SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING: TIRUPATI
DEPARTMENT OF COMPUTER SCIENCE ENGINEERING
4 year Curriculum structure 2018-19
B.Tech :Computer Science and Engineering
Total credits (4 year course): 160 Credits

SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING: TIRUPATI
INDUCTION PROGRAM

A 3-week mandatory induction program is designed for the students entering the institution to make them feel comfortable in the new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around, society at large, and nature.

The activities under the program include physical activity, creative arts, human values, literacy, Proficiency, lectures by eminent people, visits to local area, familiarization to departments etc.

The activities during the program are planned in three phases Viz: Initial, Regular and Closing phases. The initial and closing phases are of two days each.

Initial phase (2 days)

Day	Activity
Day-1 9.00 A.M. to 11.30 A.M	Academic Registration and Hostel Accommodation
11.30 A.M. to 12.30 A.M	Lunch
2.00 P.M. to 3.30 P.M	Orientation
3.00 P.M. to 5.00 P.M	Interaction with Parents
Day-2 9.00 A.M. to 11.30 A.M.	Visit to respective departments
11.30 A.M. to 12.30 P.M.	Lunch
2.00 P.M. to 4.00 P.M	Allotment of and interaction with mentors

Regular Phase (15 days)
Daily Schedule

Day	Activity
Day-3 onwards	
6.30 A.M. to 7.30 A.M.	Physical activity (yoga, meditation, etc.,)
9.00 A.M. to 11.30 A.M.	Creative Arts/Human Values
11.30 A.M. to 12.30 P.M.	Lunch
2.00 P.M. to 5.00 P.M.	Familiarization with Department/Visits to local area /literacy /Proficiency /Lectures by eminent people (3 days each)

Closing phase (2 days)

Time	Activity
Last but one day 9.00 A.M. to 11.30 A.M.	Discussion and finalization of presentations
11.30 A.M. to 12.30 P.M.	Lunch
2.00 P.M. to 5.00 P.M	Presentation by each group
Last day	Examinations (if any)

Normal classes shall start after the induction program.

SRI VENKATESWARA UNIVERSITY COLLEGE OF ENGINEERING: TIRUPATI
DEPARTMENT OF COMPUTER SCIENCE ENGINEERING
Scheme of Instruction for Choice Based Credit System
(With effect from 2018 – 2019 admitted batch)

SEMESTER I

Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits
		Lecture	Tutorial	Practical	Total	
MABST 101	Mathematics – I	3	1	-	4	4
PYBST 102	Modern Physics	3	1	-	4	4
CSEST 103	Programming for Problem Solving	2	1	-	3	3
CSEST104	Branch Subject Python Programming	3	1	-	4	4
MEEST 105	Workshop / Manufacturing Practices	-	-	3	3	1.5
CSESP 106	Programming for Problem Solving Lab	-	-	3	3	1.5
CEMCT107	Environmental Science	4	-	-	4	-
Total		15	4	6	25	18

SEMESTER II

Course Code	Course Title	Scheme of Instruction (Hours/Week)				No. of Credits
		Lecture	Tutorial	Practical	Total	
MABST 201	Mathematics- II	3	1	-	4	4
CYBST 202	Engineering Chemistry	3	1	-	4	4
ENHST 203	English	2	-	-	2	2
EEBST 204	Basic Electrical Engineering	3	1	-	4	4
MEEST 205	Engineering Graphics	2	-	3	5	3.5
ENHSP 206	English Communication Lab	-	-	3	3	1.5
Total		13	3	6	22	19

SEMESTER III

Course Code	Course Title	Instruction hr / week				Credits
		L	Tut	P/D	Total	
CSPCT301	Data structure and Algorithms	3	1		4	4
ECPCT 302	Analog Electronics (Common to EEE and CSE)	3			3	3
CSPCT 303	Discrete Mathematics	3	1		4	4
MABST 304	Probability and Statistics	2			2	2
HSMC 305	Managerial Accountancy	3			3	3
ECPCP306	Analog Electronics Lab (Common to EEE and CSE)			3	3	1.5
CSPCP307	Data structure and Algorithms Lab			3	3	1.5
CSPCW308	IT Workshop(Sci Lab/MAT Lab)	2		2	2	3
	Total	16	2	8	24	22

SEMESTER IV

Course Code	Course Title	Instruction hr / week				Credits
		L	Tut	P/D	Total	
ECPCT 401	Digital Electronics (Common to EEE and CSE)	3	0	0	3	3
ECEST 402	Signals & Systems (Commom to ECE and CSE)	3	0	0	3	3
CSPCT403	Design & Analysis of Algorithms	3	0		3	3
CSPCT 404	Database Management Systems	3	0	0	3	3
CSPCT405	Computer Organization and Architecture	3	0		3	3
CSPCP 406	Computer Organization and Architecture Lab	0	0	3	3	1.5
ECESTP407	Digital Electronics Lab (Common to EEE and CSE)			3	3	1..5
CSPCP408	Database Management Systems Lab	0	0	3	3	1.5
CSPCP 409	Design & Analysis of Algorithms Lab	0	0	3	3	1.5
HSMCT410	Constitution of India	2	0	0	2	
	Total	17		9	26	21

SEMESTER V

Course Code	Course Title	Instruction hr / week				Credits
		L	Tut	P/D	Total	
CSPCT501	Operating Systems	3	0		3	3
CSPCT502	Formal Language & Automata Theory	3	0	0	3	4
CSPCT503	Computer Graphics	2	0		2	3
GEMCT 504	Industrial Management	3	0	0	3	2
Professional Elective-I (any one of the course)		3	0	0	3	3
CSPET515	Software Engineering					
CSPET525	Software Architecture					
HSMCT506	Managerial Economics	3	0	0	3	2
CSPCP507	Operating Systems Lab			3	3	1.5
CSPCP508	Computer Graphics Lab			3	3	1.5
	Total	17	0	6	23	20

SEMESTER VI

Course Code	Course Title	Instruction hr / week				Credits
		L	Tut	P/D	Total	
CSPCT601	Complier Construction	3	0		3	3
CSPCT602	Computer Networks	3	0		3	3
Professional Elective-II (any one of the course)		3	0	0	3	3
CSPET613	Principles of Programming Language					
CSPET623	Object Oriented Programming					
Professional Elective-III (any one of the course)		3	0	0	3	3
CSPET614	Advanced Computer Architecture					
CSPET624	VLSI Design					
Open Elective-I (any one of the course)		3	0	0	3	3
CSOET605	MOOCs					
CSPCP606	Complier Construction Lab			3	3	1.5
CSPCP607	ComputerNetworks Lab			3	3	1.5
CSPWI708	Internship /Mini Project			6	6	3
	Total	15		12	27	21

SEMESTER VII

Course Code	Course Title	Instruction hr / week				Credits
		L	Tut	P/D	Total	
Professional Elective-IV (any one of the course)		3	0	0	3	3
CSPET711	Cryptography and Network Security					
CSPET721	Cloud Computing					
Professional Elective-V (any one of the course)		3	0	0	3	3
CSPET712	Mobile Computing					
CSPET722	System Programming					
Open Elective-II (any one of the course)		3	0	0	3	3
CSOET713	Cyber Law and Ethics					
CSOET723	Internet of Things					
BIBST704	Artificial Neural Networks	2	1	0	3	3
CSPET705	Distributed Operating Systems	2	0	0	2	2
CSPWX706	Project Work-I			12	12	6
	Total	13	1	12	26	20

SEMESTER VIII

Course Code	Course Title	Instruction hr / week				Credits
		L	Tut	P/D		
Professional Elective-VI (any one of the course)		3	0	0	3	3
CSPET 811	Artificial Intelligence					
CSPET 821	Digital Image Processing					
Open Elective-III (any one of the course)		3	0	0	3	3
CSPET 812	Cyber Security					
CSPET 822	Data Analytics					
CSOET 803	Big Data Analytics	4	0	0	4	4
Open Elective-IV (any one of the course)		3	0	0	3	3
CSOET814	Machine Learning					
CSOET824	Blockchain Technology					
CSPWX805	Project Work-II			12	12	6
	Total	13	0	12	25	19

SEMESTER I

MABST 101

Mathematics-I

Instruction Hours/Week: 3(L) +1(T) Credits : 4
Sectional Marks : 40 End Semester Examinations Marks: 60

UNIT I
Differential Equations: Linear differential equations of second and higher order with constant coefficients-particular integrals-homogeneous differential equations with variable coefficients-method of parameters-simulation equations.

UNIT II33
Laplace Transforms I: Laplace transforms of standard functions-inverse transforms-transforms of derivatives and integrals-derivatives of transforms-integrals of transforms.

UNIT III
Laplace Transforms II: Transforms of periodic functions-convolution theorem-applications to solution of ordinary differential equations.

UNIT IV
Calculus: Roll's and Mean value theorems - Taylor's and Maclaurins's series-maxima and minima for functions of two variables - Infinite series - Convergence Tests series of positive terms - comparison, Ratio tests - Alternating series - Leibnitz's rule - Absolute and conditional convergence.

UNIT V
Multiple Integrals: Curve tracing (both Cartesian and polar coordinate) - Evaluations of double and Triple integrals-change of order of integrations-change of variables of integrations-simple applications to areas and volumes.

Text/Reference Books

1. B S Grewal, Higher Engineering Mathematics, 40th Edition, Khanna Publications, 2007.
2. M K Venkataraman, Engineering Mathematics, National Publishing Company, Chennai.
3. B V Ramana, Higher Engineering Mathematics, 6th Reprint, Tata McGraw-Hill, 2008.
4. Bali and Iyengar, Engineering Mathematics, 6th Edition, Laxmi Publications, 2006.

Course Outcomes:

- Extends an ability to analyze differential equations and solve them
- The students become familiar with the applications of differential equations to engineering problems.
- In Mathematics, a transform is usually a device that converts one type into another type presumably easier to solve.
- Use shift theorems to compute the Laplace transform, inverse Laplace transform and the solutions of second order, linear equations with constant coefficients.
- Solve an initial value problem for an n^{th} order ordinary differential equation using the Laplace transform.
- Expand functions as power series using Maclaurin's and Talor's series
- The problems in OR, Computer science, Probability, statistics deals with functions of two or more variables. To optimize something means to maximize or minimize some aspects of it.
- Curve tracing is an analytical method of drawing an approximate shape by the study of some of its important characteristics such as symmetry, tangents, regions etc it is useful in applications of finding length, area, volume.

- Multiple integral is a natural extension of a definite integral to a function of two, three variables and are useful in evaluating area and volume of any region bounded by the given curves.

PYBST - 102

Modern Physics
(EEE, ECE and CSE)

Instruction : Hours/Week : 3 (L) +1(T) Credits: 4
Sessional Marks : 40 End Semester Examination Marks:60

UNIT I

Quantum Mechanics : Wave – Particle duality – de Broglie Concept of Matter Waves – Properties of Matter Waves – Davison and Germer Experiment – G.P. Thomson Experiment – Heisenberg's Uncertainty Principle – Schrödinger's Time Independent and Time Dependent Wave equation – Significance of Wave Function – Electron in an Infinite Square Potential Well – Probability Densities and Energy Levels.

UNIT II

Band Theory of Solids : Classical Free Electron Theory of Metals – Success and Failures – Quantum Free Electron Theory – Fermi Factor – Electron in Periodic Potential – Bloch Theorem – Kronig – Penney Model – Distinction between Metals , Insulators and semiconductors- Energy Band Structures.

UNIT III

Semiconductors – Introduction- Intrinsic and Extrinsic Semiconductors – Density of states – Carrier Concentrations at Equilibrium - Hall Effect. PN Junction Diode – Energy Band Diagram - Forward and Reverse Bias- Current – Voltage characteristics – Applications : Zener Diode - Light Emitting Diode- Photo diode -Solar Cell – Semiconductor Laser.

UNIT IV

Electromagnetism and magnetic properties of Materials:

Laws of Electrostatistics- Electric Current- Laws of Magnetism- Ampere`s, Faraday`s laws-Maxwells Equations – Polarization - Permeability and dielectric constant- Polar and non-polar Dielectrics, Clausius-Mossotti equation, Applications of Dielectrics.

Magnetization - Permeability and Susceptibility- Classification of Magnetic Materials, Ferromagnetism- Magnetic Domains and Hesteresis, Applications of ferromagnetic materials.

UNIT V

NanoPhysics and Nanotechnology : Introduction to Nanomaterials –Properties: Optical Properties – Quantum Confinement – Electrical properties. Synthesis of Nanomaterials: Ball milling, Arc deposition method – Chemical Vapour Deposition-Pulsed laser deposition. Characteristics of C^{60} (Zero dimensional), Carbon Nanotubes (One Dimensional) and Graphene (Two Dimensional). Applications of Nanomaterials. 10 hrs.

Text Books:

1. R.K.Gaur and S.L.Gupta ``Engineering Physics" Sultan and Chand Pub., New Delhi
2. S.P.Basava Raju `` A Detailed Text Book of Engineering Physics" Sole Distributors, Subhash Stores Book Corner, Bangalore
3. Hitendra K.Malik and A.K.Singh ``Engineering Physics" Tata MC Graw Hill Education PVt.Ltd., New Delhi
4. M.N.Avadhanulu and P.G.Kshirsagar ``A Text Book of Engineering Physics`` S.Chand and Company Pvt.Ltd., New Delhi

Reference Books

5. John Allison, ``Electronic Engineering Materials and Devices" Tata Mc Graw Hill Publications.
6. B.L Theraja, "Modern physics", S.Chand & Company.
7. V. Raghavan "Material Science", Tata Mc Graw Hill Publications.

8. M.S.Ramachandra Rao and Shubra Singh, ``Nanoscience and Nanotechnology``
Wiley India Pvt.Ltd, New Delhi

Course Outcomes:

- develop appropriate competence and working knowledge of laws of modern Physics in understanding advanced technical engineering courses
- understand the quantum mechanics and ultimately the quantum behaviour of charged particles when they are in motion.
- identify and apply appropriate analytical and mathematical tools of Physics in solving Engineering problems
- apply knowledge of band theory in the area of electronics and understanding the basic electron transportation phenomenon in microdevices.
- understand the principles in electrostatics and electromagnetics and magnetic properties of materials.
- understand size depended properties of nanodimensional materials and their effective utilization in making nano- and micro-devices for further microminiaturization of electronic devices.
- think and participate deeply, creatively, and analytically in emerging areas of engineering technology.
- learn the basics of instrumentation, design of laboratory techniques, measurement, data acquisition, interpretation, and analysis.
- provide multidisciplinary experiences throughout the curriculum.

CSEST 103

CSEST 203-Programming for Problem Solving

Instruction Hours / Week : 2(L) + 1(T) Credits : 3
Sessional Marks : 40 Semester End Examination Marks : 60

UNIT-I
Introduction to Programming
Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)
Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples.
From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code-.
Arithmetic expressions and precedence**.**

UNIT-II
Conditional Branching and Loops
Writing and evaluation of conditionals and consequent branching
Iteration and loops
Arrays (1-D, 2-D), Character arrays and Strings.

UNIT-III
Basic Algorithms
Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

UNIT-IV
Functions
Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference.
Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

UNIT-V

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

Text Books

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Reference Book

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

Course Outcomes

The student will learn

- To formulate simple algorithms for arithmetic and logical problems.
- To translate the algorithms to programs (in C language).
- To test and execute the programs and correct syntax and logical errors
- To implement conditional branching, iteration and recursion.
- To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
- To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

CSEST 104

Python Programming Language

Instruction : Hours/Week : 3 (L) +1(T) Credits: 4
Sessional Marks : 40 End Semester Examination Marks:60

UNIT-I
Simple program using Python, Expressions and Values, Variables and Computer Memory, error detection, multiple line statements, Designing and using functions, functions provided by Python, Tracing function calls in memory model, omitting return statement. Working with Text: Creating Strings of Characters, Using Special Characters in Strings, Creating a Multiline String, Printing Information, Getting Information from the Keyboard. A Boolean Type, Choosing Statements to Execute,

UNIT II
A Modular Approach to Program Organization, Importing Modules, Defining Your Own Modules, Testing Code Semi automatically Grouping Functions Using Methods: Modules, Classes, and Methods, Calling Methods the Object-Oriented Way, Exploring String Methods, Underscores. Storing Collections of Data Using Lists: Storing and Accessing Data in Lists, modifying Lists. Operations on Lists, Slicing Lists, Aliasing, List Methods.

UNIT III
Repeating Code Using Loops: Processing Items in a List, Processing Characters in Strings, Looping Over a Range of Numbers, Processing Lists Using Indices, Nesting Loops in Loops, Looping Until a Condition Is Reached, Repetition Based on User Input, Controlling Loops Using Break and Continue. Reading and Writing Files: Kinds of files, Opening a File, Techniques for Reading Files, Files over the Internet, Writing Files, and Writing Algorithms That Use the File-Reading Techniques, Multiline Records.

UNIT IV
Storing Data Using Other Collection Types: Storing Data Using Sets, Storing Data Using Tuples, Storing Data Using Dictionaries, Inverting a Dictionary, Using the In Operator on Tuples, Sets, and Dictionaries, Comparing Collections. Collection of New Information Object-Oriented Programming: Understanding a Problem Domain,

Function “Isinstance,” Class Object, and Class , Writing a Method in Class Book.
Plugging into Python Syntax: More Special Methods.

UNIT V
Creating Graphical User interface: Building a Basic GUI, Models, Views, and Controllers, Customizing the Visual Style Introducing few more Widgets, Object-Oriented GUIs, Keeping the Concepts from Being a GUI Mess.
Data Structures, GUI Programming, XML with Python

Text Books:
1. Practical Programming: An introduction to Computer Science Using Python, second edition, Paul Gries, Jennifer Campbell, Jason Montojo, The Pragmatic Bookshelf.
2.Exploring Python, Timothy A. Budd, Mc Graw Hill Education

Reference Books:
1.Introduction to Python for Computational Science and Engineering (A beginner's guide), Hans Fangohr.
2.Learning with Python: How to Think Like a Computer Scientist Paperback – Allen Downey , Jeffrey Elkner, 2015
3.Learning Python, Fourth Edition, Mark Lutz, O’Re illy publication.

Course Outcomes

- To be able to understand Simple program using Python
- To be able to understand To be able to understand Simple program using Python
- To be able to understand A Modular Approach to Program Organization
- To be able to understand Object-Oriented Programming
- To be able to understand Creating Graphical User interface

MEEST 105

Workshop/Manufacturing Practices

Instruction Hours/week**:** 3(P) Credits : 1.5
Sessional Marks : 40 End Semester Examinations Marks : 60

Workshop Practice:
1.Machineshop
2.Fittingshop
3.Carpentry
4.Electrical wiring
5.Weldingshop
6.Casting
7.Smithy
8.Plasticmoulding&GlassCutting

choose any of the above Five for practice

Examinationscouldinvolvetheactualfabricationofsimplecomponents,utilizingoneor moreofthetechniquescoveredabove.

Detailed contents

1.ManufacturingMethods-casting,forming,machining,joining, advancedmanufacturing methods
2. CNCmachining, Additivemanufacturing
3. Fittingoperations&powertools

4. Electrical&Electronics
5. Carpentry
6. Plasticmoulding,glasscutting
7. Metalcasting
8. Welding(arc welding&gas welding), brazing

The above course content is learnt by online videos/ppt presentations.

Suggested Text/ReferenceBooks:

1. HajraChoudhuryS.K.,HajraChoudhuryA.K.andNirjharRoyS.K.,"Elementsof
2. Workshop Technology", Vol. I 2008and Vol. II 2010, Media promoters and
3. publishersprivatelimited,Mumbai.
4. (ii)KalpakjianS.AndStevenS.Schmid,"ManufacturingEngineeringandTechnology",
5. 4th edition,PearsonEducationIndiaEdition,2002.
6. (iii)GowriP.HariharanandA.SureshBabu,"ManufacturingTechnology–I" Pearson
7. Education,2008.
8. (iv)RoyA.Lindberg,"ProcessesandMaterialsof Manufacture",4th edition,PrenticeHall
9. India,1998.
10. (v)RaoP.N., "ManufacturingTechnology",Vol.IandVol.II,TataMcGrawHillHouse,
11. 2017.

Course Outcomes:

Upon completion of this laboratory course, students will be able to

- fabricate components.
- get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- assemble different components and produce small devices

CSESP 106

Programming for Problem Solving Lab

Instruction Hours / Week ; 3(P) Credits : 1.5

Sessional Marks : 40 Semester End Examination Marks : 60

Assignments in C , JAVA and Python

Variable types and type conversions:
Simple computational problems using arithmetic expressions
Branching and logical expressions:
Problems involving if-then-else structures
Loops, while and for loops:
Iterative problems e.g., sum of series
1D Arrays: searching, sorting:
1D Array manipulation
2D arrays and Strings
Matrix problems, String operations
Functions, call by value
Simple functions
Numerical methods (Root finding, numerical differentiation, numericalintegration):
Programming for solving Numerical methods problems
Recursion, structure of recursive calls
Recursive functions
Pointers, structures and dynamic memory allocation
Pointers and structures

File handling
File operations

1. Programs using Input, output and assignment statements a)
Write a program to print Name, Address and Birth Date.
b) Write a program to add, multiply and divide two integers and float numbers. c)
Write a program to convert meters to Feet.
d) Write a program to accept number of days and print year, month and remaining days.

2. Programs using Branching statements
a) Write a program to find the largest of three numbers.
b) Write a program to check whether the entered number is prime or not.
c) Write a program to check whether the entered number is even or odd.
d) Write a program to find the roots of an equation ax2 + bx + c = 0.

3. Programs using Looping statements
a) Write a program to print 1 2 3 4 5 …..10.
b) Write a program to print series 2, 4, 6, 8,…….n.
c) Write a program to print series 2, 4, 16,……n*n using shorthand operator and while loop
d) Write a program to generate fibonnacci series.
(A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence)
e) Write a program to print the multiplication table.
f) Write a program to find a factorial of the given number.
g) Write a program to check whether the given number is Armstrong or not.
h) Write a program to check whether the given number is Strong number or not.
i) Write a program to check whether the given number is Perfect number.
j) Write a program to print all the numbers and sum of all the integers that are greater than 100 and less than 200 and are divisible by 13.

4. Programs using Functions
a) Write a program to find Fibonacci series till given number.
b) Write a program to check whether a number is a palindrome.
c) Write a program to print upper and lower triangular matrix.
d) Write a program to calculate sum and average of numbers in an array.
e) Write a program to calculate maximum and minimum value in an array.

5. Programs using Arrays
a) Write a program to find maximum element from 1-Dimensional array.
b) Write a program to sort given array in ascending order.
c) Write a program to transpose a matrix.
d) Write a program to add, subtract and multiply two matrices.

6. Programs using Structures
a) Define a structure called book that will describe the following information:Title of the book, Subject , Cost. Write a program to read the information about the 10 books and print subject-wise list containing name of the book with its cost.
b) Declare a structure with members: name, code, age, weight and height. Read the information of 10 persons and print the list of persons details whose weight is in between 35 and 50 kgs.

7. Programs using strings
a) Write a program to find string length.
b) Write a program that will read a text and count all occurrences of a particular alphabet
c) Write a program that will read a string and rewrite it in the alphabetical order. i.e.the word HELLO should be written as EHLLO.
d) Write a program that appends the one string to another string.
e) Write a program that finds a given word in a string.
f) Write a program that checks a given string for palindrome.
g) Write a program to find the number of vowels, blank spaces and other characters in a string**.**

8. Programs using Pointers
a) Write a program using pointers to read an array of integers and print its elements in reverse order.

b) Write a function to calculate the roots of the quadratic equation. The function must use two pointer parameters, one to receive the coefficients a, b, and c, and the other to send the roots to the calling function.
c) Write a function using pointers to add two matrices and to return the resultant matrix to the calling function.
d) Write a function to swap two values using pointers

9. Programs using Recursion
   a) Write a recursive program to calculate the factorial of a given number
   b) Write a recursive program to print Fibonacci series using recurssion
10. Programs using Files
   a) Write a program to create a file.
   b) Write a program to copy one file into another file
   c) Write a program to merge two files

Lab Outcomes:

- At the end of the course, students will be able to develop Programming concepts to
- formulate simple algorithms for arithmetic and logical problems.
- translate the algorithms to programs (in C language).
- test and execute the programs and correct syntax and logical errors.
- implement conditional branching, iteration and recursion.
- decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- use arrays, pointers and structures to formulate algorithms and programs.
- apply programming to solve matrix addition and multiplication problems and searching and sorting problems. and
- to apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration

CEMCT-107

207 Environmental Science

Instruction Hours/Week: 4(L)

Instruction Hours / Week : 4 (L) **Credits :**

Unit I **Environmental Studies and Natural Resources**

Definition, Scope and importance of Environment, Environmental studies, Need for public awareness

Components of Environment- Atmosphere, Hydrosphere, Lithosphere.

Renewable and **Non Renewable Resources and associated problems**

- Water resources: Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
- Forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- Land resources: Land as a resource, land degradation, Man induced landslides, soil erosion and desertification.
- Mineral resources: Use and overexploitation, Environmental effects of extracting and using mineral resources, case studies.
- Food resources: World food problems, changes caused agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity, Case studies.
- Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
- Role of an individual in conservation of natural resources.

Unit II **Ecosystem and Biodiversity :**

Ecosystem - Concept of an ecosystem.

- Structure and functions of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem.
  (a) Forest ecosystem. (b) Grassland ecosystem
  (c)Desert ecosystem. (d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation:

- Definition, genetic species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-spots of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts.
- Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit III **Environmental pollution and Global Effects.**

- Definition, Causes, Effects, and control measures of (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management: Floods, earthquakes, cyclone, landslides, Tsunami.
- Climate change-Global warming, Acid rain, Ozone depletion,.

Unit IV **Environment Issues and Management**

- Environment and Human health – Epidemic diseases, HIV/AIDS, Aviation Flue, Water Borne Diseases.
- Environmental Impact Assessment, Sustainable Development, Clean Production and Clean Development Mechanisms
- Environment Legislation: Environmental Protection Act, Water Act, Air Act, Wild Life Protection Act, Forest Conservation Act, Public Liability & Insurance Act, Issues involved in Enforcement of Environmental legislation.

Unit V **Social Issues and the Environment**

- Population growth, Population Explosion, Population Control, Women and Child welfare.
- Urbanization, Industrialization, Development projects, Resettlement and Rehabilitation of people – Problems concerned, Case studies.
- Consumerism and Waste Products Conservation, Public Awareness, Water Conservation, Rain water harvesting, watershed management, Wasteland reclamation, Human Rights, Value education, Environmental ethics- Issues and possible solution.
- Role of information Technology in Environment and Human Health.

Text books

1. Anubha Kaushik & C P Kaushik, Environmental studies, New age International Publishers, 2008
2. Benny Joseph, Environmental studies, Tata McGraw-Hill Publishers, 2005
3. M Chandra Sekhar, Environmental Science, Hi-Tech Publishers, 2004
4. Keerthinarayana and Daniel Yesudian, Principles of Environmental Sciences and Engineering , Hi-Tech Publishers, 2005
5. Amal K.Datta, Introduction to Environmental Science and Engineering, Oxford & IBH Publishing Co.Pvt.Ltd, 2000
6. Santhosh kumar Garg,Rajeshawri Garg and Rajni Garg, Ecological and Environmental studies, Khanna publishers, 2006

Reference books:

1. Gilbert M, Introduction to Environmental Engineering and Science, Masters Publication by Prentice –Hall of India Private Ltd., 1991
2. William P Cunningham and Mary Ann Cunningham, Principles of Environmental Science, Tata McGraw Hill Publishing Co.Ltd, 2002

Course Outcomes:

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

- Acquire knowledge in
- Diverse components of environment and natural resources
- Ecosystem and biodiversity & its conservation methods
- Population growth and human health
- Green technology
- Identify and resolve the issues related to sources of different types of pollutions
- Provide solutions to individuals, industries and government for sustainable development of natural resources
- Apply environmental ethics in protection of diversified ecosystems.

SEMESTER II

MABST 201

Mathematics-II

Instruction Hours/Week : 3(L) +1(T) Credits : 4
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit I
Matrices: rank of a matrix-solution of system of linear equations-Eigen values, vectors –Canley-Hamilton theorem-quadratic forms-diagonalization.

Unit II
Vector Calculus: Gradient, Divergence, Curl of a vector and related properties-line, surface, volume integrals-Green's, Stokes's and Gauss Divergence theorems and its applications.

Unit III
Fourier Series: Fourier series-even and odd functions, periodic functions-half range sine and cosine series-harmonic analysis.

Unit IV
Special Functions I: Gamma and Beta functions-series solutions of differential equations-ordinary points.

Unit V
Special Functions II: Bessel function-recurrence formulae-generating function for $J_n(X)$-Lengender polynomials-recurrence formulae-generating function for $P_n(X)$ - Rodriguez's formula - orthogonality of Lengender polynomials.

Text/Reference Books

1. B S Grewal, Higher Engineering Mathematics, 40th Edition, Khanna Publications, 2007.
2. M K Venkataraman, Engineering Mathematics, National Publishing Company, Chennai.
3. B V Ramana, Higher Engineering Mathematics, 6th Reprint, Tata McGraw-Hill, 2008.
   Bali and Iyengar, Engineering Mathematics, 6th Edition, Laxmi Publications, 2006.

Course Outcomes:

- Use ranks of matrices to decide whether the system of linear equations is consistent or not and hence solve.
- Use Cayley-Hamilton theorem to find inverses or powers of matrices.
- Use Eigen values and vectors to reduce Quadratic forms to normal form.
- Ability to analyze motion problems from real lines to curves and surfaces in 3-D. Use tools such as divergence and curl of vector and gradient, directional derivatives that play significant roles in many applications.
- To use Green's theorem to evaluate line integrals along simple closed contours on the plane
- To use Stokes' theorem to give a physical interpretation of the curl of a vector field
- To use the divergence theorem to give a physical interpretation of the divergence of a vector field.
- Find the Fourier series representation of a function of one variable. It is representation of a function as a series of constants times sine and cosine functions of different frequencies in order to see periodic phenomenon have long fascinating mankind.
- Evaluation of certain improper integrals is made simple with introduction of Gamma and Beta functions
- Primary motivation for studying certain special functions is that they arise in solving certain ordinary differential equations that model many physical phenomenon. They constitute necessary items in the toolkit of anyone who wishes to understand the work with such models.

CYBST 202

Engineering Chemistry

Instruction Hours/week:3(L) +1(T) Credits : 4
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I
Atomic and molecular structure (**12 lectures**)
Postulates of quantum chemistry. Schrodinger equation. Particle in a box solutions Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene. Band structure of solids and the role of doping on band structures

UNIT II
Spectroscopic techniques and applications
Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques.

UNIT III
Chemical equilibria, Intermolecular forces and potential energy surfaces
Use of free energy in Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Use of free energy considerations in metallurgy through Ellingham diagram. Equations of state of real gases and critical phenomena.

UNIT IV
Periodic properties
Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular
geometries, Born- Haber cycle, The use of reduction potentials, Properties of ionic and covalent compounds.

UNIT V
Stereochemistry, **Organic reactions and synthesis of a drug molecule**
Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Reference/Text Books
1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
3.Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition.
7. Principles of physical chemistry, Puri, Sharma and Pattania

Course Outcomes:
At the end of the course, students will be able to learn
- analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- rationalise bulk properties and processes using thermodynamic considerations.

- distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- list major chemical reactions that are used in the synthesis of molecules.

ENHST 203

English

Instruction Hours/week :2(L) Credits : 2
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I

Vocabulary Building

The concept of Word Formation- Root words from foreignlanguages and their use in English- Acquaintancewith prefixes and suffixes from foreign languages in English form derivatives- Synonyms,antonyms,and standard abbreviations.

UNIT II

Basic Writing Skills

SentenceStructures - Useof phrases andclauses in sentences - Importanceof properpunctuation - Creating coherence - Organizingprinciplesof paragraphs in documents -Techniques for writingprecisely

UNIT III

Identifying CommonErrors inWriting

Subject-verb agreement -Noun-pronoun agreement -Misplaced modifiers -Article -Prepositions - Redundancies -Clichés

UNIT IV

Natureand Styleofsensible Writing

Describing - Defining - Classifying -Providingexamples or evidence -Writingintroduction and conclusion

UNIT V

Writing Practices

Comprehension - Précis Writing -EssayWriting

Reference/Text Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper ResourceBook. 2001
4. Study Writing. LizHamp - Lyonsand Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumarand Pushp Lata. Oxford University Press. 2011.
6.Exercises in Spoken English. Parts.I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcomes:

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

- learn the elements of grammar and composition of English Language.
- learn literary texts such as Short stories and prose passages.
- maintain linguistic competence through training in vocabulary, sentence structures and pronunciation.
- develop communication skills by cultivating the habit of reading comprehension passages.
- develop the language skills like listening, speaking, reading and writing.
- make use of self instructed learner friendly modes of language learning through competence.

EEBST 204

Basic Electrical Engineering

Instruction Hours/Week : 3(L) +1(T) Credits : 4
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I

DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and Voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT II

AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, realpower, reactive power, apparent power, power factor. Analysis of single-phase ac circuits
Consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Threephasebalanced circuits, voltage and current relations in star and delta connections.

UNIT III

Transformers

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit,losses in transformers, regulation and efficiency. Auto-transformer and three-phase
Transformer connections.

UNIT IV

Electrical Machines

ingle-phase induction motor. Construction, working torque-speed characteristic-Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Starting and speed control of induction motor - Construction, working, torque-speed characteristic-Constructionand working of synchronous generators and speed control of separately excited dc motor.

UNIT V

Electrical Installations

Introduction to Converters and Inverters- Single phase and three phase voltage source Inverters- Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery Backup.

Text / References Books:

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill,2010.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press,2011.

4. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

Course Outcomes:

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

- understand and analyze basic electric and magnetic circuits.
- study the working principles of electrical machines and power converters.
- introduce the components of low-voltage electrical installations.

MEEST 205

Engineering Graphics and Design

Instruction Hours/week :2(L) +3(P) Credits : 3.5
Sessional Marks : 40 Semester End Examination Marks : 60

Unit – I
IntroductiontoEngineeringDrawing
PrinciplesofEngineeringGraphicsandtheirsignificance,usageofDrawinginstruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, HypocycloidandInvolute;

Unit – II
Scales
Scales– construction of Plain &Diagonal Scales.
Projections of points, lines
Projections ofPointsandlinesinclined tobothplanes, including traces;

Unit – III
Projections of planes
Projectionsofplanes (Regular surfaces only) inclinedPlanes-AuxiliaryPlanes;
ProjectionsofRegular Solids (Simple solids - cylinder, cone, prism & pyramid) thoseinclinedtobothePlanes-Auxiliary Views;

Unit – IV
Sections and Sectional views and Development of surfaces
Prism, Cylinder, Pyramid, Cone – AuxiliaryViews;Development ofsurfacesofRight RegularSolids-Prism,Pyramid,CylinderandCone;Drawthesectionalorthographicviews ofgeometricalsolids.

Unit – V
IsometricProjections& Orthographic projections
PrinciplesofOrthographicProjections-Conventions Drawsimple objects,dimensioning andscale. Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; IsometricViewsoflines,Planes,SimpleandcompoundSolids;ConversionofIsometric ViewstoOrthographicViewsand Vice-versa, Conventions;

Suggested Text/ReferenceBooks:
Bhatt N.D., PanchalV.M. &IngleP.R., (2014), Engineering Drawing, CharotarPublishingHouse

1. Shah,M.B.&RanaB.C.(2008),EngineeringDrawingandComputerGraphics,PearsonEducation
2. AgrawalB.&AgrawalC.M.(2012),EngineeringGraphics, TMHPublication
3. Narayana, K.L. &P Kannaiah(2008),Text bookonEngineeringDrawing,ScitechPublishers
4. Correspondingsetof)CADSoftwareTheoryandUserManuals

Course Outcomes:

At the end of the course, students will be able to learn/get

- Introduction to engineering design and its place in society
- Exposure to the basic aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to communicate effectively in engineering field.
- prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD engineering software.

ENHSP 206

English Communications Lab

Instruction Hours/week :3 Credits : 1.5
Sessional Marks : 40 End Semester Examinations Marks : 60

ListeningComprehension -Pronunciation,Intonation, Stress and Rhythm -Common EverydaySituations: Conversations andDialogues -Communication at Workplace -Interviews -Formal Presentations

Reference/Text Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper ResourceBook. 2001
4. Study Writing. LizHamp - Lyonsand Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumarand Pushp Lata. Oxford University Press. 2011.
6.Exercises in Spoken English. Parts.I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcomes:

- The student will acquire basic proficiency in English including reading and listening comprehension, writingand speakingskills.

SEMESTER III

CSEST 301

Data structure and Algorithms

Instruction Hours/Week : 3(L) +1(T) Credits : 4
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

Unit-II

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

Unit-III

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded BinaryTree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

Unit-IV

Sorting and Hashing: Objective and properties of different sorting algorithms:Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Graph: Basic Terminologies and Representations, Graph search and traversal algorithms andcomplexity analysis.

Unit-V

Data Structures and Algorithms in Python- Stacks, queues, linked lists,Trees, Sorting, searching, Graphs, Text Processing

Suggested books:

1. Alfred V Aho, Jhon E Hoecroft, J D Ullman, Data Structure and Algorithms, Addison-. Wesley,
2. “Fundamentals of Data Structures”, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
3. Michael T Goodrich , Robertio Tamassia and Michael H Goldwasser, Data Structure and algorithms in Python, Wileys India

Suggested reference books:

1. Algorithms, Data Structures, and Problem Solving with C++”, Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. “How to Solve it by Computer”, 2nd Impression by R. G. Dromey, Pearson Education.

Course outcomes

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

1. For a given algorithm student will able to analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. For a given Search problem (Linear Search and Binary Search) student will able to implement it.
3. For a given problem of Stacks, Queues and linked list student will able to implement it and analyze the same to determine the time and computation complexity.
4. Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity.
5. Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

ECPCT 302

Analog Electronic
(Common to EEE and CSE)

Instruction Hours/Week : 3(L) Credits : 3

Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT-I

Diode circuits (10Hours)

P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits, Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits, current mirror; common-emitter, common-base and common-collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits

UNIT-II

MOSFET circuits (8 Hours)

MOSFET structure and I-V characteristics, MOSFET as a switch, MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans-conductance, high frequency equivalent circuit.

UNIT-III

Differential, multi-stage and operational amplifiers (8 Hours)

Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

UNIT-IV

Linear applications of op-amp (8 Hours)

Idealized analysis of op-amp circuits, Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift).

UNIT-V

Nonlinear applications of op-amp (6 Hours)

Analog to Digital Conversion., Hysteresis Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector, Monoshot.

Text/References:

1. A. S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford UniversityPress, 1998.
2. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.
3. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
4. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
5. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

Course Outcomes:

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

- Understand the characteristics of transistors.
- Design and analyse various rectifier and amplifier circuits. Design sinusoidal and non-sinusoidal oscillators.
- Understand the functioning of OP-AMP and design OP-AMP based circuits.

CSPCT303

Discrete Mathematics

Instruction Hours/Week : 3(L)+1(T) Credits : 4

Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I

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

Principles of Mathematical Induction: The Well-Ordering Principle, Recursive definition, The Division algorithm: Prime Numbers, The Greatest Common Divisor: Euclidean Algorithm, The Fundamental Theorem of Arithmetic.

Unit=II

Basic counting techniques-inclusion and exclusion, pigeon-hole principle, permutation and combination.

Unit-IV

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

Unit-IV

Algebraic Structures and Morphism: Algebraic Structures with oneBinary Operation,SemiGroups,Monoids,Groups, Congruence Relation and Quotient Structures,Freeand CyclicMonoids andGroups,Permutation Groups,Substructures,NormalSubgroups,AlgebraicStructureswithtwoBinary Operation,Rings, IntegralDomainandFields.BooleanAlgebra and BooleanRing, IdentitiesofBooleanAlgebra,Duality, Representation of Boolean Function, Disjunctive and Conjunctive Normal Form Module

Unit-V

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

Suggested books :

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

Suggested reference books:

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

Course Outcomes

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

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

MABST304

Probability and Statistics

Instruction Hours/Week : 2(L) Credits : 2

Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT-I

Basic Probability

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

UNIT-II

Continuous Probability Distributions

Continuous random varibales and their properties, distribution functions and densities, normal, exponential and gamma densities.

Bivariate Distributions

Bivariate distributions and their properties, distribution of sums and quotients, conditional densities, Bayes' rule.

UNIT-III

Basic Statistics

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

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

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

Text/Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal
3. Book Stall, 2003 (Reprint).
4. (iii)S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
5. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
8. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

Course Outcomes

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

- The objective of this course is to familiarize the students with statistical techniques.
- It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

HSMC 305

Managerial Accountancy

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I
Management Accounting – Definition, Objectives, Scope and Functions.
Financial Accounting – Introduction, Process, Principles and Concepts.
Financial Statements – Trading Account, Balancing Process, Profit & Loss Account and Balance Sheet.

UNIT II
Financial Statement Analyses – Trend Percentage Analysis, Ratio Analysis, Fund Flow Statement Analysis, Cash Flow Statement Analysis

UNIT III
Methods of Depreciation – Straight line, Depletion, Machine Hour Rate, Diminishing Balance, Sum of Digits, Sinking Fund and Insurance Policy Methods.
Inventory Valuation Methods – FIFO, LIFO, Average Weighted Average, Base Stock and HIFO Methods.

UNIT IV
Capital Budgeting – Pay Back Period, ARR, NPV, PI and IRR Methods.
Unit Costing – Introduction, Direct Cost Classification and Indirect Cost Classification.
Introduction to Process Costing, Job Costing and Activity Based Costing

UNIT V
Marginal Costing – Introduction, Definition, Meaning and BEP Analysis and BEP in units.
Standard Costing – Introduction, Variance Analysis Material Cost Variance, Material Price Variance, Labor Variance, and Sales Variance.
Budgetary Control – Introduction and Classification of Budgets, Production, Material / Purchase, Sales, Sales Overhead, Cash and Factory Overheads Budgets. Flexible Budget.

Text Book:

Pandikumar M P, Management Accounting: Theory and Practice, 1st Edition, Excel Books, 2007.

UNIT	Chapters
I	1,2 and 3
II	5,6,7 and 8
III	4 and 11
IV	9,10, 13 , 14 and 18
V	15, 16 and 17

Reference Books:

1. Khan M Y, Jain P K, Management Accounting, 4th Edition, Tata McGraw-Hill, 2007.
2. Balakrishnan R, Sivaramakrishnan K, Sprinkle G B, Managerial Accounting, Wiley, 2010.

Course Outcomes

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

- To understand Management Accounting
- To understand Financial Statement Analyses
- To understand Capital Budgeting
- To understand Marginal Costing

ECPCP306

Analog Electronic Lab
(Common to EEE and CSE)

Instruction Hours/week :3 Credits : 1.5
Sectional Marks : 40 End Semester Examinations Marks : 60

1. To simulate OR, NOT, AND and EX-OR gates using NAND and NOR gates , verify their
   a. truth Tables.
2. To construct a half adder, full adder and half substractor using Logic gates.
3. To construct single ended and double ended clipper circuits and obtain concerned waveforms.
4. To Design Schmitt trigger circuit and study its response.
5. To design a collector coupled astable multivibrator and observe its waveforms.
6. To construct UJT sweep generator and observe its waveforms.
7. To study the applications of operational amplifier as scalar, summer, comparator and voltage

follower.

8. To study the applications of operational amplifier as ac coupled amplifier, integrator and differentiator.

9. To study the weighted resistor and R-2R ladder DAC and verify experimental and theoretical values.

10. To design astable multi vibrator using 555 timer.
11. To study the monolithic waveform generation using 8038.

Course Outcomes:

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

- Verify the truth tables of Logic gates and simulate them using NAND or NOR gates.
- Construct a half adder, full adder and half substractor using Logic gates.
- Build single ended and double ended clipper circuits and obtain concerned waveforms.
- Design Schmitt trigger and acquire the response of the same experimentally.
- Design a collector coupled astable multivibrator and analyse its waveforms.
- Construct UJT sweep generator and study its waveforms.
- Study the applications of operational amplifier as scalar, summer, comparator and voltage
- follower and compare theoretical and experimental values.
- Learn the applications of operational amplifier as ac coupled amplifier, integrator and
- Differentiator, get familiar with their functioning.
- Understand The working of the weighted resistor and R-2R ladder DAC and verify
- Experimental and theoretical values.
- Design astable multi vibrator using 555 timer and study its response.
- Understand the functioning of the monolithic waveform generation using 8038.

CSPCP307

Data Structures and Algorithms Lab

Instruction Hours/week :4 Credits : 2
Sessional Marks : 40 End Semester Examinations Marks : 60

Implementation of operations on list,
Implementation of operations on stacks,
Implementation of operations on queues ,
Implement binary trees, priority queues, binary search trees,
Implement AVL trees, red-black trees, and splay trees.
Implementation of operations on applications of linked lists, stacks, queues and trees.
Implement graph traversals and applications of graphs.

Laboratory Outcomes

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

- Implementation of operations on list,

- Implementation of operations on stacks,
- Implementation of operations on queues ,
- Implement binary trees, priority queues, binary search trees,
- Implement AVL trees, red-black trees, and splay trees.
- Implementation of operations on applications of linked lists, stacks, queues and trees.
- Implement graph traversals and applications of graphs.

Reference

http://users.utcluj.ro/~jim/DSA/Resources/LabCode/DSALab.pdf

CSPCW308

IT Workshop
(Sci Lab and MAT Lab)

Instruction Hours/Week : 2(L) +2(P) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Vectors and Matrices
Structures
Functions
Function handles
Graphics and Graphical user Interfaces
Interfaces with other languages-java and ActiveX

Text Book
MATLAB:An Itroduction with Applications, Wiley, 2016

Course Outcomes

To understand Structures
To understand Functions
To understand Function handles
To understand Graphics and Graphical user Interfaces
To understand Interfaces with other languages-java and ActiveX

SEMESTER IV

ECEST 401

Digital Electronics
(Common to EEE and CSE)

Instruction Hours/Week : 3(L)2 Credits : 4
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT-I

Fundamentals of Digital Systems and logic families (7Hours)

Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples ofI Cgates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital lCs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-statelogic.

UNIT-II

Combinational Digital Circuits (7Hours)

Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, ALU, elementary ALU design, popular MSI chips, digital comparator, parity checker/generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT-III

Sequential circuits and systems (7Hours)

A 1-bit memory, the circuit properties of Bi stable latch, the clocked SR flip flop, J- K-T and D-types flip flops, applications of flip flops, shift registers, applications of shift registers, serial to parallelconverter, parallelto serial converter, ringcounter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, special counter IC's, asynchronous sequential counters, applications of counters.

UNIT-IV

A/D and D/A Converters (7Hours)

Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual-slope A/D converter, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs

UNIT-V

Semiconductor memories and Programmable logic devices (7Hours)

Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory(RAM), content addressable memory (CAM), charge de coupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic, complex Programmable logic devices (CPLDS), Field Programmable Gate Array (FPGA).

Text/References:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.
3. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

Course Outcomes:

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

- Understand working of logic families and logic gates.
- Design and implement Combinational and Sequential logic circuits.
- Understand the process of Analog to Digital conversion and Digital to Analog conversion.
- Be able to use PLDs to implement the given logical problem.

ECEST402

Signals & Systems
(Common to EEE, ECE and CSE)

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

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

UNIT I

Introduction to Signals and Systems:

Definition and classification of signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character, Elementary signals such as Impulse, step, ramp, sinusoidal and exponential signals, Operations on signals. Basic System Properties (Continuous-Time and Discrete-Time): linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability, Examples, Causal LTI Systems Described by Differential and Difference Equations.

Signal Analysis:

Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions.

UNIT II

Fourier series and Fourier Transform:

The Response of LTI Systems to Complex Exponentials. Fourier series Representation of Continuous-Time Periodic Signals, Convergence of the Fourier series, Properties of Continuous-Time Fourier Series. The Continuous-Time Fourier Transform – properties. Discrete-Time Fourier Transform – Properties, Basic Fourier Transform Pairs. Introduction to Hilbert Transform.

UNIT III

Convolution and Correlation of Signals:

Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of Fourier transforms, Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT IV

Behaviour of continuous and discrete-time LTI systems:

The Magnitude-Phase Representation of the Fourier Transform, The Magnitude-Phase Representation of the Frequency Response of LTI Systems, Distortion less transmission through a system, signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time, State-space Representation of systems, State-Space Analysis, Multi-input, multi-output representation.

Sampling and Reconstruction:
The Sampling Theorem and its implications, Spectra of sampled signals, Reconstruction: ideal interpolator, zero-order hold, first-order hold, Aliasing and its effects.Relation between continuous and discrete time systems, Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

UNIT V

Laplace and z -Transform:
The Laplace Transform -The Region of Convergence - Properties, The Inverse Laplace Transform, Laplace Transform Pairs, Analysis and Characterization of LTI Systems Using the Laplace Transform, Unilateral Laplace Transform. The Z-Transform -Region of Convergence - Properties, The Inverse z-Transform, Common z-Transform Pairs, Analysis and Characterization of LTI Systems Using z-Transforms, Unilateral z-Transform.

Text / Reference Books:

1. Alan V. Oppenheim, Alan S. Willsky, & S. Hamid Nawab, "Signals and Systems," Pearson Higher Education, 2nd Ed., 1997.
2. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", Pearson, 2006.
3. Simon Haykin and B. Van Veen, "Signals & Systems," John Wiley and Sons, 2nd Edition, 2007.
4. B.P. Lathi, "Principles of LINEAR SYSTEMS and SIGNALS," Oxford Univ. Press, Second Edition, International version, 2009.
5. H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2010.
6. Luis F. Chaparro, "Signals and Systems using MATLAB," Academic Press, 2011.
7. C. L. Philips, J. M. Parr and Eve A. Riskin, "Signals, Systems and Transforms," Pearson
    1. Education, 4th Edition, 2008.Analyze different types of signals
    2. Understand the concepts of continuous time and discrete time systems.
    3. Analyse systems in complex frequency domain.
    4. Investigate whether the system is stable or not.

Course Outcomes
Understand sampling theorem and its implications

CSPCT403

Design and Analysis of Algorithms

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

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

Unit-II
Fundamental Algorithmic Strategies: Brute-Force method Greedy, method Dynamic Programming, Branch-and-Bound method and Backtracking methodologies for the design of algorithms; Illustrations of these techniques for Problem-Solving , Bin Packing, Knap Sack TSP. Heuristics – characteristics and their application domains.

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

Unit-IV

Tractable and Intractable Problems: Computability of Algorithms, Computability classes – P, NP, NP-complete and NP-hard. Cook's theorem, Standard NP-complete problems and Reduction techniques.

Unit-V Advanced Topics: Approximation Algorithms, Randamized Algorithms, Class of problem beyond NP-P SPACE

Suggested books:

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

Suggested reference books

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

approximation factor of an approximation algorithm (PTAS and FPTAS).

Course Outcomes

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

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

CSPCT404

Database Management Systems

Instruction Hours/Week : 3(L) Credits : 3

Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT-I

The Worlds of Database Systems-The Evolution of Database Systems, Overview of a Database Management System

The Relational Model of Data- An Overview of Data Models, Basics of the Relational Model, Defining a Relation Schema in SQL,An Algebraic Query Language, Constraints on Relations

Design Theory for Relational Databases- Functional Dependencies, Rules About Functional Dependencies, Design of Relational Database Schemas,

Decomposition: The Good, Bad, and Ugly, Third Normal Form, Multivalued Dependencies

UNIT-II

High-Level Database Models- The Entity/Relationship Model, Design Principles, Constraints in the E/R Model, Weak Entity Sets, From E/R Diagrams to Relational Designs, Converting Subclass Structures to Relations, Unified Modeling Language,From UML Diagrams to Relations, Object Definition Language, From ODL Designs to Relational DesignsAlgebraic and Logical Query Languages- Relational Operations on Bags, Extended Operators of Relational Algebra, A Logic for Relations, Relational Algebra and Data log.

UNIT-III

The Database Language SQL- Simple Queries in SQL 6.2 Queries Involving More Than One Relation, Subqueries, Full-Relation Operations, Database Modifications, Transactions in SQL

Constraints and Triggers- Keys and Foreign Keys, Constraints on Attributes and Tuples, Modification of Constraints, Assertions, TriggersViews and Indexes- Virtual Views, Modifying Views, Indexes in SQL, Selection of Indexes, Materialized ViewsSQL in a Server Environment- The Three-Tier Architecture, The SQL Environment, The SQL/Host-Language Interface, Stored Procedures, Using a Call-Level Interface, JDBCProgramming Languages for XM- XPath, XQuery, Extensible Stylesheet Language

UNIT-IV

Index Structures- Index-Structure Basics, B-Trees, Hash Tables, Multidimensional Indexes, Hash Structures for Multidimensional Data,Tree Structures for Multidimensional Data, Bitmap Indexes

More About Transaction Management- Serializability and Recoverability, Deadlocks, Long-Duration Transactions

UNIT-V

Parallel and Distributed Databases- Parallel Algorithms on Relations, The Map-Reduce Parallelism Framework, Distributed Databases,Distributed Query Processing, Distributed Commit, Distributed Locking, Peer-to-Peer Distributed Search

Text Books:

1. J D Ullman, H. Garcia-Molina and J. Widom,,*Database Systems: The Complete Book* Prentice-Hall, Englewood Cliffs, NJ, 2002.
2. Jeffrey A. Hoffer, Ramesh Venkataraman, Heikki Topi:Modern Database Management, Pearson, 2015.
3. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems,Third Edition, McGraw-Hill 2003.

Reference Books:

1. Silberschatz A, Korth H F, and Sudarshan S, Database System Concepts, 5th edition, McGraw-Hill, 2006.Ramakrishnan R, and Gehrke J, Database Management Systems, 3rd edition,McGraw-Hill, 2003.
2. Jeffrey A. Hoffer, Ramesh Venkataraman, Modern Database Management, 2015

Course Outcomes

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

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

CSPCT405

Computer Organization and Architecture
(Coomon to CSE and ECE)

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit.Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.

Unit-II

Data representation: signed number representation, fixed and floating pointrepresentations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-andadd, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

Unit-III

Introduction to x86 architecture.

CPU

Control unitdesign: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU.

Memory system design: semiconductor memory technologies, memory organization.

Peripheral

Unit-IV

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memoryand cache coherency.

Unit-V

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Suggested books:

1. “Computer Organization and Design:The Hardware/Software Interface”, 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

2.

2. “Computer Organization and Embedded Systems”, 6th Edition by CarlHamacher, McGraw Hill Higher Education.

Suggested reference books:

1. “Computer Architecture and Organization”, 3rd Edition by John P. Hayes, WCB/McGraw-Hill
2. “Computer Organization and Architecture: Designing for Performance”, 10th Edition by William Stallings, Pearson Education.
3. “Computer System Design and Architecture”, 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

Course outcomes

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

- Draw the functional block diagram of a single bus **architecture of a computer and describe the function of the** instruction execution cycle, RTL interpretation of instructions, addressing modes,instruction set.
- Write assembly language program for specified microprocessor for computing
  - 16 bit multiplication, division and I/O device interface (ADC,

- Write a flowchart for Concurrent access to memory and cache coherency in **ParallelProcessors** and describe the process.
- Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.
- Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology

CSPCP406

Computer Organization and Architecture Lab

Instruction Hours/week :3Credits : 1.5
Sessional Marks : 40 End Semester Examinations Marks : 60

1. Implement Two assignments on Screen and Keyboard Operations
2. Implement One assignment on String Operations
3. Implement Three assignments on processing Binary Data, ASCII and BCD data
4. Implement One assignment on Table Processing
5. Implement Two assignments on Disk processing
6. Implement One assignment on Printing
7. Implement Two assignments on Macros and Linking to Subprograms
8. **Course Outcomes:**

Lab outcomes

- At the end of the course, students will be able to do
- Two assignments on Screen and Keyboard Operations
- One assignment on String Operations
- Three assignments on processing Binary Data, ASCII and BCD data
- One assignment on Table Processing
- Two assignments on Disk processing
- One assignment on Printing
- Two assignments on Macros and Linking to Subprograms

https://www.ic.unicamp.br/~pannain/mc404/aulas/pdfs/Art%20Of%20Intel%20x86%20Assembly.pdf

ECESTP 407

Digital Electronics Lab
(Common to EEE and CSE)

Instruction Hours/week :3 Credits : 1.5
Sessional Marks : 40 End Semester Examinations Marks : 60

The concepts should be practiced using Digital Electronics lab assignments

1. study basic gates and verify their truth tables
2. design and construct basic flip-flops
3. design and implement encoder and decoder
4. design and implement multiplexer
5. design and implement demultiplexer
6. Design adder, subtractor circuit using a 4-bit adder IC
7. design and construct of Synchronous Counter
8. design and construct Asynchronous counter
9. realize Basic gates (AND,OR,NOT) From Universal Gates(NAND & NOR).

CSPCP408

Database Management Systems Lab

Instruction Hours/week :3 Credits : 1.5
Sessional Marks : 40 End Semester Examinations Marks : 60

1. Implement Design information systems
2. Implement Tuple Calclus to SQL
3. Implement Domain Callculus to SQL
4. Relational Algebra to SQL
5. Implement operations(Create, retrieve, update, delete)using Java/SQL
6. Implement operations(Create, retrieve, update, delete)using Python
7. Implement operations(Create, retrieve, update, delete)using PL/SQL
8. Implement XML queries
9. Implement XML/Python for DDBS

Lab outcomes
At the end of the course, students will be able to learn

1. To able to learn
- Design information systems
- Tuple Calclus to SQL
- Domain Callculus to SQL
- Relational Algebra to SQL
- operations(Create, retrieve, update, delete)using Java/SQL
- operations(Create, retrieve, update, delete)using Python
- operations(Create, retrieve, update, delete)using PL/SQL
- XML queries
- XML/Python

CSPCP409

Design and Analysisof Algorithms Lab

Instruction Hours/week :4Credits : 2
Sessional Marks : 40 End Semester Examinations Marks : 60

2. Implement Warshall's and Floyd's algorithm using Dynamic Programming
3. Implement Knapsack problem and Memory functions using Dynamic Programming
4. Implement Prim's algorithm using Greedy Method
5. Implement Kruskal's algorithm using Greedy Method
6. Implement Dijkstra's algorithm using Greedy Method
7. Implement Hamiltonian Circuit using Greedy Method
8. Implement Brute-force string matchingusing Brute force
9. Implement Horsepool algorithm using Space and Time tradeoffs
10. Implement Boyer-Moore algorithm using Space and Time tradeoffs
11. Implement Traveling salesman problem for Graphs
12. Implement Hamiltonian Circuit problem for Graphs
13. Implement BFS and DFS for trees

Lab outcomes
At the end of the course, students will be able to do

- Warshall's and Floyd's algorithm using Dynamic Programming
- Knapsack problem and Memory functions using Dynamic Programming
- Prim's algorithm using Greedy Method

- Kruskal's algorithm using Greedy Method
- Dijkstra's algorithm using Greedy Method
- Hamiltonian Circuit using Greedy Method
- Brute-force string matchingusing Brute force
- Horsepool algorithm using Space and Time tradeoffs
- Boyer-Moore algorithm using Space and Time tradeoffs
- Traveling salesman problem for Graphs
- Hamiltonian Circuit problem for Graphs
- BFS and DFS for trees

HSMCT410

CONSTITUTION OF INDIA

Instruction Hours/week : 2(L) **Credits : 0**
Sessional Marks : 100 **Semester-end Examination : -**

Course Objectives:

Students will be able to:
1. understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT I

History and philosophy of the Indian Constitution
History -Drafting Committee, (Composition & Working) - Preamble - Salient Features

UNIT II

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT III

Organs of Governance: Parliament – Composition - Qualifications and Disqualifications - Powers and Functions, Executive President – Governor - Council of Ministers - Judiciary, Appointment and Transfer of Judges, Qualifications - Powers and Functions

UNIT IV

Local Administration:
District's Administration Head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO ZilaPachayat: Position and role. Block level: Organizational

Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT V

Election Commission: Election Commission: Role and Functioning - Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning.
Institute and Bodies for the welfare of SC/ST/OBC and women.

References:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to kmow

- the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- the passage of the Hindu Code Bill of 1956.

SEMESTER V

CSPCT501

Operating Systems

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I

Introduction: Concept of Operating Systems, Generations of Operating systems, Typesof Operating Systems, OS Services, System Calls, Structure of an OS - Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.Processes: Definition, Process Relationship, Different states of a Process, Process Statetransitions, Process Control Block (PCB), Context switching

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept ofmultithreads,Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Schedulingcriteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time;Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessorscheduling: Real Time scheduling: RM and EDF.

Unit-II

Inter-process Communication: Critical Section, Race Conditions, MutualExclusion,HardwareSolution, Strict Alternation, Peterson'sSolution,TheProducer\ConsumerProblem, Semaphores,EventCounters,Monitors,MessagePassing,ClassicalIPC Problems: Reader's &WriterProblem,Dinning Philosopher Problem etc.

Unit-III

Deadlocks: Definition, Necessary and sufficient conditions for Deadlock, Deadlockrevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

Unit-IV

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

Unit-V

I/O Hardware: I/O devices, Device controllers, Direct memory access Principles of I/OSoftware: Goals of Interrupt handlers, Device drivers, Device independent I/Osoftware,Secondary-torage Structure: Disk structure, Disk scheduling algorithmsFile Management: Concept of File,Access methods, File types, File operation,Directorystructure,File Systemstructure,Allocation methods (contiguous,linked,indexed),Free-space management(bit vector, linked list, grouping), directoryimplementation(linearlist, hash table),efficiencyand performance.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Diskreliability, Disk formatting, Boot-block, Bad blocks

Suggested books:

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.

2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

Suggested reference books:

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

Course Outcomes

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

- Create processes and threads.
- Develop algorithms for process scheduling for a given specification of
- CPUutilization, Throughput, Turnaround Time, Waiting Time, Response Time.
- For a given specification of memory organization develop
- thetechniques for optimally allocating memory to processes by increasing memory
- utilization and for improving the access time.
- Design and implement file management system.
- For a given I/O devices and OS (specify) develop the I/O management
- functions in OS as part of a uniform device abstraction by performing operations for
- synchronization between CPU and I/O controllers.

CSPCT502

Formal Language &Automata Theory

Instruction Hours/Week : 3(L) Credits : 4

Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I

Need to study Automata Theory – Introduction to formal proof, Inductive proofs – Central concepts of Automata Theory – Informal picture of Finite Automata – Deterministic Finite Automata, Non deterministic Finite Automata and Applications – Finite Automation with Epsilon transitions.

UNIT II

Regular expressions and their applications – Finite automata and regular expressions – Algebraic laws far regular expressions.

Properties of Regular languages – Equivalence and Minimization of Automata.

UNIT III

Context free grammars – Parse trees – Applications of CFG – Ambiguous grammars and Languages.

Definition of pushdown automaton – Acceptance by PDA – Equivalence of PDA's and CFG's – Definition of PDA.

UNIT IV

Normal terms for CFG's – Pumping lemma for CFG's – closure and decision properties of CFL's

Turing machine model – Representation of Turing machines – Language acceptability by Turing machine – Design of Turing machines – Universal. Turing machine – Halting problem of Turing machines.

UNIT V

Introduction to undecidable problems – The classes of P and NP – NP complete problems.

Suggested books

1. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation, Pearson Education Asia.

Suggested reference books:

1. Harry R. Lewis and Christos H. Papadimitriou, Elements of the Theory of Computation, Pearson Education Asia.

2. Dexter C. Kozen, Automata and Computability, Undergraduate Texts in Computer Science, Springer.

3. Michael Sipser, Introduction to the Theory of Computation, PWS Publishing.

4. John Martin, Introduction to Languages and The Theory of Computation, Tata McGraw Hill.

Course Outcomes

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

- Write a formal notation for strings, languages and machines.
- Design finite automata to accept a set of strings of a language.
- For a given language determine whether the given language is regular or not.
- Design context free grammars to generate strings of context free language .
- Determine equivalence of languages accepted by Push Down Automata and languages generated by context free grammars
- Write the hierarchy of formal languages, grammars and machines.
- Distinguish between computability and non-computability and Decidability and undecidability.

CSPCT503

Computer Graphics

Instruction Hours/Week : 3(L) Credits : 3

Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I

Introduction- Image processing as picture analysis, Advantages of Interactive Graphics, Representative uses of computer graphics, Classification of applications, Development of hardware and software for computer graphics, Conceptual framework for Interactive Graphics.

Scan Converting Lines – Basic Incremental algorithm, Midpoint Line algorithm and additional issues; Scan Converting Circles, Scan Converting Ellipses, Solid Filling– Rectangles, Polygons and Ellipse arcs; Pattern filling, Thick primitives, Cohen-Sutherland line clipping algorithm, Parametric line clipping algorithms, Sutherland-Hodgeman polygon clipping algorithm, Generating characters and Antialiasing.

UNIT II

Display Systems - Raster-scan and Random scan.

Geometrical transformations – 2D transformations, Homogeneous coordinates, Matrix representation of 2D transformations, Composition of 2D transformations, Window to view-port transformation, Matrix representation of 3D transformations, Composition of 3D transformations and Transformation as a change in coordinate system.

Representing Curves and surfaces – Polygon meshes, Parametric cubic curves, Parametric bicubic surfaces andQuadric surfaces.

Fractals – Lines and Surfaces.

UNIT III

Viewing in 3D - Projections, Specifying an arbitrary 3D view, Examples of 3D viewing, Mathematics of planar geometric projections, Implementing planar geometric projections, Coordinate systems.

Solid Modeling – Representing solids, Regularized Boolean set operations, Primitive instancing, Sweep representations, Boundary representations, Spatial-Partitioning Representations, Constructive solid geometry, Comparison of representations, User interfaces for solid modeling.

UNIT IV

Achromatic and Colored Light – Achromatic light, Chromatic color, Color models for raster graphics, Reproducing color, Using color in computer graphics.

Visible Surface Determination – Functions of two variables, Techniques for efficient visible surface algorithms, z-Buffer algorithm, Scan-line algorithms, Visible surface ray tracing.
UNIT V
Illumination Models - Ambient light, Diffuse reflection, Atmospheric attenuation.
Shading4 Models – Constant shading, Interpolated shading, Polygon mesh shading, Gouraud shading, Phong shading, Problems with interpolated shading.
Surface Detail – Surface-detail polygons, Texture mapping, Bump mapping.
Animation – Conventional and Computer-Assisted animation, Animation languages, Methods of controlling animation, Basic rules of animation, Problems peculiar to animation.

Text Book:
1. Hughes J F, Van Dam A, Foley J D, et al., Computer Graphics*:* Principles and Practice, 3rd edition, Addison-Wesley, 2013.

Reference Books:
1. Foley J D, Van Dam A, Feiner S K, John F H, Computer Graphics*:* Principles & Practice in C, 2nd edition, Pearson Education, 1995.

Course Outcomes

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

- Image processing as picture analysis
- Geometrical transformations
- Viewing in 3D –Projections
- Animation

GEMCT504

Industrial Management

Instruction Hours/Week : 3(L) Credits : 2
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit I
Definition of Management, Management Functions, Management and Administration, Nature of Management, Universality of Management Principles of Management, Organization Approaches, Organization Structures and Process of Organizing
Unit-II
Nature and Scope of Financial management, Capital Budgeting, Cost of Capital and Working Capital Management
Unit II**I**
Process Design – Identifying, Selecting and Sequencing the Required Processes,Job Sequencing and Operations Scheduling.
Aggregate Production Planning, material Requirements Planning and Project Planning and Scheduling.
Unit IV
Purchasing – Objectives, Responsibilities, Policies, Practices, Procedures, Organization for Purchasing and Relationship of Purchasing with Other Departments
Marketing Management – Nature and Functions of Marketing, Distribution Channels and Marketing Research.
Unit-V
Human Resources Development – Dynamic Personnel Management, Staffing Policies and Process, and Wage and Salary Policies and Administration.

Text Books

1. R D Agarwal, Organization and Management, Tata McGraw – Hill, 2000
2. James A Tompkins and John A White, Facilities Planning, John Wiley &
3. Sons 1954
4. Elsaye A Elsayed and Thomas O Boucher, Analysis and Control of Production Systems, prentice-Hill, 1985
5. O.P Khanna, Industrial Engineering and Management , Dhanpat Rai Publication, Reprint 20003

Course Outcomes
At the end of the course, students will be able to learn

- To understand Management Functions
- To understand Organization Structures
- To understand Process Design
- To understand Marketing Management
- To understand Human Resources Development

Professional Elective-I
CSPET515

Software Engineering

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I
Software and Software Engineering: Nature of software, Unique nature of WebApps, Software engineering, The software process, Software engineering practice, Software myths.
Process Models: A generic process model, Process assessment and improvement, Prescriptive process models - Waterfall model, Incremental process models, Evolutionary process models, Concurrent models; Specialized process models - Component-based development, The formal methods model, Aspect-oriented software development; The unified process, Personal and Team process models, Product and process.

UNIT II
Agile Development: Concept of agility, Agility and cost of change, The agile process, Agility principles, Extreme programming (XP), The XP process, The XP debate, Other agile process models - Adaptive software development, Scrum, Dynamic systems development method, Crystal, Feature driven development, Lean software development, Agile modeling, Agile unified process; A tool set for the agile process.
Principles that Guide Practice: Software engineering knowledge, Core principles, Principles that guide each framework activity - Communication principles, Planning principles, Modeling principles, Construction principles, Deployment principles.
Understanding Requirements: Requirements engineering, Establishing the groundwork, Eliciting requirements, - Collaborative requirements gathering, Quality function deployment, Usage scenarios, Elicitation work products; Developing use cases, Building the requirements model, Negotiating and validating requirements.

UNIT III
Requirements Modeling: Scenarios, Information, and Analysis Classes: Requirements analysis,
Overall objective and philosophy, Requirements modeling approaches, Scenario-based modeling, UML Use Case, Activity diagram, Swimlane diagrams, Data modeling concepts, Class-based modeling, Class-responsibility-collaborator modeling.

Requirements Modeling: Flow, Behavior, Patterns, and WebApps: Requirements modeling strategies, Flow-oriented modeling, Creating a behavioral model, Patterns for requirements modeling, Requirements modeling for WebApps.

UNIT IV

Design Concepts: Design within the context of software engineering, The design process, Design concepts – Abstraction, Patterns, Modularity, Information hiding, Functional independence, Refinement, Refactoring, Object-oriented design concepts; The design model.- Data design, Architectural design, Interface design, Component-level design, Deployment-level design.

Architectural Design: Software architecture, Architectural genres, Architectural style, Architectural design, Assessing alternate architectural designs, Architectural complexity, Architectural mapping using data flow.

Component-level Design: Concept of a component, Designing class based components, Conducting component-level design, Component-level design of WebApps, Designing traditional components, Component-based development.

UNIT V

User Iinterface Design: The golden rules, User interface analysis and design, Interface analysis, Interface design steps, WebApp interface design.

Pattern-based Design: Design patterns, Pattern-based software design, Architectural patterns, Component-level design patterns, User interface design patterns, WebApps design patterns.

Webapp Design: WebApps design quality, Design goals, A design pyramid for WebApps, WebApps interface design, Aesthetic design, Content design, Architecture design, Navigation design, Component-level design, Object oriented hypermedia design method.

Text Book:

Pressman R S, Software Engineering: A Practitioner's Approach, 7th edition, McGraw-Hill, 2010. (Chapters 1 to 13)

Reference Books:

1. Sommerville I, Software Engineering, 9th edition, Pearson Education, 2011.
2. Jalote P, Software Engineering: A Precise Approach, Wiley, 2010.
3. Braude E J, Bernstein M E, Software Engineering: Modern Approaches, 2nd edition, Wiley, 2010.
4. Ghezzi C, Jazayeri M, Mandrioli D, Fundamentals of Software Engineering, 2nd edition, PHI, 2003.
5. Saleh K A, Software Engineering, J Ross Publishing, 2009.
6. Bruegge B, Dutoit A H, Object-Oriented Software Engineering Using UML, Patterns, and Java, 3rd edition, Prentice Hall, 2009.
7. Tsui F, Karam O, Essentials of Software Engineering, 2nd edition, Jones & Bartlett, 2009.
8. Schmidt M E C, Implementing the IEEE Software Engineering Standards, Sams, 2000.
9. Pilone D, Miles R, Head First Software Development, O'Reilly (Shroff), 2008.
10. Bennett S, McRobb S, Farmer R, Object-Oriented System Analysis and Design Using UML, 4nd edition, McGraw-Hill, 2010.
11. Lethbridge T C, Laganiere R, Object-Oriented Software Engineering, 2nd edition, McGraw-Hill, 2005.

Course Outcomes

- At the end of the course, students will be able to learn
- Process Models
- Agile Development
- Requirements Modeling
- Design Concepts
- User Iinterface Design

Professional Elective-I

CSPET525

Software Architecture

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I
Introduction, Architectural styles – pipes and filters, Data abstraction and object-oriented organization, Event-based implicit invocation, Layered systems, Repositories, Interpreters, Process control, Other familiar architectures, Heterogeneous architectures**.**

Shared information systems – Database integration, integration in software development environments, Integration in the design of buildings, Architectures for shared information systems
Unit-II
Architectural design guidance – Guidance for user-interface architecture, Quantified design space

Formal models and specification – Value of architectural formalism, Formalizing architecture of a specific system, Formalizing an architectural style, Formalizing an architectural design space, Toward a theory of software architecture
Unit-III
Architectural Patterns- Introduction, From mud to structure, Distributed systems, Interactive systems, Adaptable systems
Unit-IV
Design Patterns– Introduction, Structural decomposition, Organization of work, Access control, Management, Communication
Unit-V
Idioms – Introduction, What can Idioms provide ?, Idioms and style, Where can you find idioms,

Patterns and Software Architecture- Introduction, Patterns in Software architectures, Enabling techniques for software architecture, Non-functional properties of software architecture**.**
Text Books

1. Mary Shaw and David Garlan, Software Architecture- Perspectives on an Emerging Discipline, Prentice-Hall of India, 2004

2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad and Michael Stal, Pattern-Oriented Software architecture **:**A system of patterns – Volumes1, John-Wiley, 2001

Reference Books

1. Len Bass, Paul Clements and Rick Kazman, Software Architecture in Practice, second Edition, Pearson Education Asia, 2005
2. Erich Gamma, Richard Helm, Ralph Johnson and John Vlissides, Design Patterns **:**Elements of Reusable Object-Oriented Software, Pearson Education Asia, 2005

Course Outcomes

- At the end of the course, students will be able to learn
- Architectural styles
- Shared information systems
- Architectural Patterns
- Design Patterns
- Patterns and Software Architecture

HSMCT 406

Managerial Economics

Instruction Hours/Week : 3(L) Credits : 2
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I

Introduction - Nature and Scope of Managerial Economics, Economic Theory and Managerial Economics, Managerial Economist: Role and Responsibilities.

Demand Analysis and Forecasting – Demand Determinants, Demand Distinctions, Demand Forecasting: General Considerations, Methods of Demand Forecasting.

UNIT II

Cost Analysis – Cost Concepts, Classifications and Determinants; Cost-Output Relationship, Economies and Diseconomies of Scale, Cost Control and Cost Reduction.

Production and Supply Analysis – Production Functions, Supply Analysis.

UNIT III

Price and Output Decisions Under Different Market Structures – Perfect Competition, Monopoly and Monopsony; Price Discrimination, Monopolistic Competition, Oligopoly and Oligopsony.

UNIT IV

Pricing Policies and Practices – Pricing Policies, Pricing Methods, Specific Pricing Policies, Price Discounts and Differentials; Product-line Coverage and Pricing; Price Forecasting.

UNIT V

Profit Management – Nature of Profit, Measuring Accounting Profit,Profit Policies, Profit Planning and Forecasting.

Capital Management - Capital Budgeting, Cost of Capital, Appraising Project Profitability, Risk, Probability and Investment Decisions.

Text Book:

1. Varshney R L and Maheshwari K L, Managerial Economics, 19th Edition, Sultan Chand and Sons, 2009.

2. Managerial Economics and Business Strategy (English, Paperback, Michael R. Baye), Tata McGraw-Hill, 2008

Reference Books:

1. Froeb L M, and McCann B T, Managerial Economics*:* A Problem Solving Approach, Cengage Learning, 2008.
2. Dean J, Managerial Economics, PHI, 2010.

Course Outcomes

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

- Have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses
- Be able to perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.
- Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.
- Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.
- Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.

- Be able to understand how competitive bidding works and how to submit a competitive bid proposal.

CSPCP507

Operating Systems Lab

Instruction Hours/week :3Credits : 1.5
Sessional Marks : 40 End Semester Examinations Marks : 60

1. Implement Election Algorithm-The Bully Algorithm
2. Implement Election Algorithm,- The Token Ring Algorithm
3. Implement Cristan's Algorithm
4. Implement Berkley Algorithm
5. Implement Arranging Algorithm
6. Implement Token Ring Algorithm
7. Implement Page replacement Algorithms
8. Implement Deadlock Detection and Prevention Algorithm in Distributed System
9. Implement Precession Allocation Algorithm
10. Implement A Bidding Algorithm
11. Simulate the mutual exclusion in distributed systems using centralized algorithm.
12. Simulate the mutual exclusion in distributed systems using distributed algorithm.

Lob outcomes

- At the end of the course, students will be able to do
- Election Algorithm-The Bully Algorithm
- Election Algorithm,- The Token Ring Algorithm
- Cristan's Algorithm
- Berkley Algorithm
- Arranging Algorithm
- Token Ring Algorithm
- Page replacement Algorithms
- Deadlock Detection and Prevention Algorithm in Distributed System
- Precession Allocation Algorithm
- A Bidding Algorithm
- Simulate the mutual exclusion in distributed systems using centralized algorithm.
- Simulate the mutual exclusion in distributed systems using distributed algorithm.

CSPCP507

Computer Graphics Lab

Instruction Hours/week :3 Credits : 1.5
Sessional Marks : 40 End Semester Examinations Marks : 60

1. Write program to continuously rotate an object about a point
2. Write program to composition of two rotations
3. Write program that transformation to display object
4. Implement various clipping and filling algorithms
5. Implement rectangle and polygon filling
6. Implement polygon representation of cylinder
7. Implement Display a cubic begier curve
8. Implement three dimensional objects and its transformation and rotation
9. Implement projection using parallel projection

Lab outcomes

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

- program to continuously rotate an object about a point
- program to composition of two rotations
- program that transformation to display object
- various clipping and filling algorithms
- rectangle and polygon filling
- polygon representation of cylinder
- Display a cubic begier curve
- three dimensional objects and its transformation and rotation
- projection using parallel projection

SEMESTER VI

CSPCT601

Complier Construction

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I
The aim is to learn how to design and implement a compiler and also to study the underlying theories. The main emphasis is for the imperative language. Introduction: Phases of compilation and overview.
Unit-II
Lexical Analysis (scanner): Regular languages, finite automata, regular expressions, from regular expressions to finite automata, scanner generator (lex, flex).
Unit-II
Syntax Analysis (Parser): Context-free languages and grammars, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc,bison)
Unit-III
Semantic Analysis:Attribute grammars, syntax directed definition, evaluation and flow of attributein a syntax tree.SymbolTable: Itsstructure,symbol attributesand management.Run-timeenvironment:Procedureactivation, parameter passing,value return,memoryallocation, nandscope.
Unit-IV
Intermediate Code Generation: Translation of different language features,differenttypes ofintermediateforms.Code Improvement(optimization): Analysis: control-flow,data-flow dependence etc.; Code improvement local optimization, global optimization,loopoptimization,peep-hole optimizationetc. Architecturedependentcodeimprovement: instruction scheduling (for pipeline), loop optimization (for cache memory) etc. Register allocation and target code generation
Unit-V
Advanced topics: Type systems, data abstraction, compilation of Object Oriented features and non-imperative programming languages.

Text Book:

1. Aho A V, M. S LamSethi R, and Ullman J D, Compilers-Principles, Techniques and Tools, 2nd edition, Pearson Education, 2012.
2. A.A. Puntambekar, Compiler Construction, Technical Publications, 2009.

Reference Books:

1. Grune D, Bal H E,Jacobs C J H,andLangendoen K G,*Modern Compiler Design*, Wiley 2000.

Course Outcome

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

- For a given grammar specification develop the lexical analyser

- For a given parser specification design top-down and bottom-up parsers
- Develop syntax directed translation schemes
- Develop algorithms to generate code for a target machine

CSPCT602

Computer Networks

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I

Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

Physical Layer: Transmission Media coppers, Twisted pair wireless, Switching and encoding Asynchronous Communications, Narrow Brand Broad Brand ISDN and ATM.

Unit-II

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

Unit-IV

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Unit-IV

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP),Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Unit-V

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File TransferProtocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

Suggested books

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.

2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.
3. Suggested reference books

4. Computer Networks, 8th Edition, Andrew S. Tanenbaum, Pearson New International Edition.

5. Vilas S Bagad and Irish ADhotre, Computer Networks, Technical Publications, Pune,

Course Outcomes

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

- Explain the functions of the different layer of the OSI Protocol.
- Draw the functional block diagram of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) describe the function of each block.
- For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component
- For a given problem related TCP/IP protocol developed the network programming.
- Configure DNS DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls using open source available software and tools.

Professional Elective-II

CSPET613

Principles of Programming Languages

Instruction Hours/Week : 3(L) Credits : 3

Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I

Preliminaries; Reasons for studying concepts of Programming Languages, Programming Domains, Language evaluation criteria , Inffuences on Language design, Language categories Language design trade-offs, Implementation methods, Programming environments.

Describing syntax and semantics: Introduction, the general problems of describing syntax formal methods of describing syntax, recursive descent parsing, attribute grammars, dynamic semantics

Name binding, type checking Names vanables, the concept of binding type checking strong typing, type compatibility

Umit-II

Scope, Scope, Scope and life time, Referencing environments, Named constants, Variable initialization.

Data types: Introduction, Primitive Data Types, Character String Types, User-defined ordinal type, array types, Associative arrays, Record Union set, pointer

Expressions and Assignment Statements: Arithmetic Expressions, Overloaded Operators type Conversions, Relational and Boolean Expressions , Short circuit evaluation, Assignment Statements, Mixed-Mode Assignments.

Unit-III

Statement-level Control Structures: Compound Statements, Selection Statements, Iterative statements, Unconditional Branching

Sub Programs: Fundamentals, Design Issues, Local referencing environment. Parameter passing Methods, Parameters that are Sub program names, Overioaded

Sub programs, Generic Sub Programs, Separate and Independent Compilation, Design issues for functions Accessing non-local environments, User Defined Overloaded Operators, Co-routines
Implementing Sub Programs: The general semantics of calls and returns, Implementing FORTRAN 77 and ALGOL- like sub programs, Blocks, Implementing dynamic scoping implementing parameters that are sub program names
Unit-IV
Abstract Data type: The concept of abstraction, Encapsulation, Introduction to data abstraction, Design issues, Language examples, Parameterized abstract data types
Concurrency : Introduction, Introduction to subprogram-level
Concurrency: semaphores, Monitors, Message passing, Concurrency in Ada 95. Java threads, statement-level concurrency
Exception Handling: Introduction to exception handling in PL/1. Ada, C++ ,JAVA . Perl, Python
Unit-V
Support for Object-Oriented Programming: Object-Oriented Programming, Design issues Support for Object-Oriented Programming in C++ JAVA , Perl, Python, Implementation of Object-Oriented constructs.
Functional Programming Language: Overview the origins of prolog, Basic elements of Prolog deficiencies of Prolog, applications.
Text Books

1. Robert w. Sebesta, ?Concepts of programming Languages, Fourth edition pearson Education Asia.

Course Outcomes
At the end of the course, students will be able to learn

Reasons for studying concepts of Programming Languages
Programming Domains, Language evaluation criteria
Language design
Language categories Language design trade-offs
Implementation methods
Programming environments

Professional Elective-II
CSPET623

Object Oriented Programming

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I
Thinging Object Oriented, Abstraction, Abstract data types and their specification.How to implement an ADT. Concrete state space, concrete invariant, abstractionfunction. Implementing operations, illustrated by the Text example.
Unit-II
Object Oriented Design, Features of object-oriented programming. Encapsulation, object identity, polymorphism, .Inheritance, multi-inheritance in OO design.
Unit-III
Classes and Methods, Over loading ,over riding, Design patterns. Introduction and classification. The iterator pattern.Model-view-controller pattern. Commands as methods and as objects, exeption handling,

Unit-IV
Implementing OO language features. Memory management.
Generic types and collections, Object inter communication
Unit-V
GUIs. Graphical programming with Scala and Swings. The software developmentprocess.

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Suggested books

2. Barbara Liskov, Program Development in Java, Addison-Wesley.
3. Budd T, An Introduction to Object-Oriented Programming, 3rd edition, Pearson Education.

Course Outcomes

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

- Specify simple abstract data types and design implementations, using abstraction functions to document them.
- Recognise features of object-oriented design such as encapsulation, polymorphism, inheritance, and composition of systems based on object identity.
- Name and apply some common object-oriented design patterns and give examples of their use.
- Design applications with an event-driven graphical user interface.

Professional Elective-III
CSPET614

Advanced Computer Architecture

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I
Unit I
Theory of Parallelism, Parallel Computer Models, Program and network Properties, Processors and Memory hierarchy, Bus, Cache and Shared memory
Unit II
Pipelining and Super Scalar Techniques, Principles of Scalable Performance, Multiprocessors and Multicomputers
Unit III
Multivector and SIMD Computers, scalable, Multi Threads and Data flow Architecture
Unit IV
Scalable, Multithreaded and Dataflow Architectures
Unit V
Parallel Models, Languages and Compilers, Parallel Program Development and Environment

Text Books

1. Kai Hwang and Naresh Jotwan, Advanced Computer Architecture, Tata McGrahill
2. Kai Hwang, Advanced Computer Architecture – parallelism, ScalabilityProgrammability , McGraw-Hill International Editions

ReferenceBooks

1. M J Quinn, Designing Efficient Algorithms for Parallel Computers,McGraw-Hill Publications.

Course Outcomes

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

Theory of Parallelism
Parallel Computer Models
Program and network Properties
Processors and Memory hierarchy
Cache and Shared memory

Professional Elective-III
CSPET624

VLSI Design

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I
Introduction to Digital systems **and VLSI:** Why Design Integrated Circuits? Integrated Circuits manufacturing; Integrated Circuit Design Techniques; IP-Based Design
Unit-II
Sequential Machines**:** Introduction; Latches and Flip-flops; Sequential systems and clocking disciplines; Performance analysis; Clock generators;Sequential systems design, Power optimization, Design validation, Sequential testing.
Unit-III
Subsystem Design: Introduction; Combinational shifters; Adders;ALUs;Multipliers, High-density memory, Image Sensors, FPGAs;PLA
High-density memoryBuses and networks on chips; Data paths; Subsystems as IP
Unit-IV
Architecture Design**:** Introduction; Hardware description languages;Register Transfer design; Pipelining; High-level synthesis; Architecture for low power; GALS systems; Architecture testing; IP components;Design methodologies; Multiprocessor system-on-Chip design
Unit-V
Simulations: General remarks; Gate-level modeling and simulation,switch-level modeling and simulation.
Text Books:
1. Wayne Wolf: "Modern VLSI design", 4th Edition, PHI Learning, 2007.
2. Sabih H Gerez: "Algorithms for VLSI Design Automation", Wiley India, 2007.

Course Outcomes

- At the end of the course, students will be able to learn
- Sequential Machines
- Subsystem Design
- Architecture Design
- design; Pipelining
- Multiprocessor systemdesign

Open Elective-I
CSOET605

Massive Online Open Courses (MOOCs)

No. of Credits: 3 Instruction Hours / Week: 3

Any one of the courses from AICTE SWAYAM

CSPCP606

Complier Construction Lab

Instruction Hours/week :3 Credits : 1.5
Sessional Marks : 40 End Semester Examinations Marks : 60

1. Impliment the lexical analyzer to identify lexicons.
2. Implement Parsers
3. Implement Intermediate code i) Three address code ii) Quadruples
4. Implement Intermediate code i) Three address code ii) Quadruples in the form of Polish notation.
5. Implement simulation of Heap storage.
6. Generate lexical analyzer s using LEX
7. Implement the YACC macrcros like yytext, yyleng yymore, yyless , yycopy , yyinput yywrap noyywrap etc.
8. Implement clalculator using LEx and YACC

Lab outcomes

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

- the lexical analyzer to identify lexicons.
- Parsers
- Intermediate code i) Three address code ii) Quadruples
- Intermediate code i) Three address code ii) Quadruples in the form of Polish notation.
- simulation of Heap storage.
- Generate lexical analyzer s using LEX

- the YACC macrcros like yytext, yyleng yymore, yyless , yycopy , yyinput yywrap noyywrap etc.
- clalculator using LEx and YACC

CSPCP607

Computer Networks Lab

Instruction Hours/week :3 Credits : 1.5
Sessional Marks : 40 End Semester Examinations Marks : 60

1. Implement file transfer protocols
2. Implement Chechsum
3. Implement Slide window protocol
4. Implement FTP client
5. Implement bit stuffing
6. . Implementation Of Client-Server Communication Using TCP.
7. Simulation of routing protocol.
8. mplementation Of Peer to Peer connection using udp.
9. Demonstration to generate Socket programming
10. WindowChat Program.

Lab outcomes

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

- file transfer protocols
- Chechsum
- Slide window protocol
- FTP client
- bit stuffing
- . Client-Server Communication Using TCP.
- Simulation of routing protocol.
- Peer to Peer connection using udp.
- Demonstration to generate Socket programming
- WindowChat Program.

CSPWI 608

Internship/Mini Project

Instruction Hours/week :6 Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

The internship/Mini Project should be practiced in Emerging areas and applications.

SEMESTER VII

Professional Elective-IV
CSOET711

Cryptography and Network Security

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I
Introduction to Cryptography and Data Security: Concept of cryptology, Symmetric cryptography, Substitution cipher, Cryptanalysis, Modular arithmetic, Shift cipher, Affine cipher, Concept of stream cipher, Random number generators, One-time pad, Practical stream ciphers.

UNIT II
The Advanced Encryption Standard (AES): Concept of iterative ciphers, DES and its limitations, AES algorithm, Introduction to Galois fields, Internal structure of AES, Decryption.
Block Ciphers: Electronic Codebook Mode (ECB), Cipher Block Chaining Mode (CBC), Ouput Feedback Mode (OFB), Cipher Feedback Mode (CFB), Counter Mode (CTR), Galois Counter Mode(GCM).

UNIT III
Public-Key Cryptography: Symmetric vs. Asymmetric cryptography, Authenticity of public keys, Public-key algorithms, Key lengths and security levels, Euclidean algorithm, Extended Euclidean algorithm, Euler's Phi function, Fermat's Little theorem, Euler's theorem.
The RSA Cryptosystem: Encryption and Decryption, Key generation and proof of correctness.
Public-Key Cryptosystems Based on the Discrete Logarithm Problem: Diffie-Hellman key exchange, The discrete logarithm problem, Security of the Diffie-Hellman key exchange.

UNIT IV
Digital Signatures: The basic principle, The RSA signature scheme, Computational aspects.
Hash Functions: Integrity of messages, Concept of a hash function, Security requirements of hash Functions, MD4-Family of hash functions, Hash functions from block ciphers, The Secure Hash Algorithm (SHA).

UNIT V
Message Authentication Codes (MACs): The basic principle, HMAC, CBC-MAC, GMAC.
Key Establishment: Introduction, Key freshness and key derivation, The n^2 key distribution problem, Key establishment with a key distribution center, Kerberos, Man-in-the-Middle Attack, Certificates, Public-Key Infrastructures (PKI) and CAs.

Text Book:
1. Paar C, Pelzl J, Understanding Cryptography, Springer, 2010.
2. Bruce Schneier, Applied Cryptography: Protocols, Algorithms and Source Code in C, WILEY, 2015.

Reference Books:
1. Mao W, Modern Cryptography – Theory & Practice, Pearson Education, 2004.

2. Stinson D R, Cryptography*:* Theory and Practice, 3rd edition, Chapman and Hall CRC, 2006.
3. Schneier B, Applied Cryptography, 2nd edition, Wiley, 2006.

Course Outcomes

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

- The Advanced Encryption Standard
- Block Ciphers
- Public-Key Cryptography
- Digital Signatures

Professional Elective IV
CSPET721

Cloud Computing

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I
Introduction: Definition, Historical developments, Computing platforms and technologies.
Principles of Parallel and Distributed Computing: Parallel versus distributed computing, Elements of parallel computing, Elements of distributed computing, Technologies for distributed computing.

UNIT II
Virtualization: Characteristics, Virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples.
Cloud Computing Architecture: Cloud reference model, Types of clouds, Economics of clouds, Open challenges.
Aneka: Cloud Application Platform: Framework overview, Anatomy of the Aneka container, Building Aneka clouds, Cloud programming and management.

UNIT III
Concurrent Computing- Thread Programming: Programming applications with threads, Multithreading with Aneka, Programming applications with Aneka threads.
High Throughput Computing- Task Programming: Task computing, Task-based application models, Aneka task-based programming.

UNIT IV
Data Intensive Computing – Map-Reduce Programming: Introduction, Technologies for data-intensive computing, Aneka MapReduce programming.
Cloud Platforms in Industry: Amazon web services, Google AppEngine, Microsoft Azure.

UNIT V
Cloud Applications: Scientific applications in – Healthcare, Biology, Geo-science; Business applications in – CRM and ERP, Productivity, Social networking, Media applications, Multiplayer online gaming.

Advanced Topics in Cloud Computing: Energy efficiency in clouds, Market based management of clouds, Federated clouds / InterCloud, Third party cloud services.

Text Book:

1. Buyya R, Vecchiola C, Selvi S T, Mastering Cloud Computing, McGraw Hill, 2013.
2. Zaigham Mahmood, Pamela J. Wise-Martinez, Thomas Erl, Ricardo Puttini Cloud Computing - Concepts, Technology & Architecture, Pearson, 2014

Reference Books:

1. Rittinghouse J W, Ransome J F, Cloud Computing - Implementation, Management, and Security, CRC Press, 2010.
2. Velte A T, Velte T J, Cloud Computing - A Practical Approach, McGraw Hill, 2011.
3. Sosinsky B, Cloud Computing Bible, Wiley, 2011.

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Course Outcomes

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

- Principles of Parallel and Distributed Computing
- Cloud Computing Architecture
- Concurrent Computing
- Data Intensive Computing
- Cloud Applications

Professional Elective-V
CSPET712

Mobile Computing

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I

Introduction:Introduction to Mobile Computing, Introduction to AndroidDevelopment Environment, Factors in Developing Mobile Applications, MobileSoftware Engineering, Frameworks and Tools, Generic UI DevelopmentAndroid User

Unit –II

More on Uis: VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal Uis, . Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content
Provider

Unit-III

Communications via Network and the Web:State Machine, CorrectCommunications Model, Android Networking and Web, TelephonyDeciding Scope of an App, Wireless Connectivity and Mobile Apps, AndroidTelephonyNotifications and Alarms:Performance, Performance and Memory Management, Android Notifications and Alarms, Graphics, Performance and Multithreading, Graphics and UI Performance, Android Graphics

Unit-IV

Putting It All Together : Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services Android Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia

Unit –V

Platforms and Additional Issues : Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking , Active Transactions, More on Security, Hacking Android Recent trends in Communication protocols for IOT nodes, mobile computimng techniques in IOT, agents based ommunications in IOT

Course Outcomes

- identify the target platform and users and be able to define and sketch a mobile application
- understand the fundamentals, frameworks, and development lifecycle of mobile application platforms including iOS, Android, and PhoneGap
- Design and develop a mobile application prototype in one of the platform hallenge project)

Text Book:

1. Wei-Meng Lee, Beginning Android™ 4 Application Development, 2012 by John Wiley & Sons

References

2. Marko Gargenta, Learning Andraid, Oreilly

Course Outcomes

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

AndroidDevelopment Environment
Factors in Developing Mobile Applications,
MobileSoftware Engineering
Frameworks and Tools

Professional Elective-V
CSPET722

System Programming

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I

Background : Introduction, System software and machine structure, SIC, CISC, RISC Architectures.

Assemblers: Basic Assembler Functions, Machine-Dependent Assembler Features, Machine independent Assembler Features, Assembler Design Options, and Implementation Examples.

Unit-II

Loaders and Linkers: Basic loader Functions,Dependent Loader Features Machine Independent Loader Features,Loader Design Options, Implementation Examples.

Unit-III

Macro Processors: Basic Macro Processor Functions, Machine -Independent, Macro processor Features, Macro processor design Options, implementation Examples.

Other System Software: Text Editors, interactive Debugging Systems.

Unit-IV

Device Drivers: Grand design, details,types of device drivers, Gross anatomy of a device driver,General Programming consideration

Character Driver I:A test data generator - design issues, driver, recapitulation.

Character Driver II:An A/D converter-design issues, driver.

Character Driver III:Aline Printer-design issues, driver.

Unit-V

Block Drivers III:A SCSI Disk Driver-design issues, driver B

lock Drivers II:A RAM Disk drive-design issues, Driver

Block Drivers II:A RAM Disk drive-design issues, driver.

Text Books

1. Leland L.beck,System Software: An introduction to Systems Programming,3/E,Pearson education Asia,2003.
2. 2.George pajari,writing Unix Drivers, Addison-Wesley,1991.

Reference Book

1. DM Dhamdhere,System Programming and Operating Systems, Books 2nd Edition,Tata McGraw Hill, **1999.**

Course Outcomes

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

Loaders and Linkers

Macro Processors

Device Drivers

Open Elective-II
CSOET 713

Cyber Law and Ethics

Instruction Hours/Week : 3(L) Credits : 3

Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I

An Overview of Ethics: Introduction, Morals, Ethics, Laws, Ethics in the business world, Ethics in information technology.

Ethics for IT Workers and IT Users: Nature of IT profession, Professional relationships, Concept of professional code of ethics, Certification, IT professional malpractice, Common ethical issues for IT users, Supporting the ethical practices.

UNIT II

Computer and Internet Crime: IT security incidents, Laws for prosecuting computer attacks, Implementing trustworthy computing,

Privacy: Information privacy, Privacy laws, Key privacy and anonymity issues – Identity theft, Consumer profiling, Workplace monitoring, Advanced surveillance technology.

UNIT III

Freedom of Expression: Free speech issues and laws, Controlling access to information on the Internet, Anonymity on the internet, Defamation and hate speech, Corporate blogging, Pornography.

Intellectual Property: Concept of intellectual property, Copyright, Software copyright protection, International and National agreements and laws, Patents, Trade secrets,

Plagiarism, Reverse engineering, Open source code, Competitive intelligence, Trademark infringement, Cyber squatting.

UNIT IV
Software Development: The importance of software quality, Software product liability, Development of safety-critical systems, Quality management standards.
The Impact of IT on Productivity and Quality of Life: IT investment and productivity, The digital divide, The impact of IT on healthcare costs.

UNIT V
Social Networking: Introduction, Business applications of online social networking, Ethical issues in social networking, Online virtual worlds.
Ethics of IT Organizations: Key ethical issues for organizations, Outsourcing, Whistle-blowing, Green computing.
Codes of Ethics: ACM/IEEE Software engineering code of ethics, IE(India) code of ethics, CSI code of ethics.
Government Regulation: Indian IT act 2000, IT(Amendment act) 2008.
Text Book:
1. Johnson D G, Computer Ethics, 4th edition, Pearson, 2009.
2. Reynolds G, Ethics in Information Technology, 4th edition, Cengage Learning, 2012.

Reference Books:
1. Martin M, Schinzinger R, Introduction to Engineering Ethics, 2nd edition, McGraw
2. Deborah G. Johnson Computer Ethics, , Pearson, 2008

Course Outcomes

At the end of the course, students will be able to learn
- Ethics for IT Workers
- Computer and Internet Crime
- Freedom of Expression
- Intellectual Property

Social Networking

CSOET 723

Internet of Things

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I
Introduction to Internet of Things: Definition & Characteristics of IoT, Physical Design of IoT –Components, Protocols; Logical Design of IoT - Functional Blocks, Communication Models, Communication APIs; IoT Enabling Technologies - Wireless Sensor Networks, Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems; IoT Levels & Deployment Templates.
Domain Specific IoTs: Applications related to Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle.
IoT and M2M: M2M, Difference between IoT and M2M, SDN and NFV for IoT - Software Defined Networking, Network Function Virtualization.

UNIT II

IoT System Management with NETCONF-YANG: Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Network Operator Requirements, NETCONF, YANG, IoT Systems Management with NETCONF-YANG, NETOPEER.
IoT Platforms Design Methodology: Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specifications, IoT Level Specification, Functional View Specification, Operational View Specification, Device & Component Integration, Application Development; Case Study on IoT System for Weather Monitoring.
IoT Systems - Logical Design using Python: Python Data Types & Data Structures – Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions; Control Flow –if, for, while, range, break/continue, pass; Functions, Modules, Packages, File Handling, Date/Time Operations, Classes; Python Packages of Interest for IoT –JSON, XML, HTTPLib & URLLib, SMTPLib.

UNIT III

IoT Physical Devices & Endpoints: Basic building blocks of an IoT Device; Raspberry Pi architecture, Linux on Raspberry Pi, Raspberry Pi Interfaces; Programming Raspberry Pi with Python –Controlling and interfacing devices; Other IoT Devices –pcDuino, BeagleBone Black, Cubieboard.
IoT Physical Servers & Cloud Offerings: Introduction to Cloud Storage Models & Communication APIs; WAMP - AutoBahn for IoT; Xively Cloud for IoT; Python Web Application Framework –Django, Architecture and Development with Django; Designing a RESTful Web API; Amazon Web Services for IoT - Amazon EC2, Amazon AutoScaling, Amazon S3, Amazon RDS, Amazon DynamoDB, Amazon Kinesis, Amazon SQS, Amazon EMR; SkyNet IoT Messaging Platform.

UNIT IV

Case Studies Illustrating IoT Design: Home Automation - Smart Lighting, Intrusion Detection; Cities - Smart Parking; Environment - Weather Monitoring, Weather Reporting Bot, Air Pollution Monitoring, Forest Fire Detection; Agriculture - Smart Irrigation; Productivity Applications - IoT Printer.

UNIT V

Data Analytics for IoT: Apache Hadoop - MapReduce Programming Model, Hadoop MapReduce Job Execution, MapReduce Job Execution Workflow, Hadoop Cluster Setup; Using Hadoop MapReduce for Batch Data Analysis, Hadoop YARN; Apache Oozie - Workflows for IoT Data Analysis, Apache Spark, Apache Storm, Using Apache Storm for Real-time Data Analysis.
Tools for IoT: Chef - Multi-tier Application Deployment, Hadoop Cluster, Storm Cluster; Using NETCONF-YANG for IoT device Management, Managing Smart Irrigation IoT System, Managing Home Intrusion Detection IoT System; IoT Code Generator.

TEXT BOOK

1. Bahga A, Madisetti V, Internet of Things: A Hands-On Approach, Universities Press, 2015.

REFERENCE BOOKS

2. Miller M, The Internet of Things, Pearson Education, 2015.
3. Cassimally H, McEwen A, Designing the Internet of Things, Wiley, 2015.

4. Hersent O,Boswarthick D, Elloumi O, The Internet of Things: Key Applications andProtocols, Wiley, 2015.
5. Kurniawan A, Smart Internet of Things Projects, Packt Publishing, 2016.
6. Holler J, Tsiatsis V, Mulligan C, Avesand S, Karnouskos S, Boyle D, From Machine-to-
7. Machine to the Internet of Things: Introduction to a New Age of Intelligence, AcademicPress, 2014.
8. Greengard S, The Internet of Things (Essential Knowledge), MIT Press, 2015.
9. Buyya R, Dastjerdi, Internet of Things, Elsevier / Morgan Kaufmann, 2016.
10. Uckelmann D, Harrison M, Michahelles F, Architecting the Internet of Things, Springer,2011.

Course Outcomes

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

- Domain Specific IoTs
- IoT System Management
- IoT Physical Devices
- Data Analytics for IoT
- Tools for IoT

GEBST704

Artificial Neural Networks

Instruction Hours/Week : 2(L) +1(T) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I

Introduction - Trends in computing, Pattern and data, Pattern recognition methods**.**

Basics of Artificial Neural Networks - Characteristics of neural networks, Historical development, Terminology, Models of neuron, Topology, Basic learning laws**.**

Activation and Synaptic Dynamics - Activation dynamics models, Synaptic dynamics models, Learning methods, Stability and Convergence, Recall in neural networks**.**

Unit-II

Functional Units of ANNs for Pattern Recognition Tasks - Pattern recognition problem, Basic types of ANNs, Various pattern recognition tasks performed by ANNs**.**

Feed-forward Neural Networks - Analysis of - Pattern associative networks, Pattern classification networks, Pattern mapping networks**.**

Unit-III

Feed-back Neural Networks - Linear auto associative FF networks, Pattern storage networks, Stochastic networks, and Simulated annealing; Boltzmann machine**.**

Unit-IV

Competitive Learning Neural Networks - Components of a competitive learning neural network, Analysis of feedback layer for different output functions, Analysis of pattern clustering networks, Analysis of feature mapping networks.

Architecture for Complex Pattern Recognition Tasks - Associative memory, Pattern mapping, Stability-Plasticity dilemma, Adaptive resonance theory, Temporal patterns, Pattern variability – Neocognitron.

Unit-V

Applications of ANNs - Pattern classification – character recognition, Associative memories – content addressable memory, Information retrieval; Optimization – Linear programming problem, Traveling salesman problem, Smoothing images with discontinuities; Vector quantization, Control applications, Applications in speech, image processing and decision making.

Text Books

1. Haykin S, *Neural Networks: A Comprehensive Foundation*, 2nd edition, Pearson Education Asia, 1999.
2. Bishop C M, *Neural Networks for Pattern Recognition*, Oxford University Press, 1995.
3. Hagan M T, Demuth H B, and Beale M, Neural Network Design, Thomson Learning, 1996.

Reference Books

1. Yegnanarayana B, *Artificial Neural Networks*, Prentice-Hall of India Pvt. Ltd., 2009.
2. Satish Kumar, *Neural Networks: A Class Room Approach*, Tata McGraw-Hill Publishing Company Ltd., 2004.

Course Outcomes

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

- Basics of Artificial Neural Networks
- Competitive Learning Neural Networks
- Architecture for Complex Pattern Recognition Tasks
- Applications of ANNs

CSPET705

Distributed Operating Systems

Instruction Hours/Week : 3(L) Credits : 3

Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I

Distributed systems – Introduction, Hardware concepts, Software concepts and Design issues. Layered protocols, Asynchronous transfer mode networks, Client server model, Remote procedure call, Group communication.

UNIT II

Clock synchronization, Mutual exclusion, Election algorithms, Atomic transactions, Deadlocks in distributed systems.

Threads, System models, Processor allocation, Scheduling in distributed systems.

UNIT III

Fault tolerance, Real-time distributed systems, Distributed file systems – Design, Implementation and Trends.

Distributed shared memory – Introduction and shared memory concept.

UNIT IV
DSM Consistency models, Page-based distributed shared memory.
Case study Amoeba – Introduction, Objects and capabilities, Process management, Memory management, Communication and Servers.

UNIT V
Multimedia operating systems – Introduction, Multimedia files, Video compression, Audio compression, Multimedia process scheduling, Multimedia file system paradigms, File placement, Caching, Disk scheduling for multimedia.

Text Books:
2. Tanenbaum A S, Distributed Operating Systems, Pearson Education, 2005.
3. Andrew S Tanenbaum Maarten Van Steen, Distributed Systems: Principles and Paradigms, Pearson, 2006

Reference Books:
1. Tanenbaum A S, Modern Operating Systems, 3rd Edition, Pearson Education, 2008.

Course Outcomes

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

- Distributed systems
- Distributed shared memory
- Process management
- Multimedia operating systems

CSPWX 706

Project Work I

Instruction Hours/week :12 Credits : 6
Sessional Marks : 40 End Semester Examinations Marks : 60

The object of Project Work I is to enable the student to take up investigative study in the broad field of Computer Science and Engineering, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor. This is expected to provide a good initiation for the student(s) in R&D work. The assignment to normally include:

- Survey and study of published literature on the assigned topic;
- Working out a preliminary Approach to the Problem relating to the assigned topic;
- Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility;
- Preparing a Written Report on the Study conducted for presentation to the Department;
- Final Seminar, as oral Presentation before a departmental committee.

SEMESTER VIII

Professional Elective-VI
CSPET 811

Artificial Intelligence

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I

The History of AI: Concept of intelligence, Search for Mechanical Intelligence, Evolution of Artificial Intelligence (AI), Systems Approach, Overview of topics.

Uninformed Search: General state space search, Trees, Graphs and Representation, General Search Paradigms - Depth-First Search, Depth-Limited Search, Iterative Deepening Search, Breadth-First Search, Bi-directional Search, Uniform-Cost Search.

Informed Search: Best-First Search, N-Queens problem, A* Search, Eight Puzzle problem, Hill Climbing Search, Simulated Annealing, Tabu Search, Constraint Satisfaction, Graph Coloring problem, Constraint Satisfaction algorithms - Generate and Test, Backtracking, Forward Checking and Look Ahead, Min-Conflicts Search.

UKnowledge Representation (KR): Types and Role of Knowledge, Semantic Nets, Frames, Propositional Logic, First Order Logic (Predicate Logic),Scripts, Semantic Web, Computational Knowledge Discovery, Ontology, Common Sense.

NIT II

AI and Games: Two Player Games, The Minimax Algorithm, Tic-Tac-Toe problem, Minimax with Alpha-Beta Pruning, Classical Game AI, Checkers, Chess, Scrabble, Video Game AI, Movement and Path finding, Table Lookup with Offensive and Defensive Strategy, NPC Behavior, Team AI, Real-Time Strategy AI.

UNIT III

Natural Language Understanging: Syntax Analysis, Semantic Analysis, Understanding Multiple Sentences, Semantic Analysis and Representation Structures, dialog Understanding, Machine Translation

UNIT IV

Expert System Architecture: Rule-Based System Architecture, Non Production System Architecture, Dealing with Uncertainty, Knowledge Acquisition and Validation, Knowledge System Building Tools.

UNIntelligent Agents: Anatomy of an Agent, Agent Properties and AI, Hybrid Agent, Agent Architectures, Types of Architectures, Agent Languages, Agent Communication.

IT V

Robotics and AI: Introduction, Taxonomy of Robotics, Hard vs. Soft Robotics, Braitenburg Vehicles, Natural Sensing and Control, Perception with Sensors, Actuation with Effectors, Robotic Control Systems, Simple Control Architectures, Movement Planning, Distributed Robotics.

Text Book:

1. Rich E, Knight K, Nair S B, *Artificial Intelligence*, 3rd edition, Tata McGraw-Hill, 2009.

2. Jones M T, *Artificial Intelligence – A Systems Approach*, Infinity Science Press, 2008.
3. Dan W. Patterson, Introduction to Artificial Intelligence and Exprt Systems, PHI
4. Byron Weber Becker, Java learning to Program with Robots, Thumbody's

Reference Books:

5. Russel S, Norvig P, *Artificial Intelligence: A Modern Approach*, 3rd edition, Pearson Education, 2010.
6. Luger G F, *Artificial Intelligence*, 6th edition, Pearson Education, 2009.
7. Carter M, *Minds and Computers: An Introduction to the Philosophy of Artificial Intelligence*, Edinburgh University Press, 2007.
8. Coppin B, *Artificial Intelligence Illuminated*, Jones & Bartlett, 2004.
9. Ertel W, *Introduction to Artificial Intelligence*, Springer, 2011.

Course Outcomes

- At the end of the course, students will be able to learn
- Uninformed Search
- Informed Search
- AI and Games
- Knowledge Representation (KR)
- Neural Networks
- Robotics and AI: Introduction

Professional Elective-VI
CSPET 821

Digital Image Processing

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I

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

Unit-II

Image Enhancements and Filtering-Gray level transformations, histogramequalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.

Color Image Processing-Color models–RGB, YUV, HSI; Color transformations–formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation.

Unit-III

Image Segmentation- Detection of discontinuities, edge linking and boundarydetection, thresholding – global and adaptive, region-based segmentation.

Wavelets and Multi-resolution image processing- Uncertainty principles of FourierTransform, Time-frequency localization, continuous wavelet transforms, wavelet bases and multi-resolution analysis, wavelets and Subband filter banks, wavelet packets.

Unit-IV

Image Compression-Redundancy–inter-pixel and psycho-visual; Losslesscompression – predictive, entropy; Lossy compression- predictive and transform coding; Discrete Cosine Transform; Still image compression standards – JPEG and JPEG-2000.

Fundamentals of Video Coding- Inter-frame redundancy, motion estimationtechniques – full-search, fast search strategies, forward and backward motion prediction, frame classification – I, P and B; Video sequence hierarchy – Group of pictures, frames, slices, macro-blocks and blocks; Elements of a video encoder and decoder; Video coding standards – MPEG and H.26X.

Unit-V

Video Segmentation- Temporal segmentation–shot boundary detection, hard-cutsand soft-cuts; spatial segmentation – motion-based; Video object detection and tracking.

Text/Reference Books:

2. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008
3. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004
4. Murat Tekalp , Digital Video Processing" Prentice Hall, 2nd edition 2015

Course Outcomes:

At the end of the course, students will demonstrate the ability to:learn

- Mathematically represent the various types of images and analyze them.
- Process these images for the enhancement of certain properties or for optimized use of the resources.
- Develop algorithms for image compression and coding

Open Elective-III
CSPET 812

Cyber Security

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT I

Building a Secure Organization, Preventing System Intrusions, Guarding Against Network Intrusions, Internet Security, The Botnet Problem, Intranet Security, Local Area Network Security.

UNIT II

Wireless Network Security, Cellular Network Security, RFID Security, Protecting Mission-Critical Systems, Security Management Systems, Information Technology Security Management, Identity Management.

UNIT III

Intrusion Prevention and Detection Systems, Computer Forensics, Network Forensics, Firewalls, Penetration Testing, Vulnerability Assessment.

UNIT IV
NET Privacy, Personal Privacy Policies, Virtual Private Networks, Identity Theft, VoIP Security, SAN Security, SAN Devices Security.

UNIT V
Risk Management, Physical Security Essentials, Biometrics, Information Warfare, Security Through Diversity, Reputation Management, Content Filtering, Data Loss Protection.

TEXT BOOKS

1. Vacca J R, Computer and Information Security Handbook, 2nd edition, Elsevier / MorganKaufmann, 2013.
2. Belapure S, Godbole N, Cyber Security, Wiley, 2011.

REFERENCE BOOKS

1. Gogolin G, Digital Forensics Explained, CRC / Auerbach, 2013.
2. Godbole N, Information Systems Security, Wiley, 2015.
3. Wu C H, Irwin J D, Introduction to Computer Networks and Cybersecurity, CRC Press,2013.
4. Singer P W, Friedman A, Cybersecurity and Cyberwar: What Everyone Needs to Know,Oxford University Press, 2014.
5. Boddington R, Practical Digital Forensics, Packt, 2016.
6. Drake J J, Lanier Z, et al., Android Hacker's Handbook, Wiley, 2014.
7. Shema M, Anti-Hacker Tool Kit, McGraw Hill, 2011.
8. Graham J, Howard R, Olson R, Cyber Security Essentials, CRC Press, 2010.
9. Hadnagy C, Wilson P, Social Engineering: The Art of Human Hacking, Wiley, 2010

Course Outcomes

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

- Building a Secure Organization
- Wireless Network Security
- Firewalls
- Risk Management

Open Elective-III
CSPET 822

Data Analytics

Instruction Hours/Week : 2(L) Credits : 2
Sessional Marks : 40 End Semester Examinations Marks : 60

UNIT-I

Descriptive Statistics - Introduction to the course, Descriptive Statistics, Probability Distributions
Inferential Statistics - Inferential Statistics through hypothesis tests, Permutation & Randomization Test

UNIT-II

Regression & ANOVA - Regression, ANOVA(Analysis of Variance)

Machine Learning: Introduction and Concepts - Differentiating algorithmic and model basedframeworks, Regression: Ordinary Least Squares, Ridge Regression, Lasso Regression,K-Nearest Neighbours Regression & Classification

UNIT-III

Supervised Learning with Regression and Classification techniques - Bias-Variance Dichotomy, Model Validation Approaches, Logistic Regression, Linear Discriminant Analysis, Quadratic Discriminant Analysis, Regression and Classification Trees, Support Vector Machines, Ensemble Methods: Random Forest, Neural Networks, Deep learning

UNIT-IV

Unsupervised Learning and Challenges for Big Data Analytics – Clustering, Associative Rule Mining, Challenges for big data analytics.

UNIT-V

Prescriptive analytics - Creating data for analytics through designed experiments, Creating data for analytics through Active learning, Creating data for analytics through Reinforcement learning.

Textbooks:

1. Hastie, Trevor, et al "The elements of statistical learning", Volume 2, No. 1, New York: springer, 2009.
2. Montgomery, Douglas C., and George C. Runger"Applied statistics and probability for engineers", John Wiley & Sons, 2010.

Course Outcomes

- At the end of the course, students will be able to learn
- Descriptive Statistics
- Regression
- Supervised Learning
- Unsupervised Learning
- Prescriptive analytics

CSOET 803

Big Data Analysis

Instruction Hours/Week : 2(L) Credits : 2

Sessional Marks : 40 End Semester Examinations Marks : 60

Unit-I

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

Unit -II

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer-peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce

calculations.

Unit-III

Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures

Unit-IV

MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats

Unit-V

Hbase, data model and implementations, Hbase clients, Hbase examples, praxis.Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration.

Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts.

Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries.

References:

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging
2. Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
3. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of
4. Polyglot Persistence", Addison-Wesley Professional, 2012.
5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
6. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
7. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
8. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
9. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
10. Alan Gates, "Programming Pig", O'Reilley, 2011.

Course Outcomes

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

- unstructured data
- NoSQL
- Data format, analyzing data
- MapReduce workflows

Open Execute-IV
CSOET 814

Machine Learning

Instruction Hours/Week : 3(L) Credits : 3

Sessional Marks : 40 End Semester Examinations

UNIT I

Introduction: Machine Learning Applications, Learning Associations, Classification, Regression, Unsupervised Learning, Reinforcement Learning.

Supervised Learning: Learning a Class from Examples, Vapnik-Chervonenkis Dimension, Probably Approximately Correct Learning, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm.
Bayesian Decision Theory: Classification, Losses and Risks, Discriminant Functions, Association Rules.
Parametric Methods: Introduction, Maximum Likelihood Estimation, Bernoulli Density, Multinomial Density, Gaussian (Normal) Density, Evaluating an Estimator: Bias and Variance, The Bayes‘ Estimator, Parametric Classification, Regression, Tuning Model Complexity: Bias/Variance Dilemma, Model Selection Procedures.

UNIT II
Multivariate Methods: Multivariate Data, Parameter Estimation, Estimation of Missing Values, Multivariate Normal Distribution, Multivariate Classification, Tuning Complexity, Discrete Features, Multivariate Regression.
Dimensionality Reduction: Subset Selection, Principal Component Analysis, Feature Embedding, Factor Analysis, Singular Value Decomposition and Matrix Factorization, Multidimensional Scaling, Linear Discriminant Analysis, Canonical Correlation Analysis, Isomap, Locally Linear Embedding, Laplacian Eigenmaps.
Clustering: Mixture Densities, k-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Spectral Clustering, Hierarchical Clustering, Choosing the Number of Clusters.

UNIT III
Nonparametric Methods: Nonparametric Density Estimation, Generalization to Multivariate Data, Nonparametric Classification, Condensed Nearest Neighbor, Distance-Based Classification, Outlier Detection, Nonparametric Regression: Smoothing Models, How to Choose the Smoothing Parameter.
Decision Trees: Univariate Trees, Classification Trees, Regression Trees, Pruning, Rule Extraction from Trees, Learning Rules from Data, Multivariate Trees.
Linear Discrimination: Generalizing the Linear Model, Geometry of the Linear Discriminant, Pairwise Separation, Parametric Discrimination, Gradient Descent, Logistic Discrimination, Discrimination by Regression, Learning to Rank.

UNIT IV
Kernel Machines: Optimal Separating Hyperplane, The Nonseparable Case: Soft Margin Hyperplane, ν-SVM, Kernel Trick, Vectorial Kernels, Defining Kernels, Multiple Kernel Learning, Multiclass Kernel Machines, Kernel Machines for Regression, Kernel Machines for Ranking, One-Class Kernel Machines, Large Margin Nearest Neighbor Classifier, Kernel Dimensionality Reduction.
Hidden Markov Models: Discrete Markov Processes, Hidden Markov Models, Three Basic Problems of HMMs, Evaluation Problem, Finding the State Sequence, Learning Model Parameters, Continuous Observations, The HMM as a Graphical Model, Model Selection in HMMs.
Bayesian Estimation: Bayesian Estimation of the Parameters of a Discrete Distribution, Bayesian Estimation of the Parameters of a Gaussian Distribution, Bayesian Estimation of the Parameters of a Function, Choosing a Prior, Bayesian Model Comparison, Bayesian Estimation of a Mixture Model, Nonparametric Bayesian Modeling, Gaussian Processes, Dirichlet Processes and Chinese Restaurants, Latent Dirichlet Allocation, Beta Processes and Indian Buffets.

UNIT V
Combining Multiple Learners: Rationale, Generating Diverse Learners, Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging, Boosting, The Mixture of Experts Revisited, Stacked Generalization, Fine-Tuning an Ensemble, Cascading.

Reinforcement Learning: Single State Case: K-Armed Bandit, Elements of Reinforcement Learning, Model-Based Learning, Temporal Difference Learning, Generalization, Partially Observable States.
Design and Analysis of Machine Learning Experiments: Factors, Response, and Strategy of Experimentation, Response Surface Design, Randomization, Replication, and Blocking, Guidelines for Machine Learning Experiments, Cross-Validation and Resampling Methods, Measuring Classifier Performance, Interval Estimation, Hypothesis Testing, Assessing a Classification Algorithm‘s Performance, Comparing Two Classification Algorithms, Comparing Multiple Algorithms: Analysis of Variance, Comparison over Multiple Datasets, Multivariate Tests.

TEXT BOOK
Alpaydin E, *Introduction to Machine Learning*, 3rd edition, PHI, 2015.

REFERENCE BOOKS

1. Mitchell T M, *Machine Learning*, McGraw Hill, 2013.
2. Rogers S, Girolami M, *A First Course in Machine Learning*, CRC Press, 2011.
3. Shwartz S S, David S B, *Understanding Machine Learning - From Theory to Algorithms*,
4. Cambridge University Press, 2014.
5. Sugiyama M, *Introduction to Statistical Machine Learning*, Elsevier / Morgan
6. Kaufmann, 2015.
7. Müller A C, Guido S, *Introduction to Machine Learning with Python - A Guide for Data*
8. *Scientists*, O'Reilly, 2016.
9. Bali R, Sarkar D, *R Machine Learning By Example*, Packt, 2016.

Course Outcomes

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

- Supervised Learning
- Multivariate Methods
- Nonparametric Methods
- Combining Multiple Learners
- Design and Analysis of Machine Learning Experiments

Open Execute-IV
CSOET 824

Blockchain Technology

Instruction Hours/Week : 3(L) Credits : 3
Sessional Marks : 40 End Semester Examinations Marks : 60

Unit I

Introduction Currency, Contracts, and Applications beyond Financial Markets. Blockchain , What Is Bitcoin?What Is the Blockchain?, The Connected World and Blockchain: The Fifth Disruptive Computing Paradigm, M2M/IoT Bitcoin Payment Network to Enable the Machine Economy . Blockchain : Currency, Technology Stack: Blockchain, Protocol, Currency, The Double-Spend and

Byzantine Generals' Computing Problems, How a Cryptocurrency Works, eWallet Services and Personal Cryptosecurity, Merchant Acceptance of Bitcoin.

Unit II

Blockchain : Contracts, Financial Services, Crowdfunding, Bitcoin Prediction mMarkets,Smart Property, Smart Contracts, Blockchain: Protocol Projects, Wallet Development Projects, Blockchain Development Platforms and APIs, Blockchain Ecosystem: Decentralized Storage, Communication, and Computation, Ethereum: Turing-Complete Virtual Machine, Counterparty Re-creates Ethereum's Smart Contract Platform,Dapps, DAOs, DACs, and DASs: Increasingly Autonomous Smart ContractsDapps, DAOs and DACs, DASs and Self-Bootstrapped Organizations, Automatic Markets and Tradenets, The Blockchain as a Path to Artificial Intelligence

Unit III

Blockchain: Justice Applications Beyond Currency, Economics, and Markets, Blockchain Technology Is a New and Highly Effective Model for Organizing Activity,Extensibility of Blockchain Technology Concepts, Fundamental Economic Principles: Discovery, Value Attribution, and Exchange,Blockchain Technology Could Be Used in the Administration of All Quanta, Blockchain Layer Could Facilitate Big Data's Predictive Task Automation, Distributed Censorship-Resistant Organizational ModelsmmNamecoin: Decentralized Domain Name System, Challenges and Other Decentralized DNS Services

Unit IV

Blockchain Government, Decentralized Governance Services,PrecedentCoin: Blockchain Dispute Resolution, Liquid Democracy and Random-Sample Elections, Random-Sample Elections, Futarchy: Two-Step Democracy with Voting + Prediction Markets, Societal Maturity Impact of Blockchain Governance, Blockchain : Efficiency and Coordination Applications Beyond Currency, Economics, and Markets

Uni V

Blockchain Learning: Bitcoin MOOCs and Smart Contract Literacy, Learncoin, Learning Contract Exchanges, Blockchain Academic Publishing: Journalcoin, The Blockchain Is Not for Every Situation, Centralization-Decentralization Tension and Equilibrium. Limitations: Technical Challenges, Business Model Challenges, Scandals and Public Perception, Government Regulation, Privacy Challenges for Personal Records, Overall: Decentralization Trends Likely to Persist. A. Cryptocurrency Basics: Public/Private-Key Cryptography

Text Books:

1. Blockchainby Melanie SwanPublisher: O'Reilly Media, Inc.
2. Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd EditionImran BashirPackt Publishing Ltd

Course Outcomes

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

- Blockchain : Currency
- Blockchain as a Path to Artificial Intelligence
- Blockchain Government,
- Blockchain Learning

CSPWX 805

Project-II

Instruction Hours/week :12 Credits : 6
Sessio/nal Marks : 40 End Semester Examinations Marks : 60

The object of Project Work II & Dissertation is to enable the student to extend further the investigative study , either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

- In depth study of the topic assigned in the light of the Report prepared ;
- Review and finalization of the Approach to the Problem relating to the assigned topic;
- Preparing an Action Plan for conducting the investigation, including team work;
- Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed;
- Final development of product/process, testing, results, conclusions and future directions;
- Preparing a paper for Conference presentation/Publication in Journals, if possible;
- Preparing a Dissertation in the standard format for being evaluated by the Department.
- Final Seminar Presentation before a Departmental Committee.