
1. Implement various intelligent searching techniques.
2. Apply Knowledge Management techniques to implement truth maintenance system / Expert system.
3. Choose the appropriate supervised Machine Learning (ML) method and solve the given problem.
4. Choose the appropriate Unsupervised ML method and solve the given problem.

Example list of Assignments:

Assignments Group A (Mandatory)
1. Study: Learning simple statements in Prolog
2. Implement DFS/BFS for simple water jug problem
3. Implement A* algorithm for 8 puzzle problem
4. Implement Unification algorithm
5. Represent knowledge using Prolog by implementing small expert system
6. Implement Best first search algorithm

Assignments Group B (Any 3)
1. Write a program to implement Min-max algorithm for game playing
2. Write a program to implement Perceptron in artificial neural network
3. Write a program to implement SOM
4. Write a program to implement SVM/backpropagation learning algorithm

Assignment Group C
Develop any one machine learning tool for application: character/sign classification

PECE 3201 WIRELESS AND MOBILE COMMUNICATION

Teaching Scheme
Lecture: 3 Hrs. /week

Examination Scheme
In semester: 25 Marks
End semester: 50 Marks
Credits: 3

Prerequisite(s): Computer Networks (CE 3101)

Forward Course Linkage(s): -

Course Objectives:

To facilitate the learners-

1. To understand and remember fundamental concepts of Wireless Communication.
2. To compare different Wireless Network Standards.
3. To understand and apply Cellular system design fundamentals.
4. To understand modern mobile network architectures from design and performance perspective.

Course Outcomes:

By taking this course, the learner will be able to–

1. Understand basics of wireless communication and wireless standards.
2. Understand mobility management.
3. Recognize the important issues and concerns of Cellular system design.
4. Analyze evolution of mobile communication with recent trends and emerging technologies.

Unit 1: Introduction to Wireless Communication (07)

Introduction to wireless communication: Evolution, Types of wireless communication, Signals, antennas, signal propagation, mobile radio systems -examples, trends in cellular radio and personal communications, multiple access technologies Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA), Code Division Multiple Access (CDMA).

Unit 2: Wireless LAN Standards (07)

Overview of 802.11 a, b, g, n standards, Concept of Spread Spectrum- Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSSS), Comparison amongst 802.11 standards, Introduction and overview of MAC for 802.11 networks Carrier sense multiple access (CSMA/CA), Overview of IEEE 802.16 WiMax.

Unit 3: Global System for Mobile Communication (GSM) System (07)

Introduction, GSM background GSM operational and technical requirements. Cell layout, GSM system architecture, elements of GSM architecture, Signal processing in GSM, Mobility management-Signaling protocols, Basic steps in the formation of a call, Handoff management.

Unit 4: General Packet Radio Service (GPRS) System (07)

Introduction and Need, GPRS system architecture, GPRS interfaces, GPRS transmission plane, GPRS Mobility Management, MS State Transition, GPRS, GPRS routing, and application.

Unit 5: Long Term Evolution Technologies **(07)**

Long Term Evolution(LTE) Technologies-Evolution to 4G, Orthogonal Frequency Division Multiplexing (OFDM), Downlink capacity comparison, Multiple Input Multiple Output (MIMO) spatial multiplexing, code words and layer mapping, Channel Coding schemes in LTE, Frequency Division Duplex (FDD) and Time Division Duplex (TDD).

Unit 6: Cellular System Design Fundamentals **(07)**

Introduction to Cellular system design concept, Importance of Frequency Reuse, Concept of Channel assignment and Handoff strategies, Interference and System capacity-Co-channel and Interference and System capacity, Channel planning for Wireless Systems Introduction to Trunking and Grade of service, Importance of Erlang B and C formula and Problem solving**.**

Text Books:

1. Mischa Schwart, '**Mobile Wireless communications'**, *Cambridge university Press*, ISBN 9781107412712 paperback (2013).
2. T.S. Rappaport, **"Wireless Communications: Principles and Practice'**, *Pearson Education / Prentice Hall of India*,(2nd edition), Third Indian Reprint (2003).
3 G. K. Behera Lopmudra Das, '**Mobile Communication'**, *Scitech publications (INDIA) PVT LTD*, (Revised edition).

Reference Books:

1. Asha Mehrotra, '**GSM System Engineering'**, *Artech House*, (2nd edition), (1997).
2. Jerry D. Gibson, '**The Mobile Communication'** Handbook, *IEEE Press.*
3. Jochen Schiller, '**Mobile Communication'**, *Pearson Education Asia*, (2nd edition).
4.Farooq Khan, '**LTE for 4G Mobile Broadband'**, *Air interfaces Technologies and Performance, Cambridge University Press.*
5. Krzysztof Wesolowski, '**Mobile Communication Systems'**, (Student edition), *Wiley publications*.

Web References:

1. LTE Advanced FDD/TDD – http://www.radio-electronics.com/info/cellulartelecomms/lte-long-term-evolution
2. NPTEL: Introduction to Wireless and Cellular Communications-onlinecourses.nptel.ac.in/noc17_cs37/preview

PECE 3201 Software Testing And Quality Assurance

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In Semester: 50 marks
End Semester: 50 marks
Credits: 3

Prerequisites: -

Course Objectives:
To facilitate the learner to -

1. Develop familiarity with the fundamental concepts and the process of software testing.
2. Understand need and concept of black box testing and White Box Testing
3. Understand the testing strategies and system testing
4. Understand Testing Metrics and Quality Assurance measures
5. Understand Recent Trends and Automated Testing

Course Outcomes:
By taking this course, the learner will be able to -

1. Apply the fundamental concepts and the process of software testing.
2. Make use of the concepts of black box testing and White Box Testing methods
3. Make use of the testing strategies and system testing
4. Make use of Testing Metrics and Quality Assurance measures and compare techniques of automated testing and modern testing tools for testing various types of applications.

Unit 1: Introduction **(06)**
Need of testing, Basics of Software Testing, Testing Principles, Goals, Software Testing Life Cycle, Defects, Defect management, Verification and validation, Test Plan.

Unit 2: Black Box Testing **(08)**
Introduction, Need of black box testing, Testing Methods - Requirements based testing, Positive and negative testing, Equivalence Class Partitioning, Boundary value analysis, Decision table / Cause effect graphing, State based testing, Domain testing, Examples of Black-Box testing.

Unit 3: Testing Strategies and System Testing **(07)**

Unit, Integration, System, Acceptance testing, Usability testing, Regression testing, Scenario testing, Adhoc testing, Functional, Performance testing, Stress testing, Security testing, Alpha-Beta testing.

Unit 4: Testing Metrics and Quality Assurance (07)

Testing Metrics and measurements, Types of metrics – Project, Progress, Productivity, Software quality, Quality control and assurance, Quality factors, Software Quality Assurance (SQA) Model - Six Sigma, Ishikawa's Seven Basic Tools.

Unit 5: White Box Testing (07)

Introduction, Need of white box testing, Testing types, Static testing, Structural Testing – Unit / Code functional testing, Code coverage testing, Code complexity testing, Challenges in White box testing, Examples of White-Box testing.

Unit 6: Recent Trends and Automated Testing (07)

Agile Testing, Model based testing, Need for Automation, Keyword driven automation, Data driven automation, Manual testing versus Automated testing, Automated Testing Tools, Selection of tool, Study of Testing tools and frameworks (such as Selenium, JUnit, Bugzilla).

Text books:

1. Iien Burnstein, '**Practical Software Testing',** *Springer (India) private limited* (2005).
2. Srinivasan Desikan,Gopalaswamy Ramesh, **Software Testing Principle and Practices**', *Pearson Education*, ISBN 81-7758-121-X (2013).
3. Nageshwar Rao Pusuluri, '**Software Testing Concepts and Tools',** *Dreamtech press*, ISBN 81-7722-712-2 (2008).

Reference books:

1. Ron Patton, **'Software Testing',** *Pearson Education*, ISBN-13: 978-0-672-32798-8 (Second Edition) (2013).
2. Stephen H Kan, '**Metric and Model in Software Quality Engineering**', *Pearson Education* ISBN 81-297-0175-8 (Second Edition) (2006).
3. William Perry, **'Effective Methods for Software Testing'**, *Wiley Publication*, ISBN 81-265-0893-0 (Third Edition) (2006).
4. Dr. K.V.K.K. Prasad, '**Software Testing Tools**', *Dreamtech Press* ISBN: 10:81-7722-532-4 (2008).
5. Naresh Chauhan, '**Software Testing Principles and Practices**', Oxford *University Press*, ISBN 0-19-806184-6 (2011).

Web References

1. http://www.seleniumeasy.com/selenium-tutorials
2. https://www.tutorialspoint.com/junit

3. https://www.bugzilla.org

PECE 3201 Human Computer Interaction

Teaching Scheme
Lectures: 3 Hrs /week

Examination Scheme
In Semester: 50 marks
End Semester: 50 marks
Credits: 3

Course Objectives:
To facilitate the learner to-
1. Identify the main modes of human computer interaction.
2. Identify the common pitfalls in data analysis, interpretation and presentation.
3. Understanding the use of prototyping and evaluation in design.
4. Understand the advanced techniques of Human Computer Interaction.

Course Outcomes:
By taking this course, the learner will be able to:
1. Apply the concepts of HCI to enhance the user experience.
2. Select the appropriate data gathering techniques and establish the requirements for the good design.
3. Apply the fundamental aspects of designing and evaluating the interfaces.
4. Compare the advanced techniques of Human Computer Interaction.

Unit 1: Introcuction to Interactive Design (08)
What is HCI – design, models, evaluation, Need to understand people, computers and methods.
Humans – Memory, Attention Span, Visual Perception, psychology, ergonomics.
Computers – speed, interfaces, widgets, and effects on interaction.
Understanding Users, Universal Design, User-centered design.

Unit 2: Design Process and Interaction Styles (08)
HCI in the Software Process, HCI design principles and rules, Shneiderman's golden rules, Normans seven principles, Nielsens ten heuristics with example of its use.
Interaction Styles, Direct Manipulation - Menu selection, Form Fill-in and Dialog Boxes

Unit 3: Establishing Requirements (07)
Understanding importance of identifying the requirements, Different kinds of requirements, Data gathering for requirements, Data analysis, Data interpretation and presentation, Task description and analysis.

Unit 4: Design, Prototyping, and Construction (06)
Prototyping and construction, Conceptual design, Physical design, User Persona, Using scenarios in design, Using prototypes in design and support for design, Handling errors and designing help.

Unit 5: Evaluation Approaches (06)
Importance of evaluation, Evaluation approaches and methods, Evaluation case studies, Determine, Explore, Choose, Identify, Decide, Evaluate (DECIDE): A Framework to guide evaluation.

Unit 6: New Interaction Technologies (07)
Explicit and Implicit Human Computer Interaction, User Interfaces and Interaction for Four Widely Used Devices, Hidden User Interface via Basic smart Devices, Hidden User Interface via Wearable and Implanted Devices.

Text books:

1. Rogers, Sharp, Preece, 'Interaction Design', Wiley Publications (India), (Third edition), (2014).
2. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, 'Designing the User Interface: Strategies for Effective Human-Computer Interaction', Pearson Education Limited (India),(2010).
3. Stefan Poslad, 'Ubiquitous Computing', Wiley Publications (India), (2014).

Reference Books:

1.Alan Dix, 'Human Computer Interaction', Pearson Education Limited (Third edition), (2004).
2.Wilbert O. Galitz, 'The Essential Guide to User Interface Design', Wiley Publications (Second edition), (2003).
3.John M. Carroll, 'Human-Computer Interaction', Pearson Education Limited, (2002).
4.Don Norman, 'The Design of Everyday Things', Basic Books, A member of the Perseus Books Group, (2013).

PECE 3201 – Multimedia Systems

Teaching Scheme:
Lectures: 3Hrs/Week

Examination Scheme:
In-Semester: **50** Marks
End-Semester: **50** Marks
Credits: 3

Course Objectives:

To facilitate the learners to -

- Understand basics of Multimedia Systems.
- Understand various file formats.
- Learn Multimedia editing tools.
- Analyze various compression techniques.
- Learn advances in multimedia.

Course Outcomes:

By taking this course, the learner will be able to

- Build the knowledge of multimedia systems and its characteristics.
- Utilize text and audio file formats and compression techniques in multimedia applications.
- Apply digital image and video processing techniques useful in multimedia applications.
- Build the knowledge of animation and Virtual reality concepts.
- List and analyse advances in multimedia.

Unit – I: Introduction to Multimedia **(06)**

What is Multimedia? (Text, Graphics, Audio, Video, Animation), Multimedia presentation and production, Multimedia Authoring Tools (Various tools for creation and editing of Multimedia Projects), Hardware and Software requirement for Multimedia, Multimedia Applications

Unit – II: Text and Audio **(08)**

Text - Introduction, About Fonts and Faces, Using Text in Multimedia, Font Editing and Design Tools, Text Compression (HUFFMAN, LZ, LZW), File Formats (TXT, DOC, RTF, PDF, PS), Hypertext and Hypermedia.
Audio – Introduction, Characteristics of Sound, Elements of Sound System, Digital Audio, Synthesizer, MIDI, Audio File Formats (WAV, VOC, MP3) , Audio Processing Softwares.

Unit – III: Images **(07)**

Digital Image, Basic steps for image processing, Image file formats (BMP, TIFF), Image Compression (RLE, JPEG), Image Manipulation, Image processing softwares.

Unit – IV: Video **(07)**

Types of Video Signals, Analog Video, Digital Video, Video File Formats and CODEC (AVI, MPEG), Video Editing Softwares.

Unit – V: Animation and Virtual Reality **(07)**

Animation- Introduction, Uses, Types, Principles, Animation on Web, 3D animation, Rendering, Animation Softwares
Virtual reality - Introduction, Forms, Applications, Software Requirements, Devices, VRML

Unit VI: Introduction to Advances in Multimedia **(07)**

Introduction, Challenges of Multimedia Information processing, Watermarking, Organization, Storage and retrieval Issues, Neural Networks for multimedia processing, Multimedia Processors

Text Books:

1. Ranjan Parekh, **'Principles of Multimedia'**, *McGraw Hills education,* (2nd edition), (2013)
2. Ralf Steinmetz, Klara Nahrstedt, **'Multimedia: Computing, Communications and Applications'**, *Pearson,* (8th Impression 2011)
3. Nigel Chapman & Jenny Chapman, **'Digital Multimedia',** *Wiley Publications,* (2nd edition) (2004)

Reference Books:

1. Ze-Nian Li, Marks S. Drew, **'Fundamentals of Multimedia'**, *Pearson Education,* (2005)
2. Tay Vaughan , **'Multimedia: Making it work'**, *Tata McGraw-Hill, (*8th edition), (2011)
3. Judith Jeffcoate, **'Multimedia in Practice'**, *Prentice Hall of India*, (2003)

PECE 3202 Data Mining and Data Warehousing (Elective-IV)

Teaching Scheme
Practical : 3 Hrs/week

Examination Scheme
In Semester : 25 Marks
End semester : 50 marks
Credits : 3

Prerequisite : Database Management Systems (CE 3102)

Course Objectives

To facilitate the learners to -
1. Understand the concepts and techniques of data mining and data warehousing
2. Apply various data pre-processing and visualisation techniques
3. Design and model a data warehouse and its components
4. Compare and analyse various Data Mining algorithms based on performance parameters
5. Understand advances in the field of Data Mining

Course Outcomes

By taking this course, students will be able to –
1. Explore the concepts of data warehousing and data mining for modern day BI
2. Apply appropriate pre-processing techniques to make data ready to be used for various data mining algorithms
3. Design a Data warehouse model by using appropriate data modelling schema
4. Evaluate various data mining algorithms based on their outcomes for the given dataset
5. Understand the advances in the field of Data Mining

Unit 1	**Introduction to Data Mining and Data Warehousing** Introduction to data warehousing and data mining, Evolution of decision support systems, operational data Vs. historical data (data warehouse data) Importance of data preparation for data mining, types of data mining techniques, various data mining functionalities Data mining task primitives, Integration of operational systems and data warehousing system	5
Unit 2	**Data Pre-processing** Introduction / overview of data pre-processing, Descriptive data summarization – Measuring central tendency, dispersion, range, quartiles, variance and standard deviation of data, Graphical displays of descriptive data summaries, Data cleaning, Data Integration, Data Transformation, Data Reduction	7

Unit 3	**Data Warehouse and OLAP Technology** 3-tier Data Warehouse architecture, data warehouse design process, Modelling subject(s), dimensions and measures, Multidimensional data modelling using star schema, snowflake schema and fact constellation schema Introduction to OLAP, OLAP operations, Data cube generation, Concept hierarchy generation, Case study on designing a Data warehouse for a given application	6
Unit 4	**Unsupervised Learning** Data mining process, Types of Data Mining Systems, Cluster Analysis - Types of Data in Cluster Analysis, Categorization of Major Clustering Methods, K-means clustering, Density based Clustering	6
Unit 5	**Supervised Learning** Classification and Regression, Decision Tree Induction, Bayesian Classification Nearest neighbour approach, Mining frequent patterns and Association Rules – Apriori Algorithm	7
Unit 6	**Advances in Data Mining** Information Retrieval, Text mining, multimedia data mining, Graph mining, Mining World Wide Web, stream, time series and sequence data mining	5

References

Text Books

1. Han, J., and Kamber, M., “Data Mining: Concepts and Techniques”, 3rd Ed., Morgan Kaufmann, 2006

2. Tan P.N., Steinbach M., Kumar V., “Introduction to Data Mining”, Addison Wesley, 2006

Reference Books

1. W. H. Inmon, "Building the Data Warehouse", 4th edition, Wiley

2. Alex Berson, Stephen J, "Data Warehousing, Data Mining, & OLAP", Tata McGraw- Hill, 2004

3. Dunham M.H., “Data Mining: Introductory and Advanced Topics”, Prentice Hall, 3

4. Miller T. W., “Data and Text Mining - A Business Applications Approach”, Pearson education 2008

5. Maimon O., Rokach L., “Data Mining And Knowledge Discovery Handbook”, Springer 2009

6. Pujari A K, “Data Mining Techniques”, Universities Press, 2010

Web Resources :

1. www.autonlab.org/tutorials : Statistical Data mining Tutorials

2. www-db.standford.edu/ullman/mining/mining.html : Data mining lecture notes

3. ocw.mit.edu/ocwweb/slon-School-of-management/15-062Data-MiningSpring2003/course home/index.htm : MIT Data mining open course ware

4. www.kdnuggets.com : Data mining resources

Web links of similar courses offered at other universities

1. Purdue University : Introduction to Data mining : www.cs.purdue.edu/homes/clifton/cs490d/

2. University of New South Wales : Data warehousing and Data mining www.cse.unsw.edu.au/~cs9318/

3. York University: Data mining www.cs.yorku.ca/course-archieve/2005-06/w/4412/
4. IIT- Madras : Data Mining www.iitm.ernet.in/~cs672/
5. New York University: Data warehousing/mining www.cs.nyu.edu/courses/spring03/G22.3033-015
6. NPTEL Data Warehousing Data Mining Web course - http://nptel.ac.in/syllabus/syllabus_pdf/106106105.pdf

Journals

IEEE Transactions on Knowledge and Data Engineering

PECE 3202 Elective–IV EMBEDDED AND REAL TIME SYSTEMS

Teaching Scheme
Lecture : 3 Hrs/week

Examination Scheme
In semester : 25 marks
End semester : 50 marks
Credits : 3

Prerequisite:
- Microprocessor Architecture (CE 2204)

Forward Linkages :
- Internet of Things (CE 4201)

Course Objectives:
To facilitate the learners :-
1. To understand processors, its components use for embedded product.
2. To implement use of system hardware in various embedded designs.
3. To differentiate between use of embedded communications protocols and its interfacing to memory and processor.
4. To execute smaller codes written for embedded system programming using different languages.
5. To Understanding real time operating systems and compare different scheduling algorithms.

Course Outcome:
By taking this course, the learner will be able to :–
1. Summarize embedded systems with different components and design process.
2. Design an embedded system for a given application using system hardware components.
3. Analyze processor, memory, input/output and communication protocols requirement for a given embedded system.
4. Develop skills for embedded system programming.
5. Summarize the RTOS and exemplary operating system used for various embedded applications.

Unit 1: Introduction to Embedded Systems **(06)**

Components of Embedded System & its Classification, Characteristic of embedded system. Structural Units of Processor, Comparision of Microprocessors & Microcontrollers(8051 block diagram).

Introduction to embedded processor, Digital Signal Processor, Application Specific System Processor, Multiprocessor systems using General Purpose Processor. Complex Instruction Set Computer (CISC) and Reduced Instruction Set Computer(RISC) Processor architectures.

Design Process in Embedded System, Design metrics, Steps in design process. Challenges in Embedded System design, Embedded System Examples.

Unit 2: System Hardware **(08)**

Advanced RISC Machines (ARM7) Processor - Architecture, Register set, Modes of operation, Interrupt Structure and ARM family and their applications**.** Comparison with ARM9. Details of Components of Embedded Systems-Management of Power Supply, Clocking Unit, Real Time Clock and Timers, Reset Circuitry and Watchdog Timer.

Memory Map Of Embedded System, Interfacing Processors with design examples.

Unit 3: Memory and I/O interfacing and Communication Buses **(07)**

Processor and Memory Selection, I/O devices, sensors - temperature, IR, ADC / DAC, Optical Devices such as LED / LCD Display devices, Opto-Isolator, Relay & stepper motor, Timers/Counters.

Parallel v/s serial communication. Parallel ports their uses in device interfacing.

Different serial communication Protocols- RS232C, RS 485, CAN, & USB – Protocol Architecture, topology, different Packets, Communication Cycle, Arbitration, few Applications.

Unit 4 : Programming concepts, Embedded System Programming **(07)**

Programming in Assembly labuage using ARM processor, Use of High level Language – C and Python for Embedded System Applications, Selection of data strcutures, Micro, function, statement, loops etc, Embedded system programming using Developent boards, Development tools – Simulator / emulator / debugger.

Unit 5: Real time Operating System **(07)**

Operating Systems Concepts, Real-Time Systems, Real-Time Tasks, Types of Real-Time Tasks, Real-Time Operating Systems, Scheduling Algorithms – Pre-emptive, non preemptive, Real time

Unit 6: Exemplary Operating Systems and Representative Embedded System **(07)**

Examples of Real Time OS, embedded System OS and Handheld OS. Representative Embedded Systems – Digital Thermometer, smart card Design Examples and case study of - Automatic Vending machine / Automatic Cruise control System their Block diagram, class diagrams.

Text Books:

1. Rajkamal, **'Embedded System Architecture Programming Design'** *Tata Graw Hill Publication (Second Edition)*, (2008).
2. Dr. K. V. K. K. Prasad **'Embedded / real time System : Concepts, Design, & Programming – Black Book'** *Dreamtech Press Publication, (2003).*
3. Lyla B. Das, **'Embedded Systems: An Integrated Approach'**, *Pearson Education*, (2012).

References:

1. Dr. K. V. K. K. Prasad, Gupta Dass, Verma, **'Programming for Embedded system'** *Wiley – Dreamtech India Pvt. Ltd.*
2. ARM 7 Manual.
3. CAN Specification Version 2.0 Protocol Standard.
4. USB Specification Version 2.0 Protocol Standard.
5. I2C Specification Protocol Standard.

PECE 3202 LINUX INTERNALS

Teaching Scheme
Lectures: 3 Hrs/week

Examination Scheme
In Semester: 25 marks
End Semester: 50 marks
Credits: 3

Prerequisites: Operating Systems (CE 2203)

Course Objectives:
To facilitate learners -

1. To understand basic concepts of Unix Operating System
2. To understand Linux kernel and environment.
3. To understand process and memory management in Linux
4. To learn basics of Inter process communication w.r.t. Unix/Linux.

Course Outcomes:
The learner will be able to -

1. Recall basic knowledge about Unix operating system.
2. Understand Unix and Linux environment.
3. Understand basics in process, thread management.
4. Explain concepts inter-process communication.

Unit I: Foundation of Unix operating system (07)
Introduction, Kernel architecture, types of kernel,Operating system: Booting process, Grub I, Grub II,Representation of files, systems call File system,Concept of Buffer management in Unix/Linux.

Unit II: Process and threads in Linux (08)
Process states and transitions, layout of system memory,Context of a process, saving the context of a process ,Concept of threads, Linux processes and thread management, introduction to threads (advantages and implementation),Process management and Linux scheduler.

UNIT III: Swapping and Demand paging (07)
Swapping, Demand Paging, A hybrid system with swapping and demand paging, Linux memory management.

UNIT IV: Inter-process Communication in Linux (07)
Process tracing, system V IPC, Network communication, sockets, Multiprocessor systems : problem with multiprocessor systems, solution with master slave processes, Linux Inter process communication: User level IPC mechanism, Kernel synchronization, socket programming

UNIT V: MAKE and AWK (07)
Search and Sort tools: grep, egrep, fgrep, MAKE tool: When to use MAKE, Macros, abstractions and shortcuts, make, nmake, cmake. Awk tool: AWK syntax, AWK grammar, awk scripting

Unit VI: Variants in Linux (06)
Hand-held systems: requirements, Linux as hand-held operating system, Linux for distributed systems,

technology overview, Case study: Google Android

Text books:

1. Maurice J. Bach , '**The Design of the Unix Operating System**' , Third Edition,2013, Pearson , ISBN 978-81-203-0516-8.
2. Pramod Chandra P. Bhatt, '**An introduction to Operating Systems: Concepts and Practice(GNU/Linux)**' , PHI, (Fourth edition), (2014), ISBN-978-81-203-4836-3.

Reference books:

1. Evi Nemeth, Garth Snyder, Tren Hein, Ben Whaley, '**Unix and Linux System Administration Handbook**' , Pearson , (Fourth Edition), (2014), ISBN: 978-81-317-6177-2011.
2. William Stallings, '**Operating System-Internals and Design Principles' ,** Prentice Hall India, ISBN-81-297-0 1 094-3.
3. David Rusling, '**The Linux Kernel**' , Addison Wesley, (Second edition), ISBN 978-0201770605.
4. Sumitabha Das, '**UNIX Concepts and Applications**', ISBN 0-07-053475-6.

PECE 3202 Elective III Image Processing

Teaching Scheme
Lecture : 3 Hrs/week

Examination Scheme
In semester : 50 marks
End semester : 50 marks
Credits : 3

Prerequisite:
"-"

Forward course linkages:
Pattern Recognition And Machine Learning (PECE 4101)
Bio medical Image Processing (OE 4101)

Course Objectives:

To facilitate the learner to-

1. Understand basic concepts of digital image processing.
2. Learn and apply image enhancement and Image Segmentation techniques.
3. Understand object Recognition, Image Restoration and reconstructions.
4. Learn and apply image compression techniques and Understand image processing applications.

Course Outcome:

By taking this course, the learner will be able to -

1. Apply basic steps of digital image processing on given images
2. Select the image enhancement techniques
3. Make use of Image Restoration, reconstructions techniques. Choose Image Segmentation techniques for given images.
4. Identify the image compression techniques.

Unit 1: Introduction to Image Processing (07)

Introduction to digital image processing: Origin, usage and application of image processing, Fundamental steps and component of image processing system,representation of digital images. Elements of matrix theory,Arithmetic Operations,introduction to Human Visual System,Image sensing and acquisition,Basic concepts in sampling and quantization

Unit 2: Image Enhancement Techniques (08)

Basic image preprocessing (contrast enhancement, simple noise reduction, color balancing), some basic gray level transformations,Histogram Processing,Spatial filtering, Smoothing and Sharpening Spatial filters

Unit 3: Image Compression (07)

Introduction to Image Compression and its need, Coding Redundancy,Classification of Compression Techniques (Lossy and Losless - JPEG,RLE, Huffman, Shannon fano), Scalar & Vector Quantization.

Unit 4: Image Restoration & Reconstruction. (06)

Model of Image degradation, Noise Models,Classification of image restoration techniques,Inverse filtering, Wiener filtering,Blind-deconvolution techniques

Unit 5:

Image Segmentation, Analysis and Object Recognition. (08)

Introduction to feature extraction: Edges, Lines & corners detection,Texture & shape measures.
Segmentation & thresholding, region extraction, edge (Canny) and region based approach, use of motion in segmentation.
Introduction to Object Recognition, Object Representation(Signatures, Boundary Skeleton), Simple Boundary Descriptors, Regional descriptors (Texture).

Unit 6: Advances in Image processing Applications (06)

Medical Image Processing, Face detection, Iris Recognition, Remote Sensing, Synthetic-aperture radar (SAR) Image Processing

Text Books:

1. R.C. Gonzalez, R.R. Woods, '**Digital Image Processing'**, ISBN 978-81-317-2695-2,*Person (*Third Edition) ,(2011)(62 copies)
2. Sridhar S. '**Digital Image Processing',** *Oxford University Press, (Second Edition),(2016)*
3. S.Jayaraman, S. Esakkirajan,T. Veerakumar , **'Digital Image processing',**ISBN 978-0-07-014479-8, *Mcgraw Hills Publication (Tenth reprint),(2013)*

References:

1. Sonka, Hlavac, Boyle, '**Digital Image Processing and Computer Vision',** ISBN 978-81-315-0555-7,*Cenage Learning* (Sixth Indian Reprint) ,(2011)
2. B. Chanda, D.Datta Mujumdar '**Digital Image Processing And Analysis',** *PHI*, ISBN 978- 81-203- 4325-2, (Second Edition),(2013)
3. Anil Jain, '**Fundamentals of Digital Image Processing'**, *PHI*, ISBN-81-203-0929-4 (Indian Reprint) ,(1995)
4. Basudeb Bhatta **' Remote Sensing and GIS'** *Oxford University Press*, ISBN 978-0-19-807239-3 (Second Edition)(2014)

Web Reference

1 https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=6504845

PECE 3203 Data Mining and Data Warehousing Laboratory

Teaching Scheme
Practical: 2 Hrs / week

Examination Scheme
Oral: 25 marks
Credit: 1

Course Objectives:
To facilitate the learners to -

1. Model and build a data mart / data warehouse.
2. Study and analyze various open source data sets to pre-process them using open source data mining tools.
3. Implement data mining algorithms to discover interesting patterns.
4. Analyze results of data mining algorithms

Course Outcome:
By taking this course, the learner will be able to –

1. Model a data warehouse, using appropriate schema for the given application
2. Apply various pre-processing techniques on the given dataset
3. Analyze various data mining algorithms on real time data
4. Practice advanced Data Mining functionalities such as Text Mining and Mining unstructured data.

Example List of Assignments

Assignments Group A (Mandatory)

1. Explore WEKA Data Mining / Machine Learning Toolkit and perform the following operations : Understand the features of WEKA toolkit, Study the arff file format, explore the available data sets in WEKA.
2. Load any one dataset in Weka and observe the following : List the attribute names and their types, Number of records in each dataset, class attribute (if any), Plot Histogram, Determine the number of records for each class, Visualize the data in various dimensions; Apply various pre-processing tasks; Apply classification OR clustering algorithms on the chosen dataset and observe the results
3. Implement K-means clustering algorithm using a programming language that you are familiar with such as Java / Python. Compare the performance of your algorithm on the dataset, used in Weka, on different parameters such as accuracy, scalability, efficiency etc. by changing input parameter value such as K.

Assignments Group B (Any 2)

1. Implement DBSCAN clustering algorithm. Compare the performance of your algorithm on the dataset, used in Weka, on different parameters such as accuracy, scalability, efficiency etc.
2. Implement a decision tree classification algorithm. Compare the performance of your algorithm on the dataset, used in Weka, on different parameters such as accuracy, scalability, efficiency etc.
3. Implement Apriori, a Frequent Pattern Analysis algorithm. Assume suitable data. Compare the performance of your algorithm on the dataset, used in Weka, ondifferent parameters such as accuracy, scalability, efficiency etc.
4. Implement Information Retrieval using TF / IDF algorithm. Assume suitable data.

Assignments Group C (Any 1)

1. Build a Data Warehouse / Data Mart (using open source tools like Pentaho or other data warehouse tools like Microsoft - SSIS etc.) Identify source tables and populate sample data Analyze which multidimensional model (Star, snowflake and Fact constellation) will be best suited for the given application and design the schema (Example Applications can be Banking, Insurance, Finance, Health care, Manufacturing, Automobile, etc.)
2. Study any of the existing data warehouse / data repository / ... and prepare your report based on data / model / tools and techniques / software used etc.
3. Download, install and study the features of any open source data mining compare its features with Weka.

PECE 3203 Embedded Systems and Real time Operating Systems Laboratory

Practical : 02 Hours/Week

Examination Scheme:
Oral : 25 Marks
Credit : 1

Course Objectives:
By taking this course the student will learn to-

1. Understand various embedded development boards.
2. Implement different components of embedded systems on development boards.
3. Implement using assembly level language or high level language.
4. Develop mini applications based on embedded systems knowledge with proper design process.

Course Outcomes:
On completion of the course, student will be able to–

1. To apply the knowledge of embedded system to real time applications.
2. To apply the knowledge of various components to interface with embedded develoment boards.
3. To apply the knowledge of embedded programming for solving the given problem.
4. To apply the knowledge of design process to implement smaller applications.

List of Laboratory Assignments

SrNo	Assignment
1	Study of Operating System based Evaluation/development Board (16 or 32 bit Microcontroller based) – Hardware & IDE Software.
2	Write a Program to read input from the switches and display on LED using Microcontroller development board.
3	Write a Program in C language to read key press from keypad and display the key ID on LED or LCD.
4	Write a program in C to control the relay operation as per switch position and to indicate its status on LEDs.
5	Write program in C language for Data Acquisition System to Acquire data from ADC Channel , Convert it into Digital Format & transmit to PC.
6	Write a Program in C language to perform serial communication, Which Generates Packets of 32 Bits, where First bit of packet indicates whether the packet is control packet or data packet.
7	Write a Program in C language to communicate with PC serially.
8	Implement process control application/s using the peripherals such as LED/LCD, Keyboard, ADC, Relays, Switches etc.
9	Write a Shell Script that display the no. of readable, writable & executable files in specified Directory.
10	Write a C Program that takes string input from keyboard & Displays the Length of string - use Multi Threading for message Que or Shared Memory.
11	Write a program that demonstrates the communication between two Processes.
12	1. Study of ***Compiling the Embedded Linux kernel*** 2. selecting the kernel source 3. configuring the kernel 4. compiling or building the kernel modules 5. installing the kernel modules 6.

	7. ***Building the File System*** 8. basic structure of the root file system 9. kernel modules 10. kernel images 11. device files 12. BusyBox 13. Selecting a file system 14. RAMdisk 15. 16. ***Building the Toolchain*** 17. binutils 18. gcc glibc

PECE 3203 Linux Internal Laboratory

Teaching Scheme
Practical: 2Hrs/week

Examination Scheme
Oral – 25 Mark
Credits: 1

Course Objectives:

To facilitate learners -

1. To understand basic commands of Unix Operating System
2. To understand and write shell script for a given problem statement.
3. To apply socket programming concepts
4. To learn basics of awk programming.
5. To apply Inter process communication concepts for solving a problem

Course Outcomes:

The learner will be able to -

1. recall basic knowledge about Unix operating system.
2. understand and write shell script for a given problem statement.
3. understand and apply socket programming concepts .
4. apply awk scripting basics to write programs.

Group A (Mandatory)

1. Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
2. Write a shell script to find factorial of a given integer.
3. Implement in Java (modular programming) the following UNIX commands using System calls
   A. cat
   B.ls
   C.mv
4. Write an IPC program using pipe. Process A accepts a character string and Process B inverses the string. Pipe is used to establish communication between A and B processes using Python or Java
5. grep,Make, nmake commands

Group B (Any 4)

1. Write an awk script to count the number of lines in a file that do not contain vowels.

2.Write client and server programs (using Java) for interaction between
server and client processes using Unix Domain sockets.
3.Write a python program for creating virtual file system on Linux environment.
4. Write a program in Java/Python to create a RAMDRIVE and associate an acyclic directory structure to it.
5.Write a Java program to create a Zombie process.
6.Write a Java/Python program that illustrates two processes communicating using shared memory

Group C (Any one)

1. Make tool (dependency file structure)

Image Processing Laboratory (PECE 3203)

Teaching Scheme
Practical: 2Hrs/week

Examination Scheme
Oral – 25 Marks
Credits: 1

Prerequisite:
Digital Signal Processing And Applications (PECE 3201)

Course Objectives:
To facilitate the learners to
1. Learn Basics Image Processing operations like image Read, Write,add,subtract
2. Understand and apply algorithms used for image enhancement, edge detection
3.Able to develop Image Processing application using various techniques.
4.Learn and use different Image Processing Tools

Course Outcome:
By taking this course, the learner will be able to –
1. Apply basic operations on given image
2. Apply algorithms used for image enhancement, edge detection
3. Develop small image processing application using various techniques.
4. Use Image Processing Tools

List of assignments

Group A: (Mandatory)
1.Write a program to create a simple image file in .tiff format, and display it .
2.Write a program to perform Intensity Transformation technique on given image
3. Write a program for image enhancement techniques

Group B: (Any Three)
1)Write a program using derivative filtering technique for edge detection
2) Write a program to illustrate Morphological transformation using Dilation
3)Write a program to illustrate Morphological transformation using Erosion
4) Write a program to illustrate Image Restoration techniques

Group C: (Any One)
Implement any of the following small application/ or any Image processing application using MATLAB/ OpenCV

1. Medical Image Processing
2. Face detection
3. Iris Recognition
4. Finger Print detection

Autonomous Programme Structure of
Final Year B. Tech. (Computer Engineering)
Academic Year : 2019-2020

Final Year B. Tech. (Computer Engineering) Semester – I										
Course Code	Course Title	Teaching Scheme Hours /Week			Examination Scheme				Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
CE 4101	Internet of Things	3	0	0	50	50	0	0	100	3
CE 4102	Software Engineering	3	0	0	50	50	0	0	100	3
HS 4101	Organizational Behavior	3	0	0	50	50	0	0	100	3
OE 4101	Open Elective I	3	0	0	50	50	0	0	100	3
CE 4103	Internet of Things Laboratory	0	0	2	0	0	50	0	50	1
CE 4104	Project Phase-I	0	2	14	100	0	50	0	150	9
	Total	**12**	**2**	**16**	**300**	**200**	**100**	**0**	**600**	**22**
	Grand Total	**30**			**600**				**600**	**22**

OE 4101: Open Elective I

1. Soft Computing
2. Computer Graphics
3. Introduction to Cyber Crime and Forensics

DEAN ACADEMICS
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

Principal
MKSSS's Cummins College of Engg. For Women, Karvenagar, Pune-52

APPROVED BY
Governing Body Members
MKSSS's Cummins College of Engineering for Women Karvenagar, Pune-411052

CE 4101 INTERNET OF THINGS

Teaching Scheme
Lectures : 3 Hrs/week

Examination Scheme
In semester: 50 marks
End semester: 50 marks
Credits: 3

Prerequisite: Elective–III Embedded and Real time systems (PECE 3202)

Course Objectives:
To facilitate the learners to -

1. To understand the fundamental concepts, basic design and components in Internet of things(IoT).
2. Understand and design smaller systems for various devices.
3. To understand the various protocols used in IoT.
4. Learn and implement smaller scenarios using programming language.
5. To understand fundamentals of security in IoT and web and cloud based services for IoT.

Course Outcomes:
By taking this course, the learner will be able to –

1. Apply the concepts of Internet of Things with different components and design process.
2. Apply the various things and design a system.
3. Analyze through Knowledge gain and skills to select application layer protocols for seamless integration of various components of an IoT ecosystem.
4. Implement smaller codes with python programming.
5. Apply the fundamentals of security used in IoT with the different services provided in web and cloud.

Unit 1: Introduction to Internet of Things **(07)**

IoT: Definition and characteristics of IoT, Vision of IoT, IoT Ecosystem, IoT Reference Model, Physical Design Model, Logical Design: Functional Block, Communication models, Communication API's, IoT enabling Technologies, IoT Levels and Deployment Templates, Applications of IoT, IoT & M2M.

Unit 2: Embedded Devices and Programming for IoT **(07)**

Transducers, Sensors and Actuators for IoT, Introduction to Arduino, Beagle Bone Black, Raspberry Pi, Python Programming for IoT devices.

Unit 3: IoT Protocols **(07)**

Protocol Classification , Protocols for different Layers: Link layer, network layer, Transport layer and Application Layer : Message Queue Telemetry Transport (MQTT), Extensible Messaging and Presence Protocol (XMPP), Data Distribution Services (DDS), Advanced Message Queuing Protocol (AMQP), Constrained Application Protocol (COAP), Representational State Transfer (REST), Comparison of Protocols.

Unit 4 : IoT Platform Design methodology and Case studies for IoT Design (07)

Introduction to IoT platform Design methodology, Steps involved in IoT system Design methodology, Case studies: Home automation, Smart cities, Agriculture.

Unit 5: Web of things and Cloud of Things (07)

Four pillars of IoT paradigms, Two Pillars of Web, Cloud of things architecture, Four Deployment Models : Private, Public, Community and Hybrid, Cloud computing paradigm: data collection, Storage and Computing, IoT cloud-based Services using Xivel, Nimbits and other platforms, Applications and features of Cloud IoT.

Unit 6: IoT Privacy, Security and Vulnerabilities Solutions (07)

Introduction to security, Vulnerabilities, Security requirements and Threat Analysis, Use and Miuses Cases, IoT Security Tomography and Layered Attacker Model, Identity Management and Establishment, Access control and Secure Message communication, Security Models, Profiles and Protocols for IoT.

Text Books:

1. Arshdeep Bagha, Vijay Madisetti, **'Internet of Things – A Hands-on-approach'**, Universities Press (2014).
2. Srinivasa K.G., Siddesh G.M., Hanumantha Raju R., **'Internet of Things'**,Cengage Publication.
3. Rajkamal, **'Internet Of Things: Architecture and Design Principles'** McGraw *Hill Education (India) Private Limited*.

References:

1. *Ovidiu Vermesan, Peter Friess, '**Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems**'*, River Publishers.
2. *Honbo Zhou, '**The Internet of Things in the Cloud**', CRC Press(2013).*
3. *Peter Waher, '**Learning Internet of Things**', Packt Publishing (2015).*
4. *https://onlinecourses.nptel.ac.in/*

CE 4102 Software Engineering

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In Semester: 50 marks
End Semester: 50 marks
Credits: 3

Prerequisites: Software Design and Architecture (CE 3203)

Course Objectives:

To facilitate the learner to -

1. Develop familiarity with the software design and component based software engineering.
2. Get exposure to the various facets of agile software process model.
3. Learn the basic concepts of refactoring.
4. Gain knowledge about the various aspects of designing and testing of web applications.

Course Outcomes:

By taking this course, the learner will be able to -

1. Apply the concepts of component-level design to realize the solution of a system.
2. Analyze the agile software process model for application development.
3. Analyze the refactoring methods to restructure the classes.
4. Make use of various concepts of designing and testing for web applications.

Unit 1: Software Design Concepts and Component-Level Design (07)

Design within the context of Software Engineering, The design process, Design concepts, Design model. Component-Level Design: What is a component, Designing class-based components, Steps of component-level design, Component-based development.

Unit 2: Introduction to Agile Software Development (07)

Why agile software development - Limitations of traditional process models, Evaluating Agile Benefits, Understanding the Agile Manifesto, Outlining the Four Values of the agile Manifesto, Defining the 12 Agile Principles, Agile approaches - Lean, Scrum and Extreme Programming, Agile team.

Unit 3: Agile Project Planning and Software Practices (07)

Agile project inception, User stories, Estimation, Agile plan.
Agile software practices: Refactoring, Test-driven development, Continuous integration.

Unit 4: Introduction to Refactoring (07)

What is Refactoring, Why and when to refactor, Duplicated code, Long method, Extract method, Large class, Extract class, Alternative classes with different interfaces, Move method, Move field, Rename method, Replace method with method object.

Unit 5: Refactoring Methods (07)

Replace data value with object, Change unidirectional association to bidirectional, Switch statements, Replace conditional with polymorphism.

Remove control flag, Introduce assertion, Replace constructor with factory method, Replace error code with exception.
Pull up field, Pull up method, Push down method, Push down field, Extract subclass, Extract superclass, Extract interface, Replace inheritance with delegation.

Unit 6: Design and Testing of Web Applications (07)

WebApp design quality, Design goals, Design pyramid, WebApp interface design, Asthetic design, Content design, Architecture design, Navigation design, Component-level design, Object-oriented hypermedia design method.
Testing concepts for WebApps, Testing process - overview, Content testing, User interface testing, Component-level testing, Navigation testing, Configuration testing, Security testing, Performance testing.

Text books:

1. Roger S. Pressman, '**Software Engineering: A Practitioners Approach**', *Tata McGraw Hill*, (7th Edition) (2010).
2. Jonathan Rasmusson, **'The Agile Samurai: How Agile Masters Deliver Great Software',** *Shroff Publishers and Distributers (SPD)*, ISBN: 978-93-5213-411-3, (2016).
3. Martin Fowler, Kent Beck, John Brant, William Opdyke and Don Roberts, **'Refactoring: Improving The Design of Existing Code'**, *Pearson Education*, ISBN: 978-81-317-3466-7, (2017).
4. Mark C. Layton, Steven J. Ostermiller, **'Agile Project Management for Dummies',** *Wiley*, (2nd Edition), (2017).

Reference books:

1. Ian Sommerville, '**Software Engineering**', *Person Education*, (8th Edition) (2008).
2. Grady Booch, James Rumbaugh, Ivar Jacobson, **'The Unified Modeling Language User Guide'**, *Pearson Education*, (2nd Edition) (2008).

Web References:

1. Official website of R. S. Pressman and Associates, Inc: http://www.rspa.com/
2. Agile Software process model: https://www.agilealliance.org/
3. Basics of Scrum: https://www.scrumalliance.org/

HS 4101 Organizational Behavior

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
In Semester: 50 marks
End Semester: 50 marks
Credits : 3

Course Objectives:
To facilitate the learner to -

1. Develop familiarity with the concepts related to organizational behavior.
2. Gain knowledge about personality traits and individual behavior.
3. Study group dynamics.
4. Get exposure to the recent trends in Organizational behavior.

Course Outcomes:
By taking this course, the learner will be able to–

1. Explain concepts of organizational behavior, its importance and culture.
2. Outline meaning of personality and how individual behavior impacts organization.
3. Relate with ideas of group dynamics and influence of groups in work place.
4. Recall latest trends in Organizational behavior.

Unit 1: Introduction **(07)**
Management and Organizational Behavior (OB), Organizational behavior in historical perspective, Developing an OB model, Challenges and Opportunities for OB, Foundation of individual behavior.

Unit 2: Individual **(08)**
Personality, personality frameworks, big five model, perception, individual decision making, attitudes, components of attitudes, attitudes and behavior, Job attitudes, values

Unit 3 : Diversity and Ethics **(06)**
Environmental context : diversity and ethics, Communication, Case studies

Unit 4: Trends **(07)**
International organizational behavior, emotional intelligence, strategic organizational behavior, Intra-preneurship, flat organization

Unit 5: Group Dynamics **(08)**
Foundation of group behavior, stages of group development, group decision making, team building, organizational conflicts and negotiation, power and politics

Unit 6: Dynamic Environment and Culture **(06)**
Information technology and globalization, Human resource policies and practices, Learning

Text books:

1. Stephen P. Robbins, Timothi A.Judge, **'Organisational Behavior'**, 18th Global Edition, Pearson Education, ISBN: 978-0-13-410398-3
2. Dr. S. S. Khanka, **'Organisational Behaviour (Text and Cases)'** , S. Chand & Company Pvt.Ltd. (2018), ISBN 978-81-219-2014-8
3. Fred Luthans, **'Organizational Behavior'**, 12th Edition, McGraw Hill Publication, ISBN-978-1-25-909743-0

Reference Books:

1. Moorhead, Griffin, **'Introduction to Organizational Behavior'**, India Edition, Cengage Learning, ISBN: 978-81-315-1242-5.
2. P. Subba Rao, **'Organisational Behaviour (Text , Cases and Games)'**, Himalaya Publishing House, ISBN 978-93-5024-673-3.
3. K. Aswathappa, **'Organisational Behavior : Text, Cases & Games'**, 10th Revised Edition,Himalaya Publishing House, ISBN 978-93-5051-588-4.

Web resources:

https://nptel.ac.in/downloads/110105034/#

CE 4103 Internet of Things Laboratory

Teaching Scheme
Laboratory : 2 Hrs/week

Examination Scheme
Oral: 50 Marks
Credits: 1

Course Objectives:
To facilitate the learners to -

1. Understand various development boards used for Internet of Things(IoT).
2. Learn and Understand the fundamentals of sensor based applications.
3. Implement and solve the problems using high level language.
4. Develop mini applications on IoT boards with proper design.

Course Outcomes:
By taking this course, the learner will be able to :–

1. Build Internet of Things on various development boards.
2. Design the minimum system for sensor based application.
3. Solve the problems related to the primitive needs using IoT.
4. Develop IoT application for distributed environment.

Example List of Laboratory Assignments:

Assignments Group A (Mandatory)

1. Study of Raspberry-Pi, Beagle board, Arduino and other micro controller (History & Elevation)
2. Study of different operating systems for Raspberry-Pi /Beagle board. Understanding the process of OS installation on Raspberry-Pi /Beagle board.
3. Write an application to read the environment temperature. If temperature crosses a threshold value, the application indicated user using LEDSs
4. Understanding the connectivity of Raspberry-Pi /Beagle board circuit with IR sensor. Write an application to detect obstacle and notify user using LEDs.
5. Understanding and connectivity of Raspberry-Pi /Beagle board with camera. Write an application to capture and store the image.

Assignments Group B (Any 2)

1. Understanding and connectivity of Raspberry-Pi /Beagle board with a Zigbee module. Write a network application for communication between two devices using Zigbee.
2. Assignments on Beagle Bone Black :
   a. Write an application using Beagle board to control the operation of stepper motor.
   b. Write an application using Beagle board to control the operation of a hardware simulated traffic signal.
   c. Write an application using Beagle board to control the operation of a hardware simulated lift elevator.
3. Assignments on Cloud of Things:
   a. Write a server application to be deployed on Raspberry-Pi /Beagle board. Write client applications to get services from the server application.

b. Create a small dashboard application to be deployed on cloud. Different publisher devices can publish their information and interested application can subscribe.

c. Create a simple web interface for Raspberry-Pi/Beagle board to control the connected LEDs remotely through the interface.

Assignments Group C (Any 1)

Sample Mini Project Statements :

1. Develop a Real time application like smart home with following requirements: When user enters into house the required appliances like fan, light should be switched ON. Appliances should also get controlled remotely by a suitable web interface. The objective of this application is student should construct complete Smart application in group.
2. Develop a Real time application like a smart home with following requirements: If anyone comes at door the camera module automatically captures his image send it to the email account of user or send notification to the user. Door will open only after user's approval.

References:

1. *Rajkamal, **'Internet Of Things: Architecture and Design Principles'** McGraw Hill Education (India) Private Limited.*
2. *Ovidiu Vermesan, Peter Friess, '**Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems'**,* River Publishers.
3. *Honbo Zhou, **'The Internet of Things in the Cloud'**, CRC Press(2013).*
4. *Peter Waher, **'Learning Internet of Things'**, Packt Publishing (2015).*
5. *https://onlinecourses.nptel.ac.in/*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CE 4104 Project Phase-I

Teaching Scheme
Tutorial : 2 Hrs /week
Practical: 14 Hrs/Week

Examination Scheme
In Semester: 100 marks
Oral Exam : 50 marks

Credits: 9

Summary of the subject:

Final Year Projects represent the culmination of study towards the Bachelor of Engineering degree. Projects offer the opportunity to apply and extend material learned throughout the program. It also provides an opportunity to learn new technologies and frameworks .It gives an enriching experience of working with industry and / or work with real life problems.

Projects are undertaken in small groups. It emphasises on team work and gives the students chance to present and polish their interpersonal and intrapersonal skills.

The projects undertaken, span a diverse range of topics. Projects can be sponsored by a sponsoring company, faculty defined, research oriented or self defined and vary from year to year. Projects can be undertaken in various domains like Artificial Intelligence, Data Warehousing, Data mining, Machine learning, App development, Network security, Networking, Cloud computing, Embedded Systems, Systems programming and many more. Approval of the problem statement by the Course Coordinator is required.

The course necessarily introduces the dimension of workload management. By applying suitable software development processes and project management concepts, students have to conduct this relatively unstructured "assignment" over the course of the semester.

The projects are assessed using a continuous evaluation process. Students can do seminar presentation, submission of a report, oral and technical presentation to present their work.

This course is to be conducted in the first semester.

Course Objectives:

To facilitate the learners to-

1) Explore state of art, research approaches, algorithms, products in the domain.
2) Formulate a significant and challenging problem statement of relevance.
3) Provide a suitable and acceptable design solution to meet requirements considering relevent Social, ethical and legal issues.
4) Have systematic approach as a team following best practices and engineering processes.
5) Choose and learn relevant tools, APIs, languages, frameworks, technologies for Implementation of the project

6) Choose and apply appropriate SDLC approach like waterfall model, agile, RAD, Incremental model, Spiral, Prototyping etc.

7) Develop their personal skills

Course Outcomes:

By taking this course the learner will be able to -

1) Work in a team to develop the knowledge, skills, ethics and attitudes of a professional engineer.
2) Select appropriate tools, API, technologies to build a tested, working prototype, system.
3) Deliver solutions to real life problems that are acceptable.
4) Construct quality documents for entire Software Development Life Cycle.
5) Justify effectively the work done, learning achieved, learning experience, and usefulness of product or service.

Evaluation Criteria:

The project work of the team will be assessed by the Project Guide. The guide will review the work done throughout the duration of the course. The guide can give assignments. The Final semester oral examination will be conducted by examiners where the project group has to present their work using presentations.

Assessment should be done on the basis of the following points:

- The quality of oral, written presentations.
- Fitness of project to problem statement.
- Innovations, well thought contributions in giving a solution, meeting requirements, use of technology and algorithms.
- The process including the project software engineering, teamwork and documentation.
- Understanding which tools, APIs and technologies can be applied and how.

OE 4101 Soft Computing

Teaching Scheme
Lectures : 3 Hrs/Week

Examination Scheme
In Semester : 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:
To facilitate the learners to -

1. To understand basics in soft computing
2. To understand concepts of fuzzy logic and fuzzy sets
3. To understand supervised and unsupervised neural network architecture, training and testing algorithms
4. To understand concept evolutionary programming, genetic algorithm and swarm intelligent systems

Course Outcomes:
By taking this course, the learner will be able to -

1. Identify various soft computing and artificial neural network constunets to solve the problems in engineering domain
2. Experiment with fuzzy logic principles
3. Apply learning algorithms in artificial neural networks
4. Make use of principles of genetic algorithm and swarm intelligece in solving engineering problems

Unit 1: Introduction to Intelligent systems, soft tools and Artificial Neural network (07)

Soft computing constituents and conventional Artificial Intelligence, Artificial Neural network: definition, advantages of artificial neural network, Fuzzy Set Theory, Genetic algorithm, hybrid systems: neuro fuzzy, neuro genetic, fuzzy genetic, soft computing, Introduction to Artificial Neural Network: Fundamental concepts, basic models of artificial neural network, important terminologies of ANNs, McCulloch- Pitts Neuron, linear separability.

Unit 2: Fuzzy logic and fuzzy sets (07)

Introduction to fuzzy logic, fuzzy sets, fuzzy set operations, properties of fuzzy sets, classical relation, fuzzy relation, membership function, fuzzification, Methods of membership value assignments, lambda-cuts for fuzzy set, lambda-cuts for fuzzy relations, defuzzyfication.

Unit 3: Supervised Learning Networks (07)

Introduction, Perceptron Networks: Perceptron learning rule, Architecture, perceptron training algorithm for single output classes, perceptron training algorithm for multiple output classes, perceptron network testing algorithm, Back Propagation Network: flowchart for training process, training algorithm, linear factors of back- propagation networks, number of training data, number of hidden layer nodes, testing algorithm of back- propagation networks

Unit 4: Associative Memory Networks and Unsupervised Learning Networks (07)

Associative Memory Networks: Introduction, Training algorithm for pattern association: Hebb rule, Autoassociative Memory networks, Bidirectional associative memory: architecture, discrete bidirectional associative memory, Unsupervised Learning Networks: Introduction, Fixed wright competitive nets: max net, Kohonan Self organizing feature maps, counterpropogation networks, full counter propogation net.

Unit 5: Genetic Algorithm (07)

Introduction, biological background, genetic algorithms and search space, genetic algorithm vs. traditional algorithms, basic terminologies in in genetic algorithm, simple GA, operations

in genetic algorithm: encoding- binary, octal, selection- Roulette wheel selection, random selection, crossover- single point cross over, two point crossover, mutation- flipping, interchanging, stopping condition for genetic algorithm flow, constraints in genetic algorithm

Unit 6: Swarm Intelligent Systems (07)

Introduction, background of Ant Intelligent systems, Importance of the Ant Colony Paradigm, Ant colony systems, Development of Ant colony systems, Applications of Ant Colony Intelligence, the working of ant colony systems, practical swarm intelligent systems: The basic of PSO method, Characteristic features

Text Books:

1. S.N. Sivanandam- **"Principles of Soft Computing",** Second Edition, Wiley India- ISBN- 9788126527410, 2008
2. J. S. R. Jang, CT Sun and E.Mizutani, **"Neuro-Fuzzy and Soft Computing" ,** PHI PVT LTD, ISBN 0-13-261066-3. 2015
3. N.P.Padhy, **"Artificial Intelligence and Intelligent Systems"** Oxford University Press, ISBN 10: 0195671546, 2005

References:

1. De Jong, **"Evolutionary Computation: A Unified Approach",** Cambridge (Massachusetts): MIT Press. ISBN: 0-262-04194-4. 2006
2. S. Rajsekaran and G.A. Vijayalakshmi Pai, **"Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications"** , Prentice Hall of India, ISBN: 0451211243, 2003
3. Sinha N.K., **" Soft Computing And Intelligent Systems: Theory And Applications"**, ISBN-13: 978-0126464900, Elsevier. 2007.

OE 4102 Open Elective I

COMPUTER GRAPHICS

Teaching Scheme:
Lectures: 3 Hrs/Week

Examination Scheme:
In-Semester: 50 Marks
End-Semester: 50 Marks
Credits: 3

Course Objectives:

Facilitate the learners –

1. To understand basic concepts of computer graphics.
2. To understand and apply various Computer Graphics Algorithms of scan conversion, polygon filling, clipping, projection.
3. To learn 2-D and 3-D transformations.
4. To learn Computer Graphics techniques of shading, hidden surfaces and curves .
5. To get exposure on animation concept and tool to develop an animation

Course Outcomes:

By taking this course, the learner will be able to –

1. Develop logic to perform basic graphic operations and scan conversions.
2. Compare polygon filling and clipping algorithms.
3. Apply mathematics and logic for 2-D and 3-D transformations and projections.
4. Develop the competency to understand the concepts related to curves,fractals and shading
5. Apply basic concepts of animation to design an animation program.

Unit – I: Basics of Computer graphics and Scan conversions **(08)**

Introduction to computer graphics and applications, Basics of Graphics systems, lines, line segments, vectors, pixels and frame buffers, Aspect ratio, Resolution , Raster scan & random scan display

DDA and Bresenham's line drawing algorithms, Bresenham's circle drawing algorithm, Line styles- thick line drawing, dotted lines drawing

Display file structure, algorithms and display file interpreter. Primitive operations of display files

Unit – II: Polygons and Clipping algorithms **(06)**

Introduction to polygon, types of polygon , Inside-outside tests, polygon filling algorithms-flood fill, seed fill, scan line fill

Introduction to window and view-port, viewing transformations, 2-D line clipping: Cohen – Sutherland line clipping algorithm, Polygon clipping: Sutherland Hodgeman algorithm, generalized clipping

Unit – III: 2D and 3D Transformations **(08)**

2D Transformation: Introduction, Translation, Scaling, Rotation, Reflection and shear, homogeneous coordinate system ,representation of transformation matrices in homogeneous form,
3D Transformation: Introduction to 3-D geometry, translation, scaling, rotation
Projections: parallel and perspective projections and its types

Unit –IV: Hidden surfaces algorithms and shading **(08)**

Hidden Surfaces: Introduction, Back face detection and removal, Algorithms: Depth buffer (z), Depth sorts (Painter),Area subdivision (Warnock), BSP tree, and Scan line
Illumination Models: Light Sources, Ambient Light, Diffuse reflection, Specular Reflection, and the Phong model Shading Algorithms: Halftone, Gauraud and Phong Shading.

Unit – V : Curves, surfaces and fractals **(06)**

Curves and Surfaces: Cubic splines, Bezier, B-splines Fractals:Introduction,Classification, Applications, Fractal generation

Unit – VI: Segment and Animation **(06)**

Introduction to segment , Segment table, operations on segment, display file used for segment, Introduction to animation, Animation languages, design of animation sequences, Methods of controlling animation, basic rules of animation, case study -Animation tool

Text books:

1. S. Harrington, **'Computer Graphics',** *McGraw-Hill Publications (*2nd Edition*)* , (1987), ISBN 0 – 07 –100472 – 6
2. D. Rogers, **'Procedural Elements for Computer Graphics'**, *Tata McGraw-Hill Publication* (2nd Edition) ,(2001), ISBN 0 – 07 – 047371 – 4.
3. D. Hearn, M. Baker, **'Computer Graphics – C Version'** ,*Pearson Education* (2nd Edition), (2002), ISBN 81 – 7808 – 794 – 4.

Reference books:

1. J. Foley, V. Dam, S. Feiner, J. Hughes, **'Computer Graphics Principles and Practice'**, *Pearson Education*(4nd Edition), (2008), ISBN 978-81 – 317 – 0505 – 6.
2.D. Rogers, J. Adams, **'Mathematical Elements for Computer Graphics',** *Tata McGraw-Hill Publication*(2nd Edition) , (2002), ISBN 0 – 07 – 048677 – 8.
3. Donald Hearn and M Pauline Baker, Warren Carithers,**'Computer Graphics with OpenGL',** *Pearson Education* (4th Edition) ,ISBN 978-93-325-1871-1
4.F.S. Hill Jr, Stephen M.Kelley,'Computer Graphics Using OpenGL' , *PHI*(3rd Edition), (2009),ISBN 978-81 – 317 – 2414 – 9.

Online/Web/Other References:

1. NPTEL series – https://onlinecourses.nptel.ac.in/noc21_cs97
Prof. Samit Bhattacharya, IIT Guwahati


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OE 4101 Introduction to Cyber Crime and Forensics

Teaching Scheme:
Lecture: 3 Hrs./week

Examination Scheme:
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

To facilitate the learners to-

1 Learn fundamental concepts of cyber security
2. Understand Security challenges presented by mobile devices and information system access in cybercrime world
3 Learn tools used in Computer forensics and Cyber Applications
4. Understand risks associated with social media networking

Course Outcome:
By taking this course the learner will be able to-

1.Classify Cyber Crimes
2. Identify threats and risks within context of Cyber Security
3. Outline various laws and acts in Cyber security
4. Appraise various tools used in Cyber Security/ Digital forensics

UNIT- I: Introduction to Cybercrime: Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, Ethical dimensions of cybercrime,Ethics and Morality,Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes (7)

UNIT – II:Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector- Infrastructure / Cloud Computing. (7)

UNIT – III: Cybercrime: 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, Organizational Measures for Handling Mobile,Organizational Security Policies an Measures in Mobile Computing Era, Laptops. (8)

UNIT IV:Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers,Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow. (7)

UNIT V: Cyber Security: Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations. (7)

Unit VI : Digital Forensics- Introduction to Digital Forensics, Forensics Software and Hardware, Evaluating computer forensic tools , Software tools and Hardware Tools, New Trends, Sample Case studies. (6)

TEXT BOOK:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA. ISBN 978-81-265-2179-1
2. Computer Forensics and Investigations Bill Nelson, Amelia Phillips and Christopher Stuart Cenage learning. ISBN 978-81-315-1946-2

REFERENCE BOOK:

1. Intoduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group
2. Eoghan Casey,"Digital evidence and computer crime Forensic Science,Computers and the Internet , ELSVIER,2011 ISBN 978-0-12-374268-1

Final Year B. Tech. (Computer Engineering) Semester – II										
Course Code	Course Title	Teaching Scheme Hours /Week			Examination Scheme				Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Oral	Practical		
CE 4201	Network and Information Security	3	0	0	50	50	0	0	100	3
PECE 4201	Programme Elective-I	3	0	0	50	50	0	0	100	3
OE 4201	Open Elective-II	3	0	0	50	50	0	0	100	3
CE 4202	Network and Information Security Laboratory	0	0	2	0	0	50	0	50	1
CE 4203	Project Phase-II	0	2	16	100	0	50	0	150	10
CE 4204	Project based Online Course**	2	0	0	50	0	0	0	50	2
	Total	**11**	**2**	**18**	**300**	**150**	**100**	**0**	**550**	**22**
	Grand Total	**31**			**550**				**550**	**22**

**The student shall register and complete the project based online course preferably in semester- I but may complete the same till the end of semester-II.

PECE 4201: Programme Elective-I

1 Parallel Computing
2 Compiler Construction
3 Java Full Stack Technologies
4 Deep learning

OE 4201: Open Elective II

1. Introduction to Natural Language Processing
2. e-Business
3. Big Data and Analytics

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Principal
MKSSS's Cummins College of Engg.
For Women, Karvenagar, Pune-52

APPROVED BY
Governing Body Members
MKSSS's Cummins College of Engineering for Women
Karvenagar, Pune-411052

CE 4201 NETWORK AND INFORMATION SECURITY

Teaching Scheme
Lecture: 3 Hrs. /week

Examination Scheme
In semester: 50 Marks
End semester: 50 Marks
Credits: 3

Prerequisite(s): Computer Networks (CE 3101)

Forward Course Linkage(s): -

Course Objectives:

To facilitate the learners-

1. To understand the fundamental concepts of security.
2. To know the basics of cryptography
3. To understand role of protocols at various layers.
4. To apply the various security concepts.

Course Outcomes:

By taking this course, the learner will be able to–

1. Make use of principles of crypto system.
2. Identify various techniques to provide data security and integrity over the network.
3. Choose appropriate security mechanisms for various security issues.
4. Develop an understanding of Network perimeter security and application specific security mechanisms.

Unit 1: Introduction to Network Security (06)

Introduction to Network Security, Architectures , Introduction to common attacks,Overview of SQL injection, Cross Site Scripting, Buffer overflow security services, A model for Network and Inter network Security, OSI security Architecture (services and Mechanism),Introduction to cryptography- Classical Cryptography.

Unit 2: Introduction to Cryptography (07)

Introduction to secrete key cryptography, Block cipher Basics, Introduction to DES, DES analysis, DES variants, Other example algorithms like AES and IDEA, Block cipher modes of operation

Unit 3: Public Key and Management (08)

Introduction to Public Key cryptography, The RSA algorithm, Analysis of RSA, Key management Basics, Diffie- Hellman Key exchange, Key distribution of Private and Public Keys.

Unit 4: Message Integrity and Authentication (08)

Message Digest, One way hash functions, MD5, SHA, Message authentication, Introduction and overview of Digital Signatures: Implementation, Algorithms standards(DSS),Digital Certificates and X.509, Certificate structure, Certificate revocation.

Unit 5: Firewalls and Security Protocols (07)

Introduction to Network Layer Security- Overview of Firewall, Design principles of

Firewalls ,Various types of firewalls and their working principles,Concept of VPN, Tunneling protocols, Detail working of IPSEC. Introduction to transport Layer security – detail working of SSL protocol.

Unit6:Application Security **(06)**

Overview of Application security, E-mail security (PGP), SET, Overview of Wireless security.

Text Books:

1. William Stalling **'Cryptography and Network Security, principles and practices'**, *6th edition. Pearson*

Reference Books:

1. Bernard Menezes, **'Network Security and Cryptography'**, *Cengage Learning*.
2. *Bruce Schneier:* **'Applied Cryptography'**, *Second Edition, John Wiley & Sons, New York,2001.*
3. Atul Kahate, **'Cryptography and Network Security'**, *3rd edition McGraw HillPublication.*
4. Charlie Kaufman, Radia Perlman and Mike Speciner, **'Network security, private communication in a public world'** .

CE 4202 Network and Information Security Laboratory

Teaching Scheme
Laboratory : 2 Hrs/week

Examination Scheme
Oral – 50 Marks
Marks – 50
Credit : 1

Course Objectives:

To Facilitate the Lerners to:-

1.Understand Basic Cryptography Algorithms
2.Learn various techniques for secure data transmission
3. Recognize the need of Network Perimeter Security
4.Learn various techniques used for common attacks

Course Outcome :

By taking this course the learner will be able to :-

1. Implement Standard Cryptography Agorithms
2. Apply the digital signature for secure data transmission
3. Apply packet filtering concept
4. Demonstrate some common attacks

Sample /Suggested List of Assignments :

1. Implement DES algorithm

2. Implement RSA algorithms

3. Implement Message Digest Algorithm and demonstarte the collision resistance property

4. Implementation of Diffie Hellman Key exchange

5. Creation and Verification of Digital Signatures

6. Simulation of packet Filtering (ACL) concepts using CISCO packet Tracer

7. Create a small application to demonstrate SQL injection and Cross Site scripting attacks

8. Develop a website to demonstrate how the contents of the web site can be changed by attackers if it is http based and not secured

9. Case Study - Enterprise network Security/ Wireless Security / Security Information and Event Management using IBM QRadar


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CE 4203 Project Phase-II

Teaching Scheme
Tutorial: 2 Hrs /week
Practical:16Hrs/Week

Examination Scheme
In Semester: 100 marks
Oral Exam : 50 marks
Credits: 10

Summary of the subject:

This course is an extension to Project Phase-I to be completed in the semester I.

The course focuses on workload management, implementation, usage of tools, testing and delivering deliverables as per the plan presented and finalized in the semester I. Students have to apply project management concepts.

The projects are assessed using the continuous evaluation process by presentation, submission of a report, oral and technical presentation.

This course is to be conducted in the second semester.

Course Objectives:

To facilitate the learners to-

1) Provide a suitable and acceptable design solution to meet requirements.
2) Have systematic approach as a team following best practices and engineering processes.
3) Develop their personal skills.
4) Test rigorously the system developed.
5) Consolidate their work in a furnished report.

Course Outcomes:

By taking this course the learner will be able to -

1) Work in a team to develop the knowledge, skills, ethics and attitudes of a professional engineer.
2) Build a reasonably complex, useful and tested project which could be a product or service using appropriate tools, technologies.
3) Construct quality documents for entire Software Development Life Cycle.
4) Justify effectively the work done, learning achieved, learning experience, and usefulness of product or service.

Evaluation Criteria:

The project work of the team will be assessed by the Project Guide. The guide will review the work done throughout the duration of the course. The Final semester oral examination will be conducted by examiners where the project group has to present their work using presentations.

Assessment should be done on the basis of the following points:

- The quality of oral, written presentations.
- Fitness of project to problem statement.
- Innovations, well thought contributions in giving a solution, meeting requirements, use of technology and algorithms.
- The process including the project software engineering, teamwork and documentation.
- Extent to which tools and technologies have been applied.

CE 4204 Project based online course

Teaching Scheme
Lecture: 2 Hrs /week

Examination Scheme
In Semester: 50 marks
Credits: 02

Summary:

This course will be undertaken by the students as a part of their preparation for conducting their final year B Tech project. All group members belonging to the final year B Tech project group should do the course. The project guide will play the crucial role in deciding the online course to be undertaken by the project group members. The student shall register and complete the project based online course preferably in semester- I but may complete the same till the end of semester-II.

Course Objectives
To facilitate the learners to-

1) Provide solutions to complex problems
2) Develop their technical skills and knowledge.

Course Outcomes:
By taking this course the learner will be able to –

1) Apply the engineering/ technical knowledge to solve complex problems.
2) Identify deficiencies or gaps in knowledge and develop the knowledge and skills of Professional engineer by learning appropriate tools and technologies.

PECE 4201 – Parallel Computing

Teaching Scheme
Lecture: 3 Hrs/week

Examination Scheme
In semester: 50 marks
End semester: 50 marks
Credits: 3

Course Objectives:

The major objectives of the course are to facilitate the learner to:

1. Understand the various aspects of the parallel processing.
2. Familiarize with the fundamental concepts, techniques and tools of parallel computing.
3. Identify advanced computer architectures, parallel algorithms, parallel languages, and performance-oriented computing.
4. Evaluate the performance measures of different parallel communication operations.
5. Identify mapping of applications to high-performance computing systems.
6. Understand the advanced trends and techniques in High Performance Computing.

Course Outcomes:

By taking this course, students will be able to:

1. Distinguish between sequential and parallel architecture.
2. Apply different decomposition and communication techniques to approach parallel solution of the given application.
3. Apply parallel Programming constructs for Shared Address Space Platform.
4. Solve various examples of Advanced Parallel Algorithms.
5. Summarize the advanced techniques in Parallel Computing.

Unit 1-Introduction to parallelism **(07)**

Need of Parallel Architectures, Supercomputers, Parallel Application, Communication Architecture, Shared Address Space, Message Passing, Data Parallel Processing, Parallel Architectures, Trends in Microprocessor Architecture, Superscalar Processing, Very Large Instruction Word Processing, Dichotomy of Parallel Platforms.

Unit 2-Principles of Parallel Algorithm Design **(08)**

Concept of Decomposition, Tasks, Dependency Graphs, Granularity, Concurrency and Task Interaction, Decomposition Techniques, Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Interconnection Networks for Parallel Computers.

Unit 3-Basic Communication Operations and Programming Using the Message Passing Paradigm (08)

Basic communication operations, Communication Costs in Parallel Machines, One-to-All Broadcast and All-to-One Reduction operations, All-to-All Broadcast and Reduction, , Scatter and Gather. Principles of Message Passing Programming, MPI routines.

Unit 4-Programming Shared Address Space Platforms (08)

Thread Basics, The POSIX Thread API, The OpenMP Programming Model, Specifying Concurrent Tasks in OpenMP, Synchronization Constructs in OpenMP, OpenMP Library Functions, Evolution of Multicore solution, CUDA Hardware, Managing GPU memory, CUDA Kernel Function.

Unit 5-Advanced Parallel Algorithms (07)

Dense matrix algorithms- Matrix Vector Multiplication, Matrix Matrix Multiplication, Sorting -Issues in Sorting on Parallel Computers, Bubble Sort and its Variants, Quicksort, Parallel Depth-First Search, Parallel Best-First Search

Unit 6-Recent Trends in Parallel Processing (07)

Basics of Cluster and Grid Computing, Petascale Computing, High Performance Computing in Data Analytics, Quantum Computing. Parallelization tools.

Text books:

1. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, '**Introduction to Parallel Computing**', *Addison-Wesley (India)(Second edition)(2003)*, ISBN: 0-201-64865-2.

2. David Culler Jaswinder Pal Singh, '**Parallel Computer Architecture: A hardware/Software Approach**', *Morgan Kaufmann Publishers (India)(1999)*, ISBN 978-1-55860-343-1.

Reference Books:

1. Kai Hwang, '**Scalable Parallel Computing**', *McGraw Hill (1998)*, ISBN:0070317984.

2. Shane Cook, '**CUDA Programming: A Developer's Guide to Parallel Computing with GPUs**', *Morgan Kaufmann Publishers Inc.(2013)* ISBN: 9780124159884.

3. Jason sanders, Edward Kandrot, '**CUDA by Example**', *Addison-Wesley*, ISBN-13: 978-0-13-138768-3.

PECE 4201 COMPILER CONSTRUCTION

Teaching Scheme
Lectures: 3 Hrs/week
Credits: 3

Examination Scheme
In-sem : 50 Marks
End-sem : 50 marks

Course Objectives:

To facilitate the learners -

1. To perform white box probing of compilers.
2. To discuss the effectiveness of optimization.
3. To learn and use tools for automatic compiler generation.

Course Outcomes:

By taking this course, the learner will be able to -

1. Apply an algorithm for lexical analysis and token generation for simple programming language;
2. Construct a parser for a small context-free grammar.
3. Create symbol table and intermediate code for a simple programming language.
4. Apply the code optimization and code generation algorithms to get the machine code for the optimized code.

Unit 1: Introduction to System Programming (06)

Components of System Software, Language Processing Activities, Fundamentals of Language Processing, Structure of an assembler, Design of Two pass assembler, Single Pass Assembler, Linkers and Loader, Dynamic Link Libraries

Unit 2: Introduction to Compilation and Lexical Analysis (08)

What is a Compiler, what is the Challenge, Compiler Architecture, Front end and Back end model of compiler, Cross compiler, Incremental compiler, Boot strapping. Concept of Lexical Analysis, Regular Expressions, Deterministic finite automata (DFA), Non- Deterministic finite automata (NFA), Converting regular expressions to DFA, Converting NFA to DFA, Hand coding of Lexical analyzer, Introduction to LEX Tool and LEX file specification

Unit 3: Syntax Analysis (08)

Context Free Grammars (CFG), Concept of parsing, Parsing Techniques, Top-Down Parsers: Introduction, Predictive Parsing - Removal of left recursion, Removal of left factoring, Recursive Descent Parsing, Predictive LL(k) Parsing Using Tables, Bottom Up parsing: Introduction, Shift-Reduce Parsing Using the ACTION/GOTO Tables, Table Construction, SLR(1), LR(1), and LALR(1) Grammars, Practical Considerations for LALR(1) Grammars, Introduction to YACC Tool & YACC file specification

Unit 4: Semantic Analysis **(06)**

Need of semantic analysis, Abstract Parse trees for Expressions, variables, statements, functions and class declarations, Syntax directed definitions, Syntax directed translation schemes for declaration processing, type analysis, scope analysis , Symbol Tables (ST),Organization of ST for block structure and non-block structured languages, Symbol Table management, Type Checkers: type checking for expressions, declarations (variable, type, function, recursive), statements

Unit 5: Intermediate Code Generation **(06)**

Intermediate languages, Design issues, Intermediate representations: three address, postfix & abstract syntax trees, Intermediate code generation for declaration, assignment, iterative statements, case statements, arrays, structures, conditional statements and Boolean expressions. Model of a program in execution, Stack and static allocation, Activation records

Unit 6: Code Generation and Code Optimization **(08)**

Issues in the design of code generation, Target machine description, Basic blocks & flow graphs, Expression Trees, Unified algorithms for instruction selection and code generation., Sethi Ullman algorithm for expression trees , Aho Johnson algorithm, Different models of machines , order of evaluation, register allocation. Introduction to optimization, Principal sources of optimization, Machine Independent Optimization, Machine dependent Optimization, Various Optimizations: Function preserving transformation, Common Sub-expressions, Copy propagation, Dead-code elimination, Loop Optimizations, Code Motion, Induction variables and reduction in strength, Peephole Optimization, Redundant –instruction elimination

Text Books:

1. Aho, Sethi, Ulman, Lam, **“Compilers: Principles, Techniques and Tools”**, *Pearson, 2nd Edition, ISBN 978-93-325-1866-7*
2. Dhamdhere D., "**Systems Programming and Operating Systems**", *2nd Edition, ' McGraw Hill, 1999, ISBN 0 - 07 - 463579 – 4.*

Reference Books:

1. Andrew Appel, **“Modern Compiler Implementation in C”**, *Cambridge*
2. Kenneth C. Louden, **“Compiler Construction: Principles and Practice”**, *Cengage Learning, ISBN-13:978-0534939724*
3. J. R. Levine, T. Mason, D. Brown, "**Lex & Yacc**", *O'Reilly, 2000, ISBN 81-7366 –061-X*

PECE 4201 Java Full Stack Technologies

Teaching Scheme
Lectures: 3 Hrs/week

Examination Scheme
In Semester: 50 marks
End Semester: 50 marks
Credits : 3

Prerequisites: Data Structures and Algorithms II (CE 2201)

Course Objectives:
To facilitate the learner to -

1. Get exposure to full stack development in Java technologies.
2. Develop familiarity with the client side Java technologies.
3. Gain comprehensive knowledge about Java server side technologies for enterprise application development in practice.
4. Get familiar with the web services based approach for real-life application development.
5. Get acquainted with the database development technologies in Java.

Course Outcomes:
By taking this course, the learner will be able to -

1. Choose suitable client side Java technologies.
2. Analyze Java server side technologies for enterprise application development.
3. Analyze the characteristics of web services paradigm.
4. Analyze the role of Java database development technologies to realize their suitability for application development.

Unit 1: Client Side Web Technologies (07)

n-tier architecture, HTML, JavaScript (JS), Document Object Model (DOM), Introduction to JQuery, Asynchronous JavaScript And XML (AJAX).

Unit 2: Server Side Java Web Technologies (07)

Introduction to server side technology, Java Servlets, Java Server Pages (JSP), JSP tags.

Unit 3: AngularJS (06)

Overview, Model View Controller (MVC) architecture, directives, controllers, modules, forms.

Unit 4: Java 2 Enterprise Edition (J2EE) Technologies (08)

Introduction to J2EE technologies, Enterprise Java Beans (EJB), Java Messaging Service (JMS), Remote Method Invocation (RMI).

Unit 5: Java Web Services **(07)**

Web Services: Overview, Java Web services based on SOAP and REST,
Case studies: Facebook API.

Unit 6: Java Database Programming and Hibernate **(07)**

Java Database Connectivity (JDBC), JPA (Java Persistence API).
Hibernate: Overview of Hibernate, architecture, Hibernate Object/Relational Mapping.

Text books:

1. Kogent Learning Solutions Inc., **'Web Technologies: HTML, JS, PHP, Java, JSP, ASP.NET, XML, AJAX, Black Book'**, *DreamTech Press*, ISBN: 978-81-7722-997-4, 2015.
2. Kogent Learning Solutions Inc., **'Java Sever Programming Java EE6 Black Book'**, *DreamTech Press*, ISBN: 978-81-7722-936-3, 2013.
3. William Crawford, Jim Farley, **'Java Enterprise in a Nutshell'**, *O'Reilly*, ISBN-13: 978-0596101428, 3rd Edition, 2005.

References books:

1. Shyam Seshadri and Brad Green, **'AngularJS Up and Running'**, *O'Reilly*, ISBN: 978-93-5110-801-6, 2014.
2. Kevin Mukhar, Chris Zelenak, James L. Weaver and Jim Crume, **'Beginning Java EE5: From Novice to Professional'**, *Apress*, ISBN-13: 978-8181284020, 2006.
3. Jim Keogh, **'The Complete Reference J2EE'**, *McGraw Hill Education*, ISBN: 978-0-07-052912-0, 2012.

Web References:

1. https://learn.jquery.com
2. https://docs.angularjs.org/guide/concepts

PECE 4201: Deep Learning

Teaching Scheme
Lectures : 3 Hrs/Week

Examination Scheme
In Semester : 50 Marks
End Semester: 50 Marks
Credits: 3

Prerequisites :
Artificial Intelligence and Machine Learning (CE3202)

Course Objectives:
To facilitate the learners to -

1. Understand building blocks of Deep Neural Networks.
2. Understand various optimization algorithms used for training Deep Neural Networks.
3. Understand the working of Convolution Neural Network (CNN), Recurrent Neural Network (RNN), GRUs, Long Short Term Memory (LSTMs).
4. Have knowledge of Deep Architectures for solving various applications.

Course Outcomes:
By taking this course, the learner will be able to -

1. Apply the fundamental mathematical concepts to Deep Learning.
2. Interpret the basics Neural Networks for understanding of deep learning.
3. Apply the concepts of neural networks to design Convolution Neural Network and Recurrent Neural Network.
4. Apply available Deep Learning solutions to real time applications.

Unit 1: Machine learning Recap (06)

Linear Algebra, Prababilities and Information theory, Basics of Machine Learning: Model Selection and Train/Validation/Test Sets, Bias Variance trade off, Overfitting, Regularization, Confusion matrix, Precision, Recall, F-score, ROC, K-fold cross validation

Unit 2: Introduction to Deep Learning (06)

Limitations of Machine Learning, History of Deep Learning, How does Deep Learning works? Advantages of Deep Learning, Applications of Deep Learning, Perceptrons, Sigmoid neurons

Unit 3: Basics of Neural Networks (08)

Feed-forward neural network, Multi-Layer Dense Architecture, Activation Functions, Loss Function, Dropout, Stochastic Optimization: mini-batch gradient descent, Back Propagation, Gradients, hyper-parameters, over-fitting, regularization

Unit 4: Convolution Neural Network (CNN) (07)

Architecture: convolution Pooling Layers, Padding, Use of CNNs for classification, use for data compression, semantic segmentation, Image denoising, object detection

Unit 5: Recurrent Neural Network (RNN) (08)

Architecture, Gates, Use for time series data (anomaly detections), Use for text (sentiment) classification problem, generate new text, Introduction to GRUs, LSTMs

Unit 6: Advanced Deep Learning (07)

Deep Learning applications in Computer Vision / NLP / Text Mining / Big Data / IoT using ImageNet, AlexNet, VGG Net, ResNet etc. Introduction to Generative Adversarial Networks, Deep Reinforcement Learning.

Text Books:

1. Ian Goodfellow and Yoshua Bengio and Aaron Courville, **"Deep Learning",** MIT Press Ltd. ISBN:9780262035613, 0262035618

2. Josh Patterson and Adam Gibson, **"Deep Learning – A Practitioner's approach"**, O'Reilly Publication, 1st edition August 2017 ISBN : 9789352136049

References:

1. Nikhil Baduma, Nicholas Locascio, **"Fundamentals of Deep Learning: Designing Next Generation intelligence Alogrithms"**, O'Reilly Publication, ISBN 10: 9352135601 , ISBN 13: 978- 9352135608

OE 4102 - Introduction to Natural Language Processing

Teaching Scheme
Lecture: 3 Hrs/week

Examination Scheme
In semester: 50 marks
End semester: 50 marks
Credits: 3

Course Objectives:
To facilitate the learner to:

1. Understand various aspects of Natural Language Processing.
2. Learn Phonological, Morphological, Syntactic and Semantic processing.
3. Understand issues related to ambiguity of Natural Language.
4. Understand the advanced applications of Natural Language Processing.

Course Outcomes:
By taking this course, the learner will be able to:

1. Explain importance of Natural Language Processing.
2. Identify the fundamental concepts and techniques of Natural Language Processing.
3. Analyze ambiguous structure of Natural Language.
4. Summarize the advanced applications of Natural Language Processing.

Unit 1-Introduction to Natural Language Understanding (06)
The Study of Language, Applications of Natural Language Understanding, Evaluating language Understanding Systems, Different levels of Language Analysis.

Unit 2-Fundamentals of Phonetics (07)
Speech Sounds and Phonetic Transcription, Articulatory Phonetics, The Vocal Organs, Place of Articulation of Consonants, Manner of Articulation of Consonants, Vowels, Syllables, Phonological Categories and Pronunciation Variation, Phonetic Features, Predicting Phonetic Variation, Factors Influencing Phonetic Variation.

Unit 3-Fundamentals of Morphology (08)
Concept of Morphology, Survey of English Morphology, Inflectional Morphology, Derivational Morphology, Cliticization, Non-Concatenative Morphology, Agreement, Finite-State Morphological Parsing, Construction of Finite-State Lexicon, Finite-State Transducers(FST), Sequential Transducers and Determinism, Finite-State Transducers for Morphological Parsing, Transducers and Orthographic Rules, Word and Sentence Tokenization.

Unit 4-Fundamentals of Syntax (06)

The elements of Noun Phrases, Verb Phrases, Adjective Phrases, Adverbial Phrases and Simple Sentences, Grammars and Sentence Structure, Construction of a Good Grammar, A Top-Down Parser, A Bottom-Up Chart Parser, Top-Down Chart Parsing, Part-of-Speech Tagging.

Unit 5-Fundamentals of semantics and Discourse (08)

Word Senses, Relations Between Senses, WordNet, Word Sense Disambiguation, The Need for Discourse Structure, Segmentation and Cue Phrases, Discourse Structure and Reference, Relating Discourse Structure and Inference, Discourse Structure, Tense, and Aspect, Managing the Attentional Stack, Concept of Pragmatics

Unit 6-Applications of Natural Language Processing (07)

Machine Translation, Sentiment Analysis, Question Answering Systems, Cross Lingual Information Retrieval, Natural Language Interface to Database, Extractive and Abstractive Summarization Systems, Indian Language WordNets.

Text books:

1. Jurafsky, David, James H. Martin, '**Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition**', *Pearson Education Limited, Dorling Kindersley(India) Pvt. Ltd. (Indian Subcontinent Version)*(2014), ISBN: 987-93-325-1814-4.
2. James Allen, '**Natural Language Understanding**', *Pearson Education Limited, Dorling Kindersley(India) Pvt. Ltd. (Indian Subcontinent Version)(2007)*, ISBN: 987-81-317.

Reference Books:

1. Manning, Christopher D., Hinrich Schütze, '**Foundations of Statistical Natural Language Processing**', *Cambridge Publication(1999)*, ISBN: 0262133601.
2. Steven Bird, ewan Klein, and Edward Loper, '**Natural Language Processing with Python**', *O'Reilly Media*, 2009.

OE 4201 : e-Business

Teaching Scheme
Lectures : 3 Hrs / week

Examination Scheme
In Semester : 50 Marks
End semester : 50 marks
Credits : 3

Prerequisites : No Prerequisites

Course Objectives :

To facilitate the learners to -

1. Understand the technological, economic and social phenomena behind rapid changes in the e-businesses
2. Have a good working knowledge of e-business concepts, applications and technologies
3. Understand the e-business models and infrastructure
4. learn how e-business concepts are applied to different fields, such as: education, banking, tourism and so on
5. Inspire with online business ideas and motivate them to apply in the real life.
6. Study the new trends in e-business, e-commerce

Course Outcome :

By the end of this course, students should be able to -

1. Explain the concepts of e-business and e-business models
2. Apply suitable principles and practices of designing and developing e-business website
3. Apply necessary back end system components required for successful e-business implementations
4. Outline the meaning of e-business security and how it impacts the business
5. Relate e-business, BI and KM to fulfil modern e-business trends

Unit I: Introduction **(07)**

E-commerce and e-business, advantages of e-business in growth of a business, Transition from traditional business to e-business, features of e-business technology, e-business models, IT Infrastructure requirements of e-business **Case Study :** Various e-business models

Unit II : Building e-business Websites **(7)**

Issues involved in designing a website, designing in-house websites, steps involved in website development, e-business and website development solutions, Advantages of using an e-business solution, selection of a suitable e-business solution, security issues involved in websites, tracking and analysing website traffic data. Digital Marketing **Case Study**

Unit III : e-Business Infrastruture / Back end Systems **(7)**

Back end system support requirements - security, scalability, availability, adaptability, manageability, maintainability, assurance, interoperability, load balancing; internet technology, World Wide Web, Internet software; Content management, **Case Study**

Unit IV : e-security & online payment systems **(7)**

e-Business security policy, risks and risk assessment, practice guidelines to e-security, legal framework and enforcement, ethical, social and political issues in e-business

Performance characteristics of online payment systems, online payment methods, security and risk handling in online payments, fraud detection in online payments, IT Act 2000, digital signatures, digital certificates, and PKI; **Case Study**

Unit V : Knowledge management & BI for strategic e-business **(8)**

From information processing to knowledge world, aligning knowledge with business, knowledge management platforms, state of knowledge and measuring parameters; knowledge industry, knowledge strategy, and knowledge workers

Business and Intelligence - applications and importance of business intelligence, implementation of intelligence, building BI systems, selecting BI tools, integrating BI and KM, decision-making and BI, **Case Study**

Unit VI : Launching an e-Business and e-business trends **(6)**

Launching a successful e-business – requirement analysis, managing Web site development, search engine optimization, Evaluate Web sites on design criteria.

Future and next generation of enterprise e-business, challenges and new trends, ethical and regulatory issues

References

Text Books	
1	Papazoglou, Michael and Pieter Ribbers, "E-Business : Organizational and Technical Foundations", John Wiley, 2nd Edition (Sept 2011)
2	Parag Kulkarni, Sunita Jahirabadkar, Pradeep Chande, "E-Business", Oxford University Press (May 2012)
Reference Books	
1	Daniel Amor, "The E-business (R)evolution", Prentice Hall PTR (2000)
2	Kenneth Laudon, Carol Guercio, "E-commerce : Business, Technology, Society", Prentice Hall, 4th Edition (January 2008)
3	Kalakota Ravi, Marcia Robinson, "E-Business 2.0 – Roadmap for Success", Pearson Education, 2nd Edition (2004)

OE 4201D: Big Data and Analytics

Teaching Scheme
Lectures : 3 Hrs / week

Examination Scheme
In Semester : 50 Marks
End semester : 50 marks
Credits : 3

Course Objectives :

To facilitate the learners to -

1. Understand the concepts, challenges and techniques of Big data and Big data analytics
2. Introduce the concepts of Hadoop, Map Reduce framework and R for Big data analytics
3. Teach students in applying skills and tools to manage and analyze the big data

Course Outcome :

By the end of this course, students should be able to -

1. Relate big data concepts with various application
2. Choose Hadoop ecosystem components based on requirement of application
3. Apply Data Analytics life cycle for business decisions and strategy definition
4. Use various R constructs to solve different queries
5. Compare various Data Analytic Methods and trends

Unit I: Introduction (08)

Database Management Systems, Structured Data, SQL. Unstructured data, NOSQL, Advantages of NOSQL,Comparative study of SQL and NOSQL. Big data overview, characteristics of Big Data, Applications of Big data.

Unit II : Big Data Architectures, Hadoop (06)

Introduction to Big Data and Hadoop, Building blocks of hadoop: Ecosystem, HDFS, HBASE

Unit III: Map Reduce (07)

Map Reduce Working, the Mapper and Reducer,InputFormats and OutputFormats, YARN, HIVE, Sqoop, Introduction to Spark

Unit IV: Data Analytic Life Cycle (07)

Data Analytical Architecture, drivers of Big Data, Emerging Big Data Ecosystem and new approach. Data Analytic Life Cycle: Discovery, Data preparation, Model Planning, Model Building, Communicate Results, Opearationalize. Case Study: GINA

Unit V : Analytics using R **(08)**

R Fundamental : Math, Variables, Strings, Vectors, Factors, Vector operations; Data structures in R : Arrays & Matrices, Lists, Data frames; Conditions and loops, Objects and Classes; Working with file in R ; Basic statistical methods using R

Unit VI : Data Analytic Methods and trends **(06)**

Statistical Methods, Machine learning methods – supervised, unsupervised; recommendation systems, Big data Visualization

Text Books:

1. Data Science and Big Data Analytics, Wiley, 1st Edition (January 2015)
2. "Big Data, Black Book : Covers Hadoop 2, MapReduce, Hive, YARN, Pig , R and Data Visualization" ,Dreamtech Press (27 May 2015),ISBN-13-978-9351197577

Reference Books

1. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game",MC Press(November 2012)

2. J.Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big Data for Dummies", 1st Edition (April 2013)

3. Tom White, "Hadoop: The Definitive Guide", O'Reilly, 3rd edition (June 2012)

4. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database System concepts",McGraw Hill Education, 6th Edition (December 2013).

5. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packt Publishing (November 2013)

6. Shiva Achari ,"Hadoop Essentials - Tackling the Challenges of Big Data with Hadoop" ,Packt Publishing(April 2015), ISBN:978-1-78439-668-8