Course Curriculum

BTech

IN

COMPUTER SCIENCE AND ENGINEERING

2016

Department of Computer Science & Engineering

JAYPEE UNIVERSITY OF ENGINEERING & TECHNOLOGY

A-B ROAD, RAGHOGARH, DT. GUNA-473226 MP, INDIA

4 year BTech Course Curricula for Computer Science and Engineering							
BTech I semester (B1)							
S.No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1	14B11HS111	Presentation and Communication Skills	Core	1	2	0	3
2	14B11HS199	English - Audit Course	Core	2	0	0	0
3	14B11MA111	Mathematics-I	Core	3	1	0	4
4	14B11PH111	Physics-I	Core	3	1	0	4
5	14B11EC111	Electrical Circuit Analysis	Core	3	1	0	4
6	14B11CI111	Introduction to Computers and Programming	Core	3	1	0	4
7	14B17PH171	Physics Lab-I	Core	0	0	2	1
8	14B17EC171	Electrical Circuits Lab	Core	0	0	2	1
9	14B17CI171	Computer Programming Lab	Core	0	0	4	2
		Total		**15**	**6**	**8**	**23**

4 year BTech Curricula for Computer Science and Engineering							
BTech II semester (B2)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1	14B11HS211	Group and Cooperative Processes	Core	3	0	0	3
2	14B11GE211	Environment Studies	Core	3	0	0	3
3	14B11MA211	Mathematics-II	Core	3	1	0	4
4	14B11PH211	Physics-II	Core	3	1	0	4
5	14B11EC211	Electronic Devices and Circuits	Core	3	1	0	4
6	14B11CI211	Data Structures	Core	3	1	0	4
7	14B17PH271	Electronic Devices and Circuits Lab	Core	0	0	2	1
8	14B17CI271	Data Structures Lab	Core	0	0	2	1
		Total		**18**	**4**	**4**	**24**

4 year BTech Curricula for Computer Science and Engineering							
BTech III semester (B3)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1	14B11HS311	Managerial Economics	Core	2	1	0	3
2	14B11MA311	Discrete Mathematics	Core	3	1	0	4
3	14B11CI311	Object Oriented Programming	Core	3	1	0	4
4	14B11CI312	Database Systems	Core	3	1	0	4
5	14B11EC413	Digital Electronics	Core	3	1	0	4
6	14B17EC473	Digital Electronics Lab	Core	0	0	2	1
7	14B17CI371	Object Oriented Programming Lab	Core	0	0	2	1
8	14B17CI372	Database Systems Lab	Core	0	0	2	1
9	14B17CI373	Multimedia Development Lab	Core	0	0	2	1
10	14B17CI374	Advanced Programming Lab-I	Core	1	0	2	2
		Total		**15**	**5**	**10**	**25**

4 year BTech Curricula for Computer Science and Engineering							
BTech IV semester (B4)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1	14B11HS411	Financial Management	Core	2	1	0	3
2	14B11MA411	Probability Theory and Random Processes	Core	3	1	0	4
3	14B11CI611	Computer Networks	Core	3	1	0	4
4	14B11CI412	Fundamentals of Algorithms	Core	3	1	0	4
5	14B11EC415	Microprocessors and Controllers	Core	3	1	0	4
6	14B17EC475	Microprocessors and Controllers Lab	Core	0	0	2	1
7	14B17CI671	Computer Networks Lab	Core	0	0	2	1
8	14B17CI472	Algorithms Lab	Core	0	0	2	1
9	14B17CI473	Unix Programming Lab	Core	1	0	2	2
		Total		**15**	**5**	**8**	**24**

4 year BTech Curricula for Computer Science and Engineering							
BTech V semester (B5)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1		HSS Elective	Elective	3	0	0	3
	14B14HS541	Social and Legal Issues					
	14B14HS542	Human Psychology					
	14B14HS543	Professional Ethics					
	14B14HS544	Macro Economics					
2	14B11EC515	Communication Systems	Core	3	1	0	4
3	14B11CI511	Operating Systems	Core	3	1	0	4
4	14B11CI512	Software Engineering	Core	4	0	0	4
5	14B11CI513	Theory of Computation	Core	3	1	0	4
6	14B17EC575	Communication Systems Lab	Core	0	0	2	1
7	14B17CI571	Operating Systems Lab	Core	0	0	2	1
8	14B17CI572	Software Engineering Lab	Core	0	0	2	1
9	14B17CI573	Advanced Programming Lab-II	Core	1	0	2	2
10		DE-1	Elective	3	0	0	3
		Total		**20**	**3**	**8**	**27**

List of Electives for DE-1			**Core/ Elective**	**L**	**T**	**P**	**Credits**
	14B14CI542	Object Oriented Computing	Elective	3	0	0	3
	14B14CI543	Real Time Systems	Elective	3	0	0	3
	14B14CI544	Embedded Systems	Elective	3	0	0	3
	14B14CI545	Logic in Computer Science	Elective	3	0	0	3
	14B14CI546	E-Commerce	Elective	3	0	0	3
	14B14CI547	Advanced Concepts in DBMS	Elective	3	0	0	3
	14B14CI644	Computer Graphics	Elective	3	0	0	3
	14B14CI645	Computer Systems Security	Elective	3	0	0	3

4 year BTech Curricula for Computer Science and Engineering							
BTech VI semester (B6)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1		HSS Elective	Elective	3	0	0	3
	14B14HS641	Project Management					
	14B14HS642	Business Environment					
	14B14HS643	Fundamentals of Financial Market					
	14B14HS644	Marketing Management					
2	14B11CI612	Compiler Design	Core	3	1	0	4
3	14B11CI613	Computer Organisation and Architecture	Core	3	1	0	4
4	14B11CI614	Systems and Network Programming	Core	3	1	0	3
5	14B11EC311	Signals and Systems	Core	3	0	0	4
6	14B17EC371	Signals and Systems Lab	Core	0	0	2	1
7	14B17CI672	Compiler Design Lab	Core	0	0	2	1
8	14B17CI673	Computer Organisation and Architecture Lab	Core	0	0	2	1
9	14B17CI674	Systems and Network Programming Lab	Core	0	0	2	1
10	14B17CI675	Web Technology Lab	Core	0	0	2	1
11	14B19CI691	Industrial Training- Audit Course	Core				0
12		DE-2	Elective	3	0	0	3
		Total		**18**	**3**	**10**	**26**
List of Electives for DE-2			**Core/ Elective**	**L**	**T**	**P**	**Credits**
	14B14CI541	Introduction to Software Architecture	Elective	3	0	0	3
	14B14CI548	Software Testing	Elective	3	0	0	3
	14B14CI641	Design & Principles of Operating Systems	Elective	3	0	0	3
	14B14CI642	Software Quality Management	Elective	3	0	0	3
	14B14CI643	Concurrency Control and Security of Databases	Elective	3	0	0	3
	14B14CI646	Human Aspects of Information Technology	Elective	3	0	0	3
	14B14CI647	Graph Algorithms and Applications	Elective	3	0	0	3
	14B14PH611	Material Science	Elective	3	0	0	3

4 year BTech Curricula for Computer Science and Engineering							
BTech VII semester (B7)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1		HSS Elective	Elective	3	0	0	3
	14B14HS743	Entrepreneurship and Small Business					
	14B14HS744	Brand Management					
	14B14HS745	Human Resource Management					
	14B14HS746	Total Quality Management					
2	14B19CI791	Project Part I	Core	--	--	--	7
3	14B11CI711	Artificial Intelligence & Applications	Core	3	0	0	3
4	14B17CI771	Artificial Intelligence Lab	Core	0	0	2	1
5		DE-3	Elective	3	0	0	3
6		DE-4	Elective	3	0	0	3
7		DE-5	Elective	3	0	0	3
		Total		**15**	**0**	**2**	**23**

List of Electives for VII Sem			Core/ Elective	L	T	P	Credits
DE-3							
	14B14CI741	Cryptography and Network Security	Elective	3	0	0	3
	14B14CI742	Network Management	Elective	3	0	0	3
	14B14CI743	Fault Tolerant Computing Systems	Elective	3	0	0	3
	14B14CI744	Introduction to Cognitive Sciences	Elective	3	0	0	3
	14B14CI745	Ad-hoc and Wireless Networks	Elective	3	0	0	3
	14B14CI753	Modelling For Computer Networks	Elective	3	0	0	3
	14B14CI754	Component Based Software Engineering	Elective	3	0	0	3
	14B14CI755	Network Security	Elective	3	0	0	3
	14B14CI756	Introduction to Service Oriented Architecture	Elective	3	0	0	3
	DE-4						
	14B14CI746	Image Processing	Elective	3	0	0	3
	14B14CI747	Software Engineering & Management	Elective	3	0	0	3
	14B14CI749	Information Retrieval & Data Mining	Elective	3	0	0	3
	14B14CI751	Introduction to Queueing Networks	Elective	3	0	0	3
	14B14EC746	Mobile Communications	Elective	3	0	0	3
	14B14EC750	Information Theory and Applications	Elective	3	0	0	3
	14B14EC751	Digital T.V.	Elective	3	0	0	3
DE-5							
	14B14MA741	Applied Linear Algebra	Elective	3	0	0	3
	14B14MA742	Methods of Applied Mathematics	Elective	3	0	0	3
	14B14MA743	Optimization Techniques	Elective	3	0	0	3
	14B14MA744	Graph theory	Elective	3	0	0	3
	14B14MA745	Game theory	Elective	3	0	0	3
	14B14MA746	Integral Transforms	Elective	3	0	0	3
	14B14PH741	Nano Science & Technology	Elective	3	0	0	3
	14B14PH742	Nonlinear Optics & Optical Communication	Elective	3	0	0	3
	14B14PH743	Characterization Techniques	Elective	3	0	0	3
	14B14PH744	Nonlinear Dynamic Applications	Elective	3	0	0	3
	14B14PH745	Simulation of Semiconductor Devices	Elective	3	0	0	3

4 year BTech Curricula for Computer Science and Engineering							
BTech VIII semester (B8)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1		HSS Elective	Elective	3	0	0	3
	14B14HS841	Knowledge Management					
	14B14HS843	Supply Chain Management					
	14B14HS844	Management of Technology					
	14B14HS845	Strategic Management					
2	14B19CI891	Project Part II	Core	--	--	--	8
3		DE-6	Elective	3	0	0	3
4		DE-7	Elective	3	0	0	3
5		DE-8	Elective	3	0	0	3
6		DE-9	Elective	3	0	0	3
		Total		**15**	**0**	**0**	**23**

List of Electives for VIII Sem.			Core/ Elective	L	T	P	Credits
DE-6							
	14B14CI841	Introduction to Grid Computing	Elective	3	0	0	3
	14B14CI842	Parallel Computing	Elective	3	0	0	3
	14B14CI843	Data Mining Tools and Applications	Elective	3	0	0	3
	14B14CI844	Distributed Systems	Elective	3	0	0	3
	16B14CI841	Data Science and Big Data Analytics	Elective	3	0	0	3
DE-7							
	14B14CI845	Multimedia Security	Elective	3	0	0	3
	14B14CI846	Logic and Function Programming	Elective	3	0	0	3
	14B14CI847	Soft Computing	Elective	3	0	0	3
	14B14CI848	Mobile Computing	Elective	3	0	0	3
	14B14EC835	ATM Networks	Elective	3	0	0	3
DE-8							
	14B14CI849	Introduction to Machine Learning	Elective	3	0	0	3
	14B14CI850	Algorithms Analysis and Design	Elective	3	0	0	3
	14B14CI851	Introduction to Natural Language Processing	Elective	3	0	0	3
	14B14CI853	Neural Network	Elective	3	0	0	3
DE-9							
	14B14CI854	Client-Server Computing	Elective	3	0	0	3
	14B14CI855	Storage Area Networks	Elective	3	0	0	3
	14B14EC843	Data Compression	Elective	3	0	0	3
	14B14MA841	Numerical Techniques	Elective	3	0	0	3
	14B14MA842	Matrix Computation	Elective	3	0	0	3
	14B14MA843	Optimization Methods in Engineering	Elective	3	0	0	3
	14B14MA844	Mathematical Modeling and Computer Simulation	Elective	3	0	0	3
	14B14PH841	Quantum Computing	Elective	3	0	0	3

Total Credtis = 195

4 Year BTech Curricula for Computer Science and Engineering							
BTech I semester (B1)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1	14B11HS111	Presentation and Communication Skills	Core	1	2	0	3
2	14B11HS199	English - Audit Course	Core	2	0	0	0
3	14B11MA111	Mathematics-I	Core	3	1	0	4
4	14B11PH111	Physics-I	Core	3	1	0	4
5	14B11EC111	Electrical Circuit Analysis	Core	3	1	0	4
6	14B11CI111	Introduction to Computers and Programming	Core	3	1	0	4
7	14B17PH171	Physics Lab-I	Core	0	0	2	1
8	14B17EC171	Electrical Circuits Lab	Core	0	0	2	1
9	14B17CI171	Computer Programming Lab	Core	0	0	4	2
		Total		**15**	**6**	**8**	**23**

Course Description

Title of Course: Presentation and Communication Skills
Course Code: 14B11HS111
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: To develop effective presentation and communication skills that enable the students to speak, write and present in clear, correct, concise, and audience-centered manner, which has grammatical correctness, and a graceful, uncluttered style.

Learning Outcomes: Students will be able to:

- inculcate effective listening skills that enable them to comprehend instructions and become a critical listener
- augment effective oral skills that enable them to speak interpersonally
- develop active reading skills that is reading with an awareness of a purpose, and
- Instill the writing skills in a lucid style which ensures careful and nuanced textual analysis, command of primary and secondary materials, and interpretive judgment.

Course Contents:

- Introduction to Communication
- Oral Communication skills: Stress, Rhythm, Intonation, Coherence, Phonetics etc.,
- Listening Skills, Reading Skills: Intensive and Extensive Reading, SQ3R, Vocabulary and morphology
- Writing Skills: Letter Writing, Circulars, Notices, Agenda, Minutes, Report Writing, Power point presentation

Text Book

1. Business Communication by K. K. Sinha

References

2. Basic Business Communication by Lesikar Flatley

Course Description

Title of Course: English **Course Code: 14B11HS199**
L-T Scheme: 1-0 **Course Credit: 1**

Objectives: To enable the students to use English language as a tool for their specific professional and individual requirements.

Learning Outcomes: Students will be able to write and speak a proficient English language as specific professional and individual requirements.

Course Contents:

- Conversational Skills
- Vocabulary and comprehension
- Functional English grammar
- Noun, Pronoun, Verb, Tenses, Narration
- Active and Passive voices, Clause etc.
- Compositions

Text Books

1. Wren and Martin: English Grammar and Composition
2. Raymond Murphy : Essential English Grammar

Course Description

Title of Course: Mathematics-I **Course Code: 14B11MA111**
L-T Scheme: 3-1 **Course Credits: 4**

Objective: To make students aware of the basic mathematical concepts and methods which will help them in learning courses in engineering and Technology

Learning Outcomes: At the end of the course the student will have the background of mathematics necessary for understanding other courses of engineering and allied sciences.

Course Contents:

- Partial differentiation, Taylor's Series, Maxima and Minima,
- Jacobians, Double Integrals, Equations to a line, plane, curve and surfaces, Line and Surface integrals.
- Gradients, divergence and curl, Normal and Tangent to a surface, Gauss and Stokes theorems.
- Differential equations with Constant coefficients,
- Laplace transforms, Algebra of Matrices, Determinants, Rank,
- Gauss elimination Method, Eigen values and vectors, Quadratic forms.

Text Books

1. Thomas, G.B., Finney, R.L. : Calculus and Analytical Geometry, 9th Ed., Addison Wesley, 1996

References

1. Grewal, B. S., Higher Engineering Mathematics, Khanna Publishers, Delhi.
2. Prasad Mudralaya, Advanced Mathematics for engineers, 1992.
3. Lipshuts, S., Lipsom M.: Linear Algebra, 3rd Ed, Schaum series 2001.
4. Simmons, G.F, Differential Equations with Appln, 2nd Ed, McGraw Hill 1991.

Course Description

Title of Course: Physics-I **Course Code: 14B11PH111**

L-T Scheme: 3-1 **Course Credits: 4**

Objective: Broadly, the study of Physics improves one's ability to think logically about the problems of science and technology and obtain their solutions. The present course is aimed to offer a broad aspect of those areas of Physics which are specifically required as an essential background to all engineering students for their studies in higher semesters.

Learning Outcomes: At the end of the course, the students will have sufficient scientific understanding of different phenomena associated with light, relativity, statistical physics, atomic physics, and lasers.

Course Contents:

Unit-I (Relativity): Frames of reference, Galilean transformation, Michelson Morley Experiment, Postulates of special theory of relativity, time dilation and length contraction, twin paradox, Lorentz transformations, addition of velocities, Relativistic Doppler effect, Mass variation with velocity, Mass-energy relation, electricity and magnetism. Brief discussion on General theory of Relativity. Black holes, bending of light by gravity, gravitational red shift, global positioning system(GPS).

Unit-II (Elements of Quantum Mechanics): Quantization of Radiation: Black body radiation, Wein,s law, Rayleigh Jeans law, Planck's law of radiation, photo electric effect Compton scattering. Quantization of Matter: Atomic spectra, Bohr model of hydrogen atom, Frank hertz experiment, Matter waves, de Broglie hypothesis, Davisson Germer experiment, wave packets, phase and group velocity Heisenberg's uncertainty principle, Schrödinger wave equation and its applications to the free particle in a box, potential barrier and Harmonic oscillator. Quantum numbers, Spin and orbital angular momentum, L-S and j-j coupling. Atoms in magnetic field, Zeeman effect.

Unit-III (Statistical Mechanics): Micro and Macro states, temperature and the partition function, Concept of Entropy, Shannon's information entropy, Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac distributions and their applications.

Unit-IV (Elements of Solid State Physics): Basic ideas of bonding in solids, Crystal structure, X-ray diffraction, Band theory of solids, Distinction between metals, semiconductors and insulators.

Unit-V (Lasers): Principle and working of laser, Different types of lasers (He-Ne Laser, Ruby Laser, Semiconductor Laser), Applications of Lasers.

Text Books and References:

1. A. Beiser, Perspectives of Modern Physics, Tata McGraw Hill.
2. J R Taylor, C D Zafiratos, M A Dubson, Modern Physics for Scientist & Engineers, Pearson Education.
3. K Krane, Modern Physics, Wiley India
4. J Bernstein, P M Fishbane, S. Gasiorowicz, Modern Physics, Pearson Education.
5. B. B. Laud, Laser and Non-Linear Optics, New Age International (P) Ltd.
6. Resnick, Relativity, New Age.

Course Description

Title of Course: Electrical Circuit Analysis **Course Code: 14B11EC111**

L-T Scheme: 3-1 **Course Credits: 4**

Objectives: The objective of this course is to build basic concepts of electrical circuits. To understand network theorems and to build fundamental concepts in the design and implementation of different electrical circuit. To build basic concepts for the understanding of different electrical components and devices.

Learning Outcomes: The Students will be able to learn-

1. Basic concepts of electrical circuits
2. Implementation of network theorems.
3. Characteristics of different electrical components
4. Application of circuit theory in electronics circuit.

Course Contents:

Introduction to circuit elements R, L, C and their characteristics, Different types of sources (like AC and DC, current and voltage, dependent and independent), KCL and KVL, Node and Loop analysis, Star and Delta conversion, Thevenin's and Norton's theorem, Superposition, Reciprocity, Maximum Power Transfer, Graph Theory, Tree and links, planar networks, Ideal opamp as a circuit element, AC waveform analysis frequency, phase, amplitude, peak, rms and average value of ac waveform.

Single phase ac circuit analysis containing *R, L* and *C*, and their combinations, Concepts of impedance, power, active, reactive and apparent power and power factor, Series and parallel resonance, bandwidth and quality factor, Concept of 3-phase ac circuits, star and delta connections, Frequency domain analysis – Laplace transform solution of Integral differential equations, Forced and natural responses, Transient analysis, Concept of two-port Network, Z, Y, transmission (ABCD) and Hybrid parameter, Introduction to electrical filters and transmission line.

Text Books

1. B. L. Theraja, "Basic Electrical Engineering", vol. 1 (For unit 1 and 2)
2. K. M. Soni, "Circuits and System" S. K. Kataria & Sons (for unit 3,4 ,5, and 6)

References

1. M. E. Van Valkenburg, Network Analysis, (PHI)
2. Dr.Abhijit Chakrabarti "Circuit Theory".
3. W. H. Hayt Etal:Engineering Circuit Analysis(6^{th} Edition), Tata McGraw-Hill, 2006

Course Description

Title of Course: Introduction to Computer Programming
Course Code: 14B11CI111
L-T Scheme: 3-1 **Course Credits: 4**

Objective: This class is designed to explore computing and to introduce you to the art of computer programming. You will develop a sense of style and aesthetics for programs that will help your programming. You will be introduced to the design principles for writing good programs. This course teaches not only the mechanics of programming, but also how to create programs that are easy to read, maintain, and debug.

Learning Outcomes

1. Knowledge of structured programming in program design
2. Writing programs in C, Pascal
3. Program documentation skills
4. Program testing skills

Course Contents:

Unit -I: Introduction to Computers and Number Systems

Introduction to computers, Applications, Memory Hierarchy, Introduction to Operating system as user interface, Introduction to Input and Output Devices, Number system & representation - Fixed and Floating point numbers, Complement of numbers and arithmetic operations. Character and Instruction Representation.

Unit -II: Program Design and Problem solving

Structured Programming, Types of Programming Languages, Problem solving and programming, Quality aspects of structured programs, Programming Design tools (Pseudo code and Flowcharts), Operating Systems, Device driver ,Loader, Linker, BIOS Software.

Unit -III: C Operators, Case Control and Loop Control Structures

Arithmetic Operators, Assignment, Logical/Relational,Bitwise, Odds and ends Operators, if, if – else, Nested if, if – else if, switch-case, conditional operator and goto. Entry control and exit control loops, while , do while , for etc.

Unit -IV: Array, String, Functions and Pointers

One Dimensional and Two Dimensional Arrays, Strings, Function and basic concepts of pointers. Accessing array using pointers.

Unit -V: Recursion, Dynamic Memory Allocation

Storage classes, recursion and overview of malloc, calloc, free functions

Unit -VI: Structures, Union, Linked List and File Handling

Overview of structures and union, structures v/s union, enumeration, overview of linked list, File handling.

Text Book:

1. “The Complete Reference C”, Herbert Schildt.

References:

1. “Understanding Pointers in C”, Yashwant Kanetkar
2. “The Practice of Programming”, Brian W. Kernighan and Rob pike.
3. “The C Programming Language”, Brian W. Kernighan and Dennis M. Ritchie. Prentice Hall, Inc.
4. “Program Design and Development”, Charles Dickson.

Course Description

Title of Course: Physics Lab-I **Course Code: 14B17PH171**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Objective: Broadly, the study of Physics improves one's ability to think logically about the problems of science and technology and obtain their solutions. The present course is aimed to offer a broad aspect of those areas of Physics which are specifically required as an essential background to all engineering students for their studies in higher semesters.

Learning Outcomes: At the end of the course, the students will have sufficient scientific understanding of different phenomena associated with light, relativity, statistical physics, atomic physics, and lasers.

Course Contents:

Experiments Lists-

1. To study the variation of magnetic field along the axis of Helmholtz Galvanometer and to determine its reduction factor. [set-up no. 1 & 11]
2. To determine the specific rotation of cane sugar solution using Biquartz polarimeter. [set-up no. 2 & 12]
3. To observe Newton's rings and to determine the wavelength of sodium light. [Set-up no. 3 & 13]
4. To determine the wavelengths of spectral lines Red, Green and Violet of mercury using plane transmission grating. [set-up no. 4 & 14]
5. To study the presence of energy levels in an atom by Franck-Hertz Experiment. [set-up no. 5 & 15]
6. To determine the resistance per unit length of a Carey Foster's bridge and to obtain the specific resistance of a given wire. [set-up no. 6 & 16]
7. To determine the Planck's constant using solar cell. [set-up no. 7 & 17]
8. To determine the wavelength of sodium light with the help of Fresnel's biprism. [set-up no. 8 & 18]
9. To draw hysteresis loop of a ferromagnetic material and to calculate its retentivity and coercivity. [set-up no. 9 & 19]
10. To study ultrasonic waves in aluminium and to obtain Young's modulus for it. [set-up no. 10& 20]

Course Description

Title of Course: Electrical Circuit Lab **Course Code: 14B17EC171**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Objectives: The objective of this course is to build basic concepts of Electrical Circuits. To understand network theorems and to build fundamental concepts in the design and implementation of different electrical circuit.

Learning Outcomes: The Students will be able to learn:

1. Basic concepts of Electrical circuits
2. Implementation network theorems.
3. Characteristics of different electrical components
4. Application of circuit theory in electronics circuit.

Course Contents:

List of Experiments-

1. To familiarization with the Digital multimeter (DMM) and measurement of various signals and circuit elements.
2. To familiarization with the CRO, Function generator and power supply.
3. a) To study & draw the volt-ampere characteristics of the resistor.

   b) To study the loading effect of a voltmeter
4. To verify Thevenin's Theorem**.**
5. To verify Tellegen's Theorem.
6. To verify Superposition Theorem.
7. To verify Reciprocity Theorem.
8. To verify Maximum Power Transfer Theorem.
9. To determine the Z parameters of the given two port network.
10. To determine the Y parameters of the given two port network.
11. To sketch the transient response of RC Low pass filter.
12. To sketch the transient response of RC High pass filter.

Course Description

Title of Course: Computer Programming Lab **Course Code: 14B17CI171**
L-T-P Scheme: 0-0-4 **Course Credits: 2**

Objectives: This course is designed to familiarize students with the basic components of a computer, so as to be able to operate it and be able to interact with it, and carry out simple tasks. Also, it will initiate the students into the discipline of Programming. It aims to start off the development of problem solving ability using computer programming. This course teaches not only the mechanics of programming, but also how to create programs that are easy to read, maintain, and debug. Students are introduced to the design principles for writing good programs.

Learning Outcome: Students will be able to develop their ability to design, develop, test and document structured programs in C language.

Course Contents:

Unit -I: Microsoft Office

Preparing resume in MS word, Using MS Excel for calculating Average marks and grade of students, making interactive Slide in Microsoft power point.

Unit -II: C Operators and Case Control

Arithmetic Operators, Assignment, Logical/Relational, Bitwise, Odds and ends Operators if, if – else, Nested if, if – else if, switch-case, conditional operator and goto.

Unit-III: Loop Control Structures and Patterns

Entry control and exit control loops, while , do while , for etc. generating patterns for various pyramids.

Unit -IV: Array, String, Functions and Pointers

One Dimensional and Two Dimensional Arrays, Strings, Function and basic concepts of pointers. Accessing array using pointers.

Unit -V: Recursion, Dynamic Memory Allocation

Storage classes, recursion and overview of malloc, calloc, free functions

Unit -VI: Structures and Union

Overview of structures and union, structures v/s union, enumeration

Text Book

1. "The Complete Reference C", Herbert Schildt, McGraw-Hill Education.

References

1. "Understanding Pointers in C", Yashwant Kanetkar.
2. "The Practice of Programming", Brian W. Kernighan and Rob pike.
3. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie. Prentice Hall, Inc.
4. "Program Design and Development", Charles Dickson.
5. "Programming in PASCAL", Schuam's Series.

4 year BTech Curricula for Computer Science and Engineering							
BTech II semester (B2)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1	14B11HS211	Group and Cooperative Processes	Core	3	0	0	3
2	14B11GE211	Environment Studies	Core	3	0	0	3
3	14B11MA211	Mathematics-II	Core	3	1	0	4
4	14B11PH211	Physics-II	Core	3	1	0	4
5	14B11EC211	Electronic Devices and Circuits	Core	3	1	0	4
6	14B11CI211	Data Structures	Core	3	1	0	4
7	14B17PH271	Electronic Devices and Circuits Lab	Core	0	0	2	1
8	14B17CI271	Data Structures Lab	Core	0	0	2	1
		Total		**18**	**4**	**4**	**24**

Course Description

Title of Course: Group and Cooperative Process **Course Code: 14B11HS211**
L-T Scheme: 2-1 **Course Credits: 3**

Objectives: To make the students understanding how to work with and through others to accomplish individual and group goals. Methods of instruction will include cases, simulations, lectures and group activities.

Learning Outcomes: After completing this course the students will have an understanding of individual, interpersonal and group processes that influence behaviour within teams and organizations. They will also be able to effectively use the various tools in their daily activities.

Course Contents:

- Group- Behavior, Development, Structure and Process
- Team- Types and Contemporary issues, Individual-- Personality, Learning, Perception, Values, Attitudes and Job satisfaction
- Assertiveness- Communication Styles, Self expression, Social Boldness, Emotional intelligence
- Transactional Analysis-- Ego states, Life position, Transaction, Stroking
- Motivation, Leadership, Conflict and Negotiation.

Text Books

1. Stephen P. Robbins, Organizational Behaviour, 9th Edition, Prentice-Hall India.

References

1. Daniel Goleman, Emotional Intelligence;
2. Randy J. Paterson, The Assertiveness Workbook
3. Daniel Goleman, Working With Emotional Intelligence, Bantom Books

Course Description

Title of Course: Environmental Studies **Course Code: 14B11GE211**
L-T Scheme: 3-0 **Course Credits: 3**

Objective: Objective of this course is how to help environmental varieties, help using modern technology which is eco-friendly, "Preserve is better than Cure".

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

1. Measure environmental variables and interpret results.
2. Evaluate local, regional and global environmental topics related to resource use and management.
3. Propose solutions to environmental problems related to resource use and management.
4. Interpret the results of scientific studies of environmental problems.
5. Describe threats to global biodiversity, their implications, and potential solutions.

Course Contents:

Unit-1: The Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness, Types of Ecosystems, World Biomes, Ecosystem functioning, biogeochemical cycles.

Unit-2: Natural resources, their consumption & Protection: Water, Land Energy (Renewable, non-renewable, wind, solar, hydro, Biomass), Mineral, Forest, & Food resources, Role of an individual in conservation of natural resources, Equitable use of resources.

Unit-3: Pollution- a threat to environment: Air, Water & Land pollution, sources & causes, Space pollution, causes & effects, toxicity limits of pollutants. Critical issues concerning global Environment (Urbanization, population growth, global warming, climate change, acid rain, ozone depletion etc.) and the Roots in: Cultural, Social, Political, Commercial, industrial, territorial domains.

Unit-4: Biodiversity loss: Diversity of flora and fauna, species and wild life diversity, Biodiversity hotspots, threats to biodiversity, Environmental Impact assessment: Objectives of impact assessment, Study of impact parameters, Methods for impact identification, Economics. Environmental standards & Quality: Air, Water & Soil Quality, Pollutant sampling, pollution control systems. Sustainable building, Urban planning, Disaster Management and Contingency Planning, Modern safety systems.

Unit-5: Sustainability & Planned reversal of human destruction to environment: redevelopment of brown fields, energy plantations, social forestry, engineering aspects of Re-use & Recycling, biogas for marginal income groups, organic farming, eco-consumerism, dematerialization, green technologies, eco-tourism.

Unit-6: Regulation of technology and innovation, Policy and law: Environmental Laws & Regulations (Different Acts – Environmental Protection Act, Air and Water Acts, Wildlife and Forest Acts), US-EPA, National Environmental Policy;

Unit-7: Function of pollution control boards (SPCB and CPCB), their roles and responsibilities, Eco-mark Scheme, Laws relating to Urbana and Rural land use, Ethics.

Unit-8: Case studies: Industry – Environment interface, Field Work: Explore the surrounding flora & fauna (Study of common plants, insects, birds document environmental assets), documentation of industries in local region and their possible effects, measure of water, air and land quality, Visit to a local polluted site-Urban/Rural /Industrial / Agricultural, Study of simple ecosystems-pond, river, hill slopes etc.

Textbooks

1. Joseph, B., 2005, Environmental Studies, Tata McGraw Hill, India.
2. Textbook of Environmental Studies for UG Courses-Erach Bharucha, University Press.

References

1. Nebel, B.J. & Wright, R.T., 1993, Environmental Science, 8th Edition, Prentice Hall, USA.
2. Jadhav, H. & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p.
3. Chiras D. (Ed.). 2001. Environmental Science – Creating a sustainable future. 6th ed. Jones & Barlett Publishers.
4. David Laurence. 2003. Environment Impact assessment, Wiley publications.
5. Chhokar KB, Pandya M & Raghunathan M. 2004. Understanding Environment. Sage publications, New Delhi
6. Non-Conventional Energy Resources – Chauhan, DS. and Srivastava, SK, New Age International Pvt. Ltd

Course Description

Title of Course: Mathematics-II **Course Code: 14B11MA211**
L-T Scheme: 3-1 **Course Credits: 4**

Objective: In this course we have two goals:

1. To learn about a number of different mathematical concepts and methods that is used as tools in mathematical formulations on of many computational problems.
2. To gain more experience with mathematical arguments and proof techniques, that provide essential background for reasoning and computation.

Learning Outcomes: Students will be able to learn many mathematical techniques which are very helpful in analyzing and solving computational problems which occur in engineering.

Course Contents:

Unit-I: Second order linear differential equations, Convergence of series, convergence tests, solution in series

Unit-II: Bessel's and Legendre functions, Chebyshev p~omials and orthogonality, Second order partial differential equations and classification, one dimensional,

Unit-III: Wave and diffusion equations with their applications, Functions of complex variable, analytical functions and Cauchy-Riemann, Equations.

Unit-IV: Conformal mapping, Poles and singularities, complex integration,

Unit-V: Taylor's and Laurent's series, Cauchy residue theorem, contour integration and their application.

Text Books

1. Kreyszig, Erwin Advanced Engineering Mathematics, John Wiley & Sons, Inc.
2. Differential Equations with Applications, 2nd Ed., McGrawHill, 1991.
3. Complex Variables and Applications, 6th Ed., McGraw-Hill, 1996.

References

1. Prasad Mudranalaya, Higher Engineering Maths, Khanna Publishers Delhi, 1982.
2. Simmons, G.F.
3. Brown, J.W., Churchill, R.V.
4. Prasad, C.
5. Grewal, B. S.

Course Description

Title of Course: Physics-II **Course Code: 14B11PH211**
L-T Scheme: 3-1 **Course Credits: 4**

Objective: Broadly, the study of Physics improves one's ability to think logically about the problems of science and technology and obtain their solutions. The present course is aimed to offer a broad aspect of those areas of Physics which are specifically required as an essential background to all engineering students for their studies in higher semesters.

Learning Outcomes: At the end of the course, the students will have sufficient scientific understanding of em fields and waves, basic understanding of thermodynamical systems and processes, concepts and laws applicable to the quantum-mechanical particles, their applications to some ideal systems and solids, structure of solids.

Course Contents:

Unit-I: Electromagnetism: Review of vector calculus, Coulomb's law, Gauss law and its applications, boundary value problems, Biot-Savart law, Ampere's law, Faraday's law of induction, boundary conditions, Electrical and magnetic filed in matter, Maxwell's equations in free space and dielectric media. Electromagnetic waves in matter, Derivations of expressions for energy density and energy flux (Poynting vector) in an electromagnetic field, Radiation pressure. Propagation of EM waves through boundary-Reflection, Refraction, Absorption and Total Internal Reflection.

Unit-II: Band theory of solids, carrier scattering, effective mass, Electronic conduction in metals, Intrinsic and extrinsic (n- and p-type) semiconductors and their electrical conductivity. Direct and indirect bandgap semiconductors, optical and thermal properties, Hall Effect in semiconductors.

Unit-III: Review of Maxwell-Boltzmann, Fermi Dirac and Bose Einstein distribution functions. Equilibrium carrier concentrations, equilibrium thermal generation, intrinsic carrier concentration, Fermi level, dopants, extrinsic semiconductors, Statistics of donors and acceptors, Drift current; electrical mobility.

Unit-V: Device Processing Technology: oxidation, diffusion, ion-implantation, deposition, lithography, etching and interconnect. Integrated-Circuit Technology: understanding at the level of Muller and Kamins of integrated-circuit fabrication processes.

Text Books

1. D. J. Griffiths, Introduction to electrodynamics, Prentice Hall of India Ltd.
2. Schiff, Quantum Mechanics, McGraw Hill International.
3. Beiser, Perspectives of Modern Physics, Mc Graw Hill International.
4. S.O. Pillai, Solid State Physics, New Age International Publishers.
5. M.W.Zemnasky, R.H. Dittman, Heat and Thermodynamics, Mc Graw Hill

References

1. J. Reitz, F. Milford and R. Christy, Foundation of Electromagnetic Theory, Narosa Publishing.
2. C.M. Srivastava and C. Srinivasan, Science of Engineering Materials, Wiley Eastern Limited.

Course Description

Title of Course: Electronic Devices & Circuits **Course Code: 14B11EC211**
L-T Scheme: 3-1 **Course Credits: 4**

Objectives: The objective of this course is to build basic concepts of electronic devices & circuits. To understand basic circuit theorems to build fundamental concepts in the design and implementation of different electronic devices & circuits.

Learning Outcomes: The Students will be able to learn-

1. Basic concepts of electronic devices & circuits
2. Implementation of circuit theorems.
3. Characteristics of different electronic components

Course Contents:

UNIT I: Semiconductor Physics: Materials, Intrinsic semiconductors, Covalent bonds, Electron-hole concepts, Random movement of carriers, Hole as a particle, Recombination of electrons and holes, Conductivity of semiconductors. Extrinsic Semiconductors, Donor and acceptor impurities.

UNIT II: Semiconductor Diodes: Unidirectional property, *PN*-junction with no bias, with forward bias and with reverse bias, Transition and diffusion capacitances. *V-I* characteristics, Comparison of Si and Ge diodes, Temperature effects, Diode resistance (static and dynamic), Diode equation, Ideal diode, Circuit model of a diode. Half-wave and full-wave (centre tap and bridge) rectifiers, PIV rating of diode, Performance of half-wave and full-wave rectifiers, Shunt capacitor filter. Zener diode, Analysis of Zener voltage regulator.

UNIT III: Bipolar Junction Transistor (BJT): BJT Structure, Working of a transistor, Transistor current equation, Collector reverse saturation current, DC alpha of a transistor. The three configurations, CB and CE input and output characteristics, DC load line.

UNIT IV: Field-Effect Transistor (FET): Junction Field-Effect Transistor (JFET): Basic construction, Pinch-off voltage, Drain saturation current, Output and transfer characteristics. Metal Oxide Semiconductor Field-Effect Transistor (MOSFET): Depletion and Enhancement type MOSFET---Construction, Operation and Characteristics.

UNIT V: Transistor Biasing: Need of biasing, Choice of operating region, Need for bias stabilization, Fixed bias circuit, Analysis of fixed bias circuit, Saturation point. Emitter-feedback bias circuit, its analysis and drawbacks, Emitter-bias circuit, its analysis, Voltage divider bias circuit, approximate analysis, more accurate analysis, Biasing of FET, Bias stabilization of JFET, Biasing MOSFETs.

UNIT VI: Transistor Amplifiers: Meaning of amplification, Types of electronic amplifiers, Ideal voltage amplifier, Single stage BJT amplifier, Coupling capacitor, Bypass capacitor, Analysis of BJT amplifier. AC equivalent circuit model of BJT, Hybrid parameters, AC analysis using *h*-parameters, Frequency response of an *RC* coupled amplifier, Effect on bandwidth when stages are cascaded.

UNIT VII: Feedback in Amplifiers: Basic concepts of feedback, Types of feedback, Voltage gain of feedback amplifier, Effects of negative feedback on amplifier characteristics.

UNIT VIII: Sinusoidal Oscillators: Need of oscillators, Types of oscillators, Positive feedback to produce oscillations, the starting voltage, Tuned collector oscillator, Hartley oscillator, Colpitts oscillator, Clapp oscillator, *RC*-phase shift oscillator, Wein bridge oscillator, Crystal oscillator.

UNIT IX: Operational Amplifiers: Schematic symbol of op-amp, Ideal op-amp, Inverting amplifier, Virtual ground, Non-inverting amplifier, Adders, Differential amplifier, Subtractor, Integrator, Voltage Follower.

UNIT X: Switching Theory and Logic Design: Number Systems, Boolean Algebra, Logic Gates, Flip-Flops, Counters, Registers.

Text Books

1. C. Kulshreshtha, 'Electronic Devices and Circuits', New Age, 2e, 2006.
2. S.Salivahanan & Arivazhagan, 'Digital Circuits and Design' Vikas Publishing, 2e, 2003.

References

1. Boylstad and Nashelsky, 'Electronic Devices and Circuits', PHI, 6e, 2001.
2. Morris Mano, 'Digital Computer Design', PHI, 2003.
3. Electronic Devices and Circuits, Millman, Jacob

Course Description

Title of Course: Data Structures **Course Code: 14B11CI211**

L-T Scheme: 3-1 **Course Credits: 4**

Prerequisite

Students must have already registered for the course, "Introduction to Computers and Programming" (14B11CI111).

Objectives

Develop problem solving ability using Programming, develop ability to express solutions to problems clearly and precisely, develop ability to design and analyze algorithms, introduce with fundamental data structures, develop ability to design and evaluate Abstract Data Types and data structures.

Learning Outcomes

The students shall acquire the generic skills to design and implement data structures and related algorithms for a broad-based set of computing problems.

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Course Contents

Unit-1: Introduction to Data Structures

Data structure overview, need of data structure and how to select relevant data structure for given problem, basic C data types and ADT, comparison between data types and data structures

Unit-2: Algorithm and Complexity

Algorithm overview and its properties, problem analysis and construction of algorithm, difference between algorithm, program and software, algorithm analysis and complexity, asymptotic notations to represent the time complexity, Software Development Life Cycle (SDLC) phase

Unit-3: Array

Overview, memory representation of 1D and 2D array, sparse matrix, operation supported by an array. Linear search with illustration, analysis of linear search, binary search (iterative) and its analysis, binary search (recursive) and its analysis using recurrence relation, recurrence relation. Types of sorting algorithms, bubble sort, selection sort, insertion sort, quick sort, merge sort

Unit-4: Linked List

Overview, types of linked list, linear linked list – overview, traversing, insertion, deletion, searching and reverse, doubly linked list – overview, traversing, insertion, deletion, circular linked list – overview, header linked list, applications of linked list

Unit-5: Stack

Overview, stack implementation using stack and linked list, basic operations on stack using array and linked list – push, pop, dispose applications of stack – evaluation of mathematical expression, conversion of expression from one form to another (Polish Notation), Tower of Hanoi problem

Unit-6: Queue

Overview, basic operations on queue – enqueue, dequeue, implementation of queue using array and linked list, types of queue - linear queue, circular queue, deque, priority queue, applications

Unit-7: Tree

Tree definition and its terminology, representation of graph using array and linked list, tree traversals – preorder, inorder and postorder, binary search tree (BST) with insertion, deletion and searching operations, extended binary tree and its application in Huffman tree, threaded binary tree

Unit-8: Graph

Introduction to graph, types of graph, traversal algorithms in graph – breadth first search, depth first search, spanning tree, minimum cost spanning tree - Kruskal's, Prim's.

Teaching Methodology

Lectures would be interactive and it would cover the core concepts that are explained in the text and reference materials with adequate examples. Tutorials will have conceptual and numerical questions that would aid in strengthening the data structures principles.

Text Books

1. Sartaj Sahni, "Data Structures, Algorithms", Tata Mc Graw Hill, New York.
2. Preiss, Bruno R., "Data Structures and Algorithms: With Object-Oriented Design Patterns in C++ ", John Wiley & Sons, New York, 2003.
3. Seymour Lipschutz, "Data Structure", Schaum's Outlines, Tata McGraw Hill

Reference Books

1. Kruse, Tonso, Leung: Data Structures and Program Design in C
2. Langsam, Augestein, Tanenbaum : Data Structures using C and C++
3. Weiss: Data Structures and Algorithm Analysis in C/C++
4. Carrano and Prichard: Data Abstraction and Problem solving with C++
5. Horowitz and Sahni: Fundamental Data Structures
6. Sahni : Data Structures, Algorithms and applications in C++
7. Standish: Data Structures in Java
8. Corman et al: Introduction to Computer Algorithms

Course Description

Title of Course: Electronic Devices & Circuits Lab **Course Code: 14B17PH271**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Objective: Broadly, the study of Physics improves one's ability to think logically about the problems of science and technology and obtain their solutions.

Learning Outcomes: At the end of the course, the students will have sufficient scientific understanding of different phenomena associated with light, relativity, statistical physics, atomic physics, and lasers.

Course Contents:

1. To study the dielectric constant and Curie temperature of Ferroelectric ceramics.
2. To study the variation of resistivity of a semiconductor with temperature and to determine the band gap using Four-Probe method.
3. Using solar cell Trainer (a) study voltage and current of a solar cell (b) Voltage and current in series and parallel combinations. (c) Draw power curve to find maximum power point (MPP) and to obtain efficiency of a solar cell.
4. To study the magnetostriction in metallic rod.
5. To study Hall effect in a P type semiconductor. To determine
   (i) Hall voltage and Hall coefficient (ii) Number of charge carriers per unit volume (iii) Hall angle and mobility.
6. To study Zener diode characteristics & Transfer Characteristics for a given load.
7. To Implement Clipper Circuit.
8. To Implement Clamper Circuits.
9. To Implement Half-Wave and Rectifier Full-Wave Rectifier with and Without Capacitive Filter.
10. To study Common Emitter (CE) Transistor characteristics and to determine hie and hfe parameters.
11. To Implement Emitter follower
12. To study JFET Characteristics.

Course Description

Title of Course: Data Structures Lab **Course Code: 14B17CI271**

L-T-P Scheme: 0-0-2 **Credits: 1**

Scope and Objectives:

This course develop problem solving ability using programming, develop ability to express solutions to problems clearly and precisely, develop ability to design and analyze algorithms, introduce with fundamental data structures, develop ability to design and evaluate abstract data types and data structures.

Learning Outcome:

The students shall acquire the generic skills to design and implement data structures and related algorithms for a broad-based set of computing problems

Course Contents

Unit-1: Introduction to Data Structures

Data structure overview, need of data structure and how to select relevant data structure for given problem, basic C data types and ADT, comparison between data types and data structures

Unit-2: Algorithm and Complexity

Algorithm overview and its properties, problem analysis and construction of algorithm, difference between algorithm, program and software, algorithm analysis and complexity, asymptotic notations to represent the time complexity, Software Development Life Cycle (SDLC) phase

Unit-3: Array

Overview, memory representation of 1D and 2D array, sparse matrix, operation supported by an array. Linear search with illustration, analysis of linear search, binary search (iterative) and its analysis, binary search (recursive) and its analysis using recurrence relation, recurrence relation. Types of sorting algorithms, bubble sort, selection sort, insertion sort, quick sort, merge sort

Unit-4: Linked List

Overview, types of linked list, linear linked list – overview, traversing, insertion, deletion, searching and reverse, doubly linked list – overview, traversing, insertion, deletion, circular linked list – overview, header linked list, applications of linked list

Unit-5: Stack

Overview, stack implementation using stack and linked list, basic operations on stack using array and linked list – push, pop, dispose applications of stack – evaluation of mathematical expression, conversion of expression from one form to another (Polish Notation), Tower of Hanoi problem

Unit-6: Queue

Overview, basic operations on queue – enqueue, dequeue, implementation of queue using array and linked list, types of queue - linear queue, circular queue, deque, priority queue, applications

Unit-7: Tree

Tree definition and its terminology, representation of graph using array and linked list, tree traversals – preorder, inorder and postorder, binary search tree (BST) with insertion, deletion and

searching operations, extended binary tree and its application in Huffman tree, threaded binary tree

Unit-8: Graph

Introduction to graph, types of graph, traversal algorithms in graph – breadth first search, depth first search, spanning tree, minimum cost spanning tree - Kruskal's, Prim's

Text Books

1. Sartaj Sahni, "Data Structures, Algorithms", Tata Mc Graw Hill, New York.
2. Preiss, Bruno R., "Data Structures and Algorithms: With Object-Oriented Design Patterns in C++ ", John Wiley & Sons, New York, 2003.
3. Seymour Lipschutz, "Data Structure", Schaum's Outlines, Tata McGraw Hill

Reference Books

1. Kruse, Tonso, Leung: Data Structures and Program Design in C
2. Langsam, Augestein, Tanenbaum : Data Structures using C and C++
3. Weiss: Data Structures and Algorithm Analysis in C/C++
4. Carrano and Prichard: Data Abstraction and Problem solving with C++
5. Horowitz and Sahni: Fundamental Data Structures
6. Sahni : Data Structures, Algorithms and applications in C++
7. Standish: Data Structures in Java
8. Corman et al: Introduction to Computer Algorithms

4 year BTech Curricula for Computer Science and Engineering							
BTech III semester (B3)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1	14B11HS311	Managerial Economics	Core	2	1	0	3
2	14B11MA311	Discrete Mathematics	Core	3	1	0	4
3	14B11CI311	Object Oriented Programming	Core	3	1	0	4
4	14B11CI312	Database Systems	Core	3	1	0	4
5	14B11EC413	Digital Electronics	Core	3	1	0	4
6	14B17EC473	Digital Electronics Lab	Core	0	0	2	1
7	14B17CI371	Object Oriented Programming Lab	Core	0	0	2	1
8	14B17CI372	Database Systems Lab	Core	0	0	2	1
9	14B17CI373	Multimedia Development Lab	Core	0	0	2	1
10	14B17CI374	Advanced Programming Lab-I	Core	1	0	2	2
		Total		**15**	**5**	**10**	**25**

Course Description

Title of Course: Managerial Economics **Course Code: 14B11HS311**
L-T Scheme: 2-1 **Course Credits: 3**

Objectives: To make the students understanding how to work with and through others to accomplish individual and group goals. Methods of instruction will include cases, simulations, lectures and group activities.

Learning Outcomes: Students will be able to understand individual, interpersonal and group processes that influence behavior within teams and organizations.

Course Contents:

Unit 1. Introduction to Managerial Economics & Macro-economic Concepts

Definition of Economics, Meaning & Scope of Managerial Economics, Micro & Macro Economics, Concept of economic profit, (Opportunity Cost), Concept of Present value.

Unit 2. Demand Analysis

Law of demand**,** Individual & market demand, Determinants of market demand, Marginal Utility theory, Elasticity of demand – Price, Income, Cross, Advertising Theory of Consumer choice using Indifference Curve analysis, Demand forecasting techniques, Delphi, Survey, Time series analysis.

Unit 3. Production Theory and Analysis

Production with one variable, optimal employment of a factor of production, Cobb Douglas production function, Production with two variable inputs, Production Isoquants, Production Isocosts, Optimal employment of two inputs, the expansion path, Basics of Supply, Market Equilibrium

Unit 4. Cost Theory and Analysis

Cost concepts – Opportunity, Explicit, Marginal, Incremental and Sunk, Relation between Production & Cost, Short run cost function, Long run cost function, Special topics -Profit contribution analysis, - Break Even analysis, Operating Leverage

Unit 5. Pricing under Different Market Structures

Perfect Competition - Determination of Price output relationship in short run, long run, Monopoly Determination of Price output relationship in short run & long run, Price discrimination, Monopolistic Competition - Determination of Price output relationship in short run & long run, Product Differentiation ,Oligopoly -Types, Determination of Price output relationship, Kinky demand curve {Stickiness of Price}, Price leadership model.

Text Books

1. Managerial Economics – Analysis, Problems & Cases by P. L. Mehta, Sultan Chand & Sons.

References

1. Managerial Economics by Craig Peterson, Pearson Education.
2. Modern Economic Theory by K. K. Dewett.

Course Description

Title of Course: Discrete Mathematics **Course Code: 14B11MA311**
L-T Scheme: 3-1 **Course Credits: 4**

Objectives: In this course we have the two goals:

- To learn about a number of different discrete structures that is used as tools in the mathematical formalization of many computational problems.
- To gain more experience with mathematical arguments and proof techniques, that provide essential background for reasoning and computation.

Learning Outcomes: Students will be able to learn many structures which are very helpful in analyzing and solving computational problems.

Course Contents:

Set theory and Relations, Functions and Algorithms, Logic, Prepositional Functions and Quantifiers, Graphs, Trees and Graph Coloring, Sequential representation, Directed graphs and Binary trees, Groups, Rings and Fields, Ordered sets, Lattices and Boolean algebra, Languages, Finite State Automata Grammars and Finite State Machines.

Text Books

1. Lipschutz. S, Lipson, M. Discrete Mathematics, Schaum Series (TMH), 1997.
2. Deo, N. Graph Theory, Prentice Hall, 1980.

References

1. Kenneth Rosen, “Discrete Mathematics and its Applications”, TMH.
2. Liu, C.L. Elements of Discrete Mathematics, 2nd Edition TMH, 1985.
3. Lewis, H.R., Papadimtriou, C.H. Elements of the Theory of Computation, 2nd Edition, Pearson Education, 1998.

Course Description

Title of Course: Digital Electronics **Course Code: 14B11EC413**
L-T-P Scheme: 3-1-0 **Course Credits: 4**

Objectives: This course aims to introduce students to digital electronics engineering and provide them with a fundamental understanding of digital electronics and its application, Produce Digital Electronic engineering graduates equipped to play valuable roles in the computing, electronics and communication industries.

Learning outcomes: At the end of the course, successful students should have knowledge of and ability to apply the Mathematics and scientific concepts required by Digital Electronic engineers, basic level of knowledge of and ability to apply the concepts, principles and theories of Computing and IT, as likely to be required by a Digital Electronic engineer, detailed knowledge of and ability to apply the essential facts, concepts, principles and theories needed by Digital Electronic engineers.

Course Contents:

- Review of Number system, Binary Codes
- Switching mode operation of semiconductor Devices
- Digital Logic Families
- Combinational Logic Design
- Sequential Logic Design
- Basic pulse circuits
- Introduction to VHDL

Text Book

1. Morris Mano, Digital Logic and Computer Design, PHI.

References Books

1. Taub and Schilling, Digital Integrated Electronics, McGraw Hill, Int. Ed.
2. Zainalabdil Navabi , Analysis & Modeling of Digital System, TMH.
3. J.Bhaskar, VHDL Primer.

Course Description

Title of Course: Object Oriented Programming **Course Code: 14B11CI311**
L-T Scheme: 3-1 **Course Credit: 4**

Prerequisites
Students must have already registered for the course, "Introduction to Computers and Programming (14B11CI311)".

Objectives
1. To strengthen their problem solving ability by applying the characteristics of an Object-Oriented approach.
2. To introduce Object-Oriented concepts in C++ with generic data types.

Learning Outcomes

Student will be able to-
1. Explain what constitutes an object-oriented approach to programming and identify potential benefits of object-oriented programming over other approaches.
2. Apply an object-oriented approach to developing applications of varying complexities.

Course Contents

Unit-1: Review of Structured programming in C, Structured versus Object-Oriented Programming, Principles of Object-Oriented Programming, Beginning with C++, Tokens, Expressions and Control Structures, Functions in C++.

Unit-2: Classes, Member Functions, Objects, Static Data Members, Static Member Functions, Friend Functions, Pointer to Members, Local classes, Constructors and Destructors of objects in C++,

Unit-3: Operator overloading and Type Conversions, Inheritance and its form, Multiple Inheritance in C++.

Unit-4: Pointers, Virtual Functions and Polymorphism, Managing Console I/O Operations.

Unit-5: Working with Files, Templates and Exception Handling.

Unit-6: Introduction to Standard Template Library (STL), Sequence, Containers, Iterators, Manipulating Strings.

Textbooks

1. E-Balagurusamy, "Object Oriented Programming with C++", sixth edition, McGraw Hill Education Private Limited, New Delhi.

2. Lafore, Robert, “Object Oriented programming in C++”, 3rd edition, Galgotia Publishing Company, New Delhi.

References

1. Herbert Schildt, “C++: The Complete Reference”, TMH, New Delhi.
2. Deitel, H. M. and Deitel, P. J., “C++ How to program”, fifth edition, Pearson Education, New Delhi.
3. Stroustrup, Bjarne, “C++ Programming Language”, third edition, Pearson Education, New Delhi.
4. Prata, Stephen, “C++ Primer Plus”, fourth edition, Pearson Education, New Delhi.
5. Pohl, Ira, “Object-Oriented Programming Using C++”, second edition, Pearson Education, New Delhi.
6. Sarang, Poornachandra, “Object Oriented Programming using C++”, Prentice Hall of India, New Delhi.

Course Description

Title of Course: Database Systems **Course Code: 14B11CI312**
L-T Scheme: 3-1 **Course Credits: 4**

Objectives: To develop the ability to design, implement and manipulate databases as well as to build Database management systems.

Learning Outcome:

1. Ability to build normalized data bases.
2. Ability to design systems by using ER Modeling.
3. Ability to develop skills of writing applications by using SQL.
4. Ability to understand query optimization techniques.
5. Understanding of transaction processing.
6. Ability to handle recovery and concurrency issues

Course Contents:

Unit 1: Introduction to Databases, Database Environment,

Unit 2: Relational Model, Relational Algebra,

Unit 3: SQL: Data Manipulation, Data Definition, And Commercial RDMS: MS-Access/Oracle 9i, PL/SQL,

Unit 4: ER Modeling: Entity type, Attributes, Relation types, Notations, Extended ER Features,

Unit 5: Normalisation and building normalized databases & Data Dependencies, Case Study,

Unit 6: Database Connectivity: ODBC /JDBC,

Unit 7: Transactions, Concurrency, Recovery & Security,

Unit 8: Query Processing & Optimization.

Text Book

1. "Database system concepts", Henry F Korth, Abraham Silberschatz, S. Sudurshan, McGraw-Hill, 4th Edition.

References

1. "An Introduction to Database Systems" Bipin. C. Desai. Revised Edition 2006.
2. "Fundamentals of Database Systems", Elmasri, Navathe, Pearson Education, 4th Ed.
3. "An Introduction to Database Systems", C. J. Date, Pearson Education.
4. "Introduction to Data Base Management", Naveen Prakash, Tata McGraw Hill.
5. "Database Management Systems", Ramakrishna, Gehrke; McGraw-Hill.
6. "Database Systems: A Practical Approach to design, Implementation and Management", Thomas Connolly, Carolyn Begg; Third Edition, Pearson Education.
7. "A first course in Database Systems", Jeffrey D. Ullman, Jennifer Windon, Pearson Education.
8. "Data Management: databases and organization", Richard T. Watson, Wiley Publication.

Course Description

Title of Course: Digital Electronics Lab **Course Code: 14B17EC473**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Objective: Digital Electronics laboratory is the Second year's laboratory which is totally based on Digital components. This laboratory has been designed for the students of III semester of the degree course of Electronics and Computer branches of our institution and it is fully in working condition.

Learning Outcome: With the help of this laboratory, students will learn about the basics of digital electronics that how a data is being converted to digital form and how the data communicates in the digital form and how to interface the Logic gates IC with each other. The base of this subject will be helpful in further laboratory of Microprocessor and Interfacing. The entire practical are running smoothly and we keep on checking each practical kit separately time to time for its working.

Course Contents:

Implementation of DTL and TTL circuits, Verification of logic functions of the TTL ICs, Implementation of combinational digital circuits using MSI Logic, K-map and Boolean function simplification for efficient implementation of digital systems, Implementation of Binary Adders and Subtractor, Implementation of code converters (Gray-to-Binary & Binary-to-Gray), Implementation of magnitude comparators, Implementation of BCD-to-Seven Segment Decoder/Driver, Use of Flip-Flop TTL IC in digital system, Implement the 4-Bit binary counter using 7493, Verification of various logic functions of the TTL ICs using 7493 binary counter and measurement of propagation delay, Use of Multiplexer TTL IC for designing digital systems. Use of Demultiplexer, TTL ICs for designing digital systems, Implementation of shift register, Implementation of Shift register counters, Implementation of Johnson counters with decoding logic.

Text Books

1. Morris Mano, Digital Logic and Computer Design, PHI

References

1. Taub and Schilling, Digital Integrated Electronics, McGraw Hill, Int. Ed.
2. Zainalabdil Navabi , Analysis & Modeling of Digital System, TMH

Course Description

Title of Course: Object Oriented Programming Lab **Course Code: 14B17CI371**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Pre-requisites
Students must have already registered for the course, "Computer Programming Lab (14B17CI171)".

Objectives
1. To strengthen their problem solving ability by applying the characteristics of an Object-Oriented approach.
2. To introduce Object-Oriented concepts in C++ with generic data types.

Learning Outcomes
Student will be able to-
1. Explain what constitutes an object-oriented approach to programming and identify potential benefits of object-oriented programming over other approaches.
2. Apply an object-oriented approach to developing applications of varying complexities.

Course Contents-

Lab Exercises based on-

- Review of Structured programming in C
- O-O paradigm, RTTI and Casting types in C++
- Objects, Complex Objects, Classes, Methods
- Constructors and destroying objects in C++, Operator Overloading
- Inheritance and its form and Multiple Inheritance in C++
- Polymorphism and Virtual Functions in C++
- I/O operations, File Handling in C++, Friend Functions, Static members function
- Namespace and Templates in C++
- Exception Handling in C++
- STL-Container classes, Sequence, Iterators, Manipulating Strings

Laboratory Work

The students shall be given regular lab exercises, which will allow them to practically apply the concepts studied in the lecture Session. The lab exercises will be designed with focus on applying the concepts learnt in object-oriented programming, data structures in an integrated manner.

Textbooks

1. E-Balagurusamy, "Object Oriented Programming with C++", sixth edition, McGraw Hill Education Private Limited, New Delhi.
2. Lafore, Robert, "Object Oriented programming in C++", 3rd edition, Galgotia Publishing Company, New Delhi.

References

1. Herbert Schildt, "C++: The Complete Reference", TMH, New Delhi.
2. Deitel, H. M. and Deitel, P. J., "C++ How to program", fifth edition, Pearson Education, New Delhi.
3. Stroustrup, Bjarne, "C++ Programming Language", third edition, Pearson Education, New Delhi.
4. Prata, Stephen, "C++ Primer Plus", fourth edition, Pearson Education, New Delhi.
5. Pohl, Ira, "Object-Oriented Programming Using C++", second edition, Pearson Education, New Delhi.
6. Sarang, Poornachandra, "Object Oriented Programming using C++", Prentice Hall of India, New Delhi.

Course Description

Title of Course: Database Systems Lab **Course Code: 14B17CI372**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Objectives: To develop the ability to design, implement and manipulate databases as well as to build Database management systems.

Learning Outcome

1. Ability to design systems by using ER Modeling.
2. Ability to develop skills of writing applications by using SQL.
3. Ability to understand query optimization techniques and transaction processing.

Course Contents:

Unit 1: SQL queries for the creation of tables and insertion of values into tables. SQL queries for viewing all data and specific data corresponding to a particular row or column in a table.

Unit 2: SQL queries for the updation, deletion and dropping of tables. SQL queries for aggregation, range finding etc on the tables. SQL queries for renaming, truncating and destroying the tables.

Unit 3: SQL queries for the use of not null, group by, having clause. SQL queries for the computation done on the table data.

Unit 4: Exercise on nested SQL queries and sub queries. Use of cursors, triggers, functions and writing PL/SQL block.

Unit 5: A brief idea about oracle report builder.

Text Book

1. SQL, PL/SQL the Programming Language of Oracle, Ivan Bayross, 3rd edition.

References

1. “SQL, PL/SQL the Programming Language of Oracle”, Ivan Bayross, 3rd Edition.
2. “An Introduction to Database Systems” Bipin. C. Desai. Revised Edition 2006.
3. "Fundamentals of Database Systems", Elmasri, Navathe, Pearson Education, IVth Edition.
4. “An Introduction to Database Systems”, C. J. Date, Pearson Education.
5. “Introduction to Data Base Management”, Naveen Prakash, Tata McGraw Hill.
6. “Database Management Systems”, Ramakrishna, Gehrke; McGraw-Hill.
7. “Data Management: databases and organization”, Richard T. Watson, Wiley Publication.
8. “Data Modeling Essentials”, Graeme C. Simxion, Dreamtech Publications.

Course Description

Title of Course: Multimedia Development Lab **Course Code: 14B17CI373**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Objectives: To develop an ability to design and implement the multimedia processes using multimedia database.

Learning Outcomes: Students will be capable to acquire the generic programming skills to design and implement the multimedia based real life applications.

Course Contents:

Unit-I: Adobe Photoshop based exercise.

Unit-II: Adobe Illustrator based exercise.

Unit-III: Developing Movie in Windows Live Movie maker.

Unit-IV: Design, Development and Hosting of Website using Microsoft Frontpage.

Unit-V: Macromedia Flash based exercise.

Unit-VI: Project

Text Book

1. Vaughan, Tay, "Multimedia: Making It Work", Tata McGraw Hill, New Delhi, 2008

Reference Books

1. Multimedia Fundamentals : Media Coding and Content Processing Vol. 1 / Steinmetz, Ralf
2. Multimedia Systems / with 172 Figures
3. Principles of Multimedia Database Systems / Subramanian, V.S.
4. Multimedia An Introduction / Vilamail-Casanova, John
5. Fundamentals of Multimedia / Drew, Mark S.
6. Multimedia Communications: Applications, Networks, Protocols and Standards / Halsall, Fred.

Course Description

Title of Course: Advanced Programming Lab-I **Course Code: 14B17CI374**

L-T-P scheme: 1-0-2 **Course Credits: 2**

Prerequisite: No explicit prerequisite course work is required, but students are expected to have a fundamental understanding of basic computer principles and previous experience using a personal computer.

Objective: To emphasize object-oriented programming concepts and the design of algorithms and related data structures. Problem decomposition and principles of software engineering are stressed throughout the course. Advance aspects of programming may be taken care off through Python.

Learning Outcomes: At the end of the course students should be able to:

- Master the principles of object-oriented programming and the interplay of algorithms and data structures in well-written modular code;
- Solve problems requiring the writing of well-documented programs in the Python language, including use of the logical constructs of that language;
- Demonstrate significant experience with the Python program development environment.

Course Contents:

Unit-I (An Introduction to Python): Introductory Remarks about Python, Strengths and Weaknesses, A Brief History of Python, Python Versions, Installing Python, Environment Variables, Executing Python from the Command Line, IDLE, Editing Python Files, Getting Help, Dynamic Types, Python Reserved Words, Naming Conventions.

Basic Python Syntax: Introduction, Basic Syntax, Comments, String Values, String Operations, The format Method, String Slices, String Operators, Numeric Data Types, Conversions, Simple Input and Output, The print Function.

Language Components: Introduction, Control Flow and Syntax, Indenting, The if Statement, Relational Operators, Logical Operators, True or False, Bit Wise Operators, The while Loop, break and continue, The for Loop.

Unit-II (Collections): Introduction, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries, Copying Collections, Summary.

Functions: Introduction, Defining Your Own Functions, Parameters, Function Documentation, Keyword and Optional Parameters, Passing Collections to a Function, Variable Number of Arguments, Scope Functions- “First Class Citizens”, Passing Functions to a Function, Mapping Functions in a Dictionary, Lambda, Closures.

Unit-III (Modules): Modules, Standard Modules-sys, Standard Modules-math, Standard Modules-time, The dir Function.

Exceptions: Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple, Exceptions, raise, assert, Writing Your Own Exception Classes.

Unit-IV (Input and Output): Introduction, Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data From a File, Additional File Methods, Using Pipes as Data Streams, Handling IO Exceptions, Working with Directories, Metadata, The pickle Module.

Unit-V (Classes in Python): Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, File Organization, Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Custom Exception Classes, and Class Documentation-pydoc.

Introduction To GUI: Introduction, Simple input and output, Special GUI Classes, Widgets, Layout Managers Regular Expressions.

Text Book

1. Programming Python /Mark Lutz.

Reference Books

1. Think Python / Allen B Downey
2. Python 101 / Dave Kuhlman

4 year BTech Curricula for Computer Science and Engineering							
BTech IV semester (B4)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1	14B11HS411	Financial Management	Core	2	1	0	3
2	14B11MA411	Probability Theory and Random Processes	Core	3	1	0	4
3	14B11CI611	Computer Networks	Core	3	1	0	4
4	14B11EC415	Microprocessors and Controllers	Core	3	1	0	4
5	14B11CI412	Fundamentals of Algorithms	Core	3	1	0	4
6	14B17CI671	Computer Networks Lab	Core	0	0	2	1
7	14B17EC475	Microprocessors and Controllers Lab	Core	0	0	2	1
8	14B17CI472	Algorithms Lab	Core	0	0	2	1
9	14B17CI473	Unix Programming Lab	Core	1	0	2	2
		Total		**15**	**5**	**8**	**24**

Course Description

Title of Course: Financial Management **Course Code: 14B11HS411**
L-T Scheme: 2-1 **Course Credits: 3**

Objectives: In today's dynamic world engineers along with taking technical decisions also have to take financial decision like long term investment decision i.e. expansion, merger& acquisition etc., short term investment decision i.e. inventory management, receivable management etc. and so on. So they need to understand, analyze, and interpret financial data and financial issues.

Learning Outcome:

Students will be able to understand the concepts and principles of accounting and finance with the support of software packages so that they can make quick informed financial decision.

Course Contents:

Introduction, Scope and Objectives, Basic Financial Concept, Time value of money, Capital budgeting techniques, Cash flows, Long term sources of finances.

Concept and measurement of cost of capital, Leverages, EBIT-EPS analysis, Working capital management- Inventory Management, Financial Statement analysis.

Text Books

1. Financial Management by I. M. Pandey.

References

1. Principles of Financial Management by Douglas R. Emery, John D. Finnerty, John D. Stowe.

Course Description

Title of Course: Probability Theory and Random Processes
Course Code: 14B11MA411
L-T Scheme: 3-1 **Course Credits: 4**

Objectives: This course has been prepared for ECE and CSE students with the following objectives:

(i) To know about various random life length models and their uses in finding the reliability of different electronic devices.

(ii) To learn about basic properties and characteristics of various random processes with reference to signal and trunk processes.

Learning Outcomes: After leaning this course the students will be able to-

(i) Model life random processes using appropriate statistical distributions,
(ii) Compute the reliability of different stochastic systems and
(iii) Apply the knowledge of random processes in signal processing and trunking theory.

Course Contents:
Random experiments & sample space, events. Three basic approaches to probability, conditional probability, total probability theorem, Baye' s theorem, One dimensional random variables(discrete and continuous) and their distributions, bivariate distributions, joint, marginal and conditional distributions characteristic function, covariance and correlation of random variables.

Bernoulli, Binomial, Poisson, negative binomial, geometric and probability distributions, Concept of reliability, reliability function, hazard rate function, mean time to failure Introduction and description of random processes, Markov processes, processes with independent increments. Average values of random processes. Stationary processes and computation of their averages.

Random walk, Wiener process, Properties of autocorrelation function, ergodic processes Power spectral density function and its properties. Linear systems with random inputs, system in the form of convolution, Gaussian processes, Poison Processes, Markov chains.

Text Books

1. T. Veerarajan. Probability, Statistics and Random Processes. Tata McGraw Hill.

References

1. J. J. Aunon & V. Chandrasekhar, Introduction to Probability and Random Processes. McGraw Hill Intematinal Ed.
2. Papoulis & S.U. Pillai, Probability, Random Variables and Stochastic Processes, McGraw Hill.
3. H. Stark, and J.M. Woods, Probability and Random Processes with Applications to Signal Processing, Pearson Education.

Course Description

Title of Course: Computer Networks **Course Code: 14B11CI611**
L-T Scheme: 3-1 **Course Credits: 4**

Prerequisites: Students must have already registered for the course, "Introduction to Computer & Programming (14B11CI111) and "Data Structures & Algorithms (14B11CI211).

Objectives: To design and build a Computer Network.

Learning Outcome: The Course will be covered through Lecture (power point presentation), Assignment sheets (containing questioner from different books will be given on Every weekend) and practical Labs, Some Section of the course will include Additional reading in the research literature (e.g. Research paper on fault-tolerant Interconnection network) to allow them to see how the leading edge advances in this area of the discipline. Full engagement in the course is a critical part of learning methods appropriate to this area of the discipline. Full engagement in the Course is a critical part of learning methods appropriate to this area of study. In practical Labs different Network Simulators are used to make all theoretical concepts into practical examples.

Course Contents:

Unit-I: Architecture and Layers: OSI and TCP/IP Reference Models, Topology: Ring, Bus, Star and Tree,

Unit-II: Data Link Layer: Framing, Flow and Error Control, Devices: Repeaters, Bridges, Hubs, Switches, Client-Server: LAN, MAN, WAN, 1, 2, 3-Tier Architecture.

Unit-III: Network layer Addressing, IP, IPv6, Routing Algorithms: Shortest Path, Distance Vector and Link State.

Unit-IV: Transport Layer: TCP, UDP, SCTP, Congestion Control.

Unit-V: Application layer Concepts and Protocols HTTP, DNS, EMAIL.

Text Books

1. Tanenbaum A, Prentice-Hall, Computer Network (4^{th} Ed.).
2. B. Forouzan, TMH, Data Communications and Networking (4^{th} Ed.).

References

1. Stallings W, Prentice-Hall, Data and Computer Communication (6^{th} Ed.).
2. Peterson L. and Davie B., Morgan Kaufmann, Computer Networks: Systems Approach (3^{rd} Ed.).

Course Description

Title of Course: Microprocessors and Controllers **Course Code: 14B11EC415**
L-T Scheme: 3-1 **Course Credits: 4**

Objectives: Students should learn a microprocessor's programming model at a level that enables them to write assembly language programs for the processor that meets given specifications, learn concepts associated with interfacing a microprocessor to memory and to I/O devices and learn how to control components of a microprocessor based system through the use of interrupts. Students understand the basic operation of a microcontroller system and who have learned fundamental programming skills in assembly language.

Learning Outcomes: Students will be able to develop, implement, and debug 80x86 assembly language programs that meet stated specifications, understand and be able to explain bus transactions, memory organization and address decoding, basic I/O interfaces and port addressing and also understand how to control components of a computer system through the use of hardware and software interrupts. An ability to write programs for a microcontroller in assembly language, ability to interface a microcontroller to various devices, ability to effectively utilize the wide variety of peripherals integrated into a contemporary microcontroller.

Course Contents:

Introduction to Microprocessor and Microcontrollers: Historical background, Microprocessor and microcontroller based computer systems, Flynn's classification of processors, Classification of microprocessors. 8051 and its flavors, A microcontrollers survey, Development of system for microcontrollers and case studies.

Microprocessor and Microcontroller Architecture: Introduction, 8085: Addressing mode, Programming in 8085, 80x86: Internal microprocessor Architecture, Real mode memory addressing, Introduction to protected mode memory addressing. 8051: microcontrollers Hardware, Input/Output pins, ports & circuits, External memory, counters & timers, Serial Data input/output, interrupts.

Addressing modes: 8085: addressing mode , 80x86: Data-Addressing modes, Program memory –addressing modes, stack memory addressing modes, and 8051 addressing mode: Comparison with microprocessors, External data moves, code memory read only data moves Push & pop opcodes, Data exchanges, Example programs. 8086/8088 Hardware specification: pin-outs and the pin function, Clock generators, Bus buffering & latching, Bus timings, ready and wait states, Minimum mode versus maximum mode.

Programming the Microprocessors and Microcontroller: Data movement, Arithmetic & logic and program control Instructions, Programming 8086: Module programming, using keyboard & video display, Data Conversion, Disk Files, Interrupt Hooks.

Programming the 8051: Programming the 8051, Line of code, 8051 instruction syntax. Memory Interface: Memory Devices, Addressing Decoding,8088 & 80188(8bit) Memory interface, 8086, 80186, 80286, 80386sx(16bit) memory interface, Pentium ,Pentium pro and Pentium II(64-bit) memory interface, Dynamic RAM.

Interrupts for Microprocessors and Microcontrollers: Basic Interrupt processing, Hardware interrupts, expanding the interrupts structures, 8259A, interrupt examples. I/O Interfacing: Memory organization & Interfacing, Internal architecture and programming of I/O Chips: 8251, 8253/54, 8255, 8257, 8259.

Direct Memory Access & DMA Controlled I/O: Basic DMA controller, The 8237 DMA controller, Shared –Bus operation, Disk memory System, video displays. Serial Data Communications: Introduction, Network Configuration, 8051 Data communication modes.

Text Books

1. The Intel Microprocessors 80x86, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium IV Architecture, Programming and Interfacing by Berry B. Bray, Six Edition, Prentice Hall
2. The 8051 microcontrollers Architecture, Programming & application ,2nd edition by Kenneth J. Ayala.

References

1. R.S. Gaonkar, "Introduction to Microprocessors", Wiley Eastern (Latest Edition)
2. Advanced microprocessors and peripherals by AK Ray & K M Bhurchandi
3. Douglas Hall, "Microprocessors & Interfacing, Programming and Hardware", TMH.
4. The 8086 Microprocessors programming & Interfacing the PC by Ayala
5. Embedded controller hardware design By Ken Arnold
6. Embedded Systems Design With 8051 Microcontrollers: Hardware and Software By Knud Smed Christensen, Zdravko Karakehayov, Ole Winther

Course Description

Title of Course: Fundamentals of Algorithms **Course Code: 14B11CI412**
L-T Scheme: 3-1 **Course Credits: 3**

Prerequisites: Student must have already registered for "Introduction to Computer and Programming", and Data Structures.

Objectives

1. Strengthen higher level cognitive Skills of analysis, creation and evaluation.
2. Strengthen Ability of data abstraction and problem solving using computer
3. Strengthen ability to express solution to problem clearly and precisely.
4. Strengthen ability to design and evaluate ADTs, nonlinear temporary and persistent data structures and also related algorithms.

Learning Outcome: The student shall deepen the generic skills to design and implement ADTs. Non linear Data structures and algorithms for a broad-based set of computing problem in various domain

Course Contents:

Unit-I: Analysis of algorithm: Asymptotic Notation, Introduction to algorithms and its importance, mathematical foundations, growth functions, complexity, summations, recurrences. Sorting and merging Algorithm. Insertion sort, divide and conquer, merge sort, heap sort, radix sorting, counting sorting, Bucket Sorting.

Unit-II: Fundamental techniques: Divide and Conquer method, Dynamic Programming, Introduction to Greedy Method.

Unit-III: Tree and related data Structure: Heap, Priority Queues, B-Tree, AVL, Splay Tree, Red-Black Tree, Threaded Tree. Elementary Graph algorithms: Minimum spanning trees, Single source shortest path, all pair shortest path.

Unit-IV: Files: Classification, Record Organization, Retrieval System, External Sorting .Set, Dictionary: Design, Analysis, integration and applications. Hashing: technique, collision resolution and analysis.

Unit-V: Text Processing: String operation, pattern matching algorithm, Robin – Karp algorithm, Knuth – Morris Pratt algorithm, tries, text compression, text similarity testing.

Text Book

1. Weiss: Data Structure and Algorithm analysis in C/C++

References

1. Aho, Hopcraft, Ullman: Data Structure and Algorithms
2. Kruse, Tonso, Leung: Data Structure and program Design in C
3. Sahni: Data structure and algorithm and application in C++
4. Coremen: Introduction to algorithm, the Massachusetts institute of
5. Technology, Cambridge, Massachusetts.

Course Description

Title of Course: Computer Networks Lab **Course Code: 14B17CI671**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Prerequisites: Students must have already registered for the course, "Computer Programming Lab and Data Structure Lab and Algorithm Lab.

Objectives: To Design and build a Computer Network.

Learning Outcome: The Course will be covered through assignment practical Labs, Some Section of the course will include additional reading in the research literature (e.g. research paper on fault-tolerant Interconnection network) to allow them to see how the leading edge is advanced in this area of the discipline. In practical Labs different Network Simulators are used to make all theoretical concepts into practical examples.

Course Contents:

Unit-I: Architecture and Layers: OSI and TCP/IP Model, Physical Media Preparation.

Unit-II: Topology: Ring, Bus, Star and Tree, Using Wired and Wireless Mediums.

Unit-III: Repeaters/ Hubs, Access Points, Switches, LAN

Unit-IV: Routers, and Gateway, IPv6, Client-Server:, WAN, Routing Protocols: RIP, OSPF etc.

Unit-V: TCP, UDP, DNS, HTTP.

Text Books

1. Tanenbaum A, Prentice-Hall, Computer Network (4^{th} Ed.).

References

1. Stallings W, Prentice-hall, Data and Computer Communication (6^{th} Ed.).
2. Peterson L. and Davie B., Morgan Kaufmann, Computer Networks: Systems Approach (3^{rd} Ed.).

Course Description

Title of Course: Microprocessor and Controllers Lab **Course Code: 14B17EC475**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Objectives

1. Students will be able to develop, implement and debug 8086 assembly language programs that meet the stated specifications.
2. Students should learn how to control components of a microprocessor based system through the use of interrupts.

Learning Outcome

The student will be able to apply all the previously acquired knowledge. He/she will be able to design a microprocessors/microcontroller based embedded system to solve an electronic/software problem like temperature controller, Traffic light Simulation.

Course Contents:

Assemble language programming including modular programming, Input /Output programming, Stay resident programming, Alarm programming, Keyboard keys locking programming using 8086 Assembler, Simulation of LED display, Analog to Digital converters, Serial communication, Parallel communication, Keyboard and timer programming using Cx51 Keil Software simulator.

Text Books

1. The Intel Microprocessors 80x86, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium IV Architecture, Programming and Interfacing by Berry B. Bray, Six Edition, Prentice Hall.

References

1. The 8051 microcontrollers Architecture, Programming & application, 2nd edition by Kenneth, J. Ayala.
2. Embedded controller hardware design By Ken Arnold

Course Description

Title of Course: Algorithms lab **Course Code: 14B17CI472**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Prerequisites: Student must have already registered for "Computer programming lab", "Data Structures and computer programming lab".

Objectives

1. Strengthen higher level cognitive Skills of analysis, creation and evaluation.
2. Strengthen Ability of data abstraction and problem solving using computer
3. Strengthen ability to express solution to problem clearly and precisely.
4. Strengthen ability to design and evaluate ADTs, nonlinear temporary and persistent data structures and also related algorithms.
5. Introduce students to some domain specific data structures and related algorithms in various domains.

Learning Outcomes: The student shall deepen the generic skills to design and implement ADTs. Non linear Data structures and algorithms for a broad-based set of computing problem in various domain

Course Contents:

Unit-I: Analysis of algorithm: Asymptotic Notation, Introduction to algorithms and its importance, mathematical foundations, growth functions, complexity, summations, recurrences. Sorting and merging Algorithm. Insertion sort, divide and conquer, merge sort, heap sort, radix sorting, counting sorting, Bucket Sorting.

Unit-II: Fundamental techniques: Divide and Conquer method, Dynamic Programming, Introduction to Greedy Method.

Unit-III: Tree and related data Structure: Heap, Priority Queues, B-Tree, AVL, Splay Tree, Red-Black Tree, Threaded Tree. Elementary Graph algorithms: Minimum spanning trees, Single source shortest path, all pair shortest path.

Unit-IV: Files: Classification, Record Organization, Retrieval System, External Sorting .Set, Dictionary: Design, Analysis, integration and applications. Hashing: technique, collision resolution and analysis.

Unit-V: Text Processing: String operation, pattern matching algorithm, Robin – Karp algorithm, Knuth – Morris Pratt algorithm, tries, text compression, text similarity testing.

Text Book

1. Weiss: Data Structure and Algorithm analysis in C/C++

References

1. Aho, Hopcraft, Ullman: Data Structure and Algorithms
2. Kruse, Tonso, Leung: Data Structure and program Design in C
3. Sahni: Data structure and algorithm and application in C++
4. Coremen: Introduction to algorithm, the Massachusetts institute of
5. Technology, Cambridge, Massachusetts.

Course Description

Title of Course: UNIX Programming Lab **Course Code: 14B17CI473**
L-T-P Scheme: 1-0-2 **Course Credit: 2**

Objectives:

- To familiarize students with the architecture of Unix OS.
- To provide necessary skills for developing and debugging programs in UNIX environment.

Learning Outcomes: After completion of the course the student would be able to

- Appreciate the advantages of Unix OS.
- Develop and debug, C programs created on UNIX platforms.
- Use and if necessary install standard libraries.

Course Contents:

Unit I: What is Unix/Linux?

Basic overview and history of unix/linux, Command line basics, Commands: ssh, ls, pwd, cd, cp, rm, mv

Unit II: Using the Command Line

Accessing remote servers and files, Editing and manipulating files, Piping commands and saving output, Searching in command line history, Commands: mkdir, nano, cat, head, tail, less, clear, grep, sort, uniq, man, >, |, ssh-keygen

Unit III: Operating System Organization

OS basics, processes, Filesystem layout, File permissions, Commands: chmod, find, locate

Unit IV: Your Own Copy of Linux

Overview of popular Linux distributions, Running Linux in a virtual machine, Super user powers, Installing applications, Commands: make, apt-get

Unit V: Programming in Linux

Simple Bash shell scripting, Compiling C/C++ files, File processing: awk, sed, Commands: gcc, sh

Unit VI: Programming & Scripting- Scripting

Text Books

1. "Unix programming Environment", B. Kernighan and Rob Pike, PHI.
2. "Unix: Concepts and Applications", Sumitabha Das, TMH.

References

1. "Linux Programming by Example the Fundamentals", Arnold Robbins, Pearson Education.
2. "Advanced Unix a Programmers Guide", Stephen Prata, Sams Publishing.
3. "The Design of the Unix Operating System", Maurice J.Bach, PHI.

4 year BTech Curricula for Computer Science and Engineering							
BTech V semester (B5)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1		HSS Elective	Elective	3	0	0	3
	14B14HS541	Social and Legal Issues					
	14B14HS542	Human Psychology					
	14B14HS543	Professional Ethics					
	14B14HS544	Macro Economics					
2	14B11EC515	Communication Systems	Core	3	1	0	4
3	14B11CI511	Operating Systems	Core	3	1	0	4
4	14B11CI512	Software Engineering	Core	4	0	0	4
5	14B11CI513	Theory of Computation	Core	3	1	0	4
6	14B17EC575	Communication Systems Lab	Core	0	0	2	1
7	14B17CI571	Operating Systems Lab	Core	0	0	2	1
8	14B17CI572	Software Engineering Lab	Core	0	0	2	1
9	14B17CI573	Advanced Programming Lab-II	Core	1	0	2	2
10		DE-1	Elective	3	0	0	3
		Total		**20**	**3**	**8**	**27**
List of Electives for DE-1			**Core/ Elective**	**L**	**T**	**P**	**Credits**
	14B14CI542	Object Oriented Computing	Elective	3	0	0	3
	14B14CI543	Real Time Systems	Elective	3	0	0	3
	14B14CI544	Embedded Systems	Elective	3	0	0	3
	14B14CI545	Logic in Computer Science	Elective	3	0	0	3
	14B14CI546	E-Commerce	Elective	3	0	0	3
	14B14CI547	Advanced Concepts in DBMS	Elective	3	0	0	3
	14B14CI644	Computer Graphics	Elective	3	0	0	3
	14B14CI645	Computer Systems Security	Elective	3	0	0	3

Course Description

Title of Course: Social and Legal Issues **Course Code: 14B11HS541**
L-T Scheme: 2-1 **Course Credits: 3**

Objectives: Advancement in technology often comes with unexpected issues and unintended consequences. The central idea is that the society and information technology revolution are shaping each other. Information technology embodies social values and in turn produces change in values. Thus the main objective of this course is to help students grapple with the social, legal and ethical issues. The course shall eventually navigate students through legal, ethical & social issues related to social life and technology on their own.

Learning Outcome: At the end of the course the students-

1. Understand the ethical, cultural & social issues related to human life and technology.
2. Practice responsible use of technology systems, information & software
3. To develop positive attitude towards the human conduct and technology uses that support lifelong learning & productivity.
4. Identify and explore the legislative policies.
5. To be able to apply the relevant law to factual situations.

Course Contents:

Chapter	Topics
1	Social Structure and Institutions
2	Social Stratification
3	Social Inequalities-Overview, Rights and privileges of citizens
4	Public policy for Technology
5	Social Impact on Information system & Technology
6	Corporate Social responsibility
7	Ethics 2- Business Ethics and Values, Code of conduct and Professional practices, Environmental Ethics
8	Factory Act, 1942- Overview
9	Labour Law – Overview 3- Minimum Wages Act, Child Labour
10	Contract Act & Sales of Goods Act 3- Definition, Sale and Agreement to sell, Formalities of the Contract, Condition and Warrant, Transfer of Title, Rights of Unpaid Seller
11	Consumer Protection Act 3- Background and Objectives, Relief under the Consumer Protection Act, General relief of compensation, Meaning and scope of consumer and C.P.A., Consumer rights
12	Intellectual Property Act and Patent 2- Patents, Copyrights, Trademarks, Registered (industrial) design, Protection of IC layout design, Geographical indications, and Protection of undisclosed information

13	IT ACT 2000 3- Cyber Crime and Laws, Computer crimes: Fraud and Embezzlement, Sabotage and Information Theft, intruders, Hacking and cracking, Digital Forgery, Cyber Terrorism, Wire Tapping, Cyber Space: copyright and cyberspace, offensive speech in cyberspace and liability of service provider, ICE Bill
14	Right to Information Act
15	Environment Protection Act
16	Corporate Governance

Teaching Methodology

The course is a mix of classroom teaching (power point slides) which includes case studies, quiz, role plays and group presentations based on project.

Text Book

1. Industrial Relations and Labour Laws by S.C. Srivastava.
2. Business Law by PC Tulsian and Bharat Tulsian.
3. Business Law by D Chandra Bose.
4. Social Inequality in India by K.L. Sharma, Yogendra Singh.
5. Information Technology – Law and Practice by Vakul Sharma.
6. Indian ethics by PurusottamaBilimoria, Joseph Prabhu, Renuka M. Sharma.

Course Description

Title of Course: Human Psychology **Course Code: 14B11HS542**
L-T Scheme: 2-1 **Course Credits: 3**
Objectives:

1. To strengthen the fundamental knowledge of human behavior.
2. To strengthen ability to understand the basic nature and behavior of human in organizations as a whole.

Learning Outcome: Students will be able to-

1. To understand further the fundamental processes underlying human behavior such as learning, motivation, individual differences, intelligence and personality.
2. Apply the principles of psychology in day-to-day life for a better understanding of themselves and others.

Course Contents:

Unit-I: Introduction to psychology: Definition, Perspectives, Schools of psychology, Methods of psychology, Application of psychology for engineers

Unit-II: Basic Concepts: Perception, Learning, Intelligence, Motivation.

Unit-III: Cognitive Processes: Memory (sub-processes, major models), Thinking, Problem-solving, Decision making, Role of Language in cognitive process.

Unit-IV: Organizational Psychology: Leadership, Personality.

Unit-V: Engineering/Environmental Psychology: Stress, Emotions & Coping, Psychological disorders.

Teaching Methodology
The course is a mix of classroom teaching (power point slides) which includes case studies, quiz, role plays and group presentations based on project.

Text Books

1. "Introduction to Psychology", 7th edition, 24th reprint. New Delhi: TataMcGraw-Hill, Morgan, C.T, King, R.A., Weisz, J.R., and Schopler, J. (2004).
2. "Introduction to Psychology", Ninth Edition, Wadsworth Cengage Learning, Rod Plotnik and Haig Kouyoumdjian
3. "Introduction to Psychology", Kona Publishing and media group, Douglas Krull
4. "Understanding Psychology", 10th edition, Delhi: Tata- McGraw Hill, Feldman R.S (2011).

References

1. Baron, R.A. Psychology. (1995). 3rd edition.Delhi: Prentice Hall.
2. Munn, N.L., Fernald, L.D., & Fernald, P.S. (1997). Introduction to Psychology. Delhi: Houghton Mifflin.
3. Smith, E. E., Hoeksman, S. N., Fredrickson,B., Loftus, G. R.(2003). Atkinson's & Hilgard's Introduction to Psychology. First Reprint. Delhi Thomson Wadsworth.

Course Description

Title of Course: Professional Ethics **Course Code: 14B11HS543**
L-T Scheme: 2-1 **Course Credits: 3**

Objectives: While many people claim to be professional or to act in professional ways, there is a growing demand for moral behavior amongst professionals. This course will provide a values-based approach to ethical professionalism and provide a method of thinking about and dealing with ethical issues in the work place. The course will provide a discussion of what a profession is and what it means to act professionally. It will include a discussion of the features of moral reasoning and provide a case resolution method for dealing with ethical issues of the work place. The course will cover in-depth those values central to moral life of any professional: integrity, respect for persons, justice, compassion, beneficence and responsibility. The course will conclude with a focus on the ethical issues facing people in the profession of dental hygiene.

Learning Outcome: In this course the student will be able to-

1. Determine what a profession is and how it differs from work in general
2. Determine what characterizes a professional and distinguishes one from a nonprofessional
3. Understand what morality is and how it connects to professional ethics
4. Understand the features of moral reasoning, moral explanations and the role of moral theories

Course Contents:

Unit-1: Values of Liberal Society

Introduction, History of profession, Scope, The nature and characteristics of professions, Obligations and professional services, Obligation to clients, professions and third parties, Virtues in the Professions.

Unit-2: Introduction to Professional Ethics

History of Ethics, Definition of Ethics, The foundations and norms of professional ethics, Ethical theories, The need for separate code of conduct for professionals, The relation between professional and general ethics, Moral reasoning, Stages of Moral Development, Moral conflict and the issue of autonomy of professional ethics, Certain specific issues pertaining to engineering ethics , Professional code of ethics (COE).

Unit-3: Indian Value System and Values

Indian Philosophy, Basic Principles of Indian Ethos for Management, Indian values and corporate governance, Individual ethics in Indian ethos, Teaching from widely recognized Indian scriptures.

Unit-4: Ethics impact in Business

Ethical Issues in Capitalism and market systems, Ethics and social responsibility, Ethics and marketing, Ethics in finance, Ethics and human resource, Ethics and Information Technology.

Teaching Methodology

The course is a mix of classroom teaching (power point slides) which includes case studies, quiz, role plays and group presentations based on project.

Text Books

1. Managing for Value by S.S. Iyer, New Age International Publishers.
2. Business Ethics by Laura P Hartman and Abha Chatterjee, Tata McGraw Hill.
3. Business Ethics– Concepts and Cases by Velasquez, Prentice Hall.

References

1. Morality and the Professional Life, Brincat and Wike.
2. Ethics, Jurisprudence, and Practical Management, Kimbrough and Lautar.

Course Description

Title of Course: Macro Economics **Course Code: 14B11HS544**
L-T Scheme: 2-1 **Course Credits: 3**

Objectives: This course introduces students to the basic concepts in Macroeconomics. In this course the students are introduced to the macroeconomic variables like GDP, consumption, savings, investment, exchange rate and balance of payments. The course also focuses various theories of inflation, its relationship with unemployment and some basic concepts in an open economy.

Course Contents:

Unit-1: Introduction
Introduction to macroeconomics, Macroeconomic issues in an economy, Circular flow of money, National Income Accounting Concepts of GDP and National Income; measurement of national income and related aggregates; nominal and real income; limitations of the GDP concept.

Unit-2: Concept of aggregate expenditure
Consumption function; savings function; investment function; equilibrium GDP; concepts of MPS, APS, MPC, APC; autonomous expenditure; Concept of multiplier.

Unit-3: Fiscal & Monetary policy
Government Budget & Economy**,** Fiscal Policy: impact of changes in government expenditure and taxes, Concept of money in a modern economy; monetary aggregates; monetary policy; money supply and credit creation.

Unit-4: Inflation and Unemployment
Concept of inflation; determinants of inflation; relationship between inflation and unemployment: Phillips Curve in short run and long run. Derivations of the IS and LM functions; IS-LM and aggregate demand; shifts in the AD curve.

Unit-5: Balance of Payments &Exchange Rate
Balance of payments: current account and capital account; foreign exchange; determination of exchange rate

Teaching Methodology
The course is a mix of classroom teaching (power point slides) which includes case studies, quiz, role plays and group presentations based on project.

Text Books

1. Macroeconomics by R. Glenn Hubbard, Pearson 2006.
2. Macroeconomics Theory and Policy by H. L. Ahuja.

References:

1. Case, Karl E. & Ray C. Fair, Principles of Economics, Pearson Education, Inc., 8th edition, 2007.
2. Sikdar, Shoumyen, Principles of Macroeconomics, 2nd Edition, Oxford University Press, India
3. N. Gregory Mankiw, Macroeconomics, Worth Publishers.
4. R Dornbusch, S Fischer and R Startz, Macroeconomics, McGraw-Hill.

Course Description

Title of Course: Communication System **Course Code: 14B11EC515**
L-T Scheme: 3-1 **Course Credits: 4**

Objectives: This course aims to introduce students with communication systems and provide them with a fundamental understanding of communication and its application.

Learning Outcome: At the end of the course, successful students should have knowledge of and ability to apply the concepts, principles and theories of Signals and systems, as likely to be required by a electronic engineer, detailed knowledge of and ability to apply the essential facts, concepts, principles and theories needed by electronic engineers.

Course Contents:

Unit 1: Electromagnetic Spectrum, Basic Communication system model and application.

Unit 2: Introduction to AMSC, DSB, SSB and vestigial side band AM Communication. Detection of AM signals: Coherent detection, Costas Receiver, Envelop detector. Concepts of FM and PM, narrow band and wideband FM, direct and indirect method of generating FM. Detection of FM signals: Frequency differentiation, Time differentiation and direct differentiation techniques. PLL and Synchronous detection, AM & FM transmitters, Super-heterodyne AM and FM receivers.

Unit 3: Pulse Modulation Techniques: Time & Frequency Domain Sampling with aperture effects, Reconstruction of signals. PAM and PTM generation & detection – synchronous & asynchronous.

Unit 4: Pulse Code Modulation, quantization and encoding, PCM performance. Log PCM & Companding, Differential Pulse Code Modulation, and PCM hierarchy.

Unit 5: Digital Modulation Techniques: Binary and quaternary modulation techniques: FSK, PSK, and DPSK, Probability of Error analysis of Data transmission: Base band receiver, Probability of error analysis – Optimum filter, Matched filter. Coherent & Non-Coherent Reception. Probability of error for FSK, PSK, DPSK.

Unit 6: Digital Radio, Mobile Communication.

Text Book

1. B.P. Lathi, Modern Digital and Analog Communication systems, Oxford University Press

References

1. S. Haykin, Communication Systems, John Wiley & Sons, Intl. Ed.
2. Taub & Schilling, Principles of Communication Systems, TMH
3. Singh & Sapre, Communication systems: Analog and Digital, TMH

Course Description

Title of Course: Operating Systems **Course Code: 14B11CI511**
L-T Scheme: 3-1 **Course Credits: 4**

Objectives

In this course we will study the basic components of an operating system, their functions, mechanisms, policies and techniques used in their implementation and examples from popular operating systems. The way different modules in the operating system interact and work together to provide the basic services of an operating system.

Learning Outcomes

The students will have a detailed knowledge of the concepts of process and shared memory, aware of a variety of approaches to process management and main-memory management, including interference, deadlock, scheduling, fragmentation, thrashing, learn the basics behind file systems and input output systems and understand the fundamentals of network and distributed operating systems.

Course Contents:

Unit 1: Introduction, Operating system structure - Monolithic systems, Layered systems, Virtual machines, Client-Server model.

Unit 2: Process Management – process creation, deletion, inter process communication tools: pipe, FIFO, shared memory, process synchronization, synchronization primitives and Classical IPC problems.

Unit 3: Process scheduling, Processor Allocation - Allocation Model, Design issues for processor allocation algorithms, Threads and Deadlock.

Unit 4: Memory Management, paging scheme, segmentation, virtual memory concept, page replacement algorithms, threshing, working set model, issues in Virtual memory management.

Unit 5: File System management. Input output management, Disk scheduling, Case study of UNIX/LINUX.

Text Books

1. Silberschatz, P. Galvin and Greg Gagne, “Operating System Concepts”, Wiley International Company.
2. A.S. Tanenbaum, Modern Operating Systems, Prentice Hall India.

References

1. J. Archer Harris, Operating systems – Schuam’s outlines, Tata Mc Graw Hill.
2. Gary Nutt, Operating Systems – A modern perspective, Pearson Education.

Course Description

Title of Course: Software Engineering **Course Code: 14B11CI512**
L-T Scheme: 4-0 **Course Credits: 4**

Pre-requisite: Good Knowledge of Computer Programming

Post Course: Object Oriented Software Engineering, Software Quality Management Objective: To engineer good quality software from its specification.

Learning Outcomes

1. Familiar with processes of Software Engineering
2. Awareness about handling the complexities that may arise in various stages of SDLC
3. Generating test cases for software testing
4. Computer Aided Software Engineering
5. Aspect of Quality in Software Development
6. The Rational method

Course Contents:

Unit I- Interactive Systems, Usability, Introduction to software engineering, Software process models, PSP, TSP, Requirement Engineering: Requirement Elicitation, Analysis, Specification, SRS, Formal system development techniques.

Unit II- Analysis and Modeling: Data modeling, Functional modeling Software Architecture and Design: Data design, Architectural Design Process, SADT, OOAD, function-oriented design, Design Patterns: Structural Patterns, Behavioral Patterns, and Creational Patterns.

Unit III- UML: Use case diagram, State diagram, Activity Diagram, Class Diagram, Sequence diagram, Collaboration diagram, Deployment Diagram, Event trace diagram.

Unit IV- Software Estimation: Estimating Size, Effort and Cost: Metric for Analysis, Metric for Design, COCOMO model, Putnam Model etc., Implementation and Integration: Coding standard and practices.

Unit V- Software Testing: Top-Down and Bottom–up Approach, Verification and Validation, Structural testing, functional Testing, Testing Strategies, Test Case design.

Unit VI- Software Maintenance: Types, Cost of Software, maintenance, Software Maintenance Models, CASE Tool Taxonomy: Business Process Engineering tool, Process modeling and management tool, project planning tool, requirement tracking tool, Metric and management tool, documentation tool, system software tool etc. Introduction to software engineering for web and mobile applications.

Text Books

1. Software Engineering: A practitioner's approach: Roger S. Pressman, McGraw-Hill Publications (Sixth Edition).
2. Fundamentals of Software Engineering: Mall, Rajib, Prentice Hall of India, New Delhi (2nd Edition).

References

1. Software Testing Techniques, B. Beizer.
2. Structured Systems Analysis: Tools and Techniques, Gane and Sarson.
3. Software Engineering, Sommerville, Addison Wesley.
4. Modern Structured Analysis, E.Yourdon.
5. An Integrated approach to Software Engineering: Pankaj Jalote, Narosa Publishing House.
6. Structured design, E. Yourdon and L.Constantine.
7. Fundamentals of Software Engineering: Ghezzi, Jazayeri, Mandriol, PHI.

Course Description

Title of Course: Theory of Computation **Course Code: 14B11CI513**
L-T Scheme: 3-1 **Course Credits: 4**

Pre-requisite: Students must have already registered for the course, "Discrete Mathematics".

Course Description:- This module introduces the theory of computation through a set of abstract machines that serve as models for computation - finite automata, pushdown automata, and Turing machines - and examines the relationship between these automata and formal languages. Additional topics beyond the automata classes themselves include deterministic and non-deterministic machines, regular expressions, context free grammars, undecidability, and the P = NP question.

Course Objective: - Finite automata are useful models for many important kinds of hardware and software. Here are the most important kinds: Software for designing and checking the behavior of digital circuits; The "lexical analyzer" of a typical complier, that is, the compiler component that breaks the input text into logical units, such as identifiers, keywords, and punctuation; Software for scanning large bodies of text, such as collections of Web pages, to find occurrences of words, phrases, or other patterns; Software for verifying systems of all types that have a finite number of distinct states, such as communication protocols or protocols for secure exchange of information.

Learning Outcomes:-

- **Knowledge and understanding** -

  Acquire a full understanding and mentality of Automata Theory as the basis of all computer science languages design - Have a clear understanding of the Automata theory concepts such as RE's, DFA's, NFA's, Stack's, Turing machines, and Grammars.

- **Cognitive skills (thinking and analysis).**

  To able to design FAs, NFAs, Grammars, languages modeling, small compilers basics - Be able to design sample automata

- **Communication skills (personal and academic).**

  - Be able to minimize FA's and Grammars of Context Free Languages

Course Contents:

Unit-1: Introduction to Formal Proof, Deductive Proofs, Proof by Contradiction, If-then statements, If-and-only-if statements, Proving equivalences between sets, The contra positive and the converse. Counter examples. Inductive Proofs, Inductions on Integers. Course of Values Induction, Structural Inductions Mutual Inductions.

Unit-2: Finite Automata, Deterministic Finite Automata, Extending Transition Function to strings, the language of a DFA, Non-deterministic Finite Automata, Equivalence of

DFA and NFA, Subset construction, Finite automata with ε-transitions, Epsilon Closures, Extended Transitions and languages for ε-NFAs. Eliminating ε-transitions.

Unit-3: Regular Expressions and Languages, Operators of regular expressions, Building the regular expression for a DFA, Converting regular expressions to automata. Algebraic laws for regular expressions, Properties of regular languages, The pumping lemma and its applications, Closure properties of regular languages, Decision properties of regular languages, Equivalence and minimization of automata.

Unit-4: Context-free Grammars. Parse Trees, Applications of CFGs, YACC and XML, Ambiguity in Grammars and Languages, Pushdown Automata, Languages of a PDA, PDA and CFG equivalence, Deterministic pushdown automata. Normal forms of Context-Free Grammars, Pumping Lemma for CFLs, Closure properties of CFLs. Decision Properties of CFLs.

Unit-5: Turing machines, Extensions to the basic Turing Machine, Restricted Turing Machines, Undecidability, A language that is not recursively enumerable, Undecidable Problems. Post's Correspondence Problem.

Unit-6: Introduction to Computational Complexity Theory, Intractable Problems, P and NP, NP completes problems, Polynomial-time reductions, Satisfiablity. Independent Sets, Node Cover, Directed Hamiltonian Circuit, TSP.

Text Book

1. J.E.Hopcraft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education

Reference Books

1. Cohen, "Introduction to Computer Theory", John Wiley.
2. M. Sipser, Introduction to Theory of Computation, PWS Publishing Corporation, 1997.
3. J.E. Hopcroft, J.D. Ullman, Introduction to Automata Theory, Languages and Computation, Addison-Wisley, 1979.
4. T.C. Martin, Theory of Computation, Tata McGraw-Hill
5. H.R. Lewis, C.H. Papadimitrou, Elements of the Theory of Computation, PHI.

Course Description

Title of Course: Communication System Lab **Course Code: 14B17CI575**
L-T-P scheme: 0-0-2 **Course Credit: 1**

Objectives: This course aims to introduce students with communication systems and provide them with a fundamental understanding of communication and its application.

Learning Outcome: At the end of the course, successful students should have knowledge of and ability to apply the concepts, principles and theories of Signals and systems, as likely to be required by a electronic engineer, detailed knowledge of and ability to apply the essential facts, concepts, principles and theories needed by electronic engineers.

Course Contents:

(List of Experiments) -

Experiment No1. : DSB Amplitude Modulation & Demodulation

Activity 1: Generate DSB AM signal

Activity 2: Demodulation of DSB AM signal using envelop detector

Experiment No2. : DSB-SC and SSB amplitude modulation and Demodulation

Activity 1: Generate DSB-SC Amplitude Modulated signal and demodulate the generated signal

Activity 2: Generate SSB Amplitude Modulated signal and demodulate the generated signal using product modulator

Experiment No.3. Generate FM modulated signal using VCO IC and measure modulation index

Activity 1: Generate a carrier of frequency 55 kHz using 566 VCO IC

Activity 2: Generate a FM signal having center frequency 55 kHz

Experiment No.4: Phase modulation using FM

Activity 1: Generate a carrier of frequency 55 kHz using 566 VCO IC

Activity 2: Generate a FM signal having center frequency 55 kHz

Activity 3: Design a differentiator to differentiate a 1 kHz triangular signal

Activity 4: Generate a PM signal using FM

Experiment No 5: FM modulation and Demodulation

Activity 1: Generate a FM signal using Varactor Modulator and measure the modulation index.

Activity 2: Demodulate the FM signal using phase lock loop

Activity 3: Demodulate the FM signal using quadrature detector

Experiment No 6: Determination of Lock & Capture range of NE 565 PLL IC

Activity 1: Determine maximum and minimum frequency of the VCO output

Activity 2: Determine the locking range

Activity 3: Determine the capture range

Experiment No.7: Pulse width modulation & Demodulation

Activity 1: Implement a PWM modulator using 555 timer IC

Activity 2: Demodulate the PWM signal using PWM demodulator

Experiment No.8: Pulse position modulation & Demodulation

Activity 1: Implement a PPM modulator using 555 timer IC

Activity 2: Demodulate the PPM signal using PPM demodulator

Experiment No.9: TDM pulse amplitude modulation and demodulation

Activity 1: Study of TDM pulse amplitude modulation and demodulation with the presence of transmitter clock and channel identification information

Activity 2: Study of TDM pulse amplitude modulation and demodulation with presence of channel identification information only

Experiment No.10: Signal sampling and Reconstruction

Activity 1: Signal sampling using LF398 IC

Activity 2: Effect of sampling frequency

Activity 3: Effect of duty cycle

Activity 4: Implement a second order low-pass filter using 741 IC having higher cutoff frequency f_h=1.5 kHz

Activity 5: Reconstruction of the signal from its samples

Experiment No.11: Delta/Sigma Delta Modulation

Activity 1: Delta Modulation

Activity 2: Delta Demodulation

Activity 3: Sigma Delta Modulation

Activity 2: Sigma Delta Demodulation

Experiment No.12: Adaptive Delta Modulation and Demodulation

Activity 1: Adaptive Delta Modulation

Activity 2: Adaptive Delta Demodulation

Experiment No.13: Filter, Noise and Audio Amplifier

Course Description

Title of Course: Operating Systems Lab **Course Code: 14B17CI571**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Objectives: To learn and understand system calls related to files, processes, signals, semaphores and implement system programs based on that.

Learning Outcomes: The students will have a detailed knowledge of the concepts of process and shared memory, aware of a variety of approaches to process management and main-memory management, including interference, deadlock, scheduling, fragmentation, thrashing, learn the basics behind file systems and input output systems and understand the fundamentals of network and distributed operating systems.

Course Contents:

Excersises that must be done in this course are listed below:

Excersise No.1: File manipulation system calls

Excersise No. 2: Process and IPC (Pipe and FIFO)

Excersise No. 3: Process, IPC (Shared memory) and synchronization (semaphore)

Excersise No. 4: CPU scheduling

Excersise No. 5: Continuous Memory Management

Excersise No. 6: Page Replacement Strategies

Text Book

1. Maurice J. Bach, Design of the UNIX Operating System, PHI.

References

1. Silberschatz, P. Galvin and Greg Gagne, “Operating System Concepts”, Wiley International Company.
2. Brain W.Kernigham and Rob Pike, the UNIX Programming Environment.
3. W. Richard Stevens, UNIX network programming (volume II), Pearson education.

Course Description

Title of Course: Software Engineering Lab **Course Code: 14B17CI572**
L-T-P scheme: 0-0-2 **Course Credit: 1**

Prerequisite: Students must have already registered for the course, "Software Engineering".

Objectives: Students will be capable to acquire the generic software development skill through various stages of software life cycle. He will also be able to ensure the quality of software through software development with various protocol based environment.

Learning Outcomes: After completion of course student will be able to generate test cases for software testing. Students will also be able to handle software development models through rational method.

Course Contents:

Unit I- Introduction to software engineering: Code comprehension.

Unit II- Requirement engineering: Requirement Elicitation, specification, IEEE standard template for SRS, Requirement Engineering tools.

Unit III- UML Modeling: Use case diagram , State diagram, Activity Diagram, Class Diagram, Sequence diagram, Collaboration diagram, Deployment Diagram, Component Diagram, Event trace diagram , c++ code generation, Introduction to Sec UML.

Unit IV- Software Metrics: Product, process and project metrics.

Unit V- Software Testing: Structural testing, functional Testing, Testing Strategies and Tactics, Test Case design.

Text Books

1. Software Engineering: A practitioner's approach: Roger S. Pressman, McGraw-Hill Publications (Sixth Edition)
2. The Unified Modeling Language Users Guide: Grady Booch, James Rambaugh, Ivar Jacobson, Addision Wesley

References

1. Modern Structured Analysis: Edward Yourdon , PHI Publications

Course Description

Title of Course: Advance Programming Lab-II **Course Code: 14B17CI573**
L-T-P scheme: 0-0-2 **Course Credit: 2**

Prerequisite: Students must have already registered for the course, "OOP".

Objective:

1. To learn the Java programming language fundamentals: its syntax, idioms, patterns, and styles.
2. To learn object oriented programming concepts.
3. To learn the essentials of the Java class library.

Learning Outcomes: At the end of the course students should be able to:

1. Understand fundamentals of programming such as variables, conditional and iterative execution, methods, etc. Have a Good grounding for the design of object oriented concepts in JAVA.
2. Be able to use the Java SDK environment to create, debug and run simple Java programs.

Course Contents:

Unit-1: Introduction to computers, programs and Java, NetBeans (or other IDE) Tutorial.

Unit-2: Primitive Data Types and Operations. Selection Statements and Program Control (e.g., loops).

Unit-3: Objects, Classes, and Methods. Arrays and Iteration Strings and Text I/O.

Unit-4: Getting Started with GUIs Event Handling. Creating User Interfaces.

Unit-5: Project: one or a combination of Applets and Swing, Graphics, Three Level (GUI, Business Rules, Database Access) Enterprise Applications.

References:

1. Horstmann, "CoreJava", Addison Wesley.
2. Herbert Schieldt, "The Complete Reference: Java", TMH.
3. Hans Bergsten, "Java Server Pages", SPD O'Reilly.
4. Y.Daniel Liang**, "**Introduction to Java programming", Comprehensive Version (9th Edition)
5. John Zukowski, "The Definitive Guide to Java Swing" (3rd Edition).
6. Cay S. Horstmann and Gary Cornell, "Core Java, Vol.1 Fundamentals" (8th Edition)
7. Cay S. Horstmann and Gary Cornell, "Core Java, Vol.2 Advanced Features" (8th Edition).
8. Internet & World Wide Web How to Program, Deitel, H.M.
9. Web Design with HTML/Flash/Java Script and E-Commerce Bible/Crowder, David
10. Database Driven Web Sites / Feiler, Jesse.
11. Web design: the complete reference / Powell Thomas A.

Course Description

Title of Course: Object Oriented Computing **Course Code: 14B14CI542**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisite: Students must have already registered for the course, "OOP".

Objective:

1. To learn the Object Oriented fundamentals: its syntax, idioms, patterns, and styles.
2. To learn concepts of UML models.

Course Contents:

Unit-I: Object-Oriented Computing: The OMG Object Model, Interfaces, Classes and Objects, Encapsulation, Inheritance and Polymorphism, Reusability.

Unit-II: Overview of Java, ActiveX Controls and Java Beans.

Unit-III: Object-Oriented modeling, analysis and design: Modeling System Architecture, The 4 + 1 System View, Introduction to UML (Unified Modeling Language).

Unit-IV: Distributed Object Computing: TCP/IP Networks, Enterprise Intranets, Network & Client-Server Computing,

Unit-V: CORBA, RMI, DCOM, the Java Database Connection (JDBC), Object Databases.

Text Books

1. Michael Blaha, "Object - Oriented Modeling and Design with Uml", Pearson Education, 2nd Edition, 2007.

Course Description

Title of Course: Real Time Systems **Course Code: 14B14CI543**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisite: Operating System

Objectives: The course focuses on different issues associated with using a single processor computer system to implement a real-time system as well as the control and data dependency among tasks in multiprocessor systems. Specifically the student would study the operating system issues, scheduling, communication protocols and synchronization of execution of tasks on different processors.

Learning Outcomes: At the end of the course, the student shall be able to:

1. Define the concepts of real-time systems.
2. Recognize the characteristics of a real-time system.
3. Identify and determine important software engineering principles for real-time System development.
4. Produce an architectural design of a real-time system

Course Contents:

Unit I: Basic Concepts: Hard versus Soft Real Time System; A reference Model of Real Time System; Real Time Applications.

Unit II: Real Time Scheduling: Clock Driven Scheduling, Priority Driven Scheduling of Periodic Tasks, Scheduling Aperiodic and Sporadic Jobs in Priority Driven Systems.

Unit III: Real Time Operating Systems: Time Services and Scheduling Mechanisms, Basic Operating System Functions; Processor reserves and Recourse Kernel, Open System Architecture; Overview of several commercial and general purpose operating systems.

Unit IV: Multiprocessor and Distributed real time systems: Model of Multiprocessor and distributed systems, Multiprocessor scheduling, Resource Access Control and Synchronization; Assumptions on Recourse and their uses, Non Preemptive Critical Sections, Basic Priority Inheritance Protocol, Basic Priority Ceiling Protocol, Stack Based, Priority Ceiling Protocol.

Unit V: Real time Communications: Model of Real Time Communications, Priority Based Service Disciplines For Switched Networks, Weighted Round Robin service Disciplines, Medium Access Control Protocols of Broadcast Networks, Internet and Recourse Reservation Protocols, Real Time Protocol, Communication in Multicomputer Systems.

Text Books

1. Jane W.S. Liu, “Real Time Systems”, Pearson Education

Reference Books

1. C. M. Krishna and Kang G. Shin, “Real Time System”, McGraw Hill.
2. Yann Hang Lee and C. M. Krishnan, “Readings in Real Time Systems”, IEEE Computer Society Press.

Course Description

Title of Course: Advanced Concepts in DBMS **Course Code: 14B14CI547**
L-T Scheme: 3-0 **Course Credit: 3**

Objectives: To develop the ability to design, implement and manipulate databases as well as to build Advanced Database management systems.

Learning Outcomes:

1. Ability to build normalized databases.
2. Ability to design systems by using ER Modeling.
3. Ability to develop the skills of writing applications by using SQL.
4. Ability to understand query optimization techniques.
5. Understanding of transaction processing.
6. Ability to handle recovery and concurrency issues

Course Contents:

Unit-1 (Introduction): Overview of object-oriented concepts and characteristics, Objects, OIDs and reference types, Database design for ORDBMS, Comparing RDBMS, OODMBS, and ORDBMS.

Unit-2 (Distributed DBMSs-Concepts and Design): Introduction, Homogeneous and heterogeneous databases, Advantages and Disadvantages of DDBMS, Homogeneous and Heterogeneous DDBMSs, Overview of Networking , Functions and Architectures of a DDBMS, Distributed Relational Database Design, Date's Twelve Rules for a DDBMS.

Unit-3 (Distributed DBMSs- Advanced Concepts): Distributed Transaction Management, Distributed Concurrency Control, Distributed Deadlock Management, Distributed Database Recovery, Distributed Query Optimization.

Unit-4 (Replication and Mobile Databases): Introduction to Database Replication, Benefits of Database Replication, Applications of Replication, Basic Components of Database Replication, Database Replication Environments, Synchronous Versus Asynchronous Replication, Introduction to Mobile Databases.

Unit-5 (Object DBMS): Advanced Database Applications, Weaknesses of RDBMSs, Object-Oriented Concepts, Storing Objects in a Relational Database, Object-Oriented Database Design, Comparison of Object-Oriented Data Modeling, Conceptual Data Modeling ,Object-Oriented Analysis and Design with UML.

Unit-6 (Object-Oriented DBMSs Concepts): Introduction to Object-Oriented Data Models and OODBMSs, OODBMS Perspectives, Persistence, Issues in OODBMSs, Advantages and Disadvantages of OODBMSs.

Unit-7 (Object-Oriented DBMSs Standards and Systems): Object Management Group, Object Data Standard ODMG, Object Store.

Unit-8 (Object-Relational DBMSs): Introduction to Object-Relational Database Systems, The Third-Generation Database Manifestos, The Third-Generation Database System Manifesto The Third Manifesto, Postgres - An Early ORDBMS, SQL: 1999 and SQL: 2003, Query Processing and Optimization, Object-Oriented Extensions in Oracle, Comparison of ORDBMS and OODBMS.

Text Book

1. Thomas M. Connolly Carolyn E. Begg, Database Systems: A Practical Approach to Design, implementation, and Management Fourth Edition.

Reference Books

1. Elmasri and Navathe, Fundamentals of Database Systems, Pearson Education
2. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw-Hill
3. Korth, Silberchatz, Sudarshan, Database System Concepts, McGraw-Hill.
4. Peter Rob and Coronel, Database Systems, Design, Implementation and Management,
5. Thomson Learning.
6. C. J. Date & Longman, Introduction to Database Systems, Pearson Education

Course Description

Title of Course: Computer Graphics **Course Code: 14B14CI644**
L-T Scheme: 3-0 **Course Credits: 3**

Scope and Objectives: The Objective of this course is to endow with an introduction to the theory and practice of computer graphics and make students aware of the concepts underlying modern Computer Graphics.

Learning Outcome: At the end of the course the student will have the generic skills to design algorithms and overall structure of an interactive graphics program (initialization, frame updates, depiction of geometric primitives, the use of transformation stacks, the tracking and processing of user actions, text and texture rendering etc). These concepts are demonstrated and implement using the popular Processing environment.

Course Description:

Unit I: Introduction, Context and applications; Graphics Pipeline and hardware; Graphic I/O devices; Color and Color Lookup tables; Aliasing and anti-aliasing techniques.

Unit II: Raster Graphics: Standard output primitives; Primitive generation, DDA and Bresenhams line drawing algorithm; Circle drawing Algorithms; Ellipse drawing Algorithm; Text primitive.

Unit III: Data structures for modeling of planar objects; Area filling: Interactive and non interactive filling; 2D geometric transformations: Translation, Scaling, Rotation etc.; Algorithms for clipping; 2D viewing.

Unit IV: 3D concepts; Introduction to 3D object representations; Projection methods; Visible surface detection methods: Object space and Image space; Illumination models.

Unit V: Spline and beizier representation.

Text book:

1. D. Hearn and M. P. Baker, "Computer Graphics using C".

Reference Books:

1. Foley, Van Darn, Feiner, Hughes, Computer Graphics, Second edition.
2. D.F. Rogers, Mathematical elements for computer graphics, Second edition.
3. Rogers, Procedural elements for Computer Graphics, Second edition.

Course Description

Title of Course: Computer Systems Security **Course Code: 14B14CI645**
L-T Scheme: 3-0 **Course Credits: 3**

Objective: This course's first goal is to introduce students to the broad and diverse field of computer security. By the end of the semester, students will be enabled with a theoretical knowledge of security fundamentals and a set of practical tools for applying these fundamentals. The second goal for this course is for students to improve their writing skills.

Course Contents:

Unit-I: Introduction: need and basic goals for computer security, security threats etc.

Unit-II: Cryptographic building blocks: symmetric and asymmetric key cryptography, cryptographic hash functions, digital signature schemes etc., with representative applications for each.

Unit-III: Operating System Security: low-level protection mechanisms, access control: models for access control, some confidentiality, integrity, and hybrid models of access control such as Bell-La Padula, Biba, Chinese Wall etc., discretionary v/s mandatory access control.

Unit-IV: Case Studies: Java access control policy specifications, SELinux security model and implementation. Program flaws: bugs which have security implications such as buffer overflows, race conditions etc. Malicious code: viruses, worms, Trojan horses; how they work and how to defend against them.

Unit-V: Network Security: problems in network security; kinds of attacks, PKI, key exchange protocols, example protocols such as PGP, Kerberos, IPSEC/VPN, SSL, S/MIME etc. Protocol vulnerabilities: examples of protocol vulnerabilities such as in TCP/IP, denial of service attacks etc. Tools for network security such as firewalls and intrusion detection systems.

Text Books:

1. Security Engineering, Second Edition. Ross Andersen. Wiley. 2008.
2. Computer Security: Art and Science. Matt Bishop. Addison-Wesley. 2002.

References:

1. Introduction to the Theory of Computation. Michael Sipser. Course Technology. 2005.
2. Cyber Ethics: Morality and the Law of Cyberspace. Richard Spinello. Jones and Bartlett. 2002.
3. Computer Security: Principles and Practice, Stallings and Brown, PHI, 2007.
4. Computer Security in the Real World. Butler Lampson. In IEEE Computer. Vol 37 Issue 6. June 2004.
5. Introduction to Trust Negotiation. Marianne Winslett. In iTrust'03: Proceedings of the 1st international conference on Trust management. 2003.
6. Harrison, M. A., Ruzzo, W. L., and Ullman, J. D. 1976. Protection in operating systems.Commun. ACM 19, 8 (Aug. 1976), 461-471.

4 year BTech Curricula for Computer Science and Engineering							
BTech VI semester (B6)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1		HSS Elective	Elective	3	0	0	3
	14B14HS641	Project Management					
	14B14HS642	Business Environment					
	14B14HS643	Fundamentals of Financial Market					
	14B14HS644	Marketing Management					
2	14B11EC311	Signals and Systems	Core	3	1	0	4
3	14B11CI612	Compiler Design	Core	3	1	0	4
4	14B11CI613	Computer Organisation and Architecture	Core	3	1	0	4
5	14B11CI614	Systems and Network Programming	Core	3	0	0	3
6	14B17EC371	Signals and Systems Lab	Core	0	0	2	1
7	14B17CI672	Compiler Design Lab	Core	0	0	2	1
8	14B17CI673	Computer Organisation and Architecture Lab	Core	0	0	2	1
9	14B17CI674	Systems and Network Programming Lab	Core	0	0	2	1
10	14B17CI675	Web Technology Lab	Core	0	0	2	1
11	14B19CI691	Industrial Training- Audit Course	Core				0
12		DE-2	Elective	3	0	0	3
		Total		**18**	**3**	**10**	**26**
List of Electives for DE-2			**Core/ Elective**	**L**	**T**	**P**	**Credits**
	14B14CI541	Introduction to Software Architecture	Elective	3	0	0	3
	14B14CI548	Software Testing	Elective	3	0	0	3
	14B14CI641	Design and Principles of Operating Systems	Elective	3	0	0	3
	14B14CI642	Software Quality Management	Elective	3	0	0	3
	14B14CI643	Concurrency Control and Security of Databases	Elective	3	0	0	3
	14B14CI646	Human Aspects of Information Technology	Elective	3	0	0	3
	14B14CI647	Graph Algorithms and Applications	Elective	3	0	0	3
	14B14PH611	Material Science	Elective	3	0	0	3

Course Description

Title of Course: Project Management **Course Code: 14B14HS641**
L-T Scheme: 2-1 **Course Credits: 3**

Objectives

1. To address the basic nature of managing general projects, not specially focusing on one type of project.
2. The course uses the project life cycle as the organizational guideline.
3. The contents will cover the whole process of project management, including project initiation, project planning, project implementation and project termination.

Learning Outcome: Student will be able to-

1. To understand the concepts of project definition, life cycle, and systems approach;
2. To develop competency in project scoping, work definition, and work breakdown structure (WBS);
3. To handle the complex tasks of time estimation and project scheduling, including PERT and CPM
4. To be skilled in expediting projects by prudently crashing certain activities, conducting Risk analysis, Resource allocation,
5. To develop competencies in project costing, budgeting, and financial appraisal;
6. To gain exposure to project control and management, using standard tools of cost and schedule variance analysis;

Course Contents:

Unit-I: Introduction to Project Management

Defining project management, Project life cycle, Project management maturity model, Project selection and criteria of choice, Types of project selection models, the management of risks, Project portfolio process. Project management and the project manager, Special demands on the project manager. Project as a part of functional organization, pure project organization, matrix organization & mixed organization.

Unit-II: Project Planning

Initial project coordination, Sorting out the project, Work break down structure, linear responsibility chart. Estimating project budgets, improving the process of cost estimation.

Unit-III: Project Scheduling

Discussion of scheduling techniques - PERT & CPM, Resource allocation problems, crashing of project, Resource loading, Resource leveling, Multiproject scheduling and resource allocation.

Unit-IV: Project Monitoring & Control

Planning-monitoring –controlling cycle, Information needs and reporting process, Earned value analysis, Project management information system, three types of control processes, Control of change and scope creep, Project auditing, Project audit life cycle.

Unit-V: Project Termination

Varieties of project termination, when to terminate a project, the termination process, Final report.

Teaching Methodology

The course is a mix of classroom teaching (power point slides) which includes case studies, quiz, role plays and group presentations based on project.

Text Books

1. Project Management by Meridith and Mantel
2. Projects by Prasanna Chandra
3. Total Project Management: Indian Context by P. K. Joy
4. Effective Project Planning & Management by Randolph & Posmer

References

1. Parameshwar P. Iyer. Engineering Project Management with Case Studies, Vikas Publishing House Pvt. Ltd. New Delhi, 2005.
2. Project Management Institute (PMI). A Guide to the Project Management of Knowledge (PMBoK). Newton Square, PA. 1996.

Course Description

Title of Course: Business Environment **Course Code: 14B14HS642**
L-T Scheme: 2-1 **Course Credits: 3**

Objectives: This course is intended to make students understand various social, political, legal and economic and other factors that influence business in India so as to enable them appreciate associated Opportunities, risks and challenges and their relevance for managerial decisions.

Learning Outcome

- Develop an understanding of various Social, Political, Legal, Economic & other factors that influence business in India.
- Develop capability to identify core issues of related to all such factors mentioned above.
- Make the students enable to appreciate the associated opportunities, risks & challenges.
- Develop confidence & capability to take managerial decisions in light of such opportunities, risks & challenges while doing day-to-day business activities.

Course Contents:

Unit-1: Introduction to Business, Meaning of Business Environment : Economic and non economic factors influencing Business, Environmental Scanning, Process of environmental scanning, Economic systems: basic philosophies of Capitalism and Socialism with their variants, Concepts of Mixed Economy.
Unit-2: Constitutional Framework of state control of Business : The relationship between Business and Government in India, Definition of Security, Securities Exchange Board of India-Composition Stock Exchange-BSE-NSE, Securities Exchange Board of India-Powers and Functions, Competition Act 2002: Objective, Anti Competitive Agreements : Competition Commission of India- Composition, Powers and Functions, MRTP Act: Abuse of Dominant Position, Regulation, The Foreign Exchange Management Act, 1999-Objective and Applicability of the Act FEMA Vs FERA, Fiscal Policy Instruments-taxation, Monetary Policy: Types of Monetary Policy Instruments.

Unit-3: Philosophy and strategy of planning in India, Industrial Policy in recent years, Indian Financial System Financial Sector reforms-1, Indian Financial System Financial Sector reforms-2, Policy with regard to small scale industries-1, Policy with regard to small scale industries-2.

Unit-4: e-business - objectives, trends and practical uses, Corporate Social responsibility, FDI Policy, EXIM Policy.

Unit-5: New Economic policy (LPG), WTO & GATT, Make in India, Digital India campaigns.

Teaching Methodology

The course is a mix of classroom teaching (power point slides) which includes case studies, quiz, role plays and group presentations based on project.

Text Books

1. Business Environment by Vivek Mittal
2. Business Environment – Managing in a Strategic Context by John Kew & John Stredwick
3. Business Environment- Francis Cherunilam
4. Business Environment – Misra & Puri
5. Essentials of Business Environment – K. Aswathappa

Course Description

Title of Course: Fundamentals of Financial Market **Course Code: 14B14HS643**
L-T Scheme: 2-1 **Course Credits: 3**

Objectives

1. To provide general understanding of the different functions performed by financial markets and their role in the economic system.
2. To provide understanding of the fundamental principles that govern financial markets, the instruments that trade on them, and the financial and governmental institutions that use or support these markets.
3. To discuss various financial markets including money markets, bond markets, stock markets, derivatives markets and foreign exchange market in Indian context.

Learning Outcome: After the completion of the course the student will be able to-

1. Understand the importance of financial markets and financial system in the development and growth of any country.
2. Understand and analyze different financial markets processes and related financial instruments features and factors related to trading.
3. Make sound and intelligent financial decisions both on the individual as well as company level.

Course Contents:

Unit-I: Introduction to Financial Markets: Financial system structure and functions, Financial markets and their economic functions, Financial intermediaries and their functions, Financial markets structure & regulation; Determination of interest rates, Valuation of cash flows.

Unit-II: Money & Capital Markets: Money market purpose and structure, Money market instruments, Money market interest rates and yields, Capital market structure and instruments.

Unit-III: Debt Market: Debt market instrument characteristics, Bond market, Bond valuation, Bond Analysis.

Unit-IV: Equity Market: Equity instruments, Primary equity market, Secondary equity market, Equity market characteristics, Stock valuation.

Unit-V: Derivatives Market: Description of derivatives markets, Forward and futures contracts, Swaps, Options.

Unit-VI: Foreign Exchange Market: Balance of trade and balance of payments, Determination and fluctuation of exchange rate, Exchange control, Foreign exchange market – Feature, Functions, Structure and Participants.

Teaching Methodology

The course is a mix of classroom teaching (power point slides) which includes case studies, quiz, role plays and group presentations based on project.

Text Books

1. Fabozzi, Modigliani, Jones Foundations of Financial Market & Institutions Prentice Hall.
2. Mishkin and Eakins Financial Market & Institutions, Prentice Hall.
3. Jeff Madura Financial Market & Institutions, Cengage.
4. Bharati V. Pathak, The Indian Financial System – Markets, Institution & Services, Pearson.
5. Clifford Gomez, Financial Markets, Institutions & Financial Services, PHI Learning.

Course Description

Title of Course: Marketing Management **Course Code: 14B14HS644**
L-T Scheme: 2-1 **Course Credits: 3**

Objectives: The objective of this course is to train students to apply concepts and techniques in marketing so that they become acquainted with the duties of a marketing manager. More specifically, you will be exposed to the development, evaluation, and implementation of marketing management in a variety of business environments. Marketing management is the art of optimal manipulation of the marketing mix to achieve business goals. It encompasses activities such as demand creation and stimulation, positioning, product differentiation, product and brand management among others. All these activities involve planning, analysis, and decision-making.

Learning Outcome: The objectives of this course are to-

1. To develop a clear understanding of the marketing system, marketing environment, marketing mix and functions.
2. To understand evolution of marketing and the emphasis on each stage
3. To scan the environment for new business opportunities.
4. To devise a plan based on a sound conceptual framework to implement the marketing decision.
5. To make strategic marketing decisions based on analytical techniques.

Course Contents:

Unit-I: Understanding Marketing Management, Defining Marketing for the 21st Century, Developing Marketing Strategies and Plans

Unit-II: Capturing Marketing Insights, Gathering Information and Scanning the Environment, Conducting Marketing Research and Forecasting Demand

Unit-III: Connecting with Customers, Creating Customer Value, Satisfaction, and Loyalty, Analyzing Consumer Markets, Analyzing Business Markets, Identifying Market Segments and Targets

Unit-IV: Building Strong Brands, Dealing with Competition, Creating Brand Equity, Crafting the Brand Positioning

Unit-V: Shaping the Market Offerings, Setting Product Strategy, Designing and Managing Services, Developing Pricing Strategies and Programs

Teaching Methodology

The course is a mix of classroom teaching (power point slides) which includes case studies, quiz, role plays and group presentations based on project.

Text Book

1. Marketing Management, 13th edition, by Kotler/Keller/Koshi/Jha, Prentice-Hall 2009, ISBN 0-13-600998-0.

Reference Books

1. Marketing. 3rd Edition, Lamb, C., Hair, J., McDaniel, C., Faria, A. and Wellington, W. (2006), Nelson, a division of Thomson Canada Limited, Ontario.
2. Principles of Marketing. 7th Edition, Kotler, P., Armstrong, G. and Cunningham, P. (2008). Pearson Prentice Hall, Ontario.
3. Marketing Management: Analysis, Planning, Implementation, and Control, 6th Edition, Kotler, P. and Turner, R. (1989).Prentice-Hall Canada Inc., Ontario.

Course Description

Title of Course: Signals and Systems **Course Code: 14B11EC311**
L-T Scheme: 3-1 **Course Credits: 4**

Objectives: This course aims to introduce students to Signals and Systems and provide them with a fundamental understanding of Signals and its application, produce digital electronic engineering graduates equipped to play valuable roles in the computing, electronics and communication industries.

Learning Outcome: At the end of the course, successful students should have knowledge of and ability to apply the concepts, principles and theories of Signals and systems, as likely to be required by a electronic engineer, detailed knowledge of and ability to apply the essential facts, concepts, principles and theories needed by electronic engineers.

Course Contents:

Unit I: Continuous-time and discrete-time signals, signal energy and power, periodic signals, even-odd signals, exponential and sinusoidal signals, Unit impulse and step functions, continuous and discrete time systems, System classifications.

Unit-II: Convolution integral and convolution sum, properties of LTI systems, LTI systems described by differential and difference equation, response of LTI systems.

Unit-III: Fourier series representation of continuous and discrete time signals, properties, Fourier Transform representation of continuous-time and discrete time signals, properties, system characterization by linear constant coefficient difference equation.

Unit IV: The Laplace Transform, ROC, properties of Laplace-transform, analysis and characterization of LTI systems using Laplace Transform.

Unit V: The z-transform, ROC and pole-zero-plot, properties of z-transform, analysis and characterization of LTI systems using z-transform, Stability criterion.

Unit VI: Introduction to DSP, Random Variable and Random Processes, probability density function, mean, variance, correlation function, power spectral density.

Text Books

1. A.V. Oppenheim &A.S.Willsky & S.H. Nawab, Signals & Systems, Prentice Hall.
2. B. P. Lathi, Signal Processing and Linear Systems, Cambridge Press, Carmichael, CA 1998.

References

1. Symon Haykin, Signal & Systems, John Willey and Sons.

Course Description

Title of Course: Compiler Design **Course Code:14B11CI612**
L-T Scheme: 3-1 **Course Credits: 4**

Prerequisites: Students must have already registered for the course, "Theory of Computation".

Objectives: Deepen the understanding of compiler design, develop problem solving ability using programming, develop ability to design and analyze a compiler

Learning Outcomes: The students shall acquire the generic skills to design and implement a compiler along with analysis of practical aspects.

Course Contents:

Unit I: Introduction, A simple 1-pass compiler, Lexical Analysis, Token, Pattern, RE to NFA, NFA to DFA, Minimization of DFA.

Unit II: Syntax Analysis. Top down parsing, Recursive Descent, LL (1), Operator Precedence Parsers and Bottom-up Parsers-SLR, CLR and LALR.

Unit III: Semantic Analysis, Syntax directed translation, SDD, Translation Scheme, Symbol Table Management.

Unit IV: Run time environments, Intermediate code generation, Three Address Code, Storage Management and Error Handling.

Unit V: Code Optimization, Peephole Optimization, Loop Invariant Computation, Code motion, Induction variable Elimination, Code Generation, Software tools- LEX, YACC.

Text Books

1. Compilers: Principles, Techniques and Tools, Aho, Sethi and Ullman, Pearson Education.
2. Compiler Design in C, Holub, Prentice Hall of India.

Reference Books

1. Advanced Compiler Design and Implementation, Muchnick Steven, Morgan Kauffman Publishers.
2. Compiler Design, Santanu Chattopadhyay, PHI.
3. Compiler Construction Principles and Practice, Kenneth C. Louden, Thomson.
4. Compiler Construction and Design, Rajni Jindal , Umesh Publications.

Course Description

Title of Course: Computer Organization and Architecture
Course Code:14B11CI613
L-T Scheme: 3-1 **Course Credits: 4**

Pre-requisite: Introduction to Computers and Programming (14B11CI111)

Objectives:

- To learn the concepts associated with interfacing a processor to memory and to I/O devices.
- To control components of a processor based system through the use of interrupts.

Learning Outcome: At the conclusion of the course, following learning objectives are expected to be achieved:

1. You will broaden your knowledge of computer system organization and Architectures.
2. You will gain knowledge in technical aspects of computer system design.
3. You will gain understanding of computer arithmetic both integer and floating point.
4. You will acquire the background for understanding next-generation CPUs.
5. You will learn a computer programming model at a level that enables you to write assembly language programs for the processor meeting given specifications.
6. You will learn concepts associated with interfacing a processor to memory and to I/O devices.
7. You will learn how to control components of a processor based system though the use of interrupts.

Course Contents:

Unit-1: Digital Logic Circuits - Logic Gates, Boolean Algebra, Map Specification, Combinational Circuits, Flip-Flops, Sequential Circuits, Memory Components, Integrated Circuits. Data Representation - Data Types, Complements, Fixed Point Representations Floating Point Representations, Other Binary Codes, Error Detection Codes.

Unit-2: Register Transfer And Microoperations – Register Transfer Language, Register Transfer, Bus And Memory Transfers, Arithmetic Microoperations, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit. Basic Computer Organization And Design - Instruction Codes, Computer Registers, Computer Instructions, Timing And Control, Instruction Cycle, Memory Reference Instructions, Input-Output And Interrupt, Complete Computer Description, Design Of Basic Computer, Design Of Accumulator Logic.

Unit-3: Programming The Basic Computer - Introduction to Machine Language, Assembly Language , Assembler, Program Loops, Programming Arithmetic And Logic Operations Subroutines, Input-Output Programming. Microprogrammed Control-Control

Memory, Sequencing Microinstructions, Microprogram Example, Design Of Control Unit, Microinstruction Format, Nanostorage And Nanoprogram.

Unit-4: Central Processing Unit – Introduction To Cpu, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer And Manipulation, Program Control, Reduced Instruction Set Computer. Pipelining And Vector Processing - Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Risc Pipeline, Vector Processing, Array Processors.

Unit-5: Computer Arithmetic – Introduction to Computer Arithmetic, Addition and Subtraction, Multiplication algorithms, Division algorithms, Floating point arithmetic Operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations. Input-Output Organization - Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor, Serial Communication.

Unit-6: Memory Organization - Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware. Multiprocessors - Characteristics Of Multiprocessors, Interconnection Structures, Interprocessor Arbitration, Interprocessor Communication and Snchronization, Cache Coherence.

Text Books

1. "Computer System Architecture" , M. Morris Mano, Third Edition.

References

1. Computer System Organization and Architecture: Designing for Performance" by W. Stallings, Seventh Edition, Prentice Hall, 2006. ISBN: 0-13-185644-8
2. Yu-cheng Liu, Glenn A. Gibson, "The 8086/8088 Family Architecture, Programming & design", Second Edition, PHI.
3. Douglas Hall, "Microprocessors & Interfacing, Programming & Hardware", 2nd Edn. Tata McGraw Hill.
4. Kenneth Ayala "The 8086 microprocessor programming and Interfacing the PC".
5. Tom Shanley, Protected Mode Software Architecture, Addison-Wesley (1996), ISBN 0-201-55447-X.

Course Description

Title of Course: System and Network Programming **Course Code: 14B11CI614**
L-T-P Scheme: 3 **Course Credits: 3**

Prerequisites: C Programming, Computer Hardware, Operating Systems.

Objectives: The aim of this course is to learn system calls related to files, processes, signals, semaphores, threads and implement system programs based on these in C language on Linux operating system. This course also deals with Linux interprocess communication mechanisms like pipe, FIFO, TCP and UDP sockets, SUN RPC and develop network applications based on the above.

Learning Outcome: With the help of IPC mechanism it is possible to build client server architecture. Studying this subject, students should be able to develop an appropriate client/server model for an internet aware application. They should be able to establish Inter Process Communication between related and unrelated processed using pipe and FIFO. Similarly they should be able to establish IPC between two different systems with the help of TCP and UDP socket by critically analyzing the sockets interface requirements of a given application; Design, write and test programs that use the POSIX socket API. Using Sun RPC they should be able to use implicit network programming feature for the implementation of IPC.

Course Contents:

Unit-1: Introduction

Network Application - Client/Server Architecture, Protocol Independence, OSI Model, 32 bit and 64 bit architecture, various Unix Standards

Unit-2: Inter process Communication

Introduction to pipe and FIFO, Iterative and concurrent servers, Writing programs for the implementation of IPC between related and unrelated processes

Unit-3: The Transport Layer: TCP and UDP

Introduction, Overview of TCP/IP protocols, User Datagram Protocol, Transmission Control Protocol, TCP three-way handshake, TIME_WAIT State of TCP, Knowing ports and port numbers, TCP Port Numbers and Concurrent Servers, Standard TCP/UDP port numbers

Unit-4: Sockets Introduction

Sockets API- IPv4 and IPv6 Socket Address Structures, Value-Result Arguments, Byte ordering, Functions related to byte ordering, Address conversion functions, Writing and Reading a socket

Unit-5: Elementary TCP Sockets

Timeline scenario between a TCP client and server, Functions related to TCP Socket programming – socket, connect, bind, listen, accept, Understanding fork function and using it for the implementation of concurrent server, close function, TCP Client Server programming

Unit-6: Elementary UDP Socket

Timeline scenario between a UDP client and server, use of send to and recvfrom functions in UDP sockets, UDP Client Server programming

Unit-7: Remote Procedure Call

RPC- Implicit Network Programming, RPC Model, Transparency of RPC, Writing specification file, knowing program versions and numbers, rpcgen, Client and Server stub generation, external data representation, Building RPC client and server, RPC Programming

Text Books

1. "UNIX Network Programming Vol. 1" by W. Richard Stevens.
2. "UNIX Network Programming Vol. 2" by W. Richard Stevens.

Reference Books

1. "Internetworking with TCP/IP, Volume 3" by Douglas. E. Comer.
2. "The Design of the Unix Operating System" by Maurich J. Bach.
3. "IPv6 network programming" by Hagino, Publisher Elsevier.
4. "Distributed Operating Systems" by Pradeep K. Sinha, PHI.

Course Description

Title of Course: Signals and Systems Lab **Course Code: 14B17EC371**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Objectives: This course aims to introduce students to Signals and Systems and provide them with a fundamental understanding of Signals and its application, produce digital electronic engineering graduates equipped to play valuable roles in the computing, electronics and communication industries.

Learning Outcome: At the end of the course, successful students should have knowledge of and ability to apply the concepts, principles and theories of Signals and systems, as likely to be required by a electronic engineer, detailed knowledge of and ability to apply the essential facts, concepts, principles and theories needed by electronic engineers.

Course Contents:

List of Experiments (The application software is used: MATLAB 6.5)-

Experiment No.1: Signal generation

Experiment No.2: Creating user function for generating delta-function, unit-step function, periodic signal

Experiment No.3: Creating user function for performing signal operation: folding, shifting and signal addition.

Experiment No.4: To verify the linearity and time-invariance of the discrete-time systems.

Experiment No.5: Response of discrete-time LTI systems

Experiment No.6: MATLAB implementation of discrete time LTI systems, Auto and Cross Correlation.

Experiment No.7: MATLAB Implementation of Fourier series

Experiment No.8: Synthesizing continuous time periodic signals using Fourier series.

Experiment No.9: MATLAB implementation of Discrete Time Fourier Transform (DTFT) of signals.

Experiment No.10: MATLAB implementation of Discrete Time Fourier Transform (DTFT) of LTI systems.

Experiment No.11: Poles and zeros of system function H(s)

Experiment No.12: MATLAB implementation of z-transform and inverse z-transform of discrete signals.

Experiment No.13: MATLAB implementation of discrete time LTI systems in z-domain.

Text Books

1. A.V. Oppenheim &A.S.Willsky & S.H. Nawab, Signals & Systems, Prentice Hall
2. B. P. Lathi, Signal Processing and Linear Systems, Cambridge Press, Carmichael, CA 1998

References

1. Symon Haykin, Signal & Systems, John Willey and Sons

Course Description

Title of Course: Compiler Design Lab **Course Code: 14B17CI672**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Objectives: Deepen the understanding of compiler design
- Develop problem solving ability using programming
- Develop ability to design and analyze a compiler

Learning Outcomes: The students shall acquire the generic skills to design and implement a compiler along with analysis of practical aspects.

Course Contents:

List of Lab Exercises -

Exercise-1: Write any simple program in C, compile and execute it. Observe the processes involved in it. Open header files used in above program and locate the functions in this file used by you in your program. Find the use of these header files.

Exercise-2: Write a program to read and translate integers into numbers.

E.g. 1=ONE
12 = ONE TWO
856 = EIGHT FIVE SIX

Generate an error if the number of digits is more than 3.

Exercise-3: The following rules define the translation of an English word into pig Latin:

a. If the word begins with a nonempty string of consonants, move the initial consonant string to the back of the word and add the suffix AY; e.g., pig come igpay.
b. If the word begins with a vowel, add the suffix YAY; e.g., owl becomes owlyay.
c. U following a Q is a consonant.
d. Y at the beginning of a word is a vowel if it is not followed by a vowel.
e. One-letter words are not changed.

Write a C program to generate pig Latin from an English word.

Exercise-4: Write a translator to convert infix into postfix for a language consisting of sequences of expressions terminated by semicolons. The expressions consist of numbers, identifiers and the operators +, - , *, /, div and mod.

Exercise-5: Write a compiler for a language having following features:

- Only data type is integer
- Identifiers are max. 32 characters long, must begin with a letter and are composed of letters, digits and underscores
- Literals are strings of digits
- Comments begin with – and end a the end of the current line
- Statement types are –
  Assignment
  ID: = expression;

Expression is an infix expression constructed from identifiers, literals and the operators + and - parenthesis are allowed
Input/Output
Read (List of Ids);
Write (List of expressions);
Begin, end, read and write are reserved words.
Each statement is terminated by a semicolon
The body of a program is delimited by begin and end
Tokens may not extend across line boundaries

Write separate procedures for scanning, parsing and translation. These procedures should be called from main routine. The compiler will take input a program written in this language and will generate a code corresponding to input program.

Exercise- 6: Design a LEX for any programming language.

Exercise-7: Design a YACC for above programming language.

Text Books:

1. Compiler Design in C, Holub, Prentice Hall of India

Course Description

Title of Course: Computer Organization & Architecture Lab
Course Code: 14B17CI673
L-T-P Scheme: 0-0-2 **Course Credits: 1**

Prerequisites:

Students must have already registered for the course, Electrical Circuits Lab, Electronic Devices and Circuits Lab, Digital Electronics Lab & Microprocessors and Controllers Lab.

Objectives:

- To learn the students how to develop, implement and debug assembly language, VLSI programs that meet the stated specifications.
- Students should learn how the machine level (Low) languages controls components of a CPU, I/O and memory subsystems.

Learning Outcome:

The Course will be covered through assignment practical Labs, Some Section of the course will include additional reading in the research literature (e.g. research paper on high performance computer Architecture) to allow them to see how the leading edge is advanced in this area of the discipline. In practical Labs different software tools like MASM, Circuit Maker, Xilinx etc are used to make all theoretical concepts into practical examples.

Course Contents:

Unit-1: Implementation of logic gates circuits, circuits of Boolean algebra and its functions, combinational circuits – logic functions, multiplexers, decoders & encoders, half and full adder, binary adder and subtractor, binary incrementer, counters.

Unit-2: Registers- shift registers, register with parallel load, connection of various registers according to register transfer operations. Sequential circuits, integrated circuits.

Unit-3: Construction of common BUS. implementation of various arithmetic, logic and shift micro-operations.

Unit-4: Design of ALU, Design of basic computer, design of timing and control circuit of various components and registers of processor. Implementation of memory reference, register reference instructions.

Unit-5: Assemble language programs using MASM tool -basic programs, program loops, programming of arithmetic and logic operations, subroutines, input/output programs.

Text Books:

1. “The Art of Assembly Language Programming” by Randy Hyde.
2. “VHDL Primer” by Bhasker.

References Books:

1. “Computer System Organisation and Architecture: Designing for Performance” by W Stallings, Seventh Edition, Prentice Hall, 2006. ISBN: 0-13-185644-8
2. Yu-cheng Liu,Glenn A. Gibson , “The 8086/8088 Family Architecture, Programming & design”, Second Edition, PHI.
3. Douglas Hall, “Microprocessors & Interfacing, Programming & Hardware”,2nd Edn. Tata McGraw Hill.
4. Kenneth Ayala “The 8086 microprocessor programming and Interfacing the PC”.
5. Tom Shanley, Protected Mode Software Architecture, Addison-Wesley (1996), ISBN 0-201-55447-X
6. “VHDL: Programming by Example” by Douglas Perry.

Course Description

Title of Course: System and Network Programming Lab
Course Code: 14B17CI674
L-T-P Scheme: 0-0-2 **Course Credits: 1**

Objectives:

1) To write, execute and debug c programs which use Socket API.
2) To understand the use of client/server architecture in application development.
3) To understand how to use TCP and UDP based sockets and their differences.
4) To get acquainted with Unix system internals like Socket files, IPC structures.
5) To Design reliable servers using both TCP and UDP sockets.

Learning Outcomes: Students should be able to develop an appropriate client/server model for an internet aware application; Critically analyze the sockets interface requirements of a given application; Design, write and test programs that use the POSIX socket API; and Discuss applications, protocols or algorithms of current interest to the network application development research community.

Course Contents:

List of Exercises

1. Write a program that implements ls | sort
2. Write a program that implements ls | sort | wc
3. Write a program to communicate between client and server process using pipe to implement file server and client.

   File server and client description: The client reads a file name from the STDIN and writes it to the pipe. The server reads this file from the pipe and opens the file for reading. If the open is successful, the server responds by reading the file and writing it to the pipe, otherwise, the server responds with an error message. The client then reads from the pipe, writing what it receives to the STDOUT or in a file.
4. Implement file server and client using FIFO,with client and server as related processes.
5. Implement file server using FIFO, with client and server as unrelated processes.
6. Implement file server (iterative) and client using TCP sockets. It should also print client IP address and port number.
7. Implement echo server (iterative) and client using TCP sockets.

8. Implement daytime server (iterative) and client TCP sockets.
9. Implement TCP file server (concurrent) and client and also catch SIGCHLD signal to prevent zombies.
10. Implement TCP echo server (concurrent) and client and also catch SIGCHLD signal to prevent zombies.
11. Implement TCP daytime server (concurrent) and client and also catch SIGCHLD signal to prevent zombies.
12. Implement TCP whois server (iterative & concurrent) and client.
13. Implement UDP file server and client.
14. Implement UDP echo server and client.
15. Implement UDP daytime server and client.
16. Implement UDP whois server and client.
17. Implement client - server application to communicate binary structures between them using TCP and UDP.
18. Sun RPC – A Case Study.
19. Write a program using Sun RPC in which client sends an integer value to the server, server squares the value, and write the result to the client.
20. Write a program using Sun RPC in which client sends two integer values to the server, server performs addition, subtraction, multiplication or division depending on user's choice, and write the result to the client.
21. Implementing File server using RPC.
22. Write a program using Sun RPC in which clients sends name of file and a number (say i) to the server, Server opens that file and reads every i^{th} character of that file and sends it to client and client displays those characters on console.
23. Implementation of IDEMPOTENT server using RPC.

Text Books

1. "UNIX Network Programming Vol. 1" by W. Richard Stevens.
2. "UNIX Network Programming Vol. 2" by W. Richard Stevens.

Reference Books

1. "The Protocols (TCP/IP Illustrated Volume 1)" by Richard Stevens.
2. "Internetworking with TCP/IP, Volume 3" by Douglas. E. Comer.
3. Maurice J. Bach, Design of the UNIX Operating System, PHI.

Course Description

Title of Course: Web Technology Lab **Course Code: 14B17CI675**
L-T-P scheme: 0-0-2 **Course Credit: 1**

Prerequisite: Students must have already registered for the course, "OOP and DBMS".

Objective: To develop an ability to design and implement static and dynamic website.

Learning Outcomes: At the end of the course students should be able to-

1. Design and implement dynamic websites with good aesthetic sense of designing and latest technical know-how's.
2. Have a Good grounding of Web Application Terminologies, Internet Tools, E-Commerce and other Web services.
3. Get introduced in the area of Online Game programming.

Course Contents:

Unit-1 (Web Basics): Design web pages through coding using HTML and DHTML.

Unit-2 (Integrated Development Tool): Frontpage2000/DreamWeaver, Browser side scripting using JavaScript with a focus on Event Handling and Validation.

Unit-3 (Server Side Scripting): PHP Syntax, variables, loops and constructs, JAVA Graphics, Browser side scripting: Introduction to programming world of XML Technologies. Basic XML Tags, Database Handling with PHP and XML. Connecting to Databases using PHP, PHP files and databases,

Unit-4 (Advanced XML): XLINK, XQUERY, XPATH, AppML (XML Language for Internet Application), SCHEMA, DTD, DOM, RDF, RSS. AJAX (Asynchronous JavaScript and XML), E4X (New Extension to JavaScript, its Direct support of XML to JavaScript), JAVA Game Programming, XML (XSL, XSLT): 2D, 3D Graphics, Event Handling and Developing Online Games.

Unit-5: Ruby Programing, Rails Framework

Textbook

1. Shikha Mehta, Minakshi Gujral: Tutorials and lecture slides on Web Technology Labs 2007 and Web Application Engineering 2007.

References

1. Internet & World Wide Web How to Program / Deitel, H.M.
2. Web Design with HTML/Flash/Java Script and E-Commerce Bible/Crowder, David.
3. Database Driven Web Sites / Feiler, Jesse
4. Web design: the complete reference / Powell Thomas A
5. PHP 5 Unleashed / Coggeshall, John
6. PHP and MySQL Web Development / Welling Luke
7. Internet 101: a beginner's guide to the Internet and the WorldWideWeb/Lehnert Wendy G
8. E-Commerce: Fundamentals and Applications / Chan, Henry
9. E-commerce: strategy, technology & applications / Whiteley, David
10. E-Commerce Logistics & Fulfillment: delivering the goods / Bayles, Deborah L.

Course Description

Title of Course: Introduction to Software Architecture **Course Code: 14B14CI541**
L-T Scheme: 3-0 **Course Credits: 3**

Objective: The objective of course is to study complex software systems which require abstraction and analysis at an architectural level of abstraction.

Course Contents:

Unit-I: Introduction to Software Architecture: Views and Viewpoints, Place of software architecting in the whole software life cycle; decisions making process leading to architecture definition.

Unit-II: Typical software system structures (architectural views): Use Case View, Logical View, Implementation, Process, and Deployment Views techniques for designing and implementing these structures, models for characterizing and reasoning about architectures, and tools architectural modeling.

Unit-III: Design Planning: Introduction to the processes of tradeoff and risk analysis; Identification of factors and quality attributes that characterize a system; identification of underlying design issues, and suitable design strategies.

Unit-IV: Role of architecture in Software engineering; Enterprise Architectures, Zachman's Framework; Architectural Styles, Design Patterns; Architecture Description Languages; Product-line architectures; Component based development.

Unit-V: Specialized Software Architectures: Real-time architecture design, Fault-tolerant architecture design, User interface design, Secure software architecture design.

Text Books:

1. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Miachel Stal, Douglas Schmidt.Pattern Oriented Sofware Architecture, Volumes 1 &2

References:

1. Len Bass, Paul Clements, Rick Katzman, Ken Bass, Software Architecture in Practice.
2. George T. Heineman, William T. Councill.Component Based Software Engineering
3. Kurt Wallnau, Scott Hissam and Robert Seacord.Building Systems from Commercial Components.

Course Description

Title of Course: Software Testing **Course Code: 14B14CI548**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisite: Students must have good knowledge of Data Structure, Algorithms, and Software Engineering.

Objectives: Software testing and maintenance play a critical role in ensuring the quality, and thus the success, of a software product. Software testing is the single most widely used approach to detecting software bugs, and often consumes more than 50% of the cost of software development. Software maintenance is key to provide continuity of service, and is mainly concerned with how to control and manage software changes and evolution after the major features are released.

Learning Outcomes: In this course, students will be able to understand the fundamental concepts, principles, methods, and techniques for performing effective software testing and maintenance and also learn the notion of test adequacy, graph-based coverage criteria, control flow-based testing, data flow-based testing, combinatorial testing, regression testing, configuration management and software refactoring.

Course Contents:

Unit I: Introduction to Testing: Context of testing in developing software, Automation syndrome, The Oracle Problem, Specification Styles, Development life cycle models.

Unit II: Types of Testing: White Box Testing, Static Testing, Structural Testing; Black Box Testing, Positive and negative testing Boundary Value analysis, state based or graph based testing,

Unit III: Integration testing :Top down integration, bottom up integration; Equivalence Class Testing, Robustness Equivalence, Class Testing, Decision Table-based Testing, Input Space Partitioning, Combinatorial Testing.

Unit IV: System and Acceptance Testing: Functional Vs Non functional testing, Acceptance criteria, selecting test cases for acceptance testing, Multiphase testing model.

Unit V: Graph-Based Testing, Predicate Testing, Regression Testing, Software Maintenance, Version Control Software Refactoring, Test Sequencing, Algebraic Testing, Path Testing, Data Flow Testing, Mutation Testing, Industrial Experiences.

Text Book

1. Paul Ammann and Jeff Offutt, Introduction to Software Testing, ISBN 978-0-521-88038-1, Cambridge University Press, 2008.

References

1. Aditya P. Mathur, Foundations of Software Testing, ISBN 81-317-1660-0, Pearson Education, 2008.
2. Martin Fowler, Refactoring: Improving the Desing of Existing Code, ISBN 0-201-48567-2, Addison-Wesley, 1999.
3. Penny Grubb and Armstrong A. Takang, Software Maintenance: Concepts and Practice (2nd Edition), ISBN 981-238-425-1, 2003.

Course Description

Title of Course: Design & Principles of Operating Systems
Course Code: 14B14CI641
L-T Scheme: 3-0 **Course Credit: 3**

Pre-requisite: Students must have the knowledge of "Operating Systems" and "Computer Architecture".

Objectives: To provide students with an understanding of advanced topics of processes management, memory management, file management and I/O management. Also includes kernel design issues, real time operating system design trade-offs, input/output interface design issues, memory hierarchy design issues, multi-processor operating system and distributed operating system design issues. Students will experience several popular commercial operating systems.

Learning Outcomes:

- High-level understand what is an operating system and the role it plays
- A high-level understanding of the structure of operating systems, applications, and the relationship between them.
- Some knowledge of the services provided by operating systems.
- Exposure to some details of major OS concepts.

Course Contents:

Unit-1 (Introduction): Typical application scenarios and role of OS in resource management, operational view of a computer system and a bare-bone OS, Issues in resource management, OS shell and rationale for a OS kernel, the concept of support tools utilities to enhance user productivity

Unit-2 (Process Management): System Call Interface, Implementation of Processes : Process Creation, Process States, Process Dispatching, The System Stack, Timer Interrupts, System Initialization, Switching Between Processes, flow of control, The Process Table and Process Descriptors, Implementation of Mutual Exclusion : Disabling Interrupts, Using ExchangeWord, Software Solutions, Interprocess Communication Patterns, Competing and Cooperating process, Problems When Processes Compete, Race Conditions and Atomic Actions, Scheduling, Deadlock

Unit-3 (Memory and Resource Management): Motivation for memory management, when and where primary and secondary memory management is needed, compiled code and memory relocation, linking and loading, Processes and primary memory management, memory allocation policies, critique of various policies like first fit, best fit, internal and external fragmentation Secondary memory management, fixed and variable partitions, virtual memory concept, paging and page replacement policies, Page faults, thrashing, and hardware support for paging, TLB scheme segmentation, segmentation with paging. Shared resources, resource allocation and scheduling, resource graph

models, deadlocks, deadlock detection, deadlock avoidance, deadlock prevention algorithms, mutual exclusion, semaphores, wait and signal procedures.

Unit-4 (Input Output Management): Issues in human centric, device centric and computer centric IO management, input output modes, programmed IO, polling, interrupt mode of IO, various types of interrupts, interrupt servicing, priority interrupts, interrupt vectors, direct memory access (DMA) mode of transfer, setting up DMAs

Unit-5 (OS and Security): Security breaches, types of attacks, attack prevention methods, security policy and access control, OS design considerations for security, access, policy and access control, OS design considerations for security, access control lists and OS support, internet and general network security.

Text Book

1. Charles Crowley, “Operating Systems: A Design Oriented Approach”, Tata McGraw Hill, 1998.

References

1. Abraham Silberschatz and Peter Baer Galvin, “Operating System Concepts", Addison Wesley, 1999.
2. Aeleen Frisch, “Essential System Administration"; O'Reilly and Associates, Inc., 1998.
3. Andrew S. Tanenbaum, “Modern Operating Systems", Prentice Hall of India, 2001.
4. Mukesh Singhal and Niranjan G. Shivaratri, Advanced Concepts in Operating Systems, McGraw-Hill.

Course Description

Title of Course: Software Quality Management **Course Code: 14B14CI642**
L-T Scheme: 3-0 **Course Credits: 3**

Pre-requisites: Students must have knowledge of "Software Engineering and Software Management".

Objectives: The course has the basic scope to provide the students with theoretical knowledge about concepts of software quality, about the quality- models, - standards and –methodologies used in the software industry. The theory is supported and supplemented by the lecturer's 10 years experience in software quality management. Understanding and usage of the theory are consolidated by the case studies and exercises.

Course Contents:

Unit-I (Introduction to Software Quality): Quality concepts, Quality Assurance, Quality Planning, Quality control, Software Development Life Cycle , Software process, Software Quality, Views of Quality: user view and designer view, transcendent view and manufacturing view.

Unit-II (Hierarchical Models of quality): What are hierarchical models? The hierarchical models of Boehm and McCall, interrelation of quality criteria, a practical evaluation quality modeling.

Unit-III (Software Quality Measurement): Measuring quality, software metrics, problems with metrics, an overall measure of software quality.

Unit-IV (Developments in Measuring Quality): The work of Gilb, The COQUAMO project, current work of metrics, profiles of software quality.

Unit-V (The CASE for Tools and Methods): The growth of software engineering methods, methodologies based upon the waterfall Lifecycle, CASE tools, the contribution of methods and tools to quality, alternative approaches to software development, standards based on the software engineering Lifecycle.

Unit-VI (Quality Management Systems): A historical perspective, terms, elements of a quality management system, the key to quality management, a human quality culture, quality in software, the problem of user requirements, a quality management system for software, quality assurance of quality improvement.

Unit-VII (The ISO9000 series of Quality Management Standards): The purpose of standards, the ISO9000 series: a generic quality management standard, ISO9000-3: notes for guidance on the application of ISO9001 in software development, the impact of ISO9000 and TickIT.

Unit-VIII (Models and Standards for Process Improvement): The Capability Maturity Model, individual levels of CMM, the role of the CMM, SPICE modeling.

Unit-IX (Case Studies: from kitchens to software): Introduction to case studies, total quality in the kitchen, a software house: Sherwood computer services, does quality deliver benefits?

Text Book

1. “Software Quality : Theory and Management” by Alan C Gillies, CENGAGE Learning, Second Edition.

References

1. Agile and Iterative Development: A Manager's Guide, Craig Larman.
2. Practical Guide to Software Quality Management, John W. Horch.
3. Introduction to the Team Software Process(SM),Watts Humphrey.
4. Software Engineering, R.S. Pressman, McGraw Hill.

Course Description

Title of Course: Concurrency Control and Security of Databases
Course Code: 14B14CI643
L-T Scheme: 3-0 **Course Credits:3**

Objectives: This course will cover several aspects of database security and the related subject of concurrency control in distributed databases, discuss methods for concurrency control, discuss methods used in failure recovery in distributed databases, consider how security can be established within relational databases, examine the conflicting interactions between security requirements and concurrency control, examine how access control policies can be adapted to relational databases.

Learning Outcomes: On successful completion of the course students will be able to:

- Perform analysis of arbitrary transaction histories
- Construct transaction histories that have a range of desirable properties
- Analyze transactions from a serialisability, scheduling, and recovery perspective
- Examine critically a number of approaches used to achieve multi-level security whilst still permitting the concurrent execution of transactions.
- Understand why confidentiality is so difficult to achieve within a statistical database
- understand the implications that security and its administration have in the context of commercial relational databases such Oracle.

Course Contents:

Unit-1: Transaction Processing, Serialisability Theory, Two Phase Locking.

Unit-2: Centralized Recovery, Distributed Recovery, Recovery of Data, Security and Integrity of Data, Data Encryption, Multidatabase System.

Unit-3: Distributed DataBase (DDBMS), Database Allocation & Replication, Communication Network, Advantages and disadvantages od DDBMS,

Unit-4: Security and Security Models, Relational Database Security, Statistical Database Security, Mapping, Next-Generation Database System, DBGT model and Architechture of DBGT model, DBGT data manipulation.

Unit-5: Concurrency Control and Multilevel Security, Oracle Security.

Textbook

1. P.A. Bernstein, V. Hadzilacos and N. Goodman, Concurrency Control and Recovery in Database Systems, Addison-Wesley, 1987.

References

1. S. Castano, M. Fugini, G. Martella, P. Samarati, Database Security, Addison Wesley, 1994.
2. D. Gollmann, Computer Security, John Wiley & Sons, 1999.

Course Description

Title of Course: Human Aspects for Information Technology
Course Code: 14B14CI646
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: Students will be exposed to various humanistic theories and research in order to develop their ability to judge and take decisions at various phases of engineering and deployment of software and IT system in the light of wider human concerns.

Learning Outcomes: Student will be able to -

1. Understand various humanistic theories, perspectives, and approaches with reference to their applicability to engineering, deployment, and evaluation of IT systems.
2. Develop an understanding of professional ethics, human centric design, and sustainable development of IT systems.
3. Explore trans-disciplinary aspects and emerging possibilities for Information technology with human and social sciences.

Course Contents:

Unit-1: Introduction, Context, Wisdom, Problem Solving, Critical and Creative Thinking. Sustainable development and IT, Universal usability. Humanities computing, computer-aided research in literature and language studies, history, philosophy, and other humanities disciplines, leisure computing, humanistic aspects of IT and IT professions,

Unit-2: Human centric IT, research methods. Social computing computer-aided research in social sciences, social aspects of IT and IT professions, relationship and collaboration technology, digital divide, research methods. Risks and liabilities of computer-based systems, technological disasters, software failure, responsibilities towards nature.

Unit-3: Ethics and Technology, Theories of Human Development - Maslow, Perry, Kohlberg, Gilligan, Schwartz, Personality theories, etc. Cyber-ethics - Theories of ethics, Codes of Ethics and Professional Practice, ACM, AITP, IEEE, privacy, regulation.

Unit-4: Cyberethics, Introduction, Concepts, perspective, and Methodological Frameworks, Ethical Concepts and Ethical theories: establishing and justifying a moral systems, Critical Thinking skills and logical arguments: Tools for evaluating Cyberethics issues,

Unit-5: Professional Ethics, Codes of conduct, and moral responsibility, Privacy and Cyberspace, Security in Cyberspace, Cybercrime and Cyber-related crimes, Intellectual property disputes in Cyberspace, Regulating commerce and speech in Cyberspace.

Text Books

1. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, “Human-Computer Interaction” third edition, Pearson Education.
2. Tavani, Herman T., “Ethics and Technology: Ethical Issues in Information and Communication Technology”, New York: John Wiley & Sons, 2004.

References

1. John M. Carroll, “Human Computer Interaction in the New Millennium”, Pearson Education.
2. Saara Baase, “Wings of Fire: Social, Legal, and Ethical Issues in Computing”, 2nd edition, Prentice Hall, 2003
3. A.N. Tripathi, Human Values, revised second edition, New Age, 2006
4. ACM Computer and society magazine, 1972 to 2005.
5. IEEE Technology & Society Magazine, 1988 onward.
6. Software Engineering Code of Ethics and Professional Practice (Version 5.2), ACM/IEEE-CS.
7. Proceedings of the ACM SIGCPR conference on Computer personnel research.
8. Proceedings of the ACM SIGMIS-CPR conference on Computer personnel research.
9. Proceedings of the conference on Ethics in the computer age, ACM, 1994.
10. Journal of Ethics and Information Technology, Springer.
11. Journal of Business Ethics, Springer.
12. Journal of Ethical Theory and moral practice, Springer.
13. Journal of Value inquiry, Springer.
14. Journal of Human studies, Springer.
15. The Journal of ethics, Springer.
16. Journal of Empirical Software engineering, Kluwer Press.

Course Description

Title of Course: Graph Algorithm and Applications **Course Code: 14B14CI647**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisite: Data Structure and Algorithms

Objectives: This course is intended for graph algorithms and their applications.

Course Contents:

Unit-I: Planar graphs: planarity testing, problems that are easier on planar graphs, drawing planar graphs.

Unit-II: Planar separators

Unit-III: Intersection graphs and related classes: interval and chordal graphs, unit disc graphs, etc.

Unit-IV: Trees and related graphs: treewidth, series parallel graphs, problems that are easier on these.

Unit-V: Introduction to graph minors.

Text Books

1. Introduction to Graph Theory by West Prentice Hall, ISBN: 0-13-227828-6
2. Graph Theory by Deistel, Springer, ISBN: 3-540-26183-4

Reference Books

1. Extremal Graph Theory by Bollobs, Academic Press, ISBN: 0-12-111750-2
2. Computers and Tractability, Grey and Johnson, Freeman, ISBN: 0-7167-1045-5

Course Description

Title of Course: Material Science **Course Code: 14B14PH611**
L-T Scheme: 3-0 **Course Credits:3**

Objective: This course aims at giving the students a basic knowledge necessary for understanding of electric, magnetic and optical properties of materials used in Information Technology.

Learning Outcome: The course will make the basic understanding of the properties of different Information Technology materials and hence build up a suitable foundation for the understanding of design and working of communication, processing and storage devices fabricated with these materials.

Course Contents:

Dielectric Materials: Polarization mechanism & Dielectric Constant, Behavior of polarization under impulse and frequency switching, Dielectric loss, Spontaneous polarization, piezoelectric effect; Applications of Dielectric Materials, Magnetic Materials: Concept of magnetism, Classification – dia-, para-, Ferro-, antiferro- and ferri-magnetic materials, Their properties and Applications; Hysteresis; Magnetic Storage and Surfaces.

Polymers and Ceramics: Various types of Polymers and their applications; Optical/ Mechanical behavior and Processing of Polymers; Structure, Types, Properties and Applications of Ceramics; Mechanical behavior and Processing of Ceramics, Superconducting Materials: Meissner effect, Critical field, type-I and type-II superconductors; Field penetration and London equation; BCS Theory, High temperature Superconductors and their Applications.

Nuclear Materials: Materials for Nuclear power generation, Reactors, Nuclear fuel, Optical Fibers and Laser communication: Light propagation in fibers and Graded Index fibers, Numerical Aperture and Attenuation, Single and Multimode fibers and their propagation characteristics, Low loss fibers, Connectors, Splicing and Splice loss. Couplers; Applications of Laser in various fields including Optical Communication using Optical Cables, Display Devices. Fluorescent Materials.

Text Books

1. Material Science by G. K. Narula, K. S. Narula and V. K. Gupta, TMH, 1989
2. Material Science by R. S. Khurmi and R. S. Sedha, S. Chand, 2008.

4 year BTech Curricula for Computer Science and Engineering							
BTech VII semester (B7)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1		HSS Elective	Elective	3	0	0	3
	14B14HS743	Entrepreneurship and Small Business					
	14B14HS744	Brand Management					
	14B14HS745	Human Resource Management					
	14B14HS746	Total Quality Management					
2	14B19CI791	Project Part I	Core				7
3	14B11CI711	Artificial Intelligence & Applications	Core	3	0	0	3
4	14B17CI771	Artificial Intelligence Lab	Core	0	0	2	1
5		DE-3	Elective	3	0	0	3
6		DE-4	Elective	3	0	0	3
7		DE-5	Elective	3	0	0	3
		Total		**15**	**0**	**2**	**23**
List of Electives for VII Sem			**Core/ Elective**	**L**	**T**	**P**	**Credits**
DE-3							
	14B14CI741	Cryptography and Network Security	Elective	3	0	0	3
	14B14CI742	Network Management	Elective	3	0	0	3
	14B14CI743	Fault Tolerant Computing Systems	Elective	3	0	0	3
	14B14CI744	Introduction to Cognitive Sciences	Elective	3	0	0	3
	14B14CI745	Ad-hoc and Wireless Networks	Elective	3	0	0	3
	14B14CI753	Modeling For Computer Networks	Elective	3	0	0	3
	14B14CI754	Component Based Software Engineering	Elective	3	0	0	3
	14B14CI755	Network Security	Elective	3	0	0	3
	14B14CI756	Introduction to Service Oriented Architecture	Elective	3	0	0	3

DE-4							
	14B14CI746	Image Processing	Elective	3	0	0	3
	14B14CI747	Software Engineering & Management	Elective	3	0	0	3
	14B14CI749	Information Retrieval & Data Mining	Elective	3	0	0	3
	14B14CI751	Introduction to Queueing Networks	Elective	3	0	0	3
	14B14EC746	Mobile Communications	Elective	3	0	0	3
	14B14EC750	Information Theory and Applications	Elective	3	0	0	3
	14B14EC751	Digital T.V.	Elective	3	0	0	3

DE-5							
	14B14MA741	Applied Linear Algebra	Elective	3	0	0	3
	14B14MA742	Methods of Applied Mathematics	Elective	3	0	0	3
	14B14MA743	Optimization Techniques	Elective	3	0	0	3
	14B14MA744	Graph theory	Elective	3	0	0	3
	14B14MA745	Game theory	Elective	3	0	0	3
	14B14MA746	Integral Transforms	Elective	3	0	0	3
	14B14PH741	Nano Science & Technology	Elective	3	0	0	3
	14B14PH742	Nonlinear Optics & Optical Communication	Elective	3	0	0	3
	14B14PH743	Characterization Techniques	Elective	3	0	0	3
	14B14PH744	Nonlinear Dynamic Applications	Elective	3	0	0	3
	14B14PH745	Simulation of Semiconductor Devices	Elective	3	0	0	3

Course Description

Title of Course: Entrepreneurship and Small Business **Course Code: 14B14CI743**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: The purpose of this course is to prepare a ground where the students view Entrepreneurship as a desirable and feasible career option. In particular the paper seeks to build the necessary competencies and motivation for a career in Entrepreneurship.

Learning Outcome: After successfully completing this program, the student will be able to build on personal as well as external resources with a view to successfully launching and subsequently managing their enterprises. They would have not only a definite idea as to which support/ developmental agency to look up and for what purpose, but also the necessary know-how and wherewithal for accessing their help. They would have basic skills in operations, finance, and marketing and human resource management.

Course Contents:

Unit-1: Enterprise: Conceptual issues, Entrepreneurship vs. Management, Roles and functions of entrepreneur in relation to the enterprise and in relation to the economy, Entrepreneurship is an interactive process between the individual and the environment, Small business as seedbed of Entrepreneurship, Entrepreneur competencies, Entrepreneur motivation, performance and rewards.

Unit-2: Opportunity scouting and idea generation: role of creativity and innovation and business research. Sources of business ideas. Entrepreneur opportunities in contemporary business environment, for example opportunities in net-work marketing, franchising, business process outsourcing in the early 21 century. The process of setting up a small business: Preliminary screening and aspects of the detailed study of the feasibility of the business idea and financing/non-financing support agencies to familiarize themselves with the policies/programs and procedures and the available schemes. Preparation of Project Report and Report on Experiential Learning of successful and unsuccessful entrepreneurs.

Unit-3: Management roles and functions in a small business. Designing and re-designing business process, location, layout, operations planning and control. Basic awareness on the issues impinging on quality, productivity and environment. Managing business growth. The pros and cons of alternative growth options: internal expansion, acquisitions and mergers, integration and diversification. Crisis in business growth.

Unit-4: Principles of double-entry book-keeping: journal entries, cash-book, pass book, and Bank Reconciliation Statement, ledger accounts, trail balance and preparation of final accounts: Trading and Profit and Loss Account; Balance-sheet. Brief introduction to Single-Entry system of record keeping. Sources of risk/venture capital, fixed capital, working capital and a basic awareness of financial services such as leasing and factoring.

Unit-5: Issues in small business marketing. The concept and application of product life cycle [plc], advertising and publicity, sales and distribution management. The idea of consortium marketing, competitive bidding/tender marketing, negotiating with principal customers. The contemporary perspectives on Infrastructure Development, Product and Procurement Reservation, Marketing Assistance, Subsidies and other Fiscal and

Monetary Incentives. National state level and grass-root level financial and non-financial institutions in support of small business development.

Teaching Methodology

The course is a mix of classroom teaching (power point slides) which includes case studies, quiz, role plays and group presentations based on project.

Text Books

1. Brandt, Steven C., The 10 Commandments for Building a Growth Company, Third Edition, Macmillan Business Books, Delhi, 1977
2. Bhide, Amar V., The Origin and Evolution of New Business, Oxford University Press, New York, 2000.
3. Dollinger M.J., 'Entrepreneurship strategies and Resources', 3rd edition, Pearson Education, New Delhi 2006.
4. Desai, Vasant Dr. (2004) Management of small scale enterprises New Delhi: Himalaya Publishing House,
5. Taneja, Gupta, Entrepreneur Development New Venture Creation,: 2nd ed. Galgotia Publishing Company
6. Holt, David H., Entrepreneurship: Strtegies and Resources, Illinois, Irwin, 1955.
7. Panda, Shiba Charan, Entrepreneurship Development, New Delhi, Anmol Publications.
8. Patel, V.G., The Seven Business Crises and How to Beat Them, Tata-Mcgraw, New Delhi, 1995.
9. SIDBI Report n Small Scale Industries Sector[latest edition]
10. Verma, J.C.., and Gurpal Singh, Small Business and Industry-A Handbook for Entrepreneurs, Sage, New Delhi, 2002 11. Vesper, Karl H., New Venture Strategies, [Revised Edition], New Jersy, Prentice Hall, 1990
11. Thomas Zimmerer, Essentials of Entrepreneurship and Small Business Management, Fifth edition, PHI publishers.

Course Description

Title of Course: Brand Management **Course Code: 14B14CI744**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: The objectives of this course are to-

- Enhance awareness and knowledge about branding issues in creative industries
- Develop ability to identify strategic issues in branding of creative products
- Survey academic research streams addressing branding issue
- Develop critical perspectives in evaluating research in branding and applying them in strategic management of brands in creative industries
- Conduct case study focusing on branding and marketing

Learning Outcome: A brand is a perceptual entity that is rooted in reality but reflects the perceptions and perhaps even the idiosyncrasies of consumers. Ultimately a brand is something that resides in the minds of consumers. To successfully brand a product it is necessary to teach consumers:

1. Who the product is.
2. What the product does.
3. Why consumers should choose that particular brand.

A branding strategy shall be considered successful only when the consumers have an answer to the above three questions which is strong enough to make them believe that there are significant differences in the products or services provided by a brand than others.

Course Contents:

Unit-I: Opening Perspectives, Brands & Brand Management.

Unit-II: Identifying and Establishing Brand Positioning and Values, Customer-Based Brand Equity, Brand Positioning, Planning and Implementing Brand Marketing Programs, Choosing Brand Elements to Build Brand Equity.

Unit-III: Designing Marketing Programs to Build Brand Equity, Integrating Marketing Communications to Build Brand Equity, Leveraging Secondary Brand Associations to Build Brand Equity.

Unit-IV: Measuring and Interpreting Brand Performance, Developing a Brand Equity Measurement and Management System, Measuring Sources of Brand Equity: Capturing Customer Mindset, Measuring Outcomes of Brand Equity: Capturing Market Performance.

Unit-V: Growing and Sustaining Brand Equity, Designing and Implementing Branding Strategies , Introducing and Naming New Products and Brand Extensions , Managing Brands over Time , Managing Brands over Geographic Boundaries and Market Segments.

Teaching Methodology

The course is a mix of classroom teaching (power point slides) which includes case studies, quiz, role plays and group presentations based on project.

Text Book

1. Strategic Brand Management, 3/E Kevin Lane Keller, ISBN-13: 9780131888593, Prentice Hall

Reference books

1. Aaker, David, A. Managing Brand Equity, New York, Free Press, 1991.
2. Cowley, Don. Understanding Brands. London, Kogan Page, 1991.
3. Czerniawski, Richard D. & Michael W. Maloney Creating Brand Royalty, AMACOM, NY, 1999.
4. Kapferer, J N. Strategic Brand Management. New York, Free Pres,s 1992.
5. Murphy, John A. Brand Strategy. Cambridge, The Director Books, 1990.
6. Steward, P. Building Brands Directly. London, MacMillan, 1996.
7. Upshaw, Lyhh B. Building Board Identity: A Stratery for success in a hostile market place. New York, John. Wiley, 1995.

Course Description

Title of Course: Human Resource Management **Course Code: 14B14CI745**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: To develop an understanding and awareness of HRM and the policies, principles and the role of HRM in Effective, efficient utilization of other resources.

Learning Outcome: After successfully completing this program, the student will be able to-

- Effectively manage and plan key human resource functions within organizations
- Examine current issues, trends, practices, and processes in HRM
- Contribute to employee performance management and organizational effectiveness
- Problem-solve human resource challenges
- Develop employability skills for the Canadian workplace
- Develop effective written and oral communication skills

Course Contents:

Unit-1: Human Resource Management: Meaning, Nature and Scope, HRM functions and objectives, evolution of HRM environment.

Unit-2: Human resource development in India: evolution and principles of HRD Vs personnel functions, Role of HR managers.

Unit-3: Strategic Human Resource Management: Nature of strategies and strategic management, strategic management process, Environment scanning, strategy formulation, implementation and evaluation.

Unit-4: Human Resource Planning: Definition, purposes, processes and limiting factors; Human resources information system (HRIS): HR Accounting and audit, Job analysis-job description, job specification.

Unit-5: Training and Development: purpose, methods and issues of training and management development programs. Performance Appraisal: definition, purpose of appraisal, procedures and techniques including 360 degree performance appraisal.

Unit-6: Job evaluation and Compensation administration: nature and objectives of compensation, components of pay structure in India, Wage policy in India.

Unit-7: Discipline and Grievance Procedures: definition, disciplinary procedure, grievance handling procedures, Industrial relations: nature, importance and approaches to industrial relations.

Text Books

1. Human Resource Management – Stephen P. Robbins.
2. Human Resource & Personnel Management- K. Aswathappa.
3. Human Resource Management- Rao V. S. P.
4. Human Resource Management- Ivansevich.

Course Description

Title of Course: Total Quality Management **Course Code: 14B14CI746**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: This course will equip the students with the skills and knowledge necessary to implement a successful TQM program in a company, an understanding of the history, purpose and fundamentals of TQM, the tools and techniques that can improve operations, product quality, process quality, customer satisfaction and employee involvement and the various methods to assess progress of the TQM journey.

Course Contents:

Unit-1: Introduction

Basics of Total Quality, Total Quality Management, TQM- Thinkers and Thoughts, Quality Awards.

Unit-2: Features of TQM

Cost of Quality, Team work for Quality, Total Employee Involvement, Customer Satisfaction.

Unit-3: Continuous Improvement

Quality Circles, Kaizen, Six Sigma, People CMM, Benchmarking.

Unit-4: Basic Statistical Concepts

Control of Accuracy and Precision, Process Capability, Statistical Process Control, Quality Function Deployment, Quality Management Systems, Design of Experiments (Taguchi Technique), FMEA, Total Productivity Maintenance.

Unit-5: Quality Standards & Certifications

ISO: 9000 series, ISO: 14000 series.

Teaching Methodology

The course is a mix of classroom teaching (power point slides) which includes case studies, quiz, role plays and group presentations based on project.

Text Book

1. Besterfield Dale H., Carol Besterfield-Michna, Glen Besterfield, Sacre Mary Besterfield, Total Quality Management, Third Edition, Pearson Education.

References:

1. Montgomery Douglas C., Introduction to Statistical Quality Control, Fourth Edition, John Wiley & Sons Inc.
2. Wadsworth, Modern Methods Quality and Improvement, 2nd edition, CBS Publications.
3. Eckes, Six Sigma for Everyone, CBS Publications.
4. Oakland, TQM: Text With Cases, 3rd edition, Elsevier Publications.
5. Hubert K Rampersad , Managing Total Quality, Tata McGraw Hill.

Course Description

Title of Course: Project-I **Course Code: 14B19CI791**
L-T-P Scheme: 0-0-14 **Course Credits: 7**

Objectives: To Design and build a computer software/tool.

Learning Outcome: The course will be covered through research analysis, coding, design and testing, Some Section of the course will include additional reading in the research literature (e.g. research paper on high performance computer Architecture) to allow them to see how the leading edge is advanced in this area of the discipline. In practical Labs different software tools as according to the required are used to make all theoretical concepts into practical examples.

Course Contents:

Title of the Project- This should be carefully decided by the student after discussing with the project supervisor or the guide. Explain the relevance and importance of the project, Write a brief (1 or 2 pages) introduction of the project explaining its relevance and importance.

Requirements - Based on academic needs, the current technological pursuits and finding or knowing what the customers/markets need or require. Write in steps the project requirements.

Feasibility Study- The general requirements were listed in section-3 and therefore the feasibility study may start. The feasibility study of project must be completed within 4 weeks

Scope/Objectives: By doing the project feasibility, the uncertainties and ambiguities are reduced. The team is now definite about Resources, Confidence, Viability, Realizeability, Inadequacy and many such factors.

Requirement Analysis: Now one by one these requirements are to be analyzed and so as to generate general design inputs.

Activity Time Schedule: Draw a suitable representation that indicates the proposed manner of execution of the project - starting from the start to the completion date.

Detail Design - start of system and Subsystem level design, Design from the conceptual level block schematic, a detail architectural layout, indicate every subsystem and within them identify every small entity. Draw functional block schematics, data flow diagrams for every small entity, Write the algorithms, the pseudo code for every function calls, the subroutines, the recursions.

Text Books:

1. As per requirement of project.

Reference Books:

2. As per requirement of project.

Course Description

Title of Course: Artificial Intelligence and Applications Course Code: 14B11CI711
L-T Scheme: 3-1 Course Credits: 4

Objectives: In this course we will study the basic components of an intelligent system, their functions, mechanisms, policies and techniques used in their implementation and examples.

Learning Outcomes: The students will have a detailed knowledge of the concepts of artificial intelligence, various applications of AI in different fields, Aware of a variety of approaches to AI techniques.

Course Contents:

Unit-1 (Introduction to AI): Definitions, Goals of AI, AI Approaches, AI Techniques, Branches of AI, Applications of AI.
Introduction of Intelligent Systems: Agents and Environments, Good Behavior: the concept of Rationality, The Nature of Environments, The structure of Agents, How the components of agent programs work.

Unit-2 (Problems Solving, Search and Control Strategies)
Solving Problems by Searching, Study and analysis of various searching algorithms. Implementation of Depth-first search, Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bi-directional search Informed (Heuristic) Search Strategies: Greedy best-first search A* search: Minimizing the total estimated solution cost, Conditions for optimality: Admissibility and consistency, Optimality of A*, Memory-bounded heuristic search, Heuristic Functions, Generating admissible heuristics from sub problems: Pattern databases, Learning heuristics from experience.
Beyond Classical Search: Local Search Algorithms and Optimization Problems: Hill-climbing search Simulated annealing, Local beam search, Genetic algorithms, Local Search in Continuous Spaces, Searching with Non-deterministic Actions: AND-OR search trees, Searching with Partial Observations.
Adversarial Search and Constraint Satisfaction Problems, Study of min-max algorithm
Adversarial Search: Games, Optimal Decisions in Games, The mini-max algorithm, Optimal decisions in multiplayer games, Alpha--Beta Pruning, Move ordering , Imperfect Real-Time Decisions, Evaluation functions, Cutting off search, Forward pruning, Search versus lookup, Stochastic Games, Evaluation functions for games of chance, Partially Observable Games
Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Variations on the CSP formalism, Constraint Propagation: Inference in CSPs, Backtracking Search for CSPs, Local Search for CSPs, Alpha-beta pruning and CSP, Implementation aspects of mini-max algorithm and CSP.

Unit- 3 (Knowledge Representations Issues, Predicate Logic, Rules)
Knowledge representation, KR using predicate logic, KR using rules. Reasoning System - Symbolic, Statistical: Reasoning, Symbolic reasoning, Statistical reasoning.

Unit-4 (Quantifying Uncertainty, Learning Systems)

Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Bayes' Rule and Its Use, Representing Knowledge in an Uncertain Domain, Other Approaches to Uncertain Reasoning, Rule-based methods for uncertain reasoning, Representing vagueness: Fuzzy sets and fuzzy logic, Study of fuzzy logic and Decision trees, Implementation aspects of Decision trees.

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, The decision tree representation, Expressiveness of decision trees, inducing decision trees from examples.

Unit-5 (Expert Systems)

Introduction, Knowledge acquisition, Knowledge base, working memory, Inference engine, Expert system shells, Explanation, Application of expert systems.

Fundamentals of Neural Networks: Introduction and research history, Model of artificial neuron, Characteristics of neural networks, learning methods in neural networks, Single-layer neural network system, Applications of neural networks.

Fundamentals of Genetic Algorithms: Introduction, Encoding, Operators of genetic algorithm, Basic genetic algorithm.

Text Books

1. Rich, Elaine Knight, Kevin, Artificial Intelligence, Tata McGraw Hill.
2. Luger, George F, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education.

References

1. Nilsson, Nils J, Artificial Intelligence, Morgan Kaufmann.
2. Russell, Stuart J. Norvig, Peter, AI: A Modern Approach, Pearson Education.

Course Description

Title of Course: Artificial Intelligence Lab **Course Code: 14B17CI771**
L-T-P Scheme: 0-0-2 **Course Credit: 1**

Objectives: In this course we will implement the basic components of an intelligent system, their functions, mechanisms, policies and techniques used in their implementation and examples.

Learning Outcomes: The students will have a detailed knowledge of the concepts of artificial intelligence. Various applications of AI in different fields, aware of a variety of approaches to AI techniques.

Course Contents:

Unit-1: Introduction to AI and intelligent agents

Unit-2: Problem solving, Problem spaces and blind search techniques, informed search techniques, Constraint satisfaction problems

Unit-3: Knowledge representation and reasoning techniques, Logic programming, Logical agents, Game playing, Planning,

Unit-4: Learning, Reasoning under uncertain situations,

Unit-5: Expert systems, Decision support systems, Domain specific AI applications.

List of AI Problems for Lab-

Problem 1: Solve "Tower of Hanoi" with only 2 disks.
Problem 2: Solve "Tower of Hanoi" with only 3 disks.
Problem 3: Solve "4-Queens" puzzle.
Problem 4: Solve "8-Queens" puzzle.
Problem 5: Solve "4-color map" problem.
Problem 6: Solve "8 – puzzle" take any initial and goal state.
Problem 7: Calculate the sum of n elements in an integer array. Also calculate its Polynomial function the determine its complexity using "*Big-O*".
Problem 8: Find out the largest element in an square 2-D array. Also determine the "Big-O" of the algorithm. [Take size greater the 2x2]
Problem 9: Solve "Latin Square" problem.
Problem 10: Solve "Sudoku Problem" use any initial positions.
Problem 11: Solve "15-puzzle" problem using any initial and goal state.
Problem 12: Solve "Sudoku Problem" use any initial positions.
Problem 13: Code the following games software: Checkers, Chess.
Problem 14: Code the following games using software: Othello, Backgammon.
Problem 15: Code the following games using software: Bridge, Go.
Problem 16: Code the following games using software: Hex, 6x7.
Problem 17: Code the following games using software: Tetris, Tick-Tack-Toe.
Problem 18: Code the following games using software: rubik-cube, same game, mines.
Problem 19: Code the following games using software: Matches, Mines.

Text Books

1. Rich, Elaine Knight, Kevin, Artificial Intelligence, Tata McGraw Hill.
2. Luger, George F, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education.

References

1. Nilsson, Nils J, Artificial Intelligence, Morgan Kaufmann
2. Russell, Stuart J. Norvig, Peter, Artificial Intelligence: A Modern Approach,
3. Pearson Education
4. Negnevitsky, Michael, Artificial Intelligence: A Guide to Intelligent Systems, Addison-Wesley.

Course Description

Title of Course: Cryptography and Network Security **Course Code: 14B14CI741**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: The course covers fundamental aspects of security in a modern networked environment with the focus on system design aspects and cryptography in the specific context of network/internetwork security. It also dwells into basics of cryptographic techniques, algorithms and protocols required to achieve these properties; computational issues in implementing cryptographic protocols and algorithms; and system/application design issues in building secure networked systems.

Learning Outcomes: After completing this course, students will be able to explain common attacks against network assets, the associated threats and vulnerabilities, and what network security personnel do to secure assets. They would be able to protect information in an organization by using authentication and access control.

Course Contents:

Unit-I: Foundation of Security & Cryptography: OSI security architecture, Classical encryption techniques. Mathematical Tools for Cryptography: Finite fields, number theory.

Unit-II: Block Ciphers: Design principles, Data encryption standard, advanced encryption standard, multiple encryption and Triple DES, Block cipher modes of operation.

Unit-III: Public Key Cryptography: RSA, Key management, Diffie-Hellman key exchange, Elliptic curve Arithmetic, Elliptic curve cryptography, Message authentication and Hash functions.

Unit-IV: Hash and MAC algorithms: Secure hash algorithm, HMAC, Digital Signature, Certificates & Standards.

Unit-V: Authentication Applications: Kerberos, X.509 authentication service, Electronic Mail Security: PGP, S/MIME.

Unit-VI: IP Security Protocols: System Security, Computer virus, Firewall & Intrusion detection, trusted systems, Security investigation, Introduction to Trusted Computing

Text Book

1. William Stallings: Cryptography and Network Security. 4th Edition. Prentice-Hall, Englewood Cliffs, 2006.

References

1. Bruce Schneider: Applied Cryptography, Wiley Student Edition, 2nd Edition, Singapore, 1996.
2. C.Kauffman, R.Perlman and M.Spenser: Network Security, Second Edition, Prentice Hall, Englewood Cliffs, 2002.
3. S. Bellovin and W. Chesvick: Internet Security and Firewalls, Second Edition, Addison-Wesley, Reading, 1998.

Course Description

Title of Course: Network Management **Course Code: 14B14CI742**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: The course covers fundamental aspects of managing computer networks in a modern networked environment. It also dwells into details of Simple Network Management Protocol & Broadband Network Management like ATM networks, TMN.

Learning Outcomes: After completing this course, students will be able to use network management tools, systems and applications in an organization. They should be able to explain the use of simple network management protocol & broadband network management.

Course Contents

Unit-I: Data Communications and Network Management Overview, Review of Computer Network Technology.

Unit-II: Basic Foundations of Network management, standards, models and languages, SNMP v1 Organization and Information models, SNMP v1 Communication and functional Models, SNMP v2, SNMP v3,

Unit-III: SNMP management RMON, Broadband Network Management: ATM Networks.

Unit-IV: Broadband Network Management: TMN, Network Management Tools and systems and applications.

Unit-V: Network Management applications, Web Based Management.

Text Books

1. Mani Subramanian., Network Management Principles and Practices, Pearson Education.

Course Description

Title of Course: Fault Tolerant Computing Systems **Course Code: 14B14CI743**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: The explosion of data created by the businesses of today is making storage a The course will discuss the principles & practice of fault tolerance in software and distributed systems.

Course Contents:

Unit-I: System model -error, failure, faults, software fault tolerance

Unit-II: Byzantine agreement, fail-stop processors,

Unit-III: Stable storage, reliable and atomic broadcasting

Unit-IV: Process resiliency, data resiliency & recovery, commit protocols

Unit-V: Reliability modeling & performance evaluation, crash recovery in databases, and voting methods.

Text Books:

1. P. Jalote, “Fault Tolerance in Distributed Systems”, Prentice Hall Inc., 1994.

Course Description

Title of Course: Introduction to Cognitive Science **Course Code: 14B14CI744**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisite: Students opting for the course should know fairly well about Artificial Intelligence.

Objectives:

- In cognitive science, the important is not about what is done but how it is done. This means intelligent behavior is not enough, the program must operate in an intelligent manner.
- This course is an introduction to the interdisciplinary field of cognitive science, which is concerned with understanding the nature of cognition in humans, animals, and machines.
- Cognition refers to the mental processes that compose our mind: thought, reasoning, decision making, language, learning, and perception.
- We will involve ideas from psychology, philosophy, artificial intelligence, neuroscience, linguistics, and education.
- A guiding theme of work in cognitive science is the idea that the mind can be understood as a computational system, sometimes referred to as the computational metaphor of the mind.

Learning Outcomes:

- Students should be able to say how to replicate human behavior. Rather than conducting a survey of basic works in the field, we have decided to organize the course around two specific topics, and attack each topic from multiple cognitive science perspectives, in an attempt to gain a better understanding of the topic than one would acquire by adopting a single perspective.
- The topics we've chosen are consciousness and situated cognition. We've chosen these topics because they are addressed by the traditional disciplines forming cognitive science, and because the topics cut across aspects of cognition, including: perception, attention, memory, thought, language, and cognitive control.

Course Contents:

Unit I: What is Cognitive Science? Representation, Digital Representation, Analog Representation, Dual-Coding Hypothesis, Propositional Representations. Computation, Tri- Level Hypothesis, The Interdisciplinary Perspective.

Unit II: The Philosophical Approach, The Mind-Body Problem, Flavors of Monism, Flavors of Dualism, Functionalism, Knowledge Acquisition Problem, Consciousness, The Psychological Approach, Scientific Method, Mental Atoms, Structuralism, Mind as a Black Box, Gestalt Approach**.**

Unit III: Cognitive Approach, History, Vision, Attention, Memory, Imagery and Problem Solving The Neuroscience Approach: Mind As Brain, The Network Approach, The Evolutionary Approach.

Unit IV: The Linguistic Approach, Relativity Hypothesis, Cognition and Linguistics, Natural Language Processing, Semantic Analysis, Syntactic Analysis, Pragmatic Analysis, Artificial Intelligence (AI), Turing Test, AI methodologies, Machine Reasoning, Logical Reasoning, Inductive Reasoning, Rule-based Reasoning, Expert Systems, Fuzzy Logic, Artificial Neural Networks

Unit V: Probabilistic methods for uncertain reasoning, Classifiers and statistical learning methods, Genetic algorithms.

Text Book

1. Cognitive Science: An Introduction to the Study of Mind, by Jay Friedenberg, Gorden Silverman, published by SAGE Publications.

Reference Books

1. The MIT Encyclopedia of the Cognitive Science by Robert A. Wilson and Frank C. Keil.
2. Introduction to Cognitive Science by Paul Thagard.
3. Clark, A. (1993) Associative Engines MIT Press.
4. Elman, J. L. (1991) "Distributed Representations, Simple Recurrent Networks, and Grammatical Structure," in Touretzky, D. Connectionist Approaches to Language Learning, Kluwer, Dordrecht, 91-122.
5. Pinker, S. and Prince, A. (1988) "On Language and Connectionism: Analysis of a Parallel Distributed Processing Model of Language Acquisition," Cognition, 23, 73-193.
6. Rummelhart, D. and McClelland, J. (1986) "On Learning the Past Tenses of English Verbs," in Parallel Distributed Processing, vol. I, MIT Press, Ch. 18, pp. 216-271.
7. Sejnowski and Rosenberg (1987) "Parallel Networks that Learn to Pronounce English Text", Complex Systems, 1, 145-68.

Course Description

Title of Course: Ad-hoc and Wireless Networks **Course Code: 14B14CI745**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisites: Students must have knowledge of Wireless Communication fundamentals and Wired Networks

Objectives:

To understand wireless and ad hoc networks and design efficient protocols and algorithms for wireless networks, we need to understand the characteristics of wireless communications. Important building blocks of wireless and ad-hoc networks studies are various models like propagation models, energy models, interference models and mobility models. Apart from this, students should understand various existing standards for Wireless, Ad-hoc and Sensor networks.

Learning Outcomes:

This course will introduce students various aspects on Wireless as well as ad-hoc networks, and expose them to the fundamental concepts and issues in designing and analyzing wireless and ad-hoc networks. Students will study wireless transmission fundamentals as well models related to wireless networking. Learning these models should allow students understand and designing various protocols related to wireless networks. Students will be introduced with various wireless standards like IEEE 802.11 and IEEE 802.15.4. Students will be able to find issues related to Medium Access Control (MAC) and routing protocols.

Course Contents:

Unit-1 (History of Wireless Networks): Introduction, Wireless Network classification based on Network Architecture and Communication coverage area, Introduction to various wireless networks

Unit-2 (Radio wave Propagation models): Wireless Channels, Antenna gain, Aperture, Wavelength, Wireless channel models - Free-Space Propagation Model, Two-Ray Ground Model, The Log-Distance Path-Loss Model, Large-Scale and Small-Scale Variations, basic propagation mechanisms

Unit-3 (Interference and mobility models): Power Assignment and Topology Control, Wireless interference graph- Protocol-Interference Model, Fixed Power-Protocol-Interference Model, RTS/CTS Model and Physical-Interference Model, Energy consumption models for , Mobility models–Properties of mobility models, Random-Walk and Random-Direction Models, Random-Waypoint Model, Random-Trip Mobility Model, Markov Mobility Models, Smooth Random-Mobility Model, Group Mobility.

Unit-4 (Wireless Medium-Access Control Protocols): Contention based MAC, IEEE 802.11 Architecture and Protocols - Various IEEE 802.11 Protocols, Distributed Coordination Function, Problems and Solutions for the Ad Hoc Model, WiMAX.

Unit-5 (Wireless Sensor Networks): Introduction, need of WSNs, Applications, Challenges, Deployment of ad-hoc/sensor networks, MAC for WSNs, Introduction to

IEEE 802.15.4, CSMA/CA for IEEE 802.15.4, Bianchi's Markov chain analysis of throughput for the CSMA protocol.

Unit-6 (Routing protocols): Issues in designing routing protocols, Classification of routing protocols, Routing protocols, various performance metrics

Text Books

1. Wireless Ad-hoc and Sensor Network by Xiang Yang Li, Cambridge Press, 2008.

Reference Books

1. Wireless Communications: Principles and Practice by Theodore S. Rappaport, Pearson Publications, 2010.
2. Holger Karl and Andreas Willig Protocols and Architectures for Wireless Sensor Networks WILEY, ISBN: 0-470-09510-5.
3. Ad Hoc Wireless Networks: Architectures and Protocols by C. Siva Ram Murthy and B. S. Manoj, Prentice Hall, 2004.

Course Description

Title of Course: Modeling for Computer Networks **Course Code: 14B14CI753**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisites: The students are expected to have knowledge of "Computer Networks". A basic familiarity with calculus, probability and linear algebra is assumed.

Objectives: This course is designed to teach major concepts and techniques for modern network designs, to deal with network design problems such as congestion control, wireless scheduling and multi-access protocols etc. The significance of these concepts go far beyond the setting of the specific examples in which they are presented.

Learning Outcomes: Students will be able to analyze a number of important modeling techniques for networking with basic statistical methods and simulation.

Course Contents

Unit-1 (Overview of Computer Network): Review of Data Link and Transport Layer Communication, Data link layer protocols and services overview, Flow handling and flow control, Error handling

Unit-2 (Modeling): Importance of Modeling, Need Techniques Classification and limitations, Linear and Non Linear Growth Models Decay Models, Model Building, Simple Models, Complex models, Exact mathematical solution to communication networks, Mathematical Analysis

Unit-3 (Queues Time Analysis): Waiting time for Queues, Interarrival and Service Times and their variability, Obtaining the average time spent in the queue

Unit-4 (Routing Models): Internet Routing Fundamentals, Distance Vector Routing and Link State Routing, Modeling Random Routing Procedures

Unit-5 (Simulation): Introduction to Simulation, Types of Simulators, Discrete Event Simulators, Simulating Networks Topologies.

Teaching Methodology
The course will be covered through lectures supported by assignments and case studies.

Text Books

1. A. S. Tanenbaum, "Computer Networks", Prentice Hall of India.

Reference Books

1. P. Bremaud. Markov Chains: Gibbs Fields, Monte Carlo Simulation, and Queues. Springer 2008.
2. Leonard Kleinrock, Communication Nets: Stochastic Message Flow and Delay, McGraw Hill New Yok 2007.
3. J. N. Kapoor, Mathematical Modelling, New Age International Publishers, New Delhi
4. S. P. Meyn and R. L. Tweedie. Markov Chains and Stochastic Stability, Springer, 1993
5. D. Levin, Y. Peres and E. Wilmer. Markov Chains and Mixing Times. American Mathematical Society, 2008

Course Description

Title of Course: Component Based Software Engineering
Course Code: 14B14CI754
L-T Scheme: 3 **Course Credits: 3**

Course Objectives

- Describe the role of Component Based Software Engineering (CBSE) within the software life cycle.
- Apply key elements and common methods for CBSE.
- Describe, Compare, contrast and evaluate structured, Object Oriented, Data Oriented and formal approaches to component modelling.
- Do some develop CBSE.
- Conduct a review of CBSE requirements and using best practices to determine the quality of the CBS.
- Demonstrate the capacity to use a range of software tools in support of CBS.
- To understand the essentials of component-based software engineering.
- To know the main characteristics of components and component models
- To be aware of software development processes for component-based systems
- To be aware of the mutual relations between software architecture and component models

Learning Outcomes: Successful completion of this course should lead to the following learning outcomes-:

A- Knowledge and Understanding

- List the basic CBSE Standards and structures.
- List the concept of CBSE Process, and main models.
- List advanced concepts of CBSE modeling, analysis, prototyping, etc.
- List the concept of Quality of CBSE.

B- Intellectual Skills

- Analyze and compare different CBSE models.

C- Subject Specific Skills

- Implement solutions of a range of software tools in support of the CBS.
- Implement solutions using web service examples.

D-Transferable Skills

- Discuss and work in a group in order to design and implement CBS.
- Discuss and work in a group in order to study and present CBS cases.

Course Contents:

Unit-1: Introduction

Component definition, Definition of a Software Component and its elements, The Component Industry Metaphor, Component Models and Component Services, An example specification for implementing a temperature regulator Software Component. The Case for Components- The Business Case for components, COTS Myths. CBSE implementation in Java 8.

Unit-2: Planning Team Roles for CBD, Common High-Risk Mistakes, and CBSE Success Factors

Integrating Architecture, Process, and Organization. Software Engineering Practices - Practices of Software Engineering, From Subroutines to Subsystems: Component-Based Software Development, Case study of Car Navigation System.

Unit-3: The Design of Software Component Infrastructures

Software Components and the Modelling (UML), Component Infrastructures, Business Components, Components and Connectors, An OPEN process for CBD, Designing Models of Modularity and Integration. Software Architecture, Software Architecture Design Principles, Product-Line Architectures.

Unit-4: The Management of Component-Based Software Systems

Measurement and Metrics for Software Components, Implementing a Practical Reuse Program for Software Components, Selecting the Right COTS Software, Building instead of Buying, Software Component Project Management, The Trouble with Testing Components, Configuration Management and Component Libraries, The Evolution, Maintenance and Management of CBS.

Unit-5: Component Technologies

Overview of the CORBA Component Model, Overview of COM+, Overview of the EJB Component Model, Bonobo and Free Software GNOME Components, Choosing between COM+, EJB, and CCM, Event-driven component based architecture, Software Agents as Next Generation Software Components.

Teaching Methodology

Lectures would be interactive and it would cover the core concepts that are explained in the text and reference materials with adequate examples. The partly two Problem solving session will have conceptual and numerical questions that would aid in strengthening the component based software engineering.

Text Books

1. Component - Based Software Engineering, G.T. Heineman and W.T. Council, Addison-Wesley, Pearson Education.

Reference Books

1. Component Software, C.Szyperski, D.Gruntz and S.Murer, Pearson Education.
2. Software Engineering, Roger S. Pressman, 6th edition, Tata McGraw-Hill.
3. Software Engineering, Ian Sommerville, seventh edition, Pearson education, 2004.
4. Software Engineering Principles and Practice, Hans Van Vliet, 3rd edition, Wiley India edition.

Course Description

Title of Course: Network Security **Course Code: 14B14CI755**
L-T Scheme: 3 **Course Credits: 3**

Prerequisites: Computer Networks

Objectives: To Design and build a Computer Network.

Learning Outcome: The course will be covered through Lecture (power point presentation), Practical/Lab Assignment sheets and practical simulations in network security; Some Section of the course will include the study of additional literature to allow them to see how the leading edge is advanced in this area of the discipline. Full engagement in the course is a critical part of learning methods appropriate to this area of the discipline.

Course Contents:

Unit-1: Introduction to cryptography, Attacks, Services, and Mechanisms, Security Attacks, Security Services.

Unit-2: A Model for Internet work Security, Key exchange protocols, Diffie-Hellman and its variants, Man in the middle attack, PKI and certificate based key exchange, Key management, Protocol weakness in TCP/IP and other protocols.

Unit-3: Various types of attacks, Security protocol at application level: PGP, SHTTP, SSH, etc. Security protocol at socket level: SS/TSL, Security protocol at network level: IPSec.

Unit-4: Security protocol for remote connections through dial-up etc: PPTP, L2TP, Firewall and packet filtering, Proxy or application level gateways as security devices.

Unit-5: Virtual private networks, Intrusion detection system, Privacy protection and anonymity services, Electronic payment system.

Text Books

1. W. Stalling, Cryptography and Network Security: Principles and Practices.
2. B. A. Forouzan, Cryptography and Network Security.

References

1. J. M. Kizza, Computer Network Security, Springer, 2005.
2. Peterson and Davie, Computer Networks A System Approach, Elsevier.

Course Description

Title of Course: Introduction of Service Oriented Architecture
Course Code: 14B14CI756
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: The course covers the fundamental concepts and practical aspects of Service Oriented Architecture. The current software development and delivery model is service oriented in nature. The applications are inherently getting distributed and shared by multiple clients. Thus, there is a need to get an insight into service oriented architectures.

Learning Outcome: After having undergone the course, the student shall be able to understand the issues related with detailed design aspects and standards of SOA.

Course Contents:
Unit-1: SOA Fundamentals, Technologies, Benefits, Challenges and basic mechanisms associated with other computing service (Delivery models - SAS, IAS & PAS, Common Cloud deployment models and cloud characters), Security threats and mechanisms.
Unit-2: Introduction and fundamental of SOA, Benefits and Goals, SOA Manifesto, SOA and network management architecture, Service as web services, Discovery and publishing of web services, Service roles, Service models, Description of services with WSDL, Messaging with SOAP.
Unit-3: Exchange patterns of message, Service activity, Coordination, Composition, Types, Activation and registration process, Business activities, Orchestration, Composition of heterogeneous web services Choreography, Addressing, Reliable messaging, Correlation, Policies, Notification and eventing.
Unit-4: Security threats and mechanisms, Essential techniques, Patterns, Security architecture for service oriented solutions, Infrastructure, Middleware, Multitenancy concepts.

Text Books

1. Service Oriented Architecture, Concepts Technology and Design, Thomas Erl, Pearson Education, 2008

2. SOA in Practice: The Art of Distributed System Design, Nicolai M. Josuttis, O'Reilly, 2007

Course Description

Title of Course: Image Processing **Course Code: 14B14CI746**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: To introduce the students to the basic concepts and analytical methods of satellite remote sensing as applied to environmental systems (e.g., land-cover classification, vegetation monitoring, etc.). The course emphasizes the application of processing and analysis of digital satellite images, especially Landsat, SPOT, and AVHRR data, for classification of land cover, land-cover/land-use change analysis, and other geographic topics. The primary objective of the course is to provide students with the skills and knowledge to apply remote sensing to their own research problems.

Learning Outcomes: At the end of the course, the student is able to:

1. Describe the processes and hardware of image acquisition
2. Apply pre-processing operations in image enhancement
3. Compare various image segmentation and feature extraction operations
4. Identify image processing applications in various fields

Course Contents:

Unit-1 (Introduction and Digital Image Fundamentals): Digital Image Representation, Fundamental Steps in Image Processing, Elements of Digital image processing systems, Sampling and quantization, some basic relationships like neighbors, connectivity, Distance measure between pixels, Imaging Geometry.

Unit-2 (Image Transforms): Discrete Fourier Transform, Some properties of the two-dimensional Fourier transform, Fast Fourier transform, Inverse FFT.

Unit-3 (Image Enhancement): Spatial domain methods, Frequency domain methods, Enhancement by point processing, Spatial filtering, Lowpass filtering, Highpass filtering, Homomorphic filtering, Colour Image Processing.

Unit-4 (Image Restoration): Degradation model, Diagnolization of Circulant and Block-Circulant Matrices, Algebraic Approach to Restoration, Inverse filtering, Wiener filter, Constrained Least Square Restoration, Interactive Restoration, Restoration in Spatial Domain.

Unit-5 (Image Compression): Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Error free comparison, Lossy compression, Image compression standards.

Unit-6 (Image Segmentation): Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation, Motion based segmentation.

Unit-7 (Representation and Description): Representations schemes like chain coding, Polygonal Approximation, Signatures, Boundary Segments, Skeleton of region, Boundary description, Regional descriptors, Morphology.

Unit-8 (Recognition and Interpretation): Elements of Image Analysis, Pattern and Pattern Classes, Decision-Theoretic Methods, Structural Methods, Interpretation.

Text Books

1. Rafael C. Gonzalez & Richard E. Woods, “Digital Image Processing”, AWL.
2. A.K. Jain, “Fundamental of Digital Image Processing”, PHI.

References

1. Rosefield Kak, “Digital Picture Processing”.
2. W. K. Pratt, “Digital Image Processing”.
3. Paul Mather, “Computer Processing of Remotely-Sensed Imag”, Third Edition. Wiley, ISBN 0-470-84919-3, 2004.
4. Awcock, G.W & R. Thomas. 1995. Applied image processing. McGraw Hill.
5. Gonzalez, Rafel C.; Richard E. Woods. 1993. Digital image processing.

Course Description

Title of Course: Software Engineering Management **Course Code: 14B14CI747**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisite: Students must have already registered for the course, "Software Engineering"

Objectives:

1. To strengthen their ability to apply Software Engineering Principles and practices to manage individuals and teams in software projects.
2. To strengthen their skills in Requirements engineering, Configuration management, quality management, applying design patterns and software testing techniques.

Learning Outcomes: Student will be able to:

1. Manage and plan team based projects.
2. Elicit, document and validate requirements for projects.
3. Apply design pattern concepts in developing applications of varying complexities.
4. To achieve good quality software.

Course Contents:

Unit-I (Agile): Agile development, Classification of methods, Agile principals, Agile project management, SCRUM, XP, EVO and UP Method overview, Life cycle, Work product, role and services, Common mistakes and misunderstandings, Process mixture, Adoption strategy.

Unit-II (Requirement Management): Requirement management planning, Requirement Elicitation, Requirement Specification, Requirement Validation, Requirement change management.

Unit-III (Aspect Oriented Programming): Motivation and basic concepts, Join point models, Aspect's join point model, Other potential join point models, Inter-type declarations, Implementation, Comparison to other programming paradigms, Adoption risks, Implementations.

Unit-IV (Software Architecture and Design Patterns): Introduction, Architecture Designs, Architectural Patterns, Creational patterns, Structural patterns, Behavioral patterns.

Unit-V (Software Configuration Management): Revision Control, Change management, Change item, Base line and audit.

Unit-VI (Software Quality Management): Quality concepts, Quality Assurance, Quality Planning, Quality control, Software measurement And metrics, Object oriented Testing.

Unit-VII (Risk Management): Risk strategies, Risk Identification, Risk projection, Risk Mitigation, monitoring and Management.

Unit-VIII (Software Reengineering and Maintenance): Reverse engineering, Forward engineering, Restructuring, Reengineering Process Model.

References

1. Agile and Iterative Development: A Manager's Guide, Craig Larman.
2. Introduction to the Personal Software Process (SM), Watts Humphrey.
3. Introduction to the Team Software Process(SM), Watts Humphrey.
4. Software Engineering, R.S. Pressman, McGraw Hill.
5. Software Engineering Project Management, Richard Thayor, Edward Yourden.
6. Software Testing Techniques, B. Beizer.
7. Aspect-Oriented Analysis and Design: The Theme Approach.
8. Engineering and Managing Software Requirements, by Claes. Wohlin.
9. Requirements Engineering, by Elizabeth. Hull, Ken. Jackson, Jeremy. Dick.
10. User-Centered Requirements Engineering, by Alistair Sutcliffe.

Journals and Conferences

1. IEEE Transactions on Software Engineering
2. ACM Transactions on Software Engineering Methodology
3. Springer Journal of Software and Systems Modeling
4. International Journal on Software Tools for Technology Transfer, Springer

Course Description

Title of Course: Information Retrieval & Data Mining **Course Code: 14B14CI749**
L-T Scheme: 3-0 **Course Credits: 3**

Pre-requisite: Students must have already registered for the course, "Database Management System".

Course Description: This Course introduces the core concepts of data mining (DM), its techniques, implementation, and benefits. Course also identifies industry branches that most benefit from DM, such as retail, target marketing, fraud protection, health care and science, and web and e-commerce. Detailed case studies and using leading mining tools on real data are presented.

Course Objective: This subject enables students to-

- Learn data mining concepts by means of data analysis techniques to make better decisions through proper data preparation and simple tools for solving data mining problems.
- Understand core topics like classification, clustering and association rules are exhaustively dealt with.
- learn the role that software tools/applications play in DM, with emphasis on industrial case studies and practical applications;
- Have an overall understanding of the major issues and applications in data mining, including a basic grasp of the algorithm classes and best practices for building successful data mining projects.

Learning Outcomes: Upon completion of the subject, students will be able to-

- Examine the concepts of data warehousing and OLAP;
- Design various types of data models.
- Apply the concepts of DM techniques for clustering, association, and classification on real datasets.
- Select appropriate DM tools and methods to manipulate and achieve data;
- Apply DM concepts for formulating business strategies and programs to enhance business intelligence.

Course Contents:

Unit- I (Data Warehousing): Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

Unit- II (Data Preprocessing): Overview of different type of data and its format. Data collection, extraction and loading (ETL tools), data interestingness measures. Data cleaning, data integration and transformation, data reduction, discretization, concept hierarchies.

Unit-III (Data Mining): Data Mining Functionalities- Interestingness of Patterns-Classification of Data Mining Systems, Data Mining Task Primitives, Integration of a Data Mining System with a Data Warehouse.

Unit-IV (Association Rule Mining And Classification): Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction - Basic Concepts - Decision Tree.

Induction-Bayesian Classification, Rule Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction.

Unit-V (Clustering And Applications And Trends In Data Mining): Cluster Analysis - Types of Data, Categorization of Major Clustering Methods, Kmeans, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid Based Methods, Model-Based Clustering Methods, Clustering High Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis, Data Mining Application.

Unit-VI (Advance Topic in Data Mining): Mining Complex Data Types, Mining text databases, mining the Web, mining time-series and sequence datasets.

Teaching Methodology: This course relies on lectures to guide through the material, tutorial classes to provide students with class, and a sequence of written and online assignments to provide formative assessment opportunities for students to practice techniques and develop their understanding of the course.

Text Books

1. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Second Edition, Elsevier, 2007.

Reference Books

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction To Data Mining", Person Education, 2007.
2. K.P. Soman, Shyam Diwakar and V. Ajay ", Insight into Data mining Theory andPractice", Easter Economy Edition, Prentice Hall of India, 2006.
3. G. K. Gupta, "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006.
4. Daniel T. Larose, "Data Mining Methods and Models", Wile-Interscience, 2006.

Course Description

Title of Course: Introduction to Queueing Networks **Course Code: 14B14CI751**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: This course is designed for providing support of mathematical modelling to the concepts of computer networks.

Learning Outcomes: Students will be able to analyze a number of important modeling techniques in the form of "Algorithms". The students practicing as computer system analysts are relatively skilled in techniques such as workload characterization, system measurement, interpretation of performance data, and system tuning, and are at least acquainted with basic statistical methods and with simulation.

Course Contents

Unit-1: Introduction to Queueing Theory, Little's Law, Utilization Law, Kendall's Notations, Basic Relations for Birth-Death Processes,

Unit-2: Open and Closed Queueing Networks, Product Form Networks, Mean-Value Analysis,

Unit-3: Queueing Network Models of Computer Systems

Unit-4: Priority Queuing, Computer Communication Network, Multi-access Systems

Unit-5: Modelling Study of Queueing Network, Fundamental Laws, Queueing Network Models Input and Output

Unit-6: General Analytic Techniques, Bounds on performance, Models with one or multiple job classes, Flow Equivalence and Hierarchical modeling.

Teaching Methodology

Lectures would be interactive and it would cover the core concepts that are explained in the text and reference materials with adequate examples. Problem solving session will have conceptual and numerical questions that would aid in strengthening the queueing network modeling.

Text Books

1. Edward D. Lazowska, John Zahorjan, G. Scott Graham, and Kenneth C. Sevcik, "Quantitative System Performance, Computer System Analysis Using Queueing Network Models", Prentice Hall, Inc. Englewood Cliffs, New Jersey.
2. Raj Jain, "The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling", Wiley-Interscience, New York, April 1991.

Reference Books

1. F. Baccelli, P. Bremaud. Elements of Queueing Theory. Springer, 1991.
2. X. Chao, M. Miyazawa, M. Pinedo. Queueing Networks. Wiley, 1999.
3. H. Chen, D. D. Yao. Fundamental of Queueing Networks, Springer, 2001.
4. L. Kleinrock. Queueing Systems I & II, Wiley, 1975.

Course Description

Title of Course: Mobile Communications **Course Code: 14B14EC748**
L-T Scheme: 3-0 **Course Credits: 3**

Course Contents:

Introduction to mobile communication, scope and application, Mobile communication system evaluation, Basic concepts, 1G, 2G, Evolved 2G & 3G, IMT2000, Multiple access technologies: FDMA, TDMA, CDMA, Spread Aloha multiple accesses, GSM standards, GSM Architecture, Typical call flow sequences in GSM, GSM radio aspects Radio interface, Protocols Localization and Calling, Hand over, CDMA cellular standards, CDMA security aspects, Key features of CDMA, Diversity techniques, Power control, Soft handoff, System capacity & Soft capacity, Mobile data communication. Switching Techniques, Circuit switched data services, Packet switch data services, Wireless local area networks, Wireless ATM (WATM), Wireless application protocol (WAP), Bluetooth, User Scenarios in Bluetooth, Bluetooth Architecture, Link Manager Protocol, Mobile network layer, Mobile IP, Physical layer, Mac layer, Services, Networking in WLL.

Course Description

Title of Course: Information Theory and Application **Course Code: 14B14EC750**
L-T Scheme: 3-0 **Course Credits: 3**

Course Contents:

Review of probability theory, Definition and interpretation of information, Entropy, mutual information. Shannon Theorem, source encoding, Shannon-Fano Coding, Huffman Coding, coding efficiency, redundancy, source with finite memory. Communication Channel, Discrete Channel with discrete noise, Shannon's, second fundamental theorem, coding for memory-less noisy channels. Discrete channels with continuous noise, Continuous channel with continuous, noise, channel capacity theorem. Application of information theory in channel coding, detection and estimation, problem in communication.

Course Description

Title of Course: Digital T. V. **Course Code: 14B14EC751**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisite: Students must have already completed the course on Digital Signal Processing and Digital Image Processing and Data Compression related subjects.

Objectives: Digital television is about re-invention of the television industry via digital technology, just like digital computer re-invented the computing and documenting industries. This course is about Analog and Digital TV basics and relevant signal processing. The course covers the fundamental technology that lies at the heart of compression - particularly MPEG - and high definition television (HDTV), and Digital TV in general.

Learning Outcomes: At the completion of this course, students will have a basic understanding of how analog video is digitalized, carried, and tested. Students will gain an understanding of the processes involved in video encoding and decoding. They will be familiar with the color space and colorimetry, gamma processing, etc. Students will learn to identify common problems with digital video quality, their causes, and solutions. In addition, students will learn basic analog and digital video standards, principles standards are based on and terminology.

Course Contents:

Analog TV: Elements of a visual communication system, Human Visual System: color sensitivity, gamma, spatial/temporal resolution, Basic concepts, Black & White TV signals, Raster scan concept, Interlacing (vs. progressive scanning), Frame and Field, Time Domain-SYNC: vertical and horizontal; composite (Active) video signal Spectrum Standards: RS 170, CCIR.

Introduction to Colorimetry: Color TV Signals, Component: R G B; L-U-V; L-I-Q; L-Cr-Cb, Luma/Luminance, Composite, Gamma–Correction, Interleaving, Chroma/Chrominance, Color Subcarrier (fsc), Standards: NTSC (RS 170A), PAL, SECAM, Color Bar.

Introduction to Digital TV: Digitizing Video Component, Digital Composite, Digital Aspect Ratios, Features & Benefits, Signal processing, Introduction to ATSC, Need for Data Compression, Information Theory Concepts, Visual Psychophysics, Predictive Coding, Motion Estimation, Motion Compensation, Transform Coding, Subband Coding, Vector Quantization, etc., JPEG: Baseline Processing, Variable Length Coding.

MPEG-1 & 2 Standard: Functional Block Diagrams, Syntax and Semantics, Video Compression, Audio Compression, System Layer, MPEG-1-2 Audio and AAC vs. AC-3, System Layer, Program and Transport Streams, Comparison Between MPEG-1 & 2, MPEG-2 Distribution: Optical Recording of the MPEG-2 Data Stream, DTV-Broadcast/ATSC.

Satellite and Cable TV Distribution: DSP vs. Dedicated MPEG-1-2 IC's, Hardware vs. Software Solutions, Clock Recovery and Synchronization Issues, Sampling Strategies and Structures, CCIR-601 4:2:2 and 4:2:0; Interlaced/Non-interlaced VLSI Implementation,

MPEG Processing Architecture and Implementation, Architectural choices, Format Conversion, Limitations of Source Coding, Major Artifacts Associated with Video Compression, Subjective Evaluations of Digitally Compressed Video, MPEG-4-7 and Applications.

Text Books:

1. Herve Benoit, "Digital TV for Satellite Broadcasting", Elsevier Publication, 4th Edition (2005).
2. Lars Ingemar Lundstrom, "Understanding Digital Television", Elsevier Publications 1st Edition (2006).

Reference Books:

1. K.F Ibrahim, "Television and Video Technology", 4th Edition, Newnes Publications (2007).
2. M. Dhake, "Television and Video Engineering", 2nd Edition, Tata-McGraw Hill publications (2003).
3. Gulati.R.R, "Modern Television Practice", New Age International Publishers, 2nd Edition(2006).

Course Description

Title of Course: Applied Linear Algebra **Course Code: 14B14MA741**
L-T Scheme: 3-0 **Course Credits: 3**

Objective: The purpose of this course is to provide students with the advanced knowledge of linear algebra. Having successfully completed this course, a student should be able to apply concepts to problems in science and engineering.

Course Contents:

Unit 1: Vector spaces, Examples of vector spaces, Subspaces, Linear combinations of vectors, Spanning sets, Linear spans, Linear independence and dependence, Basis and dimensions of vector spaces, Sums and direct sums.

Unit 2: Linear transformations, Kernel and image of linear mappings, Rank and nullity of linear transformations, Rank nullity theorem, Singular and nonsingular linear transformations, Isomorphism, Composition of linear transformations, Linear operators, Invertible operators.

Unit 3: Matrices, Algebra of matrices, Echelon Matrices, Rank and determinant of matrices, System of linear equations, Gauss elimination method, Gauss-Jordan method to find inverse of a square matrix, Eigenvalues and eigenvectors, Characteristic polynomials, Minimal polynomials, Cayley-Hamilton theorem, Diagonalization of matrices, Block matrices.

Unit 4: Matrix representation of linear operators, Change of basis, Similar matrices, Matrices and general linear transformations

Unit 5: Canonical forms, Diagonal forms, Triangular forms, Jordan forms

Unit 6: Inner product spaces, Examples of inner product spaces, Norm of vectors, Cauchy-Schwarz inequality, Angle between vectors, Orthogonality, Orthogonal basis and orthonormal basis, Gram-Schmidt orthogonalization process

Unit 7: Bilinear forms, Symmetric bilinear forms, Quadratic forms, reduction and classification of quadratic forms, Hermitian forms.

Reference Books

1. K. Hoffman and R. Kunje, Linear Algebra, PHI Learning Private Limited, Delhi.
2. S. Lipschutz and M. Lipson, Schaum's Outline of Linear Algebra, McGraw Hill, Delhi.
3. G. Strang, Introduction to Linear Algebra, Cambridge University Press India Private Limited, Delhi.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, Delhi.

Course Description

Title of Course: Methods of Applied Mathematics **Course Code: 14B14MA742**
L-T Scheme: 3-0 **Course Credits: 3**

Course Objective:

The purpose of this course is to provide students with the advanced knowledge of Mathematical methods. Having successfully completed this course, a student should be able to apply concepts to problems in science and engineering.

Course Contents:

Unit 1: Functional and its variation, Stationary values of a functional, Euler-Lagrange equations, Some special cases, Brachistochrone problem and its history, examples, more general cases, constraints and Lagrange multipliers, variable end points

Unit 2: Sturm-Liouville problems, vibration problems, Hamilton principle, Lagrange equations.Method of weighted residuals (MWR), Collocation, Galerkin and Ritz methods.

Unit 3: Fredholm and Volterra type of integral equations, Relationship with differential equations, Green's function.

Unit 4 Fredholm equation with separable kernel, iterative methods, Singular integral equations, Abel's equation Numerical methods.

Unit 5: The finite element method, one dimensional problems, Ritz and Galerkin's methods, various type of elements and their shake functions

Unit 6: Stiffness matrix, Assembly of equations, Handling of the boundary conditions. Two dimensional problems, Triangular and rectangular elements, Stiffness matrices and assembly.

Unit 7: Some simple three dimensional elements, comparison of FEM and FDM.

Reference Books

1. Bhaskar Dasgupta , Applied Mathematical Methods , Pearson Education, 2007.
2. Cantrell, Modern Mathematical Methods for Physicists and Engineers, Cambridge University Press 2005.
3. Mathematical methods in Engineering , M Joseph M. Powers, University of Notre Dame, Indiana , Mihir Sen, University of Notre Dame, Indiana , Cambridge University Press , 2015.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, Delhi

Course Description

Title of Course: Optimization Techniques **Course Code: 14B14MA743**
L-T Scheme: 3-0 **Course Credits: 3**

Objective:

To make students aware of the basic mathematical concepts and optimization techniques this will help them in learning courses in Engineering and Technology.

Learning Outcomes:

At the end of the course the student will able to solve optimization problems of engineering and allied sciences.

Course Contents:

Formulation of Linear Programming (LP) and Non- Linear Programming Problems (NLPP) and their Graphical Solutions, Simplex Method, Sensitivity Analysis, Duality, Dual Simplex Method, Integer Linear Programming Problems, Transportation Problems, Assignment Problems, Introduction to NLPs, Kuhn-Tucker Conditions, Quadratic Programming Problem and their solution.

Methodology

The course will be covered through lectures. Apart from the discussions on the topics covered in the lectures assignments/ quizzes in the form of questions will also be given.

Books:

1. G .Hadley. (1962) Linear Programming, Massachusetts : Addison Wesley, 1962.
2. H.A. Taha. (1992) Operations Research- An Introduction, New York : Macmillan.
3. F.s. Hiller and G.J Liberman. Introduction to Operations Research, San Francisco : Holden- Day.
4. Harvey M. Wagner (1975) Principles of Operations Research with Applications to Managerial Decisions, Prentice Hall of India Pvt.Ltd.
5. S.D. Sharma. Operations Research by S. Chand & Sons.

Course Description

Title of Course: Graph Theory **Course Code: 14B14MA744**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: The main aims of this course are twofold. First, to discuss some of the major results of graph theory, and to provide an introduction to the language, methods and terminology of the subject. Second, to emphasize various approaches (algorithmic, probabilistic, etc) that have proved fruitful in modern graph theory: these modes of thinking about the subject have also proved successful in other areas of mathematics, and we hope that students will find the techniques learnt in this course to be useful in other areas of mathematics.

Learning Outcomes: The students will understand situations in which decision-makers interact. They will also be able to solve some involved engineering problems using game theoretic approach in simpler ways as the nature of computing is changing.

Course Contents:

Graphs and Trees: Incidence and degree, Isomorphism, Subgraphs and union of graphs, Connectedness, Walks, Paths and circuits, Components, Connectedness Algorithm, Shortest path Algorithms, Eulerian graph, Hamiltonian graph- necessary and sufficient conditions, Traveling salesman problem, Bipartite graphs, Properties of trees, Centre of a tree, Rooted and binary trees, Spanning trees, Fundamental circuits, Spanning trees of a weighted graph, cutsets and cut-vertices, Fundamental cutsets, connectivity, separable graphs, Network flows, Max-flow Min-cut theorem.

Planar Graphs: Combinational and geometric duals, Kuratowski's graphs, Detection of planarity, thickness and crossings, Matrix representations of graphs, Incidence matrices, Adjacency matrices and their properties, Chromatic number, Chromatic polynomial, the five color theorem, the four problem.

Directed Graphs: Binary relations, directed graphs and Connectedness, Directed trees, Arborescence, Polish method, Tournaments, Counting labeled trees, Cayley's theorem, Counting methods, Polya Theory, Applications of graphs in Computer Science.

Text Book

1. Deo, N, 'Graph Theory with Applications to Engineering and Computer Science', Prentice-Hall Inc.,1974

References

1. Harrary F, 'Graph Theory', Addison Wesley Publ. Comp., 1972.
2. Trembley J P & Manohar R P 'Discrete Mathematical Structures with Applications to Computer Science', Mc-Graw Hill, 1975.
3. J. A. Bondy & U.S.R. Murty, Graph Theory with Applications, North Holland, 1976.
4. Reinhard Diestel, Graph Theory (1st, 2nd or 3rd edition). Springer-Verlag, 1997, 2000, 2005.
5. Bela Bollobas, Modern Graph Theory, Springer-Verlag (1998).

Course Description

Title of Course: Game Theory **Course Code: 14B14MA745**

L-T Scheme: 3-0 **Course Credits: 3**

Objectives: The main objective of this course is to acquaint the students with the game theoretic reasoning for formulating problems of strategic situations that occur in a variety of engineering contexts as games.

Learning Outcomes: The students will understand situations in which decision-makers interact. They will also be able to solve some involved engineering problems using game theoretic approach in simpler ways as the nature of computing is changing.

Course Contents:

Definition and explanation of some important term in games. Characteristic of game theory. Major limitation of game theory. Co-operative and Non co-operative games, zero-sum & nonzero-sum games. Examples: Types of strategies: pure strategies and mixed strategies. Maximin and minimax principles. Fundamental theorem of game.

Saddle point (Equilibrium) point, rules of determining a saddle point. Optimal strategies and value of the game. (2x2) two -person zero-sum without saddle points, value of a game, fair and strictly determinable games. Definition of Convex set, Convexity of set of optimal strategies.

Games in coalitional form of n-Person, constant- sum games, Concept of core of a game. Concept of dominance in games, Inferior and superior strategies, dominance property. Generalized dominance property. Reduction of size of game. Graphical method for (2xn) and (mx2) games.

Algebraic method for the solution of a general Game. Iterative method for approximate solution of a game. Symmetric games. Linear Programming, Canonical and standard forms.

Simplex method, Duality in linear programming, principles of duality. Importance of duality. Solution of two-person, zero-sum game by transforming into linear programming. Prisoner's dilemma (Examples). Elementary concept of Shapely value and nucleolus in games.

Text Books

1. Game Theory, by: G. Owen, 3rd Ed., Academic Press, San Diego, 1995.
2. Game Theory, by: D. Fudenberg and J. Tirole, MIT Press, Cambridge.

References

1. Operation Research, W.L. Winston, Thomson Publishers.
2. Mathematical Methods and Theory in Games, Programming and Economics, Karlin, Dover publications, Mineola, NY.
3. Mathematical Programming Techniques, N. S. Kambo, Affiliated East-West Press (1984).
4. Game Theory: Analysis and Conflicts, R. B. Meyerson, Harvard Univ. Press, Cambridge, MA 1991.

Course Description

Title of Course: Integral Transforms **Course Code: 14B14MA746**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: In this course we have two goals:

1. To develop skills of mathematical manipulations among students.
2. To develop imagination and reasoning power of the student.

Learning Outcomes: Students will be able to

1. To learn different methods of performing integration.
2. To learn skill of mathematical modeling and its applications in engineering science.
3. To develop skill of using integral transforms in performing mathematical manipulations.

Course Contents:

Introduction to integral transforms, Generalized integral transforms, Special functions: Gamma function, Bessel function, Jacobi function, Introduction and Evaluation of Mellin Transforms, Complex variable methods and applications, Introduction and Evaluation of Hankel Transforms, Finite Hankel Transforms and their applications, Continuous Time Wavelet Transform, CWT as an operator, Inverse CWT Transform, Discrete Wavelet Transform and Orthogonal Wavelet Decomposition.

References

1. Larry C. Andrews and B.K. Shivamoggi, Integral Transformations for Engineers, Prentice –Hall of India, New Delhi.
2. Raghuveer M. Rao and Ajit S. Bopardikar, Wavelet Trasforms: Introduction to theory and applications, Pearson Education (Indian Branch), Patparganj, Delhi-110 092

Course Description

Title of Course: Nanoscience and Technology **Course Code: 14B14PH741**
L-T Scheme: 3-0 **Course Credit: 3**

Objective: The course aims to provide students understanding of materials and their properties at the atomic level, including an understanding of the intimate relationship between scale and size, nanostructure and the properties of materials.

Learning Outcome: Students will be able to understand properties of materials at nanoscale and apply modern scientific principles and techniques for their preparation, and characterization.

Course Contents :

Introduction, Synthesis of nanomaterials: different approaches of synthesis (Physical Techniques and Chemical Techniques). Characterization techniques of nanomaterials: SEM, STM, AFM, X-ray diffraction. etc. Properties of nanomaterials: Electronic, Magnetic, Optical, Chemical and Mechanical properties. Applications of Nanomaterials: Applications in memory and electronic devices, for magnetic recording, sensors, interfaces.

Text Book

1. Nano Structures & Nano Materials, Synthesis, Properties & Applications by Guozhong Cao, Imperial College Press.

References

1. Nanotechnology and Nanoelectronics, edited by W. R. Fahrner, Springer.
2. Nanotechnology basic science & emerging technologies, Kannangar, University of NSW Press.
3. Nanomaterials: Synthesis, properties and applications, edited by A S Edelstein and R C Cammarata, Institute of Physics.

Course Description

Title of Course: Nonlinear Optics and Optical Communication
Course Code: 14B14PH742
L-T Scheme: 3-0 **Course Credits:3**

Objective: Nonlinear optics play a pivotal role in developing modern communication systems. The present course aims to provide a fundamental understanding of nonlinear optics and its possible applications in fiber optics.

Course Contens:

Fundamental Concepts: Review of electromagnetic field theory, in particular electromagnetic waves in vacuum and linear media, energy of electromagnetic waves. Origin of refractive index through simple classical Lorentz Oscillator model, normal and anomalous dispersion. Propagation of light in anisotropic

media, electro-optic, acousto-optic and magneto-optic effects.

Elementary Nonlinear Optics: Extension of Lorentz model in the nonlinear domain, description of nonlinear optical interactions, nonlinear susceptibility of a Classical Anharmonic Oscillator. Second harmonic generation, sum and difference frequency generation, properties of nonlinear susceptibility, Self-focussing phenomenon etc.

Fiber Optics: Geometrical optics description of light propagation through a fiber, numerical aperture its physical significance. Propagation of electromagnetic waves in medium with variable refractive index. Explicit analytical treatment of parallel plate wave guide, TEM, TE and TM modes of a fiber. Material dispersion and attenuation of pulses, pulse broadening. Single and multimode fibers, fiber bandwidth and

dispersion management, Erbium-doped fiber amplifier. Isolators, connectors and splices. Characterization techniques including Optical time-domain reflectometer (OTDR).

Some Contemporary Developments in the Field: Optical solitons in nonlinear optical fbers, cross-phase modulation (XPM) self-phase modulation (SPM), group velocity dispersion (GVD), four wave mixing (FWM) etc. A brief introduction to materials with negative index of refraction.

Text Books & References:

1. An Introduction to Fiber Optics, A.K. Ghatak, K. Thyagarajan, Cambridge University Press 1998
2. Nonlinear Optics, R.W. Boyd, Academic Press
3. Optical Fiber Communications: Principles and Practice, J.M. Senior, Prentice Hall Publication
4. Optical Fiber Communication, G. Keiser, McGraw Hill Publications
5. Fundamentals of Photonics, B.E.A. Saleh and M.C. Teich, John Wiley & Sons Inc.

Course Description

Title of Course: Characterization Techniques **Course Code: 14B14PH743**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: The study of techniques of structural determination is the most essential part of the structural characterization. Spectroscopic techniques are used for atomic and molecular structures of inorganic and organic compounds. The objective of this course is to familiarize the student with the basic principles and application of the most commonly used spectroscopic techniques such as Infrared, Raman, Nuclear Magnetic Resonance, Atomic force microscopy, electron microscopy and X-ray crystallography etc.

Learning Outcomes: At the end of the course, students will have a basic understanding of commonly used spectroscopic techniques and their applications. This knowledge will be extremely useful for comprehensive study of various types of compounds

Course Contents:

Introduction: Quantization of energy, Regions of the electromagnetic spectrum, Representation of spectra, Basic elements of practical spectroscopy, The width and intensity of spectral lines.

Infrared & Raman Spectroscopy: Vibration of diatomic molecules, Simple Harmonic Oscillator, Anharmonic oscillator, Vibration rotation spectra of diatomic molecules, Vibration of polyatomic molecules, Analysis of Infrared techniques. Raman effect, Molecular polarisability, Rotational and vibrational Raman Spectra, Structure determination from Raman and Infrared spectroscopy.

Nano-Lithography: Lithography, Serial and parallel mode resist exposure, lithographic patterns, photo-lithography-coating, exposing, developing, etching, stripping, photolithography approaches- X-ray lithography, electron beam lithography.

X-ray crystallography: Bonding in solids, Types of crystals, Miller Indices, Reciprocal lattice, X-ray diffraction, structural analysis with theoretical program such as retvield and applications.

Differential Scattering Calorimity: DTA, TGA, DSC analysis of metal, semiconductor, insulator, polymer, alloys, and ceramic compounds.

Atomic Force Microscopy: contact, non-contact and tapping mode of force measurement, surface roughness, atomic force measurement, particle size analysis.

Electron Microscopy: Transmission Electron Microscope (TEM), Scanning Electron Microscope (SEM).

Spin Resonance Spectroscopy: Interaction between spin and magnetic field, Nuclear Magnetic Resonance (NMR). Chemical shift, Analysis by NMR technique, NMR applications. Electron spin resonance spectroscopy (ESR) and applications.

Test Books

1. Fundamentals of molecular Spectroscopy, C. N. Banwell, Tata Mc-Graw- Hill Publishing company.
2. Elements of X –ray differection, B. D. Culity, S. R. Stock, Prentics Hall Publication.

Reference Books

1. Instrumental Methods of analysis Willard, Merrit, Dean, Settle, CBS Publisher.
2. Handbook of Analytical Mathods, R. S. Khandpur, Mc graw-Hill Publication.
3. Electron Microscopy and analysis, P.J. Goodhew, J. Humphreys, R. Beanland, Taylor & Fransis.

Course Description

Title of Course: Nonlinear Dynamic Applications **Course Code: 14B14PH744**
L-T Scheme: 3-0 **Course Credits: 3**

Course Objectives: The general intent of the course, Nonlinear Dynamics: Applications to interdisciplinary Problem Solving, would be to introduce the subject of nonlinear dynamics to undergraduate engineering students. The specific objective of the course would be to establish the necessary theoretical and mathematical foundations with an appropriate degree of rigour, and then to focus, with the help of the known mathematical tools, on developing practical problem-solving skills in a wide variety of domains (many of them of engineering, socio-economic, industrial, biological and environmental relevance).

Learning Outcomes: On its successful completion, the course should inspire sufficient confidence among engineering undergraduates for them to handle, with a relatively modest set of analytical skills, many common practical problems within their professional range.

Course Contents:

First-order systems: First-order ordinary differential equations, flows on the line, autonomous systems, geometrical conceptions, fixed points and their stability, linear stability analysis, existence and uniqueness, potential formulation in an autonomous equation, the logistic equation (of an arbitrary degree of nonlinearity), power laws and exponential growth with saturation effects, bifurcations, flows on the circle, the uniform oscillator, the nonuniform oscillator and the overdamped oscillator.

Two-dimensional systems: Second-order ordinary differential equations, plane autonomous systems, the phase portrait and phase trajectories, coupled first-order autonomous dynamical systems, equilibrium points, linearised approximation near equilibrium points, the general solution of linearised autonomous dynamical systems and classification scheme for equilibrium points, Hamiltonian systems, closed paths and limit cycles, homoclinic and heteroclinic trajectories, Poincare-Bendixson theorem, Lienard systems, further concepts in bifurcation.

Chaos: Lorenz equations, one-dimensional maps, intermittency, Liapunov exponent, fractals, strange attractors. Practical problem-solving exercises: Nonlinearity leaves its imprint manifestly when the collective character of a system as a whole is qualitatively different from the sum of its individual components (a usual example of which is that one's pleasure is not necessarily doubled, when one listens to two favourite songs simultaneously).

Realistic physical systems are almost always nonlinear in character, and in many cases their nature is not very easy to decipher. Practical problems involving nonlinearity embrace a vastly diverse range comprising mechanically oscillating systems (such as a

pendulum), lasers, biological cycles, electrical circuits, growth and decline in the population of species (the predator-prey model), spread of epidemics, spread of technological innovations astrophysical and laboratory fluid flows, cosmology, chemical oscillators, complex networks, economic growth and stagnation of industrial organisations, and even individual and collective human emotions like love and war. Examples like these would be studied as a part of the course, and related exercises would be worked on.

Numerical data pertaining to some illustrative problems would be analysed, and the universal character (e.g. a power law or exponential behaviour) of the given problem would be identified. Some of these exercises would involve numerical techniques like the Runge-Kutta algorithm (preferably coded in Fortran in a Linux environment), and model fitting of numerical data with the help of graph plotting software (e.g. Gnuplot).

Text Book

1. Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry and Engineering, Steven H. Strogatz, Levant Books.

Reference Books

1. Differential Equations and Their Applications: An Introduction to Applied Mathematics, Martin Braun, Springer-Verlag.
2. Nonlinear Ordinary Di_erential Equations: An Introduction to Dynamical Systems, D. W. Jordan & P. Smith, Oxford University Press.

Course Description

Title of Course: Simulation of Semiconductor Devices **Course Code: 14B14PH745**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisite: This course has been designed to demonstrate the fundamentals of semiconductor device simulation. The prerequisites for this course are differential equation (first order and second order, Laplacian equation, Piosson's equation), programming in C or MATLAB, basic semiconductor theory, band theory for semiconductors.

Course Objective: The objective of this course is to develop aptitude for modeling and simulation of electronic devices. The level of expectation is that student should be able to simulate the performance of device using MATLAB environment. It offers the rigorous mathematical approach for understanding the semiconductor devices modeling and their behavior. In the first quarter of this course, Semiconductor modeling and fundamentals of semiconductor will be revisited and in the later part, all mathematical approach for modeling will be discusses.

Course Contents:

1. Goal of modeling and history of device modeling
2. Fundamental Properties
    a. Poisson's equation
    b. Continuity equation
    c. Carrier transport
    d. Basic semiconductor equation
    e. Physical parameters modeling
    f. Analytical investigation about the basic semiconductor equations
3. Discretization of the Basic semiconductor Equation include finite difference, finite elements approaches
4. The solution of the system of nonlinear algebraic equation
5. Newton's Methods and extension
6. Iterative methods

Text Book

1. Siegfried Selberherr, Analysis and Simulation of Semiconductor Devices.

Reference Books

1. J.S. Yuan, Juin Jei Liou, Semiconductor Device Physics and Simulation.
2. Robert W. Dutton, Process Modeling of Integrated Circuit Device Technology.

4 year BTech Curricula for Computer Science and Engineering							
BTech VIII semester (B8)							
S. No.	**Subject Code**	**Subject**	**Core/ Elective**	**L**	**T**	**P**	**Credits**
1		HSS Elective	Elective	3	0	0	3
	14B14HS841	Knowledge Management					
	14B14HS843	Supply Chain Management					
	14B14HS844	Management of Technology					
	14B14HS845	Strategic Management					
2	14B19CI891	Project Part II	Core				8
3		DE-6	Elective	3	0	0	3
4		DE-7	Elective	3	0	0	3
5		DE-8	Elective	3	0	0	3
6		DE-9	Elective	3	0	0	3
		Total		**15**	**0**	**0**	**23**
List of Electives for VIII Sem.			**Core/ Elective**	**L**	**T**	**P**	**Credits**
DE-6							
	14B14CI841	Introduction to Grid Computing	Elective	3	0	0	3
	14B14CI842	Parallel Computing	Elective	3	0	0	3
	14B14CI843	Data Mining Tools and Applications	Elective	3	0	0	3
	14B14CI844	Distributed Systems	Elective	3	0	0	3
	16B14CI841	Data Science and Big Data Analytics	Elective	3	0	0	3
DE-7							
	14B14CI845	Multimedia Security	Elective	3	0	0	3
	14B14CI846	Logic and Function Programming	Elective	3	0	0	3
	14B14CI847	Soft Computing	Elective	3	0	0	3
	14B14CI848	Mobile Computing	Elective	3	0	0	3
	14B14EC835	ATM Networks	Elective	3	0	0	3

DE-8							
	14B14CI849	Introduction to Machine Learning	Elective	3	0	0	3
	14B14CI850	Algorithms Analysis and Design	Elective	3	0	0	3
	14B14CI851	Introduction to Natural Language Processing	Elective	3	0	0	3
	14B14CI853	Neural Network	Elective	3	0	0	3
DE-9							
	14B14CI854	Client Server Computing	Elective	3	0	0	3
	14B14CI855	Storage Area Networks	Elective	3	0	0	3
	14B14EC843	Data Compression	Elective	3	0	0	3
	14B14MA841	Numerical Techniques	Elective	3	0	0	3
	14B14MA842	Matrix Computation	Elective	3	0	0	3
	14B14MA843	Optimization Methods in Engineering	Elective	3	0	0	3
	14B14MA844	Mathematical Modeling and Computer Simulation	Elective	3	0	0	3
	14B14PH841	Quantum Computing	Elective	3	0	0	3

Course Description

Title of Course: Knowledge Management **Course Code: 14B14HS841**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives

1. To strengthen the understanding of different methods for work with knowledge management.
2. To understand the theoretical foundation for knowledge and to build capabilities to manage knowledge within and across organizational boundaries.

Learning Outcome: Student will be able to-

1. Define the nature and topology of knowledge and knowledge management within a business context
2. Identify technologies that are most useful for capturing/acquiring, organizing, distributing, and sharing knowledge within an enterprise
3. Explain how to formulate a knowledge management strategy, identify major requirements and issues for designing enterprise knowledge architecture and implementing knowledge management projects

Course Contents:

Unit-1: Working Smarter, Not Harder: What is KM? Why KM? KM myths, KM Life cycle, Implications for KM.

Practice-Based perspectives on Knowledge: Definitions, Cognitions and KM, Data, Information and Knowledge, Types of Knowledge, Expert Knowledge, Human thinking and Learning, Innovation Dynamics and knowledge processes.

Unit-2: KM System Life Cycle (KMSLC): Challenges in building KM Systems, Conventional V/S KM System Lifecycle, KMSLC, system Justification, role of rapid prototyping, selecting an expert, Role of K developer.

Knowledge Creation and Capture: K- Creation, Nonaka's Model of Knowledge Creation and Transformation, K-Architecture, The people Core, identifying K- centers, and the technical core.

Unit-3: Capturing Tacit Knowledge: What is K capture?, Evaluating the expert, Developing a Relationship with expert, fuzzy reasoning and the quality of Knowledge, the Interview as a tool, guide to Successful Interview.

Other Knowledge Capture Techniques: On-site observation, Brainstorming, Protocol Analysis, Consensus Decision Making, the repertory grid, Nominal-Group Technique, The Delphi Method, concept Mapping, black boarding.

Unit-4: Information and Communication Technologies and Knowledge Management: Linking KM and ICTs, Epistemological assumptions and practice based perspectives on ICTs.

Power, politics, conflict and knowledge processes: Power as a resource and the critical discourse on KM, two perspectives on power /knowledge relationship.

Unit-5: Communities of Practice: CoP and Organizational dynamics, Study of intra-community knowledge processes, Emergence of CoPs, inward looking communities, Business Online communities. Cross community, Boundary spanning knowledge processes, Facilitating/managing knowledge between communities, using communities for relationship management and marketing.

Unit-6: Knowledge Discovery from Databases (Concepts): Overview of Nearest Neighbor approaches, Market Basket Analysis and Association rules, Cluster analysis. Facilitating KM via Culture management: Organizational Culture and KM, Strategic roles of business functions.

Unit-7: Managing Knowledge Workers: What is a K worker?, Business Roles in the Learning Organizations, Work adjustment and the Knowledge Worker, Technology and the Knowledge worker, Role of the CKO, Managing Considerations, Managing Knowledge Projects.

Text Books

1. E. M. Awad and H. M. Ghaziri, Knowledge Management , 2nd ed., Pearson Education, 2004.

References

1. Hislop, D., Knowldege Management in Organisations, 2nd Ed, Oxford, 2009.
2. R. Maier, Knowledge Management Systems. Information and Communication Technologies for Knowledge Management. 2nd ed., Springer, Berlin et al., 2004.
3. A. Tiwana, The Knowledge Management Tool Kit, Prentice Hall, 2000.

Course Description

Title of Course: Supply Chain Management **Course Code: 14B14HS843**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: This course covers basic principles of supply chain management and provides techniques used to analyze various aspects of logistics systems. Key concepts such as inventory management, communication, warehousing, distribution, and facility location are examined as an integral part of modern business. The course addresses insights, concepts, practical tools, and decision support systems that are important for the effective management of the supply chain.

Learning Outcome: After completion of the course students will be able to understand-

1. The primary differences between logistics and supply chain management.
2. The individual processes of supply chain management and their interrelationships within individual companies and across the supply chain .
3. The management components of supply chain management .
4. The tools and techniques useful in implementing supply chain management .
5. The professional opportunities in supply chain management.

Course Contents

Unit-1: Introduction to Supply Chain Management
Introduction: Basic Concept & Philosophy of Supply Chain Management; Essential features, Various flows (cash, value and information), Key Issues in SCM, benefits and case examples.

Unit-2: Logistics, Purchase and Vendor Management
Logistics as part of SCM, Logistics costs, different models, logistics sub-system,inbound and outbound logistics, bullwhip effect in logistics, Distribution and warehousing management, Purchasing & Vendor management: Centralized and decentralized purchasing, functions of purchase, department and purchase policies. Use of mathematical model for vendor rating / evaluation, single vendor concept, management of stores, accounting for materials.

Unit-3: Inventory Management
Concept, various costs associated with inventory, various EOQ models, buffer stock (trade off between stock out/working capital cost), lead time reduction, re-order point/re-order level fixation, exercises –numerical problem solving, ABC, SDE/ VED Analysis, Just-In-Time & Kanban System of Inventory management.

Unit-4: Recent Issues in SCM
Role of Computer/IT in Supply Chain Management, CRM Vs SCM, Benchmarking concept, Features and Implementation, Outsourcing-basic concept, Value Addition in SCM-concept of demand chain management.

Text Books

1. Logistics and Supply Chain Management by G. Raghuram, Macmillan.
2. Material Management by Dr. Gopal Krishnan, Pearson Education.
3. Supply Chain Management by B.S. Sahay, Macmillan.

Course Description

Title of Course: Management of Technology **Course Code: 14B14HS844**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: In the Management of Technology programme the students learn to explore and understand technology as a corporate resource - a resource that allows a firm to keep many different balls in the air. It shows how firms can use technology to design and develop products and services that maximize customer satisfaction on the one hand, while maximizing corporate productivity, profitability and competitiveness on the other.

Learning Outcome: The programme addresses challenging questions most companies face such as:

- What technologies do we need and when?
- Do we procure the technology we need with our own research capabilities, in collaboration with outside parties, or by acquiring it or licensing it from others?
- How can we use the abundant technological opportunities to affect our mission, objectives and strategies?

Students that have completed the programme are well-versed to analyse technologies and their commercial impact and implement these in the organizational context of the firm. More specific, this involves that engineers investigate and understand, both internal to their own organisation and external in relation with business partners, what the current and future technological, economic and social environments require technological firms to do. They will be able to analyse and anticipate wider societal trends in which new technological production takes shape and in which market the resulting products and services are to be sold.

Course Contents:

Unit-1: Introduction to Technology Management

Definition, Concept of creativity, Components, Features, Classification of Technology, Concept and Nature of Technology Management, Drivers of MOT, Significance and Scope of MOT, Role of Chief Technology Officer, Responding to Technology challenges.

Unit-2: The Role of Technology in the Creation of Wealth

The creation of wealth, Long-wave cycle, Evolution of production technology, Critical Factors in Managing Technology: The creativity factor, Types of innovation, Technology, price relationship, Managing change.

Unit-3: Management of Technology

The New Paradigms Essential issues in technology management, Project planning and management, Management paradigm and the technology factor

Unit-4: Technology Life Cycles

S-curve of technological progress, Multiple generation technologies ,Diffusion of technology

Unit-5: The Process of Technological Innovation

Innovation and creative transformation in the knowledge age: critical trajectories, Case-Xerox, A model for technological innovation in biomedical devices.

Unit-6: Strategic planning

Competitiveness, Business Strategy and Technology Strategy, Technology Planning. The Acquisition and Exploitation of Technology: Acquisition of technology. Exploitation of technology, Stages of technology development, Technology Transfer

Unit-7: Technology Diffusion

Concept of Diffusion, Integrated Diffusion Strategy, Influencing factors, Innovation adoption, Diffusion strategies, Community effects and network externalities, Distribution of Adopters, Crossing the Chasm, Market dynamics.

Technology Absorption and Deployment, Technology Absorption, Influencing factors, Deployment strategies, Corporate Venturing, Benefits and Drawbacks of Corporate Venturing, Spin-off Companies.

Text Book

1. Management of Technology by Tarek Khalil.

Reference Books

1. Rastogi P.N: “Management of Technology and Innovation”, Sage Publications,
2. New Delhi, 2009.
3. Scott Shane: “Technology Strategy for Managers and Entrepreneurs”, Pearson
4. Education, New Delhi, 2009.
5. CSG Krishnamacharyulu, Lalitha Ramakrishnan, “Management of Technology”,Himalaya Publishing House Private Limited, New Delhi, 2008.
6. White and Bruton: “The Management of Technology and Innovation”, Cengage Learning India, New Delhi, 2009.
7. Tarek Khalil, “Management of Technology—The Key to Competitiveness and
8. Wealth Creation”,McGraw Hill, Boston, 2000.
9. P.N.Rastogi, “Managing Creativity”, Macmillan India Ltd, 2003.
10. William L Miller and Longdon, Morris, “Fourth Generation R & D”, John Wiley & Sons Inc.
11. Pradip N Khandwalla: “Lifelong Creativity—An Unending Fest”, TMH, 2004.
12. Pradip N Khandwalla: “Corporate Creativity”, TMH, 2003.

Course Description

Title of Course: Strategic Management **Course Code: 14B14HS845**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: This course introduces the key concepts, tools, and principles of strategy formulation and competitive analysis. It is concerned with managerial decisions and actions that affect the performance and survival of business enterprises. The course is focused on the information, analyses, organizational processes, and skills and business judgment managers must use to devise strategies, position their businesses, define firm boundaries and maximize long-term profits in the face of uncertainty and competition. Strategic Management is an integrative and interdisciplinary course. It assumes a broad view of the environment that includes buyers, suppliers, competitors, technology, the economy, capital markets, government, and global forces and views the external environment as dynamic and characterized by uncertainty. In studying strategy, the course draws together and builds on all the ideas, concepts, and theories from functional courses such as Accounting, Economics, Finance, Marketing, Organizational Behavior, and Statistics.

Learning Outcome: By the end of semester, students will be able to-

1. Analyze the main structural features of an industry and develop strategies that position the firm most favorably in relation to competition and influence industry structure to enhance industry attractiveness.
2. Appraise the resources and capabilities of the firm in terms of their ability to confer sustainable competitive advantage and formulate strategies that leverage a firm's core competencies.
3. Demonstrate understanding of the concept of competitive advantage and its sources and the ability to recognize it in real-world scenarios.
4. Formulate strategies for exploiting international business opportunities including foreign entry strategies and international location of production.
5. Demonstrate the ability to think critically in relation to a particular problem, situation or strategic decision through real-world scenarios.
6. Recognize strategic decisions that present ethical challenges and make appropriate recommendations for ethical decision-making.

Course Contents:

Unit -1 : Introduction & Strategic Management Concepts

- Introduction-Strategic Management, Business Policy, Corporate Strategy, Basic Concept of Strategic Management, Mission, Vision, Objectives.
- Basic Model of Strategic Management.
- Strategic Decision Making.
- Impact of globalization, Impact of Internet and E-Commerce.
- Role of Strategic Management in Marketing, Finance, HR and Global Competitiveness.

Unit-2 : Environmental Scanning and Industry Analysis

- Environmental Scanning, Industry Analysis, Competitive Intelligence ETOP Study, OCP, SAP Scanning,

- Corporate Analysis, Resource based approach,
- Value-Chain Approach,
- Scanning Functional Resources,
- Strategic Budget and Audit

Unit 3 : Strategy Formulation

- SWOT Analysis, TOWS Matrix,
- Various Corporate Strategies: Growth/ Expansion, Diversification, Stability, Retrenchment & Combination Strategy.
- Process of Strategic Planning,
- Stages of corporate development, Corporate Restructuring, Mergers & Acquisitions, Strategic Alliances, Portfolio Analysis, Corporate Parenting, Functional Strategy,
- BCG Model, GE 9 Cell, Porters Model: 5 Force and Porters Diamond Model, Strategic Choice.

Unit 4 : Organizing Strategy Implementation

- Strategy Implementation through structure, through Human Resource Management: through values and ethics.
- Mc Kinsey's 7S Model,
- Organization Life Cycle,
- Management and Control,
- Activity based Costing,
- Strategic Information System

Teaching Methodology

The course is a mix of classroom teaching (power point slides) which includes case studies, quiz, role plays and group presentations based on project.

Text Books

1. Strategic Management by Saroj Datta
2. Strategic Management: The Indian Context by Srinivasan R
3. Strategic Management by Azhar Khazmi

Course Description

Title of Course: Project-II **Course Code: 14B19CI891**
L-T-P Scheme: 0-0-16 **Course Credits: 8**

Objectives: To implement and test the design of a computer software/tool.

Learning Outcome: Students will be able to develop own softwares or tools and also be able to test the functionality.

Course Contents:

Module-1: Design from the conceptual level block schematic, a detail architectural layout, indicate every subsystem and within them identify every small entity.

Module-2: Draw functional block schematics, data flow diagrams for every small entity, Write the algorithms, the pseudo code for every function calls, the subroutines, the recursions.

Module-3: Convert all above designs (at the entity, subsystems, system levels) into programs.

Module-4: Execute or Run the programs step by step for each module, subsystem or any other entity considered necessary for the purpose of debugging and performance evaluation and design validation. Finally integrate all subsystems so as to realize the over system.

Module-5: Perform all system level test, evaluate the results and compare with the project scope/objects and the requirements.

Module-6: Project Completion Report with complete documentation.

Text Books

1. As per requirement of project.

Reference Books

2. As per requirement of project.

Course Description

Title of Course: Introduction to Grid Computing **Course Code: 14B14CI841**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: The objective of this course is to apply distributed computing techniques like cluster computing and grid computing developed over the last few years, to help scientific community's projects like e-Science and remote invocation, distributed naming, sharing computing and storage resources in a distributed environment, distributed file systems, data replication and distributed transaction mechanisms to provide the run-time infrastructure supporting today's computing needs will be covered under this course.

Learning Outcomes: With this course we will be able to convey insight into, and knowledge of, the principles and practice underlying the design of distributed systems, cluster computing, grid computing. Information will be provided in sufficient depth to allow students to evaluate existing systems or design new ones. Detailed case studies illustrate the concepts for each major topic.

Course Contents:

Unit-1: The history and evolution of Grid computing, basic concepts of Grid Computing and requirements, Data Centre's, Metacomputing.

Unit-2: Technologies and Architectures for Grid Computing, Issues in Data Grids,

Unit-3: Recent Technological trends in Large Data Grids, World Wide grid computing Activities, Organizations and Projects.

Unit-4: Web Services and SOA, Open Grid Services Architecture (OGSA), WSRF

Unit-5: Globus Toolkit, Storage Resource Broker.

Text Books

1. Tanenbaum, Andrew S. Steen, Maarten Van , "Distributed Systems Principles and Paradigms", Pearson Education.
2. Prabhu, C.S.R., "Grid and Cluster Computing", Prentice-Hall of India.

References

1. Coulouris, George, Dollimore, Jean, "Distributed Systems: Concepts and Design" Pearson Education.
2. Buchanan, William "Distributed Systems and Networks" Tata McGraw Hill.
3. Ghosh, Sukumar, "Distributed Systems: An Algorithmic Approach".
4. Foster, Ian, Kesselman, Carl, Grid-2: Blueprint for a New Computing Infrastructure. Morgan Kaufmann.
5. Joseph, Joshy, Fellenstein, Craig, Grid Computing , Pearson Education

Course Description

Title of Course: Parallel Computing **Course Code: 14B14CI842**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisites: Data Structures

Objectives: To familiarize the students with classical results of parallel computing and to provide practical insights into how algorithms are made to run efficiently on processor arrays, multiprocessors and multi-computers.

Learning Outcomes: Students will be able to

1. Apply knowledge of mathematics, science, and engineering to real world problems;
2. Design and conduct experiments, as well as to analyze and interpret data;
3. Design a system, component, or process to meet desired needs within realistic constraints;
4. Function on multi-disciplinary teams;
5. Ability to identify, formulate, and solve engineering problems;
6. Understand professional and ethical responsibility;

Course Contents:

Unit-1 (Introduction): Paradigms of parallel computing: Synchronous - vector/array, SIMD, Systolic; Asynchronous - MIMD, reduction paradigm. Need for Higher-Performance computers, Methods used to achieve Higher Performance, Classifying Architectures Hardware taxonomy: Flynn's classifications, Handler's classifications.

Unit-2 (Abstract parallel computational models): Combinational circuits, Sorting network, PRAM models, Interconnection RAMs. Parallelism approaches - data parallelism, control parallelism, Models of Parallel Computation: Processor organization, Processor arrays, Multiprocessors and Multi-computers.

Unit-3 (Performance Matrices): Laws governing performance measurements. Matrices-speedups, efficiency, utilization, communication overheads, single/multiple program performances, bench marks. Parallel Processors: Taxonomy and topology - shared memory multiprocessors, distributed memory networks. Processor organization - Static and dynamic interconnections.

Unit-4 (Parallel Programming & Designing Parallel Algorithms): Developing algorithms for Processor Arrays, Shared memory programming, distributed memory programming, object oriented programming, data parallel programming, functional and dataflow programming.

Unit-5 (Sorting on different models of SIMD, Matrix Multiplication): Matrix multiplication for different models of Processor arrays and multiprocessors. Scheduling and Parallelization: Scheduling parallel programs. Loop scheduling. Parallelization of sequential programs. Parallel programming support environments.

Text Books

1. M. J. Quinn. Parallel Computing: Theory and Practice, McGraw Hill, New York, 1994.

References

1. T. G. Lewis and H. El-Rewini. Introduction to Parallel Computing, Prentice Hall, New Jersey, 1992.
2. T. G. Lewis. Parallel Programming: A Machine-Independent Approach, IEEE Computer Society Press, Los Alamitos, 1994. Research articles.

Course Description

Title of Course: Data Mining Tools and Applications **Course Code: 14B14CI843**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: To study advanced aspects of data warehousing and data mining, encompassing the principles, research results and commercial application of the technologies.

Learning Outcomes: At the end of the programme the students will have knowledge of:

1. Data analysis methods, covering traditional methods but with greater emphasis on modern methods that locate and address common data foibles;
2. Survey design & data collection issues;
3. Multivariate methods: supervised/unsupervised classification, data reduction;
4. Univariate methods: both basic (e.g. t-tests, ANOVA, linear models) and advanced (e.g. Generalized Linear Models, Generalized Additive Models);
5. Data mining methods: tree methods with boosting and bagging; Multivariate Adaptive Regression Splines; Random Forests; Neural Nets; model diagnostics.
6. Tools for difficult data: ridge regression; basic data imputation;

Course Contents:

Unit-I: Data Mining and Knowledge Discovery, The KDD process and methodology, Data preparation for knowledge discovery, Overview of data mining and Machine Learning techniques, Review of Python and overview of Python tools for Data Analysis.

Unit-II: Supervised Techniques, Classification and Prediction using K-Nearest-Neighbor, Classifying with Probability Theory; Naïve Bayes, Building Decision Trees, Forecasting and Regression models, Evaluating predictive models.

Unit-III: Unsupervised Learning, Clustering using K-Means, Association Rule discovery, Sequential Pattern Analysis, Principal Component Analysis and Dimensionality, Reduction.

Unit-IV: Possible Applications (covered throughout the course), Collaborative Recommender Systems, Content Based personalization, Predictive User Modeling, Concept Discovery from Documents, Blogs, Social Annotations, Finding groups using social or behavioral data, Building predictive models for target marketing, Customer or user segmentation.

Unit-V: Advance Topics (if time permits), SVD and Matrix Factorization, Search and Optimization Techniques, Markov Models, Dealing with Big Data and Map Reduce.

Text Books

1. "Building the Data Warehouse", W. H. Inman, 3rd edition, John Wiley & Sons.
2. "Data Mining Techniques", Arun K. Pujari, University Press.

References

1. W.H.Inmon, C.L.Gassey, “Managing the Data Warehouse”, John Wiley & Sons.
2. Fayyad, Usama M. et. al., “Advances in knowledge discovery & Data-Mining”, MIT Press.
3. Dunham, Margaret H.,”Data Mining –Introductory and Advanced Topics.

Course Description

Title of Course: Distributed Systems **Course Code: 14B14CI844**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: Distributed systems techniques developed over the last two to three decades, such as inter-process communication and remote invocation, distributed naming, cryptographic security, distributed file systems, data replication and distributed transaction mechanisms, to provide the run-time infrastructure supporting today's networked computer applications will be covered under this course.

Learning Outcomes: With this course we will be able to convey insight into, and knowledge of, the principles and practice underlying the design of distributed systems, both Internet-based and otherwise. Information will be provided in sufficient depth to allow students to evaluate existing systems or design new ones. Detailed case studies illustrate the concepts for each major topic.

Course Contents:

Unit-1 (Introduction): Introduction to distributed systems, Definition of distributed systems, goals, hardware concepts, software concepts, the client-server model.

Unit-2 (Communication): Layered protocols, remote procedure call, remote object invocation, message-oriented communication, stream-oriented communication.

Unit-3 (Processes): Threads, clients, servers, code migration, software agents.

Unit-4 (Naming): Naming entities, location mobile entities, removing unreferenced entities.

Unit-5 (Synchronization): Clock synchronization, logical clocks, global state, election algorithms, mutual exclusion, and distributed transaction.

Text Books

1. Tanenbaum, Andrew S. Steen, Maarten Van , “Distributed Systems Principles and Paradigms”, Pearson Education.

References

1. Coulouris, George ,Dollimore, Jean , Distributed Systems: Concepts and Design” Person
2. Buchanan, William “Distributed Systems and Networks” TMGH
3. Ghosh, Sukumar, “Distributed Systems: An Algorithmic Approach”

Course Description

Title of Course: Data Science and Big Data Analytics **Course Code: 16B14CI841**
L-T Scheme: 3-0 **Course Credit: 3**

Prerequisites: Students must have already registered for the course, "Statistical method-Engineering Marhematics", "SQL- DBMS".

Objectives

1. Provide practical foundation level training that enables immediate and effective participation in big data and other analytics projects.
2. Provide grounding and tools advanced analytic methods and an introduction to big data analytics technology and tools.
3. Explain how advanced analytics can be leveraged to create competitive advantage and how the data scientist role and skills differ from those of a traditional business intelligence analyst.

Learning Outcomes: Student will be able to-

1. Apply appropriate analytic techniques and tools to analyze big data, create statistical models and identify insights leading to actionable results.
2. deploy a structured lifecycle approach to data science and big data analytics projects .
3. select visualization techniques and tools to analyze big data and create statistical models.
4. Use tools such as R and RStudio.
4. Understand the principles and purposes of data analytics, and articulate the different dimensions of the area.
5. Understand big data challenges in different domains including social media, transportation, finance and medicine

Course Contents:

- **Introduction to Data Science**
  - Preprocessing of Data: discriminate analysis, factor analysis, principal component analysis
  - Data science process : roles, stages in data science project
  - Working with data from files ,working with relational databases ,
  - Exploring data, managing data cleaning and sampling for modeling and validation – introduction to NoSQL.
  - Statistical analysis of data
- **Introduction to Big Data Analytics:**
  - Big Data overview , state of the practice of Analytics
  - The Data Scientist Role , Big Data Analytics in Industry Verticals
- **Data Analytics Lifecycle**
  - Discovery ,Data Preparation ,Model Planning
  - Model Building , Communicating Results ,Operationalizing
  - Knowledge representation

- **Using R for Initial Analysis of the Data:**
  - Reading and getting data into R , ordered and unordered factors
  - vector , file lists and data frames
  - reading data from files , probability distributions
  - statistical models in R - manipulating objects – data distribution.
- **Advanced Analytics and statistical Modeling for Big Data Theory and Methods:**
  - K Means Clustering,Association Rules,Linear Regression
  - Logistic Regression , Naïve Bayesian Classifier
  - Decision Trees , Time Series Analysis , Text Analysis
  - Graph Partitioning Algorithm
  - CURD(create,read,update,delete) Method
- **Big Data Analytics Lifecycle Lab:**
  - Case study

Teaching Methodology

The course will use the mixed technique of interactive lectures, tutorials, guided case studies, literature survey, regular assignments and project work. Teaching in this course is designed to engage the students in active and experiential learning by taking a problem solving and design-oriented approach with special emphasis on real world applications.

In the lectures the fundamental theoretical concepts will be introduced and demonstrated through examples and case studies. Discussion in lecture will be done using design problems which will be implemented in laboratory individually in JAVA and C++.

Textbooks

1. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014.
2. Johannes Ledolter , “Data Mining and Business Analytics with R”, John Wiley and Sons.

References

1. Prasad R.N. , Acharya Seema,”Fundamentals of Business Analytics”, Wiley India Pvt. Ltd., 2012.
2. Mark Gardener, “Beginning R - The Statistical Programming Language”, John Wiley & Sons, Inc., 2012.
3. Vignesh Prajapati , “Big Data Analytics with R and Hadoop”, Packt Publishing.
4. Gareth James , Daniela Witten , Trevor Hastie, Robert Tibshirani, “An Inroduction to Statistical Learning with Application in R”, Springer.
5. Luis Torgo ,“Data mining with R”, CRC Press.
6. A.K. Jain ,”Algorithm for Clustering Data”, PHI.

Course Description

Title of Course: Multimedia Security **Course Code: 14B14CI845**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisites: Students must have knowledge of Digital Image Processing & Introduction to Communication Systems.

Objectives:
Multimedia Security is designed for undergraduate students or practitioners to gain knowledge and hand-on experiences in digital media systems and security applications. This course provides an introduction to important multimedia security technologies and standards in assuring the rights owners and consumers of multimedia systems. These include encryption, key management, and watermarking and media authentication. It also introduces important topics on using multimedia information for security objectives, including video surveillance, and media sensor networks.

Learning Outcomes:
By the end of this course, students should be able to-

1. Understand the concept of watermarking
2. Understand the security concept of multimedia

Course Contents:

Unit-1 (Introduction): Overview of Multimedia Systems, Secured Multimedia, Digital Rights Management Systems, and Technical Trends.

Unit-2 (Multimedia Content Security): Multimedia Compression Technologies and Standards, Multimedia Encryption, Multimedia Authentication, Multimedia Forensics.

Unit-3 (Introduction to Digital Watermarking): Overview of Digital Watermarking, Types of Digital Watermarking, Requirements of Watermarking, Digital watermarking and cryptography, Basic principles of watermarking, Applications of digital watermarking, Evaluation parameter of Watermarking.

Unit-4 (Digital Watermarking in Various Domains): Overview, introduction to Watermarking in Various Domains, Orthogonal transforms, KL Transform, Discrete Cosine Transform based Watermarking, Discrete Wavelet Transform based Watermarking, and Fractional Fourier Transform based Watermarking, Reference Watermarking

Unit-5 (Singular Value Decomposition in Watermarking): Introduction, Eigen values and Eigenvectors, Singular Value Decomposition, Singular Vectors in watermarking, principal component in watermarking, Hybrid Watermarking, Problem with Hybrid Watermarking, Adaptive Watermarking.

Unit-6 (Voice over IP security): Internet Protocol (IP), User Datagram Protocol (UDP), Real-Time Transport Protocol (RTP), RTP Payload, Packet Analysis, Network Security Issues and Solutions.

Text Books

1. Ingemar J. Cox, Matthew L. Miller, Jeffrey A. Bloom, Jessica Fridrich, and Ton Kalker," Digital Watermarking and Steganography", Second Edition Morgan Kaufmann Publishers,2001

References

1. Techniques and Applications of Digital Watermarking and Content Protection, Michael Arnold Martin Schmucker Stephen D. Wolthusen, Artech House Boston, London.
2. C. I. Podilchuk and E. J. Delp, "Digital Watermarking: Algorithms and Applications," IEEE Signal Processing Magazine, pp.33-46, July 2001.
3. Chih-Chin Lai, Cheng-Chih Tsai, "Digital Image Watermarking Using Discrete Wavelet Transform and Singular Value Decomposition,"IEEE Transaction on Instrumentation and Measurement, vol. 59, no.11, pp. 3060-3063, 2010.
4. R. Liu, T. Tan, "An SVD-based watermarking scheme for protecting rightful ownership," IEEE Transactions on Multimedia, vol. 4, no.1, pp.121–128, 2002
5. T. H. Chen, G. Hrong, W. B. Lee, "A publically verifiable copyright-proving scheme resistant to malaises attacks, "IEEE Transactions on industrial electronics, vol.52, no.1, pp.327-334, 2005.
6. J. Cox, J. Kilian, T. Leighton, T. Shamoon, "Secure Spread Spectrum Watermarking for Multimedia," IEEE Transactions on Image Processing, vol.6, no.12, pp.1673-1687, 1997.
7. Xiao-Ping Zhang, Kan Li, "Comments on "An SVD-Based Watermarking Scheme for Protecting Rightful Ownership," IEEE Transaction on Multimedia, vol. 7,no. 2,pp593-594, 2005.
8. Wu, Y., "On the security of an SVD-based ownership watermarking", IEEE Transaction on Multimedia vol.7, no. 4, pp. 624-627, 2005.

Course Description

Title of Course: Logic and Function Programming **Course Code: 14B14CI846**
L-T Scheme: 3-0 **Course Credits: 3**

Objective: The course introduces and explores programming concepts used in functional and knowledge-based computing. It is intended to give the student a programming background which will be useful for further work in logic programming, expert systems, and artificial intelligence.

Course Contents:

Unit-I (Basic Syntax and semantics of programming languages): Language definition, semantic, language processing, variable, routines, aliasing and overloading, abstract semantic processor, run-time structure.

Unit-II (Structuring the data): Built-in types and primitive types, data aggregates and type constructors, user defined types and abstract data types, type systems, type-structure of representing languages, implementation models.

Unit-III (Structuring the computation): Expressions and statements, conditional execution and iteration routines, exceptions, pattern matching, non-determinism and back tracking, event driven computation, concurrent computations.

Unit-IV (Structuring the program): Software design method, concepts in support of modularity, languages features for the programming in the large generic units.

Unit-V (Functional programming languages): Characteristics of imperative languages, mathematical and programming functions, principals of functional programming, representative functional languages.

Unit-VI (Logic and rule based languages): Specification versus implementation, principals of logic programming, PROLOG, functional programming versus logic programming, rule based languages. Languages in context: Execution context, development context.

Textbooks

1. Robert Wilensky, Common LISPcraft, W.W.Norton & Company, 1986. ISBN 0-393-95544-3
2. W.F. Clocksin, C.S. Melish, Programming in Prolog, Springer-Verlag, 5'th edition, 2004. ISBN 0-387-00678-8
3. Carlo Ghezzi, and Mehdi Jazayeri.. Programming Languages Concepts , John Wiley & Sons.

Reference Books

1. Patrick Harrison, Common Lisp and Artificial Intelligence QA 76.73 C28 H36 1990
2. Robert Wilensky, Common LISPcraft QA 76.73 C28 W55 1986
3. W.F. Clocksin, C.S. Mellish, Programming in Prolog QA 76.73 P76 C57 1987
4. Robert Mueller, Symbolic Computing with Lisp and Prolog QA 76.73 L23 M84 1988.
5. Terrence W. Pratt and Marvin V. Zelkowitz.. Programming Languages: Design and Implementation, EARSON, Prentice Hall of India.
6. Allen Tucker and Robert Noonan.. Programming Languages: principles and Paradigms, Tata McGraw-Hill.

Course Description

Title of Course: Soft Computing **Course Code: 14B14CI847**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisite: Students must have already registered the course, "Artificial Intelligence and Applications(14B11CI711)".

Objectives: This course aims to develop students' abilities in using some contemporary approaches in solving problems in automation.

Learning Outcomes: It will enable students to-

1. Appreciate the advantages and limitations of fuzzy systems and their potential impacts and applications in intelligent control and automation;
2. Appreciate the advantages and limitations of neural networks and their potential impacts and applications in intelligent automation; and
3. Develop an understanding of generic algorithms and their potential applications.

Course Contents:

Unit-1: Basics of Soft Computing - Introduction, Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Applications. Fundamental of Neural Networks- Introduction, Model of Artificial Neuron, Architectures, Learning Methods, Taxonomy of NN Systems, Single-Layer NN System, Applications.

Unit-2: Back-propagation Networks - Background, Back-Propagation Learning, Back-Propagation Algorithm. Associative Memory - Description, Auto-associative Memory, Bi-directional Hetero-associative Memory.

Unit-3: Adaptive Resonance Theory -Recap supervised, unsupervised, backprop algorithms; Competitive Learning; Stability-Plasticity Dilemma (SPD), ART Networks, Iterative Clustering, Unsupervised ART Clustering. Fuzzy Set Theory – Introduction, Fuzzy set : Membership, Operations, Properties; Fuzzy Relations.

Unit-4: Fuzzy Systems– Introduction, Fuzzy Logic, Fuzzification, Fuzzy Inference, Fuzzy Rule Based System, Defuzzification. Genetic algorithms & Modeling-Introduction, Encoding, Operators of Genetic Algorithm, Basic Genetic Algorithm.

Unit-5: Integration of Neural Networks, Fuzzy Logic and Genetic Algorithms - GA Based Back Propagation Networks, Fuzzy Back Propagation Networks, Fuzzy Associative Memories, Simplified Fuzzy ARTMAP.

Text Book

1. "Neural Networks, Fuzzy Logic, and Genetic Algorithms" by S. Rajasekaran, G.A. Vijayalakshmi Pai, (Prentice-Hall of India Private Ltd.).

Reference Books

1. "Neuro-Fuzzy And Soft Computing" by J. S. R. Jang, C. T. Sun, E. Mizutani (Pearson Education).
2. "Soft Computing in Human-Related Science" by Horia-Nicolai Teodorescu, Abraham Kandel, Lakhmi C. Jain (CRC Press).
3. "Genetic Algorithms" by David E. Goldberg (Pearson Education).

Course Description

Title of Course: Mobile Computing **Course Code: 14B14CI848**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: The objective of mobile computing is to develop system and application level software for small, battery powered terminals equipped with the wireless network connection. There is a rapidly growing interest in this field with companies spending billions of dollars developing technology and buying spectrum in the recent PCS auctions.

Learning Outcomes: Students will be able to

- Learn the basics of networking theory.
- Learn networking concepts relevant to modern wireless systems.
- Learn emerging mobile computing ideas and best practices.
- Learn new cloud computing ideas, and how it they relate to mobile computing.
- Get hands-on knowledge practice with mobile computing and cloud services.

Course Contents:

Unit-1 (History of Wireless Networks): Introduction, Wireless Network classification based on Network Architecture and Communication coverage area, Introduction to various wireless networks, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Unit-2 (Wireless Medium-Access Control Protocols): Contention based MAC, IEEE 802.11 Architecture and Protocols - Various IEEE 802.11 Protocols, Distributed Coordination Function, Problems and Solutions for the Ad Hoc Model.

Unit-3 (Routing Protocols): Issues in designing routing protocols, Classification of routing protocols, Routing protocols, various performance metrics, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks.

Unit-4 (Mobile Transport Layer): Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

Unit-5 (Wireless Access Protocol): Architecture, protocol stack, application environment, applications. Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, file system, disconnected operations. Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment, data broadcasting, Mobile IP.

Unit-6 (Personal Area Networks): Introduction, Bluetooth, need of WSNs, Applications, Challenges, Deployment of ad-hoc/sensor networks, MAC for WSNs, Introduction to IEEE 802.15.4, CSMA/CA for IEEE 802.15.4

Text Book

1. Shambhu Upadhyaya, Kevin Kwiat, Abhijit Chaudhury, Mobile Computing, Kluwer Academic Publishers.

References

1. J. Schiller, Mobile Communications, Addison Wesley.
2. Mehrotra, GSM System Engineering.
3. M. V. D. Heijden, M. Taylor, Understanding WAP, Artech House.
4. Charles Perkins, Mobile IP, Addison Wesley.
5. Charles Perkins, Ad hoc Networks, Addison Wesley.
6. C.S.R. Prabhu, Mobile Computing, Universities Press.

Course Description

Title of Course: Introduction to Machine Learning **Course Code: 14B14CI849**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisite: Students must have knowledge of "Artificial Intelligence".

Objectives: In this course we will study the basic component of an intelligence system i.e. machine learning, their functions, mechanisms, policies and techniques used in their implementation and examples.

Learning Outcomes: The students will have-

1. Detailed knowledge of the concepts of machine learning.
2. Various application of machine learning in AI and different fields.

Course Contents:

Unit 1: Introduction: Natural vs. Machine learning, Types of Learning.

Unit 2: Inductive Classification: Concept Learning and General-to-Specific Ordering.

Unit 3: Decision Tree Learning: Properties, Top-down Induction, Entropy, Overfitting, Other Issues.

Unit 4: Artificial Neural Networks: Perceptron learning, Multilayer N/w, Backpropagation, Applications.

Unit 5: Experimental Evaluation: Inductive hypotheses, Types of Tests, Comparing learning Algorithms, Significance Testing

Unit 6: Bayesian learning: Naïve bayes, regression, Generative model and inference

Unit 7: Computational learning Theory: PAC model, Version Spaces, Complexity, Hypotheses Spaces, VC dimension

Unit 8: Instance based Learning: Distance Metrics, K-nearest neighbor and Variations.

Unit 9: Evolutionary learning: Genetic algorithms, Fuzzy models

Unit 10: Support vector machine: Separation, Classification, optimization, applications.

Unit 11: Other Learning: Reinforcement, statistical, unsupervised, temporal and explanation based learning

Unit 12: Analytical and Inductive learning: Analytical and Inductive learning

Text Book

1. Machine Learning: Tom Mitchell, McGraw Hill, 1997

References

1. Rich, Elaine Knight, Kevin, Artificial Intelligence, Tata McGraw Hill.

Course Description

Title of Course: Algorithms Analysis & Design **Course Code: 14B14CI850**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisite: The Student should have studied one undergraduate level course "Fundamental of Algorithms".

Objectives: The need for efficient algorithms arises in nearly every area of computer science. But the type of problem to be solved, the notion of what algorithms are "efficient",' and even the model of computation can vary widely from area to area. In this course in algorithms, we will survey many of the techniques that apply broadly in the design of efficient algorithms, and study their application in a wide range of application domains and computational models.

Learning Outcomes: At the end of the course,

1. The student shall be able to formulate and seek known solutions to an algorithmic problem.
2. The student will learn a set of tools for design and analysis of new algorithms for new problems

Course Contents:

Unit-1 (Fundamental Concepts): Model of computation, Features of an algorithm, asymptotic analysis, Amortized Analysis, Proof Techniques.

Unit-2 (Algorithm Design Techniques): Recursive Procedures, Iterative Procedures, Divide and Conquer, Dynamic Programming, Greedy Approach, Branch and Bound, Backtracking.

Unit-3 (Network Flow and Matching): Flows and cuts, Maximum Flow, Maximum Bipartite matching, Minimum Cost Flow.

Unit-4 (Numerical Algorithms): Flows and cuts, Maximum Flow, Maximum bipartite matching, Minimum Cost Flow.

Unit-5 (Geometric Algorithms): Convex hull, closest pair, Intersection of line segments, Polygon triangulation.

Unit-6 (NP Completeness): Polynomial time and intractability, Space and time complexity, Problem Reductions, NP-completeness of satisfiability.

Text Books

1. Aho Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms", Pearson Education, New Delhi.
2. Goodrich, Tamassia, "Algorithm Design", Willey India.
3. Cormen, Leiserson, Rivest, and Stein, "Introduction to Algorithms", MIT Press.

References

1. Basse, Gelder, "Computer Algorithms", Pearson Education, New Delhi.
2. Sartaj Sahni, Horowitz, "Fundamental of Computer Algorithms",University Press.
3. Udi Manber, "Introduction to Algorithms" Addison Wesley.

Course Description

Title of Course: Introduction to Natural Languages Processing
Course Code: 14B14CI851
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: This course provides an introduction to the theory of natural language processing (NLP). The creations of computer programs that can understand, generate, and learn natural language. We will use natural language understanding as a vehicle to introduce the three major subfields of NLP: syntax (which concerns itself with determining the structure of a sentence), semantics (which concerns itself with determining the explicit meaning of a single sentence), and pragmatics (which concerns itself with deriving the implicit meaning of a sentence when it is used in a specific discourse context). The course will introduce both knowledge-based and statistical approaches to NLP, illustrate the use of NLP techniques and tools in a variety of application areas, and provide insight into many open research problems.

Learning Outcomes: In this course, students will explore techniques for creating computer programs that analyze, generate, and understand natural human language. Upon completion of the course, students will have a broad understanding of what is involved in NLP generally and a good awareness of the issues related to syntactic, semantic, and pragmatics of language. Throughout the course, students will be exposed to state-of-the-art techniques for automatic language processing, including but not limited to automatic text understanding, machine translation, speech understanding, question answering, automatic summarization, intelligent information retrieval.

Course Contents:

Unit-1: Natural Language Processing: applications and key issues, The lexicon and morphology.

Unit-2: Phrase structure grammars and English syntax, Part of speech tagging,

Unit-3: Syntactic parsing , top-down and bottom-up parsing strategies.

Unit-4: Semantics, Word Sense Disambiguation, Semantic parsing, Subjectivity and sentiment analysis.

Unit-5: Information extraction, Automatic summarization.

Unit-6: Information retrieval and Question answering, Machine translation.

Text Books

1. Speech and Language Processing, by D. Jurafsky and R. Martin, 2nd Edition.
2. An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition (second edition), D. Jurafsky and J. Martin.

References

1. Foundations of Statistical Natural Language Processing, C. Manning and H. Schütze.
2. Perl documentation

Course Description

Title of Course: Neural Networks **Course Code: 14B14CI853**
L-T Scheme: 3-0 **Course Credits: 3**

Objective: This course will cover basic neural network architectures and learning algorithms, for applications in pattern recognition, image processing, and computer vision. Three forms of learning will be introduced (i.e., supervised, unsupervised and reinforcement learning) and applications of these will be discussed. The students will have a chance to try out several of these models on practical problems.

Course Contents:

Unit-1: Introduction, Neuron Model and Network Architectures, an Illustrative Example.

Unit-2: Perceptron Learning Rule, Background on Linear Algebra,

Unit-3: Supervised Hebbian Learning,

Unit-4: Background on performance surfaces and optimization,

Unit-5: Widrow-Hoff Learning, Backpropagation,

Unit-6: Associative Learning, Competitive Networks.

Textbook:

1. M. Hagan, H. Demuth and M. Beale, Neural Network Design, PWS Publishing Company, 1996.

References:

1. S. Haykin, Neural Networks: A Comprehensive Foundation 2nd edition, (Prentice Hall, 1999)
2. K. Mehrotra, C. Mohan, and S. Ranka, Elements of Artificial Neural Networks, MIT Press, 1997.
3. C. Looney, Pattern Recognition Using Neural Networks, Oxford University Press, 1997
4. C. Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.
5. J. Hertz, A. Krogh, R.G. Palmer, Introduction to the Theory of Neural Computation (Addison-Wesley, 1991).

Course Description

Title of Course: Client-Server Computing **Course Code: 14B14CI854**
L-T Scheme: 3-0 **Course Credits: 3**

Pre-requisite: Students must have the knowledge of "Introduction to Operating Systems" & "Computer Network".

Objectives:
Client-Server Computing examines the computing environment that satisfies the organizational needs of allocating application processing between workstation (the client) and server processors. The student will be exposed to terminology, concepts, and client/server programming techniques.

Learning Outcomes:
Student should be able to

- Define a client/server network
- Implement the current client/server standards
- Describe the basic client/server models.
- Demonstrate the concepts of a typical client operating system.
- Implement typical client software.
- Demonstrate the difference between client and server hardware technology.
- Demonstrate the uses of client/server productivity software.
- Demonstrate the relationship between client/server productivity software and client/server resource management.

Course Contents:

Unit-1 (Introduction): Client/Server Fundamentals, Driving forces behind client/server business perspective, Layered communication protocols, Enterprise computing Advantages & Disadvantages of client/server,

Unit-2 (Components of Client/Server Applications (Client)): The Role of the Client , Client Services, Request for Service , Remote Procedure Call (RPC), Message Services, Network Services, Application Services, Database Services, Types of Client, FAT, THIN, HYBRID.

Unit-3 (Components of Client/Server Applications (Server)): The Role of the Server, Server Functionality, Request Processing, File Services, Communications Services, Security Services, The Network Operating System, The Server Operating System.

Unit-4 (Components of Client/Server architecture (Connectivity)): Open systems interconnection (OSI), Inter Process Communication, Interface Technology, Wide area Network Technology, Client/Server Systems development software, Platform Migration and Reengineering of Existing Systems, Client Server System development methodology, Client Server Systems development hardware, PC level processing units, Unit Workstation, server hardware, Mirrored disk, RAID, Disk array, CDROM, WORM, Network interface cards (NIC).

Unit-5 (Applying Client/Server in Businesses): Reasons for adopting client/server technology, Benefits obtained from adopting client/server technology, a sensible approach towards client/server technology, Limitations for the client/server technology, Golden Rules of Client/Server Implementation.

Unit-6 (The Future of Client/Server Computing): Enabling Technologies, Expert Systems, Geographic Information Systems, Point-of-Service (POS), Imaging, Electronic Document Management, Multimedia, Electronic Data Interchange, Case Studies.

Text Book

1. Smith, Patrick, Steve Guengerich "Client/server computing" PHI (2002).

References

1. Orfali, Robert, "Essential Client/Server Survival Guide New York: Van Nostrand Reinhold.
2. Paul E. Renaud, "Introduction to Client/Server Systems", Wiley Computer Publishing (2nd ed.), 1996.
3. James E. Goldman, Phillip T. Rawles, and Julie R. Mariga, "Client/Server Information Systems: A Business-Oriented Approach", John Wiley & Sons, Inc.,

Course Description

Title of Course: Storage Area Networks **Course Code: 14B14CI855**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: The explosion of data created by the businesses of today is making storage a strategic investment priority for companies of all sizes. The course covers various aspects of managing storage networking in a present networked environment. It also dwells into details of Attaching Storage to Networks and managing them to support storage intensive computations.

Learning Outcomes: This course equips students with the knowledge they need to understand and explain storage networking concepts, the storage networking market and technologies, and key applications. After completing this course, students will be able to describe storage networking concepts and explain the vendors and products available for storage networking.

Course Contents:

Unit-1: Introduction to Storage Networks, Fundamentals of Storage, Fiber channels.

Unit-2: Network attached storage devices and its software requirements.

Unit-3: Storage area networks and its H/W & S/W, Storage area networking solutions.

Unit-4: Network attached storage solutions, Managing storage area networks.

Unit-5: Securing storage area networks.

Text Books:

1. Robert Spalding., The Complete Reference Storage Networks, tata McGraw Hill

Reference Books:

1. Tom Clark., Designing Storage Area Networks: A Practical Reference for Implementing Fibre Channel and IP SANs, Second Edition, Addison-Wesley Professional.
2. W. Curtis Preston., Using SANs and NAS, O'REILLY
3. Huseyin Simitci., Storage Network Performance Analysis, Wiley

Course Description

Title of Course: Data Compression **Course Code: 14B14EC843**
L-T Scheme: 3-0 **Course Credits: 3**

Prerequisite: Digital Signal Processing

Objective: The main objective of course discusses the theory and methods of data compression of signals, images, and video. The techniques covered include: Quantization, Vector Quantization, Difference Schemes, Filter Banks and Subband Coding, Wavelet Transform, JPEG 2000, and MPEG.

Course Contents:
Introduction, Math Preliminaries for Lossless Compression, Huffman Coding, Arithmetic Coding, Mathematical Preliminaries for Lossy Coding, Scalar Quantization, Vector Quantization, Math for Transforms, Subbands, and Wavelets, Transform Coding, Subband Coding, Wavelet Method

Textbook

1. Introduction to Data Compression, 3rd Edition by Khalid Sayood.

Course Description

Title of Course: Numerical Techniques **Course Code: 14B14MA841**
L-T Scheme: 3-0 **Course Credits: 3**

Objectives: In this course we have two goals:

1. To develop an analytical faculty of the students.
2. To develop skills of mathematical manipulations among students.
3. To develop imagination and reasoning power of the student.

Learning Outcomes: Students will be able to

1. To learn different methods of performing integration.
2. To learn skill of mathematical modeling and its applications in engineering science.
3. To develop skill of using integral transforms in performing mathematical manipulations.

Course Contents:

Solution of linear systems of equations - Direct and iterative methods, Eigen values and eigenvectors. Interpolation and Approximation. Numerical differentiation. Numerical integration. Solution of a single and a system of non-linear equations. Initial and boundary value problems in ODE. Numerical solutions of partial differential equations by finite difference method.

References

1. Larry C. Andrews and B.K. Shivamoggi, Integral Transformations for Engineers, Prentice-Hall of India, New Delhi.
2. Raghuveer M. Rao and Ajit S. Bopardikar, Wavelet Trasforms: Introduction to theory and applications, Pearson Education (Indian Branch), Patparganj, Delhi-110 092.

Course Description

Title of Course: Optimization Methods for Engineering **Course Code: 14B14MA843**
L-T Scheme: 3-0 **Course Credits: 3**

Objective:

To make students aware of the basic mathematical concepts and optimization techniques which will help them in learning courses in Engineering and Technology.

Learning Outcomes:

At the end of the course, the student will able to solve optimization problems of engineering and allied sciences.

Course Contents:

Unit-I: Introduction and concept of optimization, Optimization problems in chemical engineering, Heat exchanger, reactor, fluid flow, separation chain, inventory Control, Analytical methods for unconstrained single variable optimization.

Unit-II: Various Numerical methods applicable to optimization of chemical processes.

Unit-III: Graphical solution, Simplex method, Duality and duel simplex,

Unit-IV: Integer programming (Branch and bound only), brief review of Transportation problem, Assignment problem.

Unit-V: Single item static model, Static model with price breaks, Static model with shortage permitted.

Unit-VI: Cost model, Aspiration level model.

Unit-VII: Games of pure strategy, Games of mixed strategy: Solution of 2×2 Games by mixed strategy

Methodology

The course will be covered through lectures supported by tutorials. Apart from the discussions on the topics covered in the lectures assignments/quizzes in the form of questions will also be given.

Text Books:

1. Edgar, T. E. & D. M. Himmelblau, “Optimization of chemical process”
2. Rao, S.S, “Engineering optimization”

3. Hamdy, A. & Taba, “Operation Research”
4. Bronsan Richard, “Theory & problems of operation research”, Schaums outline Series.
5. Problems in optimization research by P.K. Gupta & D.S. Hira

Reference Books:

1. P.K. Gupta and Manmohan, “Problems in operation research”.
2. Hadley, G.,”Linear Programming, Massachussets: Addison-Wesley, 1962.
3. Hiller, F.S. and G. J. Lieberman., “Introduction to operations research, San Francisco: Holden-Day.
4. V.K. Kapoor , “Problems and solutions in operation research”.
5. J.K. Sharma, “Operation research- Theory and applications”.
6. Principals of operation research by Harvey M. wagner
7. Roberts, Dynamic Programming.

Course Description

Title of Course: Mathematical Modelling and Computer Simulation
Course Code: 14B14MA844
L-T Scheme: 3-0 **Course Credits: 3**

Objective

In this course we have studied the Mathematical modeling which consists of applying your mathematical skills to obtain useful answers to real problems. Models are used in a very wide range of applications, some of which do not appear initially to be mathematical in nature. Learning to apply mathematical skills is very different from learning mathematics itself.

Learning Outcomes

Mathematical modeling and simulation are widely used in planning, security and communication, flow of water , electricity, gas and oil.. Students learn many mathematical modeling and simulation techniques, which are very helpful in analyzing and solving real life problems.

Course Contents:

Unit-I: Mathematical Modeling: Need, Techniques, Classifications and Simple Illustrations. Mathematical Modeling through ordinary differential equations of first order

Unit-II: Mathematical Modeling through differential equations, Linear and nonlinear Growth and decay models

Unit-III: Compartments Models, Mathematical Modeling in dynamics through ordinary differential equations of first order

Unit-IV: Mathematical Modeling through systems of ordinary differential equations of the first order

Unit-V: Mathematical Modeling through difference equations

Unit-VI: Computer Simulation: introduction, simulation process, Simulation of queuing models, inventory system

Unit-VII: PERT and CPM networks, application and validation of simulation modeling

Methodology:

The course will be covered through lectures supported by assignments'. Apart from the discussions on the topics covered in the lectures assignments and quizzes in the form of questions will also be given.

Text Books

1. Pratiksha Saxena "Modeling and Simulation", Narosa Publication.
2. Geoffrey Gordon, "System simulation".

Reference Books

1. Dilwyn Edwards and Mike Hamson–Guide to Mathematical Modelling, Palgrace, 2007
2. Jerry Banks, John S. Carson II, Barry L. Nelson and David M. Nicol, "Discrete Event System simulation".
3. W. David, Randall P. Sadowski and Deborah A. Sadowski, "Simulation with ARENA" .
4. Law. A.M. and W.D. Kelton, "Simulation Modeling and Analysis".

Course Description

Title of Course: Quantum Computing **Course Code: 14B14PH841**
L-T Scheme: 3-0 **Course Credits: 3**

Objective: Information is something that can be encoded in the state of a physical system. Quantum information technology is the art of managing information in a way in which the information is stored in the quantum state of a physical system. Quantum information has properties that contrast sharply with the familiar properties of "classical information. A quantum computer is a new type of machine that exploits the quantum properties of information and performs certain types of calculations far more efficiently than any foreseeable classical computer.

At the beginning of this course, we will briefly review classical and quantum information theories. Then we will study the properties of quantum information that distinguish it from classical information. We will also see how these properties can be exploited in the design of quantum algorithm that solves certain problems faster than classical algorithm.

Learning Outcome: The course will provide the basic understanding of quantum computation and will therefore build up a suitable foundation for a complete course on quantum computation.

Course Contents:

Unit-1: Introduction

Definitions of classical information, Quantum information and their differences.

Unit-2: Thermodynamics and statistical mechanics

Introduction to thermodynamics; First and second law of thermodynamics; Microstates and Macro states; Entropy, Conditional entropy; Entropy as a measure of disorder (up to S = kln (omega)

Unit-3: Classical theory of information

Basic ideas of classical information theory; Measures of information (information content and entropy); Maxwell's Demon; Data compression; The binary symmetric channel; error correcting codes; Classical theory of computation; Universal computer; Turing machine; Computational complexity; Uncomputable functions; Shortcomings of classical information theory and necessity of information theory.

Unit-4: Introduction to quantum mechanics

Basic ideas of quantum mechanics; Probability interpretation; Measurement problem; Hilbert space; Schrödinger equation.

Unit-5: Quantum information

Quit; Quantum gates; No cloning theorem (Why quantum information can't be perfectly copied); Dense coding; Quantum teleportation; Quantum data compression; Quantum

cryptography; The universal quantum computer; Universal gate; Church-Turing principle; Quantum algorithms; Simulation of Physical systems; Shor's factorization algorithm; Grover's search algorithm; Experimental quantum information processors; Quantum error correction. Basic ideas of quantum computers and intelligent machines. Summary of entire course and a short of introduction to the present goals of quantum information technology.

Text Books

1. Neil Gershenfeld, The Physics of information technology, Cambridge University Press.
2. H Hirvensalo, Quantum computing, Springer Verlag.
3. Lecture notes for Physics 229: Quantum Information and Computation, John Preskil http://www.theory.caltech.edu/people/preskill/ph229/#describe
4. Andew steane, Quantum computing, Rep. Prog. Phys. 61, 117-173 (1998) or quant-ph/9708022 http://xxx.lanl.gov
5. P A M Dirac, The principles of Quantum mechanics, Oxford University Press.

References

1. David J.C. MacKay, Information Theory, Inference and Learning Algorithm.
2. A. Barenco, Quantum Physics and Computers, Contemporary Physics, 37, 375-89 (1996).
3. C.H. Bennett, Quantum Information and Computation, Physics Today, Oct., 1995, 24-30 (1995).
4. A. Ekert, P. Hayden, H Inamori, Basic concepts in quantum computation, quant-ph/ 0011013.
5. D. Gottesman and H K Lo, from quantum cheating to quantum security, Physics Today, Nov., 2000.
6. J Preskill, battling decoherence: the fault tolerant quantum computer. Physics Today, 24-30, June 1999.
7. A. M. Steane and W. Van Dam, Physicists triumph at guess my number, Physics Today, 35-39, Feb. 2000.
8. V. Vedral and M. B. Plenio, Basics of quantum computation, Prog. Quant. Electron, 22 1-39 (1998)
9. A. Zeilinger, Fundamentals of quantum information, Physics World, 11, March, 1998.

Course Description

Title of Course: Data Analytics Systems and Algorithms **Course Code: 18B11CI917**
L-T-P Scheme: 3-0-0 **Credits: 3**

Pre-requisite: Introduction to machine learning techniques and brief introduction to data science.

Post Course:
Big data Analytics, Information retrieval

Objective: The primary aim of this course is to further expand your understanding of data analytics and algorithms. To understand Data Analytics Life Cycle and Business Challenges. To understand Analytical Techniques and Statically Models

Learning Outcomes

After learning this course, a student should be able to:

- Deploying the Data Analytics Lifecycle to address data analytics projects.
- Reframing a business challenge as an analytics challenge.
- Applying appropriate analytic techniques and tools to analyze data, create statistical models, and identify insights that can lead to actionable results.
- Selecting appropriate data visualizations to clearly communicate analytic insights to business sponsors and analytic audiences.
- Using tools such as: Jupyter notebook, R-studio, in-database analytics.
- Explain how advanced analytics can be leveraged to create competitive advantage.

Course Outline:

Unit-I Business Intelligence, Decision Support Systems, Data Warehousing; Definition of Big Data,Big data characteristics & considerations, Introduction to Hadoop.
Unit-II Data repositories- analyst perspective, Business drivers for analytics, Typical analytical architecture, Business Intelligence Vs Data science, Drivers of Big data analytics, Role of data scientist in Big data ecosystem, Applications of Big data analytics.
Unit-III Need of Data analytic lifecycle, Key roles for successful analytic projects, various phases of Data analytic lifecycle: Discovery, Data Preparation, Model Planning, Model Building, Communicating Results, Operationalization.
Unit-IV What is Machine Learning? Applications of Machine Learning; Supervised Learning: Structure of Regression Model, Linear Regression, Logistics Regression, Time series analysis, Support Vector Machine.
Unit-V Python for Data Analytics, Jupyter Notebook, Markdown and Latex, Plotting, Algorithm Analysis, Time series analysis, Text analysis.

Text Book

1. David Dietrich, Barry Hiller, “Data Science & Big Data Analytics”, EMC education services, Wiley publications, 2012.

2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition, 2011..

Teaching Methodology:

This course should be conducted in a highly interactive environment. The primary aim of this course is to further expand your understanding of data analytics and algorithms. In this course, we use the Python programming language and libraries to explore the fundamental concepts, constructs, and techniques of modern data analytics systems including program structures, algorithms, and Big Data sets. Good solutions by students will be appreciated and discussed in the same class. There is a self learning component that shall be announced.

Evaluation Scheme:

Evaluations	Marks	Remarks
T-1	15 Marks (1-Hours)	1^{st} - 4^{th} Week
T-2	25 Marks (1:30 Hours)	5^{th} - 10^{th} Week
T-3	35 Marks (2-Hours)	11^{th} - 16^{th} Week
Assignments	10 Marks	
Tutorials / Subject Seminar	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Reference Books:

1. Business Intelligence – Data Mining and Optimization for Decision Making – Carlo Vercellis – Wiley Publications.
2. Big Data & Analytics – Seema Acharya & Subhashini Chellappan – Wiley Publications.
3. Big Data (Black Book) – DT Editorial Services – Dreamtech Press.
4. Data Mining: Concepts and Techniques Second Edition – Jiawei Han and Micheline Kamber – Morgan KaufMan Publisher

Course Description

Title of Course: Design Patterns **Course Code: 16B14CI842**
L-T-P Scheme: 3-0-0 **Credits: 3**

Pre-requisite: Object Oriented Programming (OOP), Java as an OOP language.

Post Course:
Object Oriented Software Engineering, Software Quality Management

Objective: To engineer good quality software from its specification

Learning Outcomes

After learning this course, a student should be able to:

1. Understand and use the basic design principles in solving real life problems
2. Appreciate the concept of pattern based analysis and design in software development
3. Identify appropriate patterns for design of solution to given problem.
4. Distinguish between different categories of design patterns.
5. Implement design patterns to solve the real life software design problems.

Course Outline:

Unit-I Software Maintenance and maintainability issues, Need for software design, Rules of an effective software design.
Unit-II Classes and objects revisited, class relationships, composition, inheritance versus interface, inheritance versus composition.
Unit-III Scope and aim of design patterns, object generation, object-object interaction, determining object granularity, specifying object interfaces, specifying object implementations, relating compile-time and run-time structures, frameworks.
Unit-IV Types of design patterns, Creational Patterns: Abstract Factory, Singleton, Factory, Prototype etc. Structural Patterns: Adapter, Composite, Decorator, Façade, etc. Behavioral Patterns: Chain of responsibility, Command, Interpreter, Mediator, Observer, State, Template, Strategy, Visitor, etc.
Unit-V Organization of design patterns, selection of design patterns, model-view-controller, an introduction to architectural and other software engineering patterns.

Text Book

1. Grady Booch, James Rambaugh, Ivar Jacobson, "The Unified Modeling Language Users Guide", Addision Wesley.

2. Pressman S. Roger, "Software Engineering: A practitioner's Approach", 7th Edition, McGraw Hill.

3. The Gang of Four, "Design Patterns: Elements of Reusable Object-Oriented Software", Addision Wesley.

Teaching Methodology:

This course should be conducted in a highly interactive environment. Students will be taught on different software design principles and how each design pattern fulfils the requirements of one or more design principles. Design patterns will be introduced by taking a real-life example and then the importance of that design pattern in solving the problem will be discussed. Exercises shall almost exclusively consist of design work and students will be required to perform these exercises in the following lectures/ tutorials. Good solutions by students will be appreciated and discussed in the same class. There is a self learning component that shall be announced.

Evaluation Scheme:

Evaluations	Marks	Remarks
T-1	15 Marks (1-Hours)	1st - 4th Week
T-2	25 Marks (1:30 Hours)	5th - 10th Week
T-3	35 Marks (2-Hours)	11th - 16th Week
Assignments	10 Marks	
Tutorials / Subject Seminar	5 Marks	
Quiz	5 Marks	
Attendance	5 Marks	
Total	**100 Marks**	

Text Book

4. Grady Booch, James Rambaugh, Ivar Jacobson, “The Unified Modeling Language Users Guide”, Addision Wesley.
5. Pressman S. Roger, “Software Engineering: A practitioner's Approach”, 7th Edition, McGraw Hill.
6. The Gang of Four, “Design Patterns: Elements of Reusable Object-Oriented Software”, Addision Wesley.