B.TECH. DEGREE COURSE IN COMPUTER SCIENCE & ENGINEERING

(2019 Admissions)

SCHEME OF EXAMINATIONS & SYLLABUS

B.TECH. DEGREE COURSE IN
COMPUTER SCIENCE & ENGINEERING

Scheme of Examinations (2019 Admissions)

SEMESTER III

Code No.	Subject	L Hrs/Wk	T Hrs/Wk	P/D Hrs/Wk	C	Marks		Total
						CA	SEE	
19-200-0301	*Linear Algebra and Transform Techniques	3	1	0	3	40	60	100
19-202-0302	Logic Design	3	1	0	3	40	60	100
19-202-0303	**Discrete Computational Structures	3	1	0	3	40	60	100
19-202-0304	Object Oriented Programming	3	1	0	3	40	60	100
19-202-0305	Principles of Programming Languages	3	1	0	3	40	60	100
19-202-0306	Data and Computer Communication	3	1	0	3	40	60	100
19-202-0307	Digital Electronics Laboratory	0	0	3	1	25	25	50
19-202-0308	Object Oriented Programming Laboratory	0	0	3	1	25	25	50
	TOTAL	**18**	**6**	**6**	**20**			

*** Common for CE/CS/EC/EE/IT/ME/SE**
**** Common for CS/IT**

SEMESTER IV

Code No.	Subject	L Hrs/Wk	T Hrs/Wk	P/D Hrs/Wk	C	Marks		Total
						CA	SEE	
19-200-0401	*Complex Variables and Partial Differential Equations	3	1	0	3	40	60	100
19-202-0402	Microprocessors	3	1	0	3	40	60	100
19-202-0403	Computer Architecture and Organization	3	1	0	3	40	60	100
19-202-0404	Automata Languages and Computations	3	1	0	3	40	60	100
19-202-0405	Data Structures and Algorithms	3	1	0	3	40	60	100
19-202-0406	Database Management Systems	3	1	0	3	40	60	100
19-202-0407	Database Management Systems Laboratory	0	0	3	1	25	25	50
19-202-0408	Data Structures Laboratory	0	0	3	1	25	25	50
	TOTAL	**18**	**6**	**6**	**20**			

*** Common for CE/CS/EC/EE/IT/ME/SE**

SEMESTER V

Code No.	Subject	L Hrs/Wk	T Hrs/Wk	P/D Hrs/Wk	C	Marks		Total
						CA	SEE	
19-200-0501	*Numerical and Statistical Methods	3	1	0	3	40	60	100
19-202-0502	System Programming	3	1	0	3	40	60	100
19-202-0503	Object Oriented Software Engineering	3	1	0	3	40	60	100
19-202-0504	Operating System	3	1	0	3	40	60	100
19-202-0505	Advanced Microprocessors and Microcontrollers	3	1	0	3	40	60	100
19-202-0506	Computer Graphics	3	1	0	3	40	60	100
19-202-0507	Computer Graphics Laboratory	0	0	3	1	25	25	50
19-202-0508	Microprocessors Laboratory	0	0	3	1	25	25	50
	TOTAL	**18**	**6**	**6**	**20**			

*** Common for CE/CS/EC/EE/IT/ME/SE**

SEMESTER VI

Code No.	Subject	L Hrs/Wk	T Hrs/Wk	P/D Hrs/Wk	C	Marks		Total
						CA	SEE	
19-202-0601	Computer Networks	3	1	0	3	40	60	100
19-202-0602	*Compiler Construction	3	1	0	3	40	60	100
19-202-0603	Analysis and Design of Algorithms	3	1	0	3	40	60	100
19-202-0604	Data Mining	3	1	0	3	40	60	100
19-202-0605	Artificial Intelligence	3	1	0	3	40	60	100
19-202-06**	Professional Elective I	3	1	0	3	40	60	100
19-202-0610	Operating System Laboratory	0	0	3	1	25	25	50
19-202-0611	Mini Project	0	0	3	1	50	-	50
	TOTAL	**18**	**6**	**6**	**20**			

*** Common for CS/IT**

<u>19-202-0606 to 0609: PROFESSIONAL ELECTIVE I</u>

19-202-0606 Web Technologies
19-202-0607 Software Project Management
19-202-0608 Digital Image Processing
19-202-0609 Bioinformatics

SEMESTER VII

Code No.	Subject	L Hrs/Wk	T Hrs/Wk	P/D Hrs/Wk	C	Marks		Total
						CA	SEE	
19-202-0701	*Principles of Management	3	1	0	3	40	60	100
19-202-0702	Advanced Computer Networks	3	1	0	3	40	60	100
19-202-0703	Cryptography and Network Security	3	1	0	3	40	60	100
19-202-07**	Professional Elective II	3	1	0	3	40	60	100
19-202-07**	Open Elective I	3	1	0	3	40	60	100
19-202-0712	Language Processors Laboratory	0	0	3	1	25	25	50
19-202-0713	Networks Laboratory	0	0	3	1	25	25	50
19-202-0714	Entrepreneurship Development	0	0	2	1	50	-	50
19-202-0715	Project Phase I	0	0	1	1	50	-	50
19-202-0716	Industrial Internship	0	0	1	1	50	-	50
	TOTAL	**15**	**5**	**10**	**20**			

*** Common for CS/EC/EE/IT**

19-202-0704 to 0707:PROFESSIONAL ELECTIVE II

19-202-0704 Artificial Neural Networks
19-202-0705 Advanced Mobile Communications
19-202-0706 Embedded System Design
19-202-0707 Computer Vision

19-202-0708 to 0711:OPEN ELECTIVE I

19-202-0708 Mobile Application Development
19-202-0709 System Modeling and Simulation
19-202-0710 Cyber Law and Ethics
19-202-0711 Business Intelligence and Analytics

SEMESTER VIII

Code No.	Subject	L Hrs/Wk	T Hrs/Wk	P/D Hrs/Wk	C	Marks		Total
						CA	SEE	
19-202-0801	Advanced Architecture and Parallel Processing	3	1	0	3	40	60	100
19-202-08**	Professional Elective III	3	1	0	3	40	60	100
19-202-08**	Professional Elective IV	3	1	0	3	40	60	100
19-202-08**	Open Elective II	3	1	0	3	40	60	100
19-202-0814	Seminar	0	0	3	1	50	-	50
19-202-0815	Project Phase II	0	0	11	6	200	-	200
19-202-0816	Comprehensive Viva Voce	0	0	0	1	-	50	50
	TOTAL	**12**	**4**	**14**	**20**			

19-202-0802 to 0805:PROFESSIONAL ELECTIVE III

19-202-0802 Big Data Analytics
19-202-0803 Cloud Computing
19-202-0804 Computational Linguistics
19-202-0805 High Performance Computing

19-202-0806 to 0809:PROFESSIONAL ELECTIVE IV

19-202-0806 Machine learning
19-202-0807 Agent Based Intelligent System
19-202-0808 Augmented Reality
19-202-0809 Ethical Hacking

19-202-0810 to 0813:OPEN ELECTIVE II

19-202-0810 High Performance Embedded Computing
19-202-0811 Cyberspace and Information System Security
19-202-0812 Soft Computing
19-202-0813 Internet of Things

Evaluation Pattern for Theory and Practical courses

Theory courses

Type of Questions for Semester End Examination (SEE)

PART - A (8 x 4 = 32 marks)

Question No. I (a) to (h) – Eight short answer questions of 4 marks each with two questions from each of the four modules.

PART - B (4 x 10 = 40 marks)

Question nos. II, III with sub sections (a), (b) ---- 10 marks each with option to answer either II or III from Module I.
Question nos. IV, V with sub sections (a), (b) ---- 10 marks each with option to answer either IV or V from Module II.
Question nos. VI, VII with sub sections (a), (b) ---- 10 marks each with option to answer either VI or VII from Module III.
Question nos. VIII, IX with sub sections (a), (b) ---- 10 marks each with option to answer either VIII or IX from Module IV.

The maximum marks that can be awarded for the Semester End Examination (SEE) will be only 60, even though the questions are for 72 marks.

Practical courses

50% marks is earmarked for Continuous Evaluation, and 50% marks for Semester End Examination. The Semester End Examination to be conducted by a minimum of two examiners – one, not below the rank of an Associate Professor. A candidate shall secure a minimum of 50% marks in the aggregate and 40% minimum in the Semester End Examination for a pass.

19-200-0301 LINEAR ALGEBRA AND TRANSFORM TECHNIQUES

Course Outcomes:

On completion of this course the student will be able to:

1. *Solve linear system of equations and to determine Eigen values and vectors of a matrix.*
2. *Understand the concept of vector space and sub space.*
3. *Determine Fourier series expansion of functions and transform.*
4. *Solve linear differential equation and integral equation using Laplace transform.*

Module I

Linear Algebra 1:Rank of a matrix, solution of linear system of equations- existence, uniqueness, general form-Eigen values and Eigen vectors- properties of Eigen values - Diagonalization of a matrix- Cayley Hamilton theorem (without proof) Verification-Finding inverse and power of a matrix using it-Quadratic form-orthogonal reduction of quadratic form to Canonical form.

Module II

Linear Algebra 2: Vector space-subspace-Linear dependence and independence-Spanning of a subspace- Basis and Dimension. Inner product- Inner product spaces - Orthogonal and Orthonormal basis –Gram- Schmidt Orthogonalization process. Linear Transformation.

Module III

Fourier Analysis: Periodic function, Fourier series, Functions of arbitrary period, Even and odd functions, Half Range Expansion, Harmonic analysis, Complex Fourier Series, Fourier Integrals, Fourier Cosine and Sine Transform, Fourier Transform.

Module IV

Laplace Transforms: Gamma functions and Beta function-Definition and properties, Laplace transforms. Inverse Laplace Transform, Shifting theorem, Transform of Derivative and Integrals, Solution of differential equation and integral equation using Laplace transform, Convolution, Unit step function, Second Shifting theorem, Laplace transform of periodic function.

References:

1. Erwin Kreyzig, Advanced Engineering Mathematics, 10th Edition, Wiley, 2011.
2. Grewal, B. S., Higher Engineering Mathematics, 43th Edition, Khanna Publishers, 2013.
3. Hsiung, C.Y. and Mao, G.Y.- Linear Algebra, WorldScientfic.
4. Hoffman, K. and Kunze, R., Linear Algebra, Prentice Hall of India ,New Delhi 1971
5. Venkataraman, M. K., Linear Algebra, The National Co., 1999.

19-202-0302 LOGIC DESIGN

Course Outcomes:

On completion of this course the student will be able to:

1. *Understand about the basic number systems and the conversion between them.*
2. *Manipulate boolean expressions and simplify them.*
3. *Design combinational circuits for any given problem.*
4. *Design sequential circuits, flip-flops etc.*
5. *Design circuits like counters, registers etc.*
6. *Familiarize with the basic principles of memory, design of memory etc.*
7. *Gain knowledge about the basics of integrated circuits.*

Module I

Introduction : Digital System - Binary Numbers - Base conversions - Octal and Hexadecimal numbers - compliments - operations of compliments - Signed binary numbers - Binary codes - Binary storage and Registers - Binary Logic. Boolean algebra and logic gates: Axiomatic definition of boolean algebra - Basic theorems and properties - Boolean functions - Canonical and standard forms - Logic operations- Introduction to Digital Logic gates. Gate level minimisation: Karnaugh map - two, three, four and five variable maps - Product of Sums and Sum of Products simplification - Don't care conditions - NAND and NOR implementation - Exclusive OR function - Quine McCluskey Technique for simplification.

Module II

Combinational Logic : Combinational Circuits - Analysis procedure - Design procedure - Binary adder-subtractor - Fast adders - Decimal adder - Binary multiplier - Magnitude comparator - Decoders - Encoders - Multiplexers and demultiplexers. Synchronous sequential circuits: Sequential circuits - Storage elements: Latches and Flip-Flops - Analysis of clocked sequential circuits - State reduction and assignment - Design procedure.

Module III

Registers and Counters: Registers - Shift Registers - Ripple counters - Synchronous counters - Counter with unused states - Ring counter - Johnson counter.Asynchronous Sequential circuits: Analysis procedure - Circuits with Latches – Hazards.

Module IV

Memory and Programmable Logic: Random Access Memory - Memory decoding – Error detection and correction - Read Only Memory - Programmable Logic Array - Programmable Array Logic - Sequential programmable devices. Digital Integrated circuit: IC digital logic families - Characteristics: Fan out - Power dissipation - Propagation delay - Noise Margin. RTL and DTL circuits - Transistor Transistor Logic - Emitter coupled Logic - CMOS Logic - CMOS transmission gate circuit.

References:

1. M.Morris Mano , Michael D.Ciletti, Digital Design, Fifth edition, Pearson Education, 2013, ISBN-13: 978-0-13-277420-8.
2. Yarbrough, Digital Logic-Applications And Design ,Thomson Learning, ISBN:981-240 062-1.
3. Thomas L. Floyd, Digital Fundamentals, Eleventh edition, Pearson Education , 2017,ISBN-13**:** 978-9332584600.
4. Herbert Taub, Donald Schilling, Digital Integrated Electronics, Mcgraw Hill Education, ISBN:978-00-702-6508-0.
5. M.Morris Mano, Digital Logic and Computer Design, 1/e, Pearson Education, ISBN: 978-81-775-8409-7.

19-202-0303 DISCRETE COMPUTATIONAL STRUCTURES

Course Outcomes:

On completion of this course the student will be able to:

1. *Use logical notation to define and reason mathematically about the fundamental data types and structures used in computer algorithms.*
2. *Summarise mathematical notations and concepts in discrete mathematics that is essential for computing.*
3. *Construct proofs using direct proof, proof by contraposition, proof by contradiction and proof by resolution and by mathematical induction.*
4. *Familiarise mathematical reasoning and proof strategies.*
5. *Identify and Apply the counting principle.*
6. *Apply graph theory to solve real world problems.*
7. *Interpret the conceptual background needed to identify structures of algebraic nature, and discover, prove and use properties about them.*

Module I

Mathematical Logic: Propositions, Connectives, Equivalences of Proposition, Algebra of Propositions, Quantifiers, Proofs: Direct - Contraposition - Contradiction - Resolution - Mathematical Induction, Sets, Relations: properties - Representation - Composition of Relations - Equivalence Relation, Functions: Types - Composition of Functions.

Module II

Algorithms: Introduction - The Growth of Functions - Complexity of Algorithms, Recursive algorithms, Counting techniques: Counting Principle - The Pigeonhole Principle, Recurrence relations - Order of Recurrence Relation - Linear Recurrence Relation with Constant Coefficients - Linear Homogeneous Recurrence Relation with Constant Coefficients.

Module III

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homomorphism of graphs, Euler and Hamiltonian paths and graphs, Fleury's Algorithm, Shortest path in weighted graphs-Dijkstra’s Algorithm Trees: Introduction to trees - Binary Tree - Tree Traversal, Expression Trees - Spanning Trees - Minimum Spanning Tree - Kruskal’s Algorithm.

Module IV

Algebraic Structures: Semigroups and Monoids, groups, subgroups, homomorphisms, Isomorphism, Rings, Field. Posets, Hasse Diagrams, Lattice: Bounded Lattice - Sublattices - Isomorphic Lattices - Distributive Lattice.

References:

1. Veerarajan, T., Discrete Mathematics with Graph Theory and Combinatorics, McGraw-Hill Education ISBN-13**:** 978-0070616783.
2. Rosen, K.H., Discrete Mathematics and its Applications, McGraw-Hill, 7 th Edition, 2011.
3. Ralph P. Grimaldi, Discrete and Combinatorial Mathematics: An applied introduction, Pearson Education Limited, 2014 ISBN 10 : 1-292-02279-5.
4. Satinder Bal Gupta, Discrete Mathematics and Structures, University science Press (Laxmi Publications (P) Ltd.) ISBN : 978 – 81 – 318 – 0452 – 0, 5 th Edition.

19-202-0304 OBJECT ORIENTED PROGRAMMING

Course Outcomes:

On completion of this course the student will be able to:

1. *Find the basics of OOPS and relate object oriented approach for design software.*
2. *Demonstrate the adaptness of various object oriented concepts in developing solutions to problems.*
3. *Design and implement efficient programs for a given problem by incorporating features such as encapsulation, abstraction, inheritance etc.*
4. *Analyse the polymorphic behaviour of objects both in run time and compile time.*
5. *Choose between the different inheritance structures according to the problem and practice reusability.*
6. *Experiment with generic programming and exception handling capability of C++.*
7. *Learn the features and usage of file handling statements in C++.*

Module I

Procedure oriented programming - Object oriented programming paradigm – Basic concepts of object oriented programming - Benefits of OOP – console I/O operations – formatted and unformatted – managing output with manipulators. Functions in C++ -call and return by reference – inline functions - default arguments – const arguments – function overloading – friend functions.

Module II

Classes and objects – Specifying a class – Defining member functions – Memory allocation for objects – Static data members – Static member functions – Arrays of objects – const member functions – Constructors and Destructors – Constructors- default, parameterised, with default arguments. copy constructor – destructors –operator overloading – overloading unary operators - overloading binary operators - overloading binary operators using friends – manipulation of strings using operators – Type conversions – basic to class, class to basic, class to class.

Module III

Inheritance – Defining derived classes- Single inheritance - Multilevel inheritance - multiple inheritance – Hierarchical inheritance - Hybrid inheritance – virtual base classes – Abstract classes – Constructors in derived classes –pointers - pointers to objects - this pointer – pointers to derived classes – virtual functions – pure virtual functions.

Module IV

Working with files – classes for fstream operations- opening and closing of file – detecting end of file – file modes – file pointers and manipulators – sequential input and output operations – random access – Templates – Exception handling – Manipulating strings.

References:

1. Balagurusamy, E., Object Oriented Programming with C++, 6th Edition, Tata McGraw Hill, ISBN: 978-1-25-902993-6.
2. Robert Lafore, Object Oriented Programming in Turbo C++, 4th Edition, Galgotia, ISBN-13: 978-0672323089.
3. Ashok N. Kamthane, Object oriented programming with ANSI & Turbo C++, 2/ E , Pearson Publications, ISBN: 9788131703830.
4. Ravichandran, D., Programming with C++, E/3, Tata McGraw Hill,ISBN: 9780070681897, 0070681899
5. Bjarne Stroustrup, The C++ Programming Language, 4th Edition, Addison Wesley. ISBN-13: 978-0321563842.
6. Herbert Schildt, The Complete Reference to C++ Language,Fourth Edition,Tata McGraw-Hill Education India ,ISBN: 9780070532465.

19-202-0305 PRINCIPLES OF PROGRAMMING LANGUAGES

Course Outcomes:

On completion of this course the student will be able to:

1. *Summarize the evaluation criteria for programming languages.*
2. *Familiarise notations to describe syntax and semantics of programming languages.*
3. *Compare different programming paradigms – imperative, object oriented, functional and logical programming and choose the appropriate one for problem solving.*
4. *Analyze and explain behavior of imperative languages using concepts like binding, scope and lifetime, referencing environment, subprograms and parameter passing mechanisms.*
5. *Explain the concepts of object oriented, functional and logic programming for solving problems.*
6. *Explain the design issues involved in various constructs of programming languages.*

Module I

Programming domains, Language Evaluation Programming paradigms - Imperative programming, Functional programming, Object oriented programming, Logic programming. Formal methods of describing syntax and semantics - Backus Naur Form, Attribute grammars. Describing semantics - Denotational semantics.

Module II

Data types, Names, Variables, Bindings, Scope and lifetime, Referencing Environments-Named Constants-Variable Initialization-Subprograms-Parameter Passing – Coroutines.

Module III

Data abstraction and encapsulation. Polymorphism and inheritance.Features of object-oriented languages - Smalltalk, C++ and Java. Design and implementation issues. Exception handling.

Module IV

Functional programming languages - Lambda calculus - Introduction to pure LISP. Application of functional programming languages. Logic programming languages - a brief introduction to predicate calculus – Horn clauses - Logic programming. Introduction to Prolog. Applications of Logic programming.

References:

1. Robert W. Sebesta, Concepts of Programming Languages, 10th Edition, Addison Wesley.
2. Ravi Sethi, Programming Languages - concepts and constructs, 2nd Edition, Addison Wesley.
3. Michael L. Scott, Programming Language Pragmatics – 3rd Edition, Morgan Kaufmann.
4. Kenneth C. Louden, Programming Languages : Principles and Practices, 3rd Edition, Thomson Learning.
5. Terence W. Pratt, Programming Languages, 4th Edition, Prentice Hall.
6. Bjarne Stroustrup, Design and Evolution of C++, Addison Wesley.

19-202-0306 DATA AND COMPUTER COMMUNICATION

Course Outcomes:

On completion of this course the student will be able to:

1. *Explain and calculate digital transmission over different types of communication media.*
2. *Describe the principles of access control to shared media and carry out performance calculations.*
3. *Solve issues in networking by referring to problem solving steps through relevant information by choosing suitable techniques.*
4. *Explain the role of protocols in networking.*
5. *Analyse the services and features of various communication devices.*

Module I

Introduction to Data Communications and Computer Networks, The Internet, Protocols and Standards, Network Models, Layered Tasks, The OSI Model, Layers in the OSI Model, Addressing. Data and Signals: Analog and Digital, Periodic Analog Signals, Digital Signals, Noise, Transmission impairments, Data Rate Limits - Nyquist's and Shannon's capacity equations, Performance, Digital Transmission: Digital data over Digital channel, Analog data over Digital channel, Analog Transmission: Analog data over Analog channel, Digital data over Analog channel.

Module II

Bandwidth utilization: Multiplexing and Spreading, Multiplexing, Spread Spectrum, Transmission Media: Guided Media, Unguided Media: Wireless, Switching, Circuit - Switched Networks, Datagram Networks, Virtual - Circuit Networks, Structure of a Switch, Using Telephone and Cable Networks for Data Transmission, Telephone Networks, Dial-up Modems and modem standards, Digital Subscriber Line - different DSL technologies, Cable TV Networks, Cable TV for Data Transfer.

Module III

Error Detection and Correction: Block Coding, Linear Block Codes, Hamming distance, Cyclic Codes,Checksum – CRC - capabilities of CRC, FEC: Hamming code, constant ratio code, convolutional code-Threshold decoding,Sequential decoding,Viterbi decoding. Error and flow control methods: ARQ implementations - Stop and wait, Go-back-n, Selective repeat-Link utilisation and efficiency of ARQ methods. Data Compression: Simple coding schemes, Frequency based coding - Huffman coding, Relative encoding, Run length encoding, LZW compression - Image and video compression standards.

Module IV

Network Topologies - Mesh, Star, Tree, Ring, Bus, Hybrid. Connecting devices: Passive hubs, Repeaters, Active hubs, Bridges, Two layer and Three layer switches, Routers, Gateway. IEEE Ethernet Standards, Standard Ethernet, Changes in the Standard, Fast Ethernet, Gigabit Ethernet,10 Gigabit ethernet - IEEE 802.11, Bluetooth.

References:

1. Behrouz A. Forouzan, Data Communication and Networking, 5th Edition, McGraw Hill, 2012.ISBN: 978-0073376226.
2. Andrew S. Tanenbaum and David J. Wetherall,Computer Networks, 5th edition,, Prentice Hall, 2011, ISBN-13 978-0-13-212695-3.
3. William Stallings, Data and Computer Communication, 10th Edition, Pearson education, 2006.978-0133506488.
4. Fred Halsal, Data Communication Computer Network and Open Systems, 4th Edition, Pearson education, 2005.
5. William Stalling, Wireless Communication and Networks, 2nd Edition, Pearson Education, 2004ISBN: 978-0-13-191835-1.
6. William A. Shay, Understanding Data Communication & Networks, 2nd Edition, Thomson Learning, 2003, ISBN: 978-0-53-420244-6.

19-202-0307 DIGITAL ELECTRONICS LABORATORY

Course Outcomes:

On completion of this course the student will be able to:

1. *Gain good knowledge about the concepts of digital electronics.*
2. *Apply these concepts in practical cases.*
3. *Design and analyse various combinational circuits using basic gates.*
4. *Implement sequential circuits like flip-flops, registers, counters etc.*
5. *Develop teamwork skills.*

Cycle-I

1. Study of standard logic gates and universal gates.
2. Arithmetic circuits

   i. Adders &subtractors using standard logic & universal gates.

   ii.Study of 7483 & binary addition & subtraction using 1’s & 2’s complement.

   iii. BCD adder using 7483.
3. Code converters with mode control, Parity generator/ checkers.
4. Study of MUX, DEMUX, decoder & encoder circuits & their IC’s.

Cycle-II

1. Flip flops: RS, JK, T, D, master-slave JK flip flops using universal gates.
2. Counters

   i. Asynchronous UP, DOWN, UP/DOWN counter using JK Flip flops

   ii.Design and realization of sequence generators.

   iii.Study of IC counters 7490, 7492, 7493 and 74193.
3. Study of shift registers and design of Johnson and Ring counter using it.

Cycle-III

1. Study of seven segment display & decoder driver (7447).
2. Astable and nonstable multi-vibrators using TTL gates.
3. Transfer characteristics and specifications of TTL gates

References:

1. Morris Mano, M., Michael D. Ciletti, Digital Design, 4th Edition, Pearson Education, 2009, ISBN:978-81-317-1450-8.
2. Herbert Taub, Donald Schilling, Digital Integrated Electronics, McGraw Hill Education, ISBN: 978-00-702-6508-0.
3. Thomas L. Floyd, Digital Fundamentals, 10th Edition, Pearson Education, 2011, ISBN: 978-81-317-3448-3.
4. Yarbrough, Digital Logic - Applications And Design, Thomson Learning, ISBN: 981-240-062-1.
5. Morris Mano, M., Digital Logic and Computer Design, 1st Edition, Pearson Education, ISBN: 978-81-775-8409-7.
6. Anand Kumar, A., Fundamentals of Digital Circuits, PHI Learning, 2nd Edition, 2010, ISBN: 978-81-203-3679-7.

19-202-0308 OBJECT ORIENTED PROGRAMMING LABORATORY

Course Outcomes:

On completion of this course the student will be able to:

1. *Familiarise with the language environment.*
2. *Develop object oriented programming style and compare that with structured style of programming.*
3. *Plan and decide appropriate oops features for the problems in hand.*
4. *Create a complete class definition with constructors and methods and to instantiate it.*
5. *Design efficient programs by incorporating oops features like operator overloading, virtual functions, different ways of inheritance structures etc.*
6. *Develop programs that can read and write data to and from secondary storage.*

Cycle-I

1. Programs to differentiate between struct and class.
2. Programs to implement data abstraction, data encapsulation and information hiding.
3. Programs to demonstrate parameter passing techniques.

Cycle-II

1. Programs to implement different Inheritance structures - Single, multiple, multilevel, and hierarchical.
2. Programs to implement Operator overloading and function overloading.
3. Programs to implement virtual functions and dynamic binding.

Cycle-III

1. Programs to implement Pointers and arrays.
2. Programs to implement Files.

References:

1. Balagurusamy, E., Object Oriented Programming with C++, 6th Edition, Tata McGraw Hill., ISBN: 978-1-25-902993-6.
2. Robert Lafore, Object Oriented Programming in Turbo C++, 4th Edition, Galgotia, ISBN-13: 978-0672323089.
3. Bjarne Stroustrup, The C++ Programming Language, 4th Edition, Addison Wesley. ISBN-13: 978-0321563842.

19-200-0401 COMPLEX VARIABLES AND PARTIAL DIFFERENTIAL EQUATIONS

Course Outcomes:

On completion of this course the student will be able to:

1. *Transform a region to another region using conformal mapping.*
2. *Evaluate real integrals using residue theorem.*
3. *Formation and solution of partial differential equation.*
4. *Determine solution of partial differential equation for vibrating string and heat conduction.*

Module I

Analytic function- Cauchy-Riemann equation (Cartesian and polar)-Harmonic function-construction of analytic function given real or imaginary parts- Conformal mapping of standard elementary function and bilinear transformation.

Module II

Cauchy's integral theorem, Cauchy's integral formula and for derivatives-Taylor's and Laurent's expansion (without proof) - Singularities-Residues-Cauchy's Residues theorem- Contour integration involving unit circle.

Module III

Formation of partial differential equation eliminating arbitrary constants and function—Solution of first order equation-four standard types- Lagrange's equation—Linear homogeneous partial differential equation with constant coefficient.

Module IV

One dimensional wave equation, D'Alembert's solution and one dimensional heat flow equation - solution by the method of separation of variables - application of Fourier series solution. Solution of Laplace's equation over a rectangular region by the method of separation of variables.

References:

1.Erwin Kreyzig Advanced Engineering Mathematics, 10th Edition,Wiley, 2011.

2.Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2013.

19-202-0402 MICROPROCESSORS

Course Outcomes:

On completion of this course the student will be able to:

1. *Describe the architecture & organization of 8085 & 8086 Microprocessor.*
2. *Understand and classify the instruction set of 8085/8086 microprocessor and distinguish the use of different instructions and apply it in assembly language programming.*
3. *Relate the addressing modes used in the instructions.*
4. *Realize the Interfacing of memory & various I/O devices with 8085/8086 microprocessor.*
5. *Familiarise the architecture and operation of Programmable Interface Devices and realize the programming & interfacing of it with 8085 microprocessor.*
6. *Interface various pheripheral IC's with Intel 8085/8086 microprocessor for its various applications.*

Module I

Introduction to 8 bit microprocessor: Internal architecture of Intel 8085 microprocessor: Block diagram, Registers, Internal Bus Organization, Functional details of pins, Control signals, External Address / Data bus multiplexing, Demultiplexing.

Module II

8085 instruction set: Instructions, Classifications, Addressing modes, Programming examples, Instruction Timing, I/ O mapped I/ O, and memory mapped I/ O techniques. Interrupts of the 8085 Microprocessor.

Module III

Introduction to 8086 - 8086 Architecture - Addressing Modes - Instruction Set and Programming, Assembler Directives. 8086 hardware design: minimum mode and maximum mode configurations, Bus structure, bus buffering, latching, system bus timing with diagram, Interrupt of 8086 Microprocessor.

Module IV

I/O and memory interfacing using 8085 and 8086:Memory interfacing and I/O interfacing with 8085 and 8086 – Parallel communication interface (8255) –Timer (8253 / 8254) – Keyboard / Display controller (8279) – Interrupt controller (8259) – DMA controller (8257).

References:

1. Ramesh S. Gaonkar , Microprocessor – Architecture, Programming and Applications with the 8085 Penram International Publisher, 6th Edition 2013.
2. Nilesh B. Bahadure, Microprocessors - The 8086/8088, 80186/80286, 80386/80486 and the Pentium Family. 2010, PHI Learning, ISBN-978-81-203-3943-2.
3. Douglas V. Hall,Microprocessors and Interfacing, Tata McGraw Hill publications, 2nd Edition, 2012.
4. Yu-Cheng Liu, Glenn A. Gibson, Microcomputer Systems: The 8086/8088 Family : Architecture, Programming, and Design, Prentice-Hall, ISBN:9780135818510.
5. Kenneth Ayala, The 8086 Microprocessor: programming and interfacing the PC, Thomson Learning.
6. Barry B. Brey, The INTEL Microprocessors – 8086 / 8088, 80186 / 80188, 80286, 80386, 80486 Pentium and Pentium pro processor, Pentium II, Pentium III and Pentium IV - Architecture, Programming and interfacing, PHI , 8th Edition, ISBN 0-13-502645-8.

19-202-0403 COMPUTER ARCHITECTURE AND ORGANIZATION

Course Outcomes:

On completion of this course the student will be able to:

1. *Acquire knowledge about structure, functions and characteristics of computer systems.*
2. *Identify the addressing modes used in instructions.*
3. *Determine the set of control signals generated and their timing sequence, given an instruction.*
4. *Demonstrate how addition, multiplication and division operations are implemented inside a computer system.*
5. *Explain each level of memory hierarchy.*
6. *Show how cache mapping affect the location of the data and the replacement policies.*
7. *Map a virtual address to physical address.*
8. *Identify and compare different methods for computer I/O.*

Module I

Basic structure of computers – Functional units – Basic operational concepts – Historical Perspective. - Instruction set architecture- Memory locations and addresses-Instructions & instruction sequencing - Addressing modes – Assembly language – Basic Input Output operations - Stacks, Subroutines- RISC and CISC styles.

Module II

Processing Unit – Some fundamental concepts – Instruction Execution - Hardware components-Register file, ALU, Data path-Instruction fetch and execution steps-control signals-Hardwired control - CISC style processors-Interconnect using buses, microprogrammed control.

Computer arithmetic - design of fast adders -multiplication of unsigned numbers-multiplication of signed numbers - Booth’s algorithm - Fast multiplication - bit pair recoding of multipliers, carry save addition of summands-integer division - floating point numbers and operations.

Module III

Memory organization - Semiconductor RAM memories - internal organization of memory chips - Static and Dynamic memories - cache memories - mapping functions - replacement algorithms - performance considerations- virtual memory - address translations - Secondary storage.

Module IV

Input-output organization - Accessing I/O devices-program controlled I/O-interrupts – Enabling & Disabling interrupts - handling multiple devices - device identification - vectored interrupts - interrupt nesting – Simultaneous requests.

Bus structures–Synchronous and asynchronous - Arbitration - I/O interface circuits – parallel and serial interfaces-Interconnection standards.

References:

1. Carl Hamacher, Naraig Manjikian, Safwat G. Zaky, Zvonko G. Vranesic, Computer Organization and Embedded Systems ,6th Edition,McGraw Hill Education (India) Private Limited. ISBN: 9780071089005.
2. Pal Chaudhury, P., Computer Organization and Design, 3rd Edition, PHI Learning, New Delhi, 2009, ISBN: 978-81-203-3511-0.
3. John P. Hayes, Computer Organization and Architecture, 4th Edition, McGraw Hill, 2003, ISBN-13: 978-0072320886.
4. Kai Hwang & Faye A. Briggs, Computer Architecture and Parallel Processing, 1st Edition, McGraw Hill Education, 2012, ISBN-13:9781259029141.
5. David A. Patterson and John L. Hennessy, Computer Organization and Design, The Hardware / Software Interface, 5th Edition, Morgan Kaufmann, 2013, ISBN: 978-0-12-407726-3.

19-202-0404 AUTOMATA LANGUAGES AND COMPUTATIONS

Course Outcomes:

On completion of this course the student will be able to:

1. *Design a minimized Deterministic Finite Automata.*
2. *Analyse and generate regular expressions for any structure.*
3. *Demonstrate that a given language is regular or not.*
4. *Design new context free grammar.*
5. *Design Push Down Automata for any context free grammar.*
6. *Analyse and design turing machines for any problem.*

Module I

Finite state systems: NFA, DFA, Definitions. Equivalence of NFA and DFA, NFA to DFA conversion,NFA with epsilon transitions, Elimination of epsilon transitions, Minimization of Finite Automata, Finite Automata with output. Designing Moore and Mealy machines.

Module II

Regular Expressions: Definitions, Equivalence of regular expression and finite automata, Conversion between regular expression and DFA, Arden’s Theorem, Pumping Lemma of regular languages and its application, closure properties of Regular sets, Applications of regular expressions: Expressions in UNIX, lexical analysis.

Regular grammars: equivalence of regular grammar and FA, converting regular grammar to Finite Automata, Converting Finite Automata to regular grammar.

Module III

Context Free grammars (CFG): Definition, Derivations, parse trees, ambiguity, Simplification of CFG, Conversion to Normal Forms: Chomsky, Greibach. Pumping lemma for Context free languages, application of pumping lemma, Closure Properties of CFL, decision algorithms for CFL.

Pushdown Automata: Definition, Design examples, Equivalence of acceptance by final state and empty stack, Equivalence of PDA and CFG.

Module IV

Turing machine (TM): Model of TM, Design examples, Techniques for construction of TM: storage in the state, multiple tracks ,subroutines, multi-tape . Church’s Thesis, Universal TM Recursive and recursively enumerable languages, halting problem of TM, Decidable and Undecidable problems. Problem reduction. Introduction to Linear Bound Automata and Context Sensitive Grammars, Chomsky Hierarchy.

References:

1. Hopcroft J. E., Motwani,R. and Ullman J. D., Introduction to Automata Theory, Languages, and Computation, 3rd Edition, ISBN : 978-03-214-5536-9.
2. Padma Reddy, A.M., Finite Automata and Formal Languages, 1st Edition, Pearson Education,ISBN 978-81-317-6047-5.
3. Mishra, K.L.P. and Chandrasekaran, N., Theory of Computer Science, Automata , Languages and Computation, 3 rd Edition, PHI, 2014, ISBN 978-81-203-2968-3.
4. lPeter Linz, An Introduction to Formal Languages and Automata, 4th Edition, Narosa Publishing Co., ISBN 978-81-7319-781-9
5. Sivadandam, S. N., Janaki Meena, M., Theory of Computation, I. K. International Publishing House, 1 st Edition, ISBN 978-93-80026-20-6.
6. John.C. Martin, Introduction to Languages and the theory of computation, 3rd Edition, Tata McGraw Hill, ISBN 978-0-07-066048-9.

19-202-0405 DATA STRUCTURES AND ALGORITHMS

Course Outcomes:

On completion of this course the student will be able to:

1. *Explain the important features of data structures like arrays, linked lists, trees and graphs.*
2. *Define advanced data structures such as balanced search trees, hash tables, spatial data structures etc.*
3. *Create the different data structures to solve a problem.*
4. *Describe and compare the performance of various sorting algorithms like quicksort, mergesort and heapsort.*
5. *Describe algorithms on trees and graphs such as traversals, shortest path and minimum spanning tree.*
6. *Design a data structure and algorithm for maximum efficiency.*

Module I

Introduction to Data structures - Arrays & sparse matrices - representation, Searching - linear, binary – Sorting – selection, bubble, insertion, quick, merge, heap - Hash tables – Hashing functions -Associative arrays.

Module II

Linked lists – singly, doubly and circular lists, Application of linked lists – Polynomial manipulation, stacks – Implementation of stacks using arrays and lists – Typical problems – Conversion of infix to postfix – Evaluation of postfix expression . Queues and Deques – implementation., priority queues.

Module III

Trees, Definition and mathematical properties. Representation – sequential, lists - Binary trees – Binary tree traversals – pre-order, in-order & post-order, Expression trees. Threaded binary trees. Binary Search trees. AVL trees-tries-Spatial data structures- k-d tree.

Module IV

Graphs – Graph representation using adjacency matrices and lists – Graph traversals – DFS, BFS -shortest path – Dijkstra’s algorithm, Minimum spanning tree – Kruskal Algorithm, Prims algorithm – Tree based indexing, B trees and B+ trees.

References:

1. Robert Lafore, Data structures and algorithms in JAVA, 2nd Edition, Pearson, ISBN: 978-8131718124.
2. Adam Drozdek, Data Structures and Algorithms in Java, Thomson Publications, 2nd Edition , ISBN-13: 9780534492526.
3. Aaron M. Tanenbaum, Moshe J. Augenstein, Yedidyah Langsam, Data Structures using Java, Pearson Education, 2003, ISBN 13: 9780130477217.
4. Ellis Horowitz, SartajSahni, Dinesh P. Mehta, Fundamentals of Data Structures in C++, Silicon Press, 2007.
5. Jean Paul Tremblay and Paul G Sorenson, An introduction to Data Structures with Applications,McGraw-Hill, Singapore, 1984.
6. Clifford A. Shaffer, Data structures and Algorithm analysis in Java, Dover Publications, 2012, ISBN 97804864858127.

19-202-0406 DATABASE MANAGEMENT SYSTEMS

Course Outcomes:

On completion of this course the student will be able to:

1. *Outline the characteristics and features of database systems.*
2. *Represent the components and relations through an ER diagram and convert that to relational model.*
3. *Familiarise with the storage structures, accessing methods and indexing techniques.*
4. *Formulate relational algebra queries according to user requirements.*
5. *Formulate efficient SQL query and refine it with procedures, cursors etc.*
6. *Improve the database design by applying normalisation techniques.*
7. *Familiarise with an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain and query a database.*
8. *Discover the basic issues of transactions and concurrency control of them.*

Module I

Introduction: Characteristics of the Database approach – Data models, schemas and instances – DBMS architecture – Data independence – Database languages and interfaces – Database administrator – Data modeling using Entity - Relationship (ER), Entity sets, attributes and keys - Relationships, Relationship types, roles and structural constraints - Weak Entity types - Enhanced Entity - Relationship (EER) and object modeling. Sub classes, super classes and inheritance - Specialization and generalization.

Module II

Record storage and file organizations: Placing file records on disks – Fixed length and variable length records- Spanned Vs Unspanned records - Heap files, Sorted files. Hashing Techniques- Internal,External. Indexed structures for files – single level ordered index, multi- level indexes.

Module III

The Relational model:Concepts-Relational model constraints – The Relational Algebra. Functional Dependencies – Basic definition – Trivial and Nontrivial dependencies – First, Second and Third normal forms – Boyce - codd normal form. SQL – Commands – Group By & Order By – Cursor – Procedure & Function – Trigger – View-Introduction to SQL variants-PL/SQL, XML query language- Introduction to query optimization.

Module IV

Transaction Management - Concurrency Control - Lost Updates - Uncommitted Data - Inconsistent Retrievals - The Scheduler - Concurrency Control with Locking Methods – Concurrency Control with Time Stamping - Concurrency Control with Optimistic Methods - Database Recovery Management. Introduction to object oriented databases, Active databases.

References:

1. Elmasri and Navathe, Fundamentals of Database Systems, 5th Edition, Addison - Wesley, 2011.
2. Peter Rob Carlos Coronel, Database Systems , Design, Implementation & Management,5th Edition, Thomson Course Technology.
3. Silberschatz, A., Korth, H.F. and Sudarshan, S., Database System Concepts, 4th Edition, Tata McGraw Hill, 2002.
4. Thomas Connoly, Carolyn Begg, Database Systems, 3rd Edition, Pearson Education.
5. Date, C.J., An Introduction to Database Systems, Addison –Wesley.
6. Margaret H. Dunham, Data Mining - Introductory and advanced topics, Pearson Education, 2003.

19-202-0407 DATABASE MANAGEMENT SYSTEMS LABORATORY

Course Outcomes:

On completion of this course the student will be able to:

1. *Design and manipulate database tables using MySQL queries.*
2. *Apply set operations on database tables.*
3. *Design and develop applications using PHP-MySQL.*
4. *Design procedures and functions to manipulate database tables.*
5. *Implement Triggers and cursors.*

Cycle-I

Implementation of DDL and DML queries and set operations.

Cycle- II

Implementation of views, Procedures and Functions.

Cycle-III

Implementation of Triggers and Cursors.

Cycle-IV

Develop web applications using PHP-MySQL.

References:

1. Seyed, M. M. et.al, Learning MySQL: Get a handle on your data, O'Reillypublishers.
2. Robin Nixon, Learning PHP, MySQL and JavaScript, 5th Edition,O'Reillypublishers.
3. Peter Rob ,Carlos Coronel, Database Systems , Design, Implementation &Management, 8th Edition, Thomson CourseTechnology.
4. Elmasri and Navathe,Fundamentals ofDatabase Systems,7thEdition,Pearson Education, 2015.

19-202-0408 DATA STRUCTURES LABORATORY

Course Outcomes:

On completion of this course the student will be able to:

1. *Write the syntax of Java language constructs.*
2. *Write a Java program.*
3. *Implement data structures like arrays,stacks, queues, linked lists, trees and graphs.*
4. *Implement various sorting algorithms like quicksort, mergesort and heapsort.*
5. *Design a data structure and algorithm for a problem for maximum efficiency.*

Cycle-I

- Simple programming exercises in Java.
- Implementation in Java for Stacks – various applications.
- Implementation in Java for Queues-Linear and circular.

Cycle- II

- Implementation in Java for Searching and Sorting.

Cycle-III

- Implementation in Java for Linked Lists- Singly linked and doubly linked.
- Implementation in Java for Trees –Binary search tree and threaded binary trees.

Cycle-IV

- Implementation in Java programming language for Graphs- Traversals, Minimum spanning trees.

References:

1. Robert Lafore, Data structures and algorithms in JAVA-Second edition, Pearson, ISBN: 978-8131718124.
2. Herbert Schildt, Java The complete reference, 10th edition, Mc Grawhill, 2017, ISBN**:** 9789387432291.
3. Balaguruswamy, Programming with JAVA, a primer, 4th Edition, Tata McGraw-Hill, ISBN:978- 0070141698.

19-200-0501 NUMERICAL AND STATISTICAL METHODS

Course Outcomes:

On completion of this course the student will be able to:

1. *Solve algebraic and transcendental equations by numerical methods.*
2. *Perform numerical differentiation and integration.*
3. *Find the mean and variance of a probability distribution including the binomial distribution.*
4. *Use statistical tests in testing hypotheses on data.*

Module I

Numerical solution of algebraic and transcendental equation by - Regula-Falsi method, Newton Raphson's method. Gauss Seidal iteration method to solve a system of equations and convergence (without proof) Newton's forward and backward interpolation formula. Lagrange interpolation, Newton's divided difference and central differences.

Module II

Numerical differentiation at the tabulated points with forward, backward and central diffrences. Numerical integration with trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule. Taylor series method. Euler method, Modified Euler method, Runge–Kutta method of second and fourth order for solving 1st order ordinary differential equation.

Module III

Random variable (discrete and continuous) Expectation-mean and variance of probability distribution. Binomial, Poisson and Normal distribution and Fitting of this Distribution to the given data. Curve fitting- fitting of straight line, parabola, exponential.

Module IV

Population and Sample-Sampling Distribution (of mean and variance) Testing of Hypothesis-level of significance, Z-test statistic, Chi square test for variance, for goodness of fit and F-test .

References:

1.Erwin Kreyzig, Advanced Engineering Mathematics, 10th Edition, Wiley, 2011.

2.Grewal, B.S, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2013.

3.Kandaswamy, P., Thilagavathy,K., Gunavathy,K., Numerical methods, S Chand & Co.

4.Richard A. Johnson. Irvin Miller and John E. Freund. Probability and statistics for engineers, 8th Edition, Pearson, 2010.

19-202-0502 SYSTEM PROGRAMMING

Course Outcomes:

On completion of this course the student will be able to:

1. *Familiarise the basics of system programs like assemblers, macro processors, linkers, loaders and operating systems.*
2. *Design, analyze and implement one pass, two or multi pass assembler.*
3. *Design and implement macro processors, linkers and loaders.*
4. *Compare different types of operating systems.*

Module I

Assemblers: Overview of the assembly process- Machine dependent assembler features-Machine independent assembler features - Design of two pass assembler - single pass assembler.

Module II

Linker and Loader :Basic Loader functions - Design of absolute loader, Simple bootstrap Loader, Machine dependent loader features- Relocation, Program Linking, Algorithm and data structures of two pass Linking Loader, Overview of linkage editing - linking loader - Dynamic linking - Design of the linkage editor.

Module III

Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine- Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion, General-Purpose Macro Processors, Design of a Macro assembler.

Module IV

Operating Systems - Basic Operating Systems functions -Types of Operating Systems- User Interface -Runtime Environment. Operating Systems Design Options -Hierarchical Structures -Virtual Machines-Multiprocessor Operating Systems - Distributed Operating Systems - Object Oriented Operating Systems.

References:

1. Leland L. Beck,System Software-An Introduction to System Programming, 3rd Edition,Addison Wesley.
2. John J. Donovan, Systems Programming, McGraw Hill, 2009.
3. D.M. Dhamdhere, Systems Programming and Operating Systems, Second Revised Edition, Tata McGraw Hill.
4. J Nithyashri, System Software, Second Edition, Tata McGraw Hill.
5. Srimanta Pal ,System Programming,OXFORD Publication.
6. John R. Levine,Linkers & Loaders – Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000.

19-202-0503 OBJECT ORIENTED SOFTWARE ENGINEERING

Course Outcomes:

On completion of this course the student will be able to:

1. *Compare and classify various software process / life cycle models.*
2. *Analyze structured vs object oriented modeling.*
3. *Illustrate various techniques in software quality assurance.*
4. *Analyze various principles of software project management.*
5. *Compare and classify the new trends in life cycle models in industry.*
6. *Analyze and make use of any one testing tool used in the industry.*

Module I

Software Life Cycle - Waterfall model – Prototyping – Spiral model - Agile development - pros and cons of each model.Requirements Analysis - SRS – Introduction to Structured analysis and design techniques - Introduction to Object oriented analysis and design techniques.

Module II

Software Design: Design Heuristics – Cohesion and Coupling. Concepts of user interface design - Architectural design - Use case analysis - Introduction to UML diagrams - case studies - ATM system design using object oriented analysis techniques. Emerging trends in software engineering:Introduction to Rational unified process, Service oriented architecture(SOA).

Module III

Introduction to Software Quality Management - SQA-SQM-SCM-Software Testing - Objectives of testing– Black Box and white box testing – Test Plan - Unit testing – Integration testing – System testing – Test reporting-Testing object oriented programs - Quality standards ISO and CMM - Software quality metrics. Familiarisation with testing tools.

Module IV

Software Project Management - Brief study of various phases of Project Management – Planning – Organizing – Staffing – Directing and Controlling-Case studies and activities.

Software Project Cost Estimation – COCOMO model – Software Project Scheduling - Work Breakdown Structure - CASE tools-Life cycle, classification and different types.

References:

1. Roger S. Pressman, Software Engineering – 6th illustrated edition, McGraw Hill,2005.
2. Booch et.al, The UML Reference Manual- Pearson Education, 2005.
3. Jacobs et.al, Object Oriented Software Engineering: A Use case driven approach, Pearson Education, 7th edition, 2009.
4. Frank Tsui, Managing Software Projects - Illustrated Edition, Jones and Barlett learning,2011.
5. David Gustafson, Software Engineering-, 1st Edition, Schaum's outline series, 2002.
6. Richard Thayer et.al, Software Engineering Project Management – 2nd Illustrated Edition, IEEE Computer Society, 2006.

19-202-0504 OPERATING SYSTEM

Course Outcomes:

On completion of this course the student will be able to:

1. *Familiarize with the basic concepts of operating systems.*
2. *Implement various process scheduling algorithms.*
3. *Design programs to avoid the synchronization problems.*
4. *Gain knowledge about memory management and virtual memory concepts.*
5. *Analyze various security and protection mechanisms in file system implementation.*
6. *Illustrate the problems related with deadlocks and deadlock handling.*
7. *Compare different types of operating systems.*

Module I

Introduction to Operating Systems. Operating system concepts – System calls – Operating System Structure.Processes - Interprocess Communication – Race Conditions - Critical Sections – Mutual Exclusion - Busy Waiting - Sleep And Wakeup -Semaphores - Monitors - Message Passing. Process Scheduling – First come First Served - Shortest Job First - Priority scheduling - Round Robin Scheduling - Multiple queues scheduling – Guaranteed scheduling - Two- level scheduling.

Module II

Memory management. Multiprogramming and memory usage - Swapping - multiprogramming with fixed and variable partitions - Memory management with bitmaps, linked lists, Buddy system - Allocation of swap space. Virtual memory - paging and page tables, Associative memory - Inverted page tables. Page replacement algorithms – Segmentation.

Module III

File systems and Input/output. Files - Directories - File system implementation - Security and Protection mechanisms.Principles of I/O hardware - I/O devices - Device controllers - DMA. Principles of I/O software - Interrupt handlers - Device drivers - Disk scheduling - Clocks and terminals. I/O Buffering - RAID- Disk Cache.

Module IV

Deadlocks - Conditions for deadlock. Deadlock detection and recovery. Deadlock avoidance - resource trajectories - safe and unsafe states – Banker’s algorithms. Deadlock prevention. Two phase locking – Non-resource deadlocks - Starvation.Case Study: UNIX / LINUX operating system.

References:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, “Operating Systems Concepts”, Tenth Edition, John Wiley & Sons, 2018, ISBN:978-1-118-06333-0.
2. Andrew S Tanenbaum, Herbert Bos “Modern Operating Systems” , Fourth Edition, Pearson Education India, 2016. ISBN 978-9332575776.
3. William Stallings, “Operating Systems Internals and Design Principles”, Seventh Edition, Pearson Education, 2018. ISBN 978-9352866717.
4. Garry Nutt, Nabendu Chaki, Sarmistha Neogy, “Operating Systems”, Third Edition, Pearson Education.
5. D.M.Dhamdhere, “Operating Systems”, 2nd Edition, Tata McGraw Hill, 2011.
6. Achyut S Godbole, Atul Kahate, “Operating Systems”, 3rd Edition, Tata McGraw Hill, 2011.

19-202-0505 ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

Course Outcomes:

On completion of this course the student will be able to:

1. *Familiarize 32bit, 64bit and multi core architectures.*
2. *Compare the features of various microprocessors.*
3. *Learn the architecture and programming with 8O51 microcontroller*.
4. *Explain the basic architecture and features of PIC microcontrollers.*
5. *Develop microcontroller programs.*
6. *Familiarize basics of interfacing.*

Module I

Intel 80386 Microprocessor: Architecture - Registers – Descriptors - Real Mode - Protected mode - Virtual 8086 mode - Paging and Segmentation - Comparison with 80486 Microprocessor. Pentium class of processors: RISC and CISC architectures - Superscalar Architecture - MMX technology – SSE – Pipelining - Branch Prediction techniques – FPU - Comparative study of features of Pentium-II, Pentium-III and Pentium-IV processors.

Module II

Intel 64 bit processors-:Overview of 64 bit processor execution environment – Memory organization – IA-32 memory models – Memory organization in 64 bit mode – Extended physical addressing in protected mode - Basic program execution registers – Operand addressing. Multicore Architectures: Concepts – Power reduction techniques in processors – Comparison of Intel Skylake,Goldmont and Ice Lake microarchitectures

Module III

8051 microcontroller: Architecture - pin configuration - addressing modes - instruction set – programming - timers – counters - Programming - interrupts- communication interfaces - interfacing with DAC, ADC,stepper motor.

Module IV

PIC micro controllers: PIC family - PIC16F84A: Features - architecture – data memory organization – RAM - Program memory - ROM – instruction types and addressing modes- instruction cycle -ports - Introduction to programming PIC microcontrollers using MPLAB.

References:

1. Intel x86 processors programmer's reference manuals.
2. Lyla B. Das, The x86 Microprocessors: 8086 to Pentium, Multi cores, Atom and the 8051 Microcontroller, 2/e, Pearson Education. ISBN-13**:** 978-9332536821.
3. Barry B. Brey, The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions : Architecture, Programming, and Interfacing, Pearson Education India, ISBN:9788131726228.
4. Tim Wilmshurst, Designing Embedded Systems with PIC Microcontrollers, Newnes Publisher, ISBN:9780080961842.
5. PIC: 18F2420, 16F84A data sheet ,by Microchip.
6. Intel® 64 and IA-32 Architectures Software Developer's Manual: Vol. 1.

19-202-0506 COMPUTER GRAPHICS

Course Outcomes:

On completion of this course the student will be able to:

1. *Explain the organisation of an interactive computer graphics system.*
2. *Generate 2D and 3D geometrical objects.*
3. *Explain the important transformations on graphical objects.*
4. *Fill a region given boundary and clip lines and polygons against a rectangular boundary.*
5. *Describe the different types of curves and generate curves.*
6. *Apply the operations like projections and rendering for 3D picture generation.*
7. *Design graphical objects.*
8. *Design interactive graphics systems and animation systems.*

Module I

Graphic hardware: Raster scan and random scan displays, color CRTs, Hard copy output devices,interactive input devices, Output primitives –points and lines. Line drawing algorithms – dda-Bresenham, parametric and nonparametric forms of circle and ellipse, midpoint algorithms for circle and ellipse, polygon filling algorithms – boundary fill, flood fill and scan line fill, Filling arcs – pattern filling- Attributes of output primitives - Antialiasing. Graphical user interface - Logical classification of input devices.

Module II

Two dimensional transformations: Representation of points - Transformations and matrices -transformation of points- Transformations of lines – Rotation - Reflection- Scaling - Combined transformations - Homogeneous coordinates. Viewing transformations: Viewing pipeline, window to viewport transformation. Clipping: Interior and exterior clipping-Point clipping- Line clipping – Cohen Sutherland - Liang Barsky- Sutherland Hodgeman Polygon clipping- Curve clipping - Text clipping. Curves: Curve representation- Geometric and Parametric Continuity – Natural Cubic Splines – Hermite spline - Bezier curves - B-spline curves.

Module III

Polygon meshes, Quadric surfaces, sweep representations, Bezier surfaces, B-spline surfaces. Three Dimensional Transformations: Three dimensional scaling, shearing, rotation, reflection, translations - Rotation about arbitrary axis Parallel to coordinate axis- Rotation about arbitrary axis in space. Projections: Orthographic projections – Oblique projections-perspective projections and Vanishing points. Visible surfaces: classification of visible surface detection algorithms, Back Face detection method - Depth buffer method(z-Buffer algorithm)- A-Buffer method-Screen subdivision method-Painter's algorithm - Scan line algorithms- octree hidden surface elimination.

Module IV

Rendering: Illumination models-diffuse reflection – specular reflection-Determining surface normal and reflection vector- Polygon rendering – Gouraud shading- Phong Shading -Ray tracing- Texture mapping. Color models: Color- Chromacity - Tristimulus theory of color – RGB color system -CMY color system -HSV color system. Modeling techniques and fractals: Surfaces and hierarchical modeling- Hierarchical modeling with structures – Fractals. Animation: Computer assisted animation – Real-Time animation techniques.

References:

1. Donald Hearn, Pauline Baker, M., Computer Graphics with OpenGL, 3 rd Edition, Pearson Education,2004, ISBN:978-0-13-015390-6.
2. David F. Rogers, Procedural Elements for Computer Graphics, 2nd Edition, Tata McGraw Hill, 2001, ISBN-13:978-0-07-047371-3, ISBN-10:0-07-047371-4.
3. James D. Foley et.al., Introduction to Computer Graphics, Addison Wesley Publishing Company, 1994, ISBN : 0-201-60921-5.
4. David F. Rogers, Mathematical Elements for Computer Graphics, 2nd Edition, Tata McGraw-Hill,2001,ISBN-13:978-0-07-048677-5,ISBN-10:0-07-048677-8.
5. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics Principles.

19-202-0507 COMPUTER GRAPHICS LABORATORY

Course Outcomes:

On completion of this course the student will be able to:

1. *Understand and explain the mathematical and theoretical principles of computer graphics and openGL.*
2. *Familiarize generation and transformations for 2D geometrical objects, filling and clipping operations.*
3. *Design algorithms for different geometric shapes line, circle and ellipse.*
4. *Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.*
5. *Understand the practical implementation of modeling, rendering, viewing of objects in 2D, 3D etc. and describe the importance of viewing and projections.*

Note: All programs should be done using python with openGL libraries.

Cycle-I

Introduction: Study of graphical input devices and display devices and different display standards.Study of OpenGL libraries and programming techniques using python.

Implementation of algorithms for drawing 2D Primitives .

1) Line – DDA,Bresenham's
2) Circle- Bresenham's, Midpoint
3) Ellipse – Midpoint

Cycle- II

2D Filling Algorithms

1) Seed filling algorithms (recursive and non-recursive methods)
    a) Flood fill
    b) Boundary fill
2) Scanline filling

    filling a given polygon using the scan line polygon fill algorithm.

2D Geometric Transformations:

1) Translation
2) Rotation
3) Scaling
4) Reflection
5) Sheer
6) Window to Viewport
7) Composite Transformations.

Cycle-III

2D Clipping Algorithms

1) Line clipping (Cohen Sutherland, Cyrus–Beck)
2) Polygon clipping (Sutherland–Hodgman, Weiler–Atherton)

3D Transformations:

1) Translation
2) Rotation
3) Scaling

3D Projections **–** Orthographic and Perspective.

Cycle-IV

1) Programs for generating Splines.
   a) Interpolation curves.
   b) B-Spline
   c) Bezier Spline
2) Generating fractal images
3) 3D rendering
4) Simple animation programs using python animation libraries.

References:

1. Donald Hearn, Pauline Baker, M., Computer Graphics with OpenGL, 3rd Edition, Pearson Education,2004, ISBN:978-0-13-015390-6.
2. Dave Shreiner, Bill The Khronos OpenGL ARB Working Group, OpenGL Programming Guide: The Official Guide to Learning OpenGL, Versions 3.0 and 3.1, Pearson Education, 2009.ISBN: 9780321669278.
3. David F. Rogers, Procedural Elements for Computer Graphics, 2nd Edition, Tata McGraw- Hill, 2001,ISBN- 13:978-0-07-047371-3, ISBN-10:0-07-047371-4.
4. David F. Rogers,Mathematical elements for computer graphics',McGraw Hill Education; 2nd edition ,2017.ISBN: 978-0070486775.
5. PyopenGL libraries and documents , http://pyopengl.sourceforge.net/.
6. Python Tutorial, http://soe.cusat.ac.in/tutorials/python/.

19-202-0508 MICROPROCESSORS LABORATORY

Course Outcomes:

On completion of this course the student will be able to:

1. *Perform the given set of operations like 8 bit addition, subtraction, multiplication and division.*
2. *Perform code conversion, counters using 8085 microprocessor.*
3. *Perform basic arithmetic, logical and system related operations using 8086 microprocessor.*
4. *Perform peripherals and interfacing experiments using 8085 and 8086 Microprocessors.*

Cycle-I

1. Assembly language programming to explore instruction set of 8O85 using the microprocessor kit -Basic Programming
   -Sorting
   -Code Conversion
   -Counters

Cycle- II

1. Design and implementation of basic interface circuits (Any two)
   -Interfacing 8085 with 8255
   -Interfacing 8085 with 8279
   -Stepper motor
   -ADC/DAC
   -Hex keyboard
   -LCD

Cycle-III

1. x86 Assembly language programming using TASM/MASM/NASM.
   -Familiarise assembler directives, addressing modes and memory models.
   -Interrupts and functions.
   -Arithmetic operation using keyboard inputs and display on the screen (Signed and Unsigned)
   -Programs on array manipulation using Indirect, indexed and based indexed addressing modes.
   -Programs using keyboard interrupts - manipulate key functions.
   -Programs using display interrupts - managing texts and drawings.
   -Programs using disk interrupts - formatting, partitioning, file management.
   -Programs using interrupts to read and set system parameters-date, time, resolution,BIOS etc.
   -Programs to test Memory resident programs.

Cycle-IV

1. Interfacing with 8051/PIC (Any two)
   - DAC,ADC, stepper motor, hex keyboard, LCD displays, LED
2. Familiarising computer hardware components, assembling and troubleshooting.

References:

1. 8080/8085 Assembly Language Programming Manual, Intel Corporation.
2. Barry B. Brey, The 8085A Microprocessor: Software Programming, and Architecture, Prentice Hall, ISBN:9780130908049.
3. Ytha Y. Yu, Charles Marut, Assembly Language Programming and Organization of the IBM PC,McGraw-Hill, ISBN:9780071128964.
4. Sivarama P. Dandamudi, Guide to Assembly Language Programming in Linux, Springer,ISBN:10: 0-387-26171-0.
5. Jeff Duntemann, Assembly Language Step-by-Step: Programming with DOS and Linux, 2nd dition, John Wiley & Sons, ISBN:0471375233.
6. Lyla B. Das, The x86 Microprocessors:8086 to Pentium, Multi cores, Atom and the 8051 Microcontroller, 2nd Edition, Pearson Education, ISBN-13**:** 978-933253682.

19-202-0601 COMPUTER NETWORKS

Course Outcomes:

On completion of this course the student will be able to:

1. *Familiarize with fundamental underlying principles of computer networking.*
2. *Explain the details and functionality of layered network architecture.*
3. *Apply mathematical foundations to solve computational problems in computer networking.*
4. *Acquire knowledge in ethical, legal, security and social issues related to computer networking.*

Module I

TCP/IP Protocol stack - Application Layer: Application layer Protocols: - WWW and HTTP, FTP, DNS, SMTP, SNMP, RPC, P2P File sharing, Domain Name System (DNS).TCP/IP and Socket Programming.

Module II

Transport layer: Transport Layer Services, Relationship with Network Layer, Relationship with Application Layer, Multiplexing and Demultiplexing, UDP, TCP: Header, Segment Structure, Services, Connection establishment and termination, Flow control and window size advertising, TCP timeout and retransmission, Congestion Control, TCP Fairness.

Module III

Network Layer: Network layer Services, Datagram and Virtual circuit services, IP datagram format and Types of Services, The Original Classful Addressing Scheme Dotted Decimal Notation - Subnet and Classless Extensions - IP Multicast Addresses. ARP: Resolution Through Direct Mapping - Resolution Through Dynamic Binding - ARP Protocol Format- ARP Implementation . RARP.

Datagram encapsulation and Fragmentation, Reassembly and fragmentation Routing : Link state routing, distance vector routing, hierarchical routing, multicast routing.

Module IV

Data link layer services: Elementary Data link layer protocols, sliding window protocols, HDLC, Multiple access protocols, TDM, FDM, CDM Random access protocols: ALOHA, CSMA, CSMA/CD, CSMA/CA. Circuit and Packet Switching, Virtual Circuits. High speed Networks and Network programming: Physical Layer services, ISDN, BISDN, Frame relay, Fast Ethernet and Gigabit Ethernet. Properties of an Ethernet - interoperability & collision domains – Ethernet Hardware Addresses - Ethernet Frame Format - Extending An Ethernet With Bridges - Switched Ethernet -VLAN.

References:

1. James F. Kurose and Keith W. Ross, Computer Networking – A Top-Down Approach 7 th Edition, Pearson Education, 2016, ISBN: 978-1292153599.
2. Douglas E. Comer, Computer Networks and Internet, 6th Edition, Pearson Education, 2018, ISBN: 978-9352869152.
3. Behrouz A. Fourouzan, Firouz Mosharraf, Computer Networks - A Top Down Approach,Tata McGraw Hill, 2017, ISBN: 13978-1-25-900156-7.
4. Andrew S. Tanenbaum and David J. Wetherall, Computer Networks, 5th Edition, Pearson education, 2013, ISBN: 978- 9332518742.

19-202-0602 COMPILER CONSTRUCTION

Course Outcomes:

On completion of this course the student will be able to:

1. *Summarize the functionality of each phase involved in compilation process.*
2. *Develop scanner and parser using lex and yacc tools.*
3. *Design top down parsers including recursive descent parser and non-recursive predictive parser for CFGs.*
4. *Design bottom up parsers including shift reduce, operator precedence and LR parsers (SLR, CLR and LALR).*
5. *Explain Syntax directed translation using S-attributed definition and L-attributed definition.*
6. *Familiarize specification for a type checker and run time environment.*
7. *Comprehend different representations of intermediate code.*
8. *Describe various code optimization techniques to improve the performance of a program and learn code generation techniques.*

Module I

Compiler: Introduction – Analysis of the source program – phases of a compiler – Lexical analysis – Role of the lexical analyser – Input Buffering -- Specification of tokens – Recognition of tokens – Lexical analyser generators.

Module II

Syntax Analysis – Role of the parser – Context free grammars – Top-down parsing – Bottom-up parsing –Operator precedence parsing – LR parsers (SLR, Canonical LR, LALR) – Parser generators.

Module III

Syntax-directed translation – Syntax-directed definitions – S-attributed definitions –L-attributed definition – Top-down and bottom-up translation – Type checking – Type systems – Specification of a type checker. Run time environment – Source language issues – Storage organization – Storage allocation strategies – Access to nonlocal names – Symbol tables.

Module IV

Intermediate code generation – Intermediate languages – Declarations – Assignment Statement – Boolean Expression – Procedure calls - Code optimization – Introduction – Sources of optimization – Introduction to data flow analysis. Code generator – Issues in the design of a code generator, the target machine, A simple code generator.

References:

1. Alfred V. Aho, Ravi Sethi & Jeffrey D. Ullman, Compilers Principles, Techniques & Tools, Pearson.
2. Kenneth C. Louden, Compiler Construction: Principles and Practice, Thomson Learning, India.
3. Keith D. Cooper & Linda Torczon, Engineering a Compiler, 2nd Edition, Elsevier, New Delhi.
4. Muchnick, S.S., Harcourt Asra, Advanced Compiler Design implementation, Morgan Kaufman.
5. Alan Holub, Compiler Design in C, PHI.

19-202-0603 ANALYSIS AND DESIGN OF ALGORITHMS

Course Outcomes:

On completion of this course the student will be able to:

1. *Analyse a given algorithm and express its worst, best and average time and space complexities in asymptotic notations.*
2. *Solve recurrence equations using Substitution Method, Changing Variables, Recursion Tree and Masters Theorem.*
3. *Understand the dynamic programming paradigm and its algorithmic design solutions.*
4. *Familiarise optimization problems using Greedy Method.*
5. *Design efficient algorithms using Backtracking and Branch and Bound Techniques for solving problems.*
6. *Familiarize some approximation algorithms and the benefit of using them.*
7. *Classify computational problems into P, NP, NP-Hard and NP-Complete complexity classes.*

Module I

Introduction to algorithm analysis-Time and Space Complexity-Classifying functions by their asymptotic growth rate-Best, Worst and Average case complexities-Complexity Calculation of simple algorithms (sequential and iterative algorithms).

Recurrence Equations-Analyse Recursive algorithms, Solution of recurrence equations-Substitution Method, Changing Variables, Recursion Tree, Masters Theorem-divide and conquer and decrease and conquer. Introduction to design techniques-Divide and conquer-Decrease and Conquer-Dynamic Programming-Greedy Programming-Backtracking.

Module II

Analysis of searching Algorithms and Sorting Algorithms-Linear Search and Binary Search.

Sorting- In Place and Stable Sorting-Insertion Sort, Bubble Sort, Quick Sort, Merge Sort and Heap Sort - Comparison of sorting Algorithms.

Analysis of complex Data Structures-Binomial Heap, Fibonacci Heap, AVL Tree and Red Black Tree. Amortized Analysis.

Module III

Graph Algorithms- DFS and BFS Traversal-Complexity. Greedy Strategy-Spanning Tree, Minimum spanning Tree- Prim’s and Kruskal Algorithm-Complexity.

Dynamic Programming- The optimality Principle-optimal Matrix chain multiplication, Transitive Closure, Bellman ford algorithm for all pair shortest path in a graph. Backtracking- The N queens Problem.

Module IV

Introduction to Complexity Theory- Tractable and Intractable Problems-P and NP, Polynomial Reductions, NP-Hard and NP Complete Complexity Classes.NP Complete Problems- Bin Packing, Graph Colouring, Travelling salesman problem.

Approximation Algorithms, Algorithm for parallel Computers-PRAM models and simple PRAM algorithms.

References:

1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Computer Algorithms,Universities Press, 2007.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, MIT Press, 2009.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, The Design and Analysis of Computer Algorithms, Pearson Education, 1999.
4. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Pearson, 3rd Edition, 2011.
5. Gilles Brassard, Paul Bratley, Fundamentals of Algorithmics, Pearson Education, 1995.
6. Richard E. Neapolitan, Kumarss Naimipour, Foundations of Algorithms using C++ Psuedocode, Second Edition, 1997.

19-202-0604 DATA MINING

Course Outcomes:

On completion of this course the student will be able to:

1. *Analyse various types of data, its collection and cleaning.*
2. *Illustrate and analyse various applications of data mining.*
3. *Analyse and compare various classification models in data mining.*
4. *Understand developments in big data technologies.*
5. *Familiarize the concepts of machine learning using R/Python.*
6. *Analyse and make use of deep learning using R/Python.*

Module I

Data Mining-Purpose-Various phases of data mining - supervised vs. unsupervised - learning - Data Warehouses - OLAP - Multidimensional databases - Data Pre-processing-Case studies in data pre-processing-Different applications of data mining.

Module II

Association Rules mining-Apriori algorithm-Examples-Improvements for apriori algorithm-Classification concepts, mathematical notions and case studies-Decision trees, Neural networks, Naïve Bayes classifier, KNN, Support vector machines.

Module III

Cluster Analysis-K-Means algorithm-Example and suggestions for improvements- A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods (DBSCAN), Time series mining, Graph Mining-Case studies-Introduction to rough sets-Mathematical Notions.

Module IV

Introduction to cloud computing-Services from a cloud- Big Data-definition-data bases for the big data platform-Introduction to Hadoop its architecture and ecosystem. MapReduce-basic concepts-Introduction to Spark-Deep learning-Concepts-CNN and RNN- Typical usecase.

References:

1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques – 3rd Edition, Elsevier, 2011.
2. Richard Royger, Data mining – 1st Edition, CRC Press, 2nd Edition, 2017.
3. Tom White, Hadoop: The definitive guide, 3rd edition, OReilly Publishers, 2012.
4. Karau. H. et.al, Learning Spark: lightning-fast big data analysis, OReilly Publishers, 2015 hadoop, tom white.
5. Ian H.Witten et.al, Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kofman publishers. 4th edition, 2016.
6. Ian Good fellow et.al, Deep learning, First edition, MIT Press, 2016.

19-202-0605 ARTIFICIAL INTELLIGENCE

Course Outcomes:

On completion of this course the student will be able to:

1. *Explain the characteristics of software agents and java framework for implementing agents.*
2. *Describe important search techniques and their suitable problem domains.*
3. *Define knowledge representation and deduction methods.*
4. *Describe the important phases in natural language processing.*
5. *Apply the AI principles and techniques to solve problems.*
6. *Analyse the problems and suggest a suitable problem solving method.*

Module I

Software agents – agent characteristics, agent topology, and agent oriented programming, Java implementation of intelligent agents. AI domains-Problem Characteristics - Problem spaces- search: DFS, BFS - Production systems- Swarm intelligence- genetic algorithm.

Module II

Heuristic search techniques: Generate and Test - Hill climbing -Best first - A* algorithm. Problem reduction –AO*algorithm, constraint satisfaction - Means Ends analysis. Game playing: Minimax – Alpha-betacut-off.

Module III

Logic and Deduction: Introduction to symbolic logic - Propositional logic - Well Formed Formula-Predicate Logic - predicates variables and constants - First order logic, Quantifiers- Forward and backward chaining-Resolution by refutation- Unification- Goal trees.

Module IV

Representing Knowledge: Procedural versus Declarative. Reasoning under uncertainty: Non Monotonic reasoning –support lists and dependency directed backtracking - Statistical reasoning: Bayes theorem. Bayesian networks. Fuzzy Logic, Semantic Nets, Frames, Conceptual Dependency, Scripts, CYC. Natural Language Processing. Learning: Types of learning.

References:

1. Elaine Rich and Kevin Knight, Artificial Intelligence, Tata McGraw-Hill, Third Edition, ISBN: 13:978-0-07-008770-5, 2010.
2. Jeffrey M. Bradshaw, Software Agents, AAAI Press/ The MIT Press (1997) (Module 1), ISBN: 0-262-52234-9.
3. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, Prentice Hall India Ltd., 2009, ISBN: 81-203-0777-1 (modules 2,3,4).
4. Stuart Russell and Peter Norvig, Artificial Intelligence – A Modern Approach. 3rd Edition, Prentice Hall, 2009.
5. Padhy, N.P., Artificial intelligence and intelligent systems, 2010, 0-19-567154-6.
6. Jurafsky D., Martin J.H., Speech and natural language processing, Second Edition, Prentice Hall, 2008, ISBN 10: 0131873210.

19-202-0610 OPERATING SYSTEM LABORATORY

Course Outcomes:

On completion of this course the student will be able to:

1. *Develop shell scripts.*
2. *Implement scheduling algorithms.*
3. *Write programs using system calls.*
4. *Write programs to implement inter process communication.*
5. *Write system level programs.*

Cycle-I

1. Study of different system calls.
2. Programs using the system calls of linux operating system-fork,exec,getpid,exit,wait,close,stat,opendir,readdir.
3. Programs using the I/O system calls of Linux operating system.
4. Programs to simulate Linux commands like ls,grep etc

Cycle- II

1. Programs to study and analyse various scheduling policies.
2. Programs to study uses of semaphore.
3. Programs to implement page replacement algorithms.

Cycle-III

1. Programs to implement IPC using shared memory, pipes, and message queue.
2. Linux shell programming.
3. Kernel programming--Linux Kernel configuration, compilation and rebooting from the newly compiled kernel.
4. Kernel space programming: Implement and add a loadable kernel module to Linuxkernel, demonstrate using insmod, lsmod and rmmod commands.
5. Developing device drivers.
6. Creating Linux distributions from debian source.

References:

1. Richard Stevens, W., UNIX Network Programming: Interprocess communications, Volume 2,Second Edition, Prentice Hall, ISBN: 9780130810816.
2. Peter Jay Salzman, Michael Burian, Ori Pomerantz, The Linux Kernel ModuleProgramming Guide. http://www.tldp.org/LDP/lkmpg/2.6/lkmpg.pdf.
3. Robert Love, Linux Kernel Development, 3rd Edition Addison-Wesley Professional, ISBN: 978- 0672329463.
4. Mark G. Sobell, Practical Guide to Linux Commands, Editors, and Shell Programming, 3rd Edition, Prentice Hall, ISBN-13: 978-033085044.

19-202-0611 MINI PROJECT

Course Outcomes:

On completion of this course the student will be able to:

1. *Identify project topic of current relevance.*
2. *Explain software development cycle with emphasis on different processes - requirements, design and implementation phases.*
3. *Develop confidence at having conceptualized, designed and implemented a working, medium sized project.*
4. *Learn how to work as a team and to do a working project on time with each student taking responsibility for their part in the project.*
5. *Familiarise document and report preparation.*

The students are expected to develop an application in the field of embedded system / mobile application / any other current relevant topic. They have to do a proper system study and prepare SRS and design documents.

Each batch comprising of 3 to 5 students. Each student shall submit a project report at the end of the semester. The project report should contain the design and engineering documentation and test results. Product has to be demonstrated for its full design specifications. Innovative design concepts, reliability considerations and aesthetics / ergonomic aspects taken care of in the project shall be given due weight.

Guidelines for evaluation:

i) Attendance and Regularity	5
ii) Work knowledge and Involvement	15
iii) Semester end presentation & Oral examination	10
iv) Level of completion and demonstration of functionality/specifications	10
v) Project Report	10
Total	50 marks

Note: External projects and R&D projects need not be encouraged at this level. Points (i) & (ii) to be evaluated by the project guide & coordinator and the rest by the final evaluation team comprising of 3 teachers including the project guide.

19-202-0606 WEB TECHNOLOGIES

Course Outcomes:

On completion of this course the student will be able to:

1. *Write programs in PHP language for server side scripting.*
2. *Understand XML and processing of XML Data with Java.*
3. *Develop server side programming using JSP.*
4. *Use client side scripting using Javascript.*
5. *Use AJAX with PHP and Mysql.*

Module I

Introduction to PHP: Variables, data types, numbers, date, arrays, strings. Operators, Expressions, Control structures, Functions, Handling POST and GET methods, Connecting to database (MySQL or Postgres), executing queries and handling results, managing sessions and cookies, PHP file handling: open, read, write and closing files. Working with Images.PHP errors and exception handling. Security Considerations in PHP. Object Oriented Programming with PHP.

Module II

Introduction of XML- Features of XML, Anatomy of XML document, The XML Declaration, Defining XML tags, their attributes and values, Document Type Definition, XML Schemas, Document Object Model, XHTML Parsing XML Data. XMLHttpRequest- Introduction, XMLHttpRequest, The XMLHttpRequest Object, Events for the XMLHttpRequest Object, Request Object for XMLHttpRequest, Response Object for XMLHttpRequest.

Module III

JavaServer Pages (JSP): Introduction, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.Error and exception handling in JSP.

Module IV

Java Script : Client side scripting with JavaScript , variables, functions, conditions, event handlers ,loops and repetition, Pop up boxes, Form validation, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web browser environment.AJAX: Introduction, AJAX Introduction, AJAX Components, Handling Dynamic HTML with Ajax. AJAX Database, Working of AJAX with PHP, Ajax PHP Database Form, AJAX PHP MySQL query.

References:

1. Kogent Learning Solutions Inc. Web Technologies, HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML AND AJAX Black Book.Dreamtech Press**,**Wiley India Pvt.Ltd.,2009. ISBH: 978-8177229974.
2. Uttam Kumar Roy, Web Technologies, Oxford University Press.2010. ISBN: 978-0198066224.
3. Alan Forbes,The Joy of PHP: A Beginner's Guide to Programming Interactive Web Applications with PHP and MySQL,CreateSpace Independent Publishing Platform, 2012. ISBN: 978-1522792147.
4. Hans Bergsten, JavaServer Pages, 3rd Edition,O'Reilly Media ,2009. ISBN: 978-0596005634.
5. David Flanagan,JavaScript:The Definitive Guide, 6th edition, O'Reilly Media,ISBN:978-059680552.

19-202-0607 SOFTWARE PROJECT MANAGEMENT

Course Outcomes:

On completion of this course the student will be able to:

1. *Gain knowledge on the issues and challenges to be faced while managing a software project.*
2. *Familiarise with various project scheduling techniques, project control and monitoring.*
3. *Identify factors that influence the performance of team members in a project environment.*
4. *Explain the role of continuous training, improve team working and select appropriate leadership styles.*

Module I

Introduction And Software Project Planning: Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of Project plan, Structure of a Software Project Management Plan, software project estimation, Estimation methods, Estimation models, Decision process.

Module II

Project Organization And Scheduling: Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts, Milestone charts, Gantt Charts.

Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

Module III

Monitoring And Control: Creating Framework – Collecting the Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back To Target – Change control –Managing contracts – Introduction – Types of Contract – Stages in Contract Placement – Typical Terms of a Contract – Contract Management – Acceptance.

Module IV

Managing People and Organizing Teams: Introduction – Understanding Behavior – Organizational Behaviour: A Background – Selecting the Right Person For The Job – Instruction in the Best Methods –Motivation – The Oldman – Hackman Job Characteristics Model – Working in Groups – Becoming a Team –Decision Making – Leadership – Organizational Structures – Stress – Health and Safety – Case Studies.

References:

1. Jalote, software Project Management in Practice, First edition, Pearson Education, ISBN: 978-7-30-210682-1.
2. Bob Hughes, Mike cotterell, Software Project Management, Third Edition, Tata McGrawHill, ISBN: 978-0-07-070653-8.
3. Ramesh, Gopalaswamy, Managing Global Projects, First edition, Tata McGraw Hill, ISBN:978-0-07-059897-3.
4. Royce, Software Project Management, 1st Edition, Pearson Education, ISBN: 978-0-2-0130958-4.

19-202-0608 DIGITAL IMAGE PROCESSING

Course Outcomes:

On completion of this course the student will be able to:

1. *Outline the basics of image processing.*
2. *Interpret image enhancement techniques.*
3. *Illustrate image restoration and segmentation techniques.*
4. *Infer image compression techniques.*
5. *Identify current technologies and applications of image processing.*

Module I

Introduction-Digital image representation, Fundamental steps in image processing, Components of image processing system. Digital image fundamentals- Sampling and quantization, relationship between pixels. Image transforms-2D DFT, DCT, Walsh-Hadamard transform, Haar Transform, Wavelet Transform.

Module II

Image enhancement-Spatial domain methods-Basic Gray Level Transformations, Histogram Processing. Basics of Spatial Filtering-Smoothing, Sharpening. Frequency Domain Methods-low pass filters, high pass filters, homomorphic filters.

Module III

Image restoration- Degradation model, Inverse filtering, Wiener filter, constrained least squares filtering. Morphological Image Processing-Dilation and Erosion, Opening and Closing. Fundamentals of color image processing-Color models-RGB, CMY, CMYK, and HSI. Pseudocolor Image Processing- Intensity slicing, gray level to color transformation.

Module IV

Image Segmentation-Detection of Discontinuities, edge linking and boundary detection, thresholding, region based segmentation, use of motion in segmentation.

Image compression-Error-free Compression-variable length coding, LZW coding, bit plane coding, lossless predictive coding, Lossy compression-lossy predictive coding, transform coding, wavelet coding, Image compression standards.

References:

1. Rafael C., Gonzalez & Woods R.E., Digital Image Processing, 3rd edition, Pearson Education, 2008.
2. Anil K Jain, Fundamentals of Digital Image Processing, Prentice Hall India, 2010.
3. William K Pratt, Digital Image Processing, 4th Edition, John Wiley and Sons, 2007.
4. Ioannis Pittas, Digital Image Processing Algorithms and Applications, John Wiley, 2000.

19-202-0609 BIOINFORMATICS

Course Outcomes:

On completion of this course the student will be able to:

1. *Demonstrate different biological databases and tools.*
2. *Apply algorithms for searching the biological databases.*
3. *Categorize sequence alignment methods.*
4. *Implement phylogenetic tree construction algorithms.*
5. *Predict gene and protein secondary structure.*
6. *Analyse genomic sequence.*

Module I

Introduction to Bioinformatics and computational biology-Nature and scope of Bioinformatics--Bio informatics tools and databases-Biological Databases - Major biological databases and its classification, sequence and structure file formats, Biological data types.

Module II

Sequence Analysis-Sequence Alignment-Types of sequence alignment -Global, local- Pair wise alignment - Multiple sequence alignment- Application of multiple alignments- Tools for Multiple Sequence Alignment-Methods of Sequence Alignment- Dot matrix, Dynamic programming algorithm, Word method alignment, Progressive Methods- BLAST, PSI BLAST.

Module III

Phylogeny - Phylogenetic Trees-Tree Topologies-Distance matrix methods, Character based methods. Solving UPGMA, NJ and small parsimony problems. Methods of evaluating phylogenetic methods-bootstrapping, jackknifing.

Module IV

Macromolecular Structure Analysis -Gene prediction, Gene prediction approaches, Conserved domain analysis, Protein visualization, Prediction of protein secondary structure, Tertiary structure prediction-stereo chemical properties.

References:

1. CynthiaGibas, PerJambeck, Developing Bioinformatics Computer Skills O’Reilly MediaInc a 2001.
2. David Edwards, Jason Eric Stajich, David Hansen, Bioinformatics Tools and Applications, Springer, 2009.
3. S C Rastogi, N Mendiratta and P Rastogi, " Bioinformatics: Methods and Applications" , ISBN : 978-81-203-4785-4, PHI Learning Private Limited, 2015.
4. David W Mount, Bioinformatics: Sequence and genome analysis, Cold spring harbor laboratory press, 2nd Edition, 2004.
5. Attwood, T.K., Parry, D.J., Smith, Introduction to Bioinformatics, Pearson Education, 2005.
6. Stan Tsai C., Bio macro molecules: Introduction to Structure, Function and Informatics, John Wiley & Sons, 2007.

19-202-0701 PRINCIPLES OF MANAGEMENT

Course Outcomes:

On completion of this course the student will be able to:

1. *Understand the basic principles underlying in the management of organizations.*
2. *Get exposure in all industrial management functions .*
3. *Get knowledge to analyse the financial accounts and ratios .*
4. *Understand the principles of economics and IPR aspects.*

Module I

Basic concept of Management: Introduction, definitions of managements, characteristics of management, levels of management, management skills, Scientific management - Contributions of Gilbreth and Gantt.

Functions of Management: Planning, forecasting, organizing, staffing, directing, motivating, controlling, co-coordinating, communicating, decision making.

Organization: Introduction, definition of organization, elements of organization, process of organization, principles of organization, formal and informal organization, organization structure, types of organization structure.

Forms of Business Organization: Concept of ownership organization, types of ownership, Individual ownership, partnership, joint stock company, private and limited company, co-operative organizations, state ownership, public corporation

Module II

Production planning and control: Objectives and functions.

Production management: Structure, objectives, productivity index, modern productivity improvement techniques.

Inventory Management: Functions, classifications of inventory, basic inventory models, inventory costs, Economic order quantity (EOQ). Materials Requirement Planning – Objectives, Functions and methods.

Project Management: Functions, Characteristics, Feasibility studies, Project network analysis – PERT/CPM.

Module III

Human Resource Management: Introduction, definition, objectives, characteristics, functions, principles and organization of HR management, Recruitment, selection process and training methods, Wages and incentives, Job evaluation and merit rating, Industrial accidents-causes and related issues

Marketing Management: Introduction, Functions and objectives, Marketing environment and Information, Market segmentation, Distribution channels, Consumer and Industrial markets, Consumer behaviour, Pricing methods, Sales promotion and Advertisement. Market research: Objectives and methods.

Module IV

Financial Management: Basic functions, Capital-classifications, Sources of funds, Financial accounts-types, basic concepts and importance, Financial ratios and its significance, Types of budgets and budgetary controls, Overheads, Standard costing, Marginal costing.

Economics: Principles of economics, problem of scarcity, demand, supply, utility, time value of money, inflation and deflation, Consumer Demand Curve.

IPR Aspects: General introduction to IPR, eligibility for patent, patent information and prior art search, procedure for filing patent application, rights of patent owner and duration, ownership of patent and commercialization.

References:

1. Fraidoon Mazda, Engineering Management, Addison-Wesley, (1997).
2. Koontz and O’Donnell, Essentials of Management, Mc Graw Hill, (1978).
3. Kotler P., Marketing Management, Prentice Hall, (2011).
4. Prasanna Chandra, Finance Management, Tata Mc Graw Hill, (2008).
5. Monks, J. G., Operations Management, Mc Graw Hill, (1982).
6. Production and Operations Management,PHI(2010).

19-202-0702 ADVANCED COMPUTER NETWORKS

Course Outcomes:

On completion of this course the student will be able to:

1. *Interpret internetworking approaches and issues.*
2. *Explain routing and management protocols.*
3. *Categorize technologies used in wireless transmission.*
4. *Identify latest technologies used in telecommunication systems.*

Module I

Multimedia Networking-Multimedia Networking Applications,Streaming stored Video, Voice over IP, Protocols for Real-time conversational applications, Network Support for Multimedia- Scheduling Mechanisms, Diffserv.

Module II

Internet Routing: Routing Between Peers (BGP)-Routing Within An Autonomous System (RIP, OSPF).Internet Multicasting : Ethernet Multicast- IP Multicast- IGMP-DVMRP-PIM. Understanding Router Components: Ports-Queueing- Scheduling-shaping-policing-marking. QoS in IP networkk. IPv6: Frame formats-Comparison with IPv4. Introduction to ICMP,DHCP and NAT. Network Management: SNMP and RMON models.

Module III

Wireless transmission: Frequencies for radio transmission-Signals-Antennas-Signal propagation-Multiplexing-Modulation-Spread spectrum-Cellular systems. Medium access control: SDMA-FDMA-TDMA-CDMA-Comparison of S/T/F/CDMA.

Module IV

Mobile Comminication System: GSM,:-System Architecture, Radio Interface, Protocols, Addressing-Call management and Handover. GPRS and UMTS networks. HSDPA and HSPA Protocols.- LTE and Advanced LTE Standards – VoLTE .Wireless LAN(WiFi): Infrared vs radio transmission-Infrastructure and ad-hoc network-IEEE 802.11a,b,g, 802.15 and 802.16 protocol standards – Bluetooth - Principle of WiMax . Mobile IP.

References:

1. Douglas E.Comer, Internetworking With TCP/IP Volume 1: Principles Protocols, and Architecture, 5/e ,Prentice Hall,2006. (Module I and II), ISBN:978-8-12-031053-7
2. Martin Sauter,From GSM to LTE-Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband, 3rd Edition,Wiley, ISBN**:** 978-1119346869
3. Schiller, Mobile Communication, 2/e , Addison Wesley, 2005 (Module III and IV) ISBN:978-0321123817
4. Youlu Zheng and Shakil Akhtar, Networks for Computer Scientist and Engineers, Oxford University Press,2006
5. James.F.Kurose & Keith W.Ross , Computer Networking –A Top Down approach featuring Internet, 3/e, Pearson Education,2005.
6. Douglas E.Comer, Computer Network and Internets, 2/e, Person education ,2003.

19-202-0703 CRYPTOGRAPHY AND NETWORK SECURITY

Course Outcomes:

On completion of this course the student will be able to:

1. *Identify security issues in the network and provide data security over the network.*
2. *Familiarise cryptographic algorithms, hash codes and digital signatures.*
3. *Examine the issues and structure of authentication service and electronic mail security.*
4. *Familiarise with network security protocols used to protect against threats in the network.*
5. *Familiarise methods for authentication, access control, intrusion detection and prevention.*

Module I

Introduction- Security problem in computing, Security in networks. Elementary cryptography-Introduction-Substitution,Transposition,Hill Ciphers and Affine Ciphers.Review of number Theory-Modular arithmetic.

Module II

Encryption Algorithms- Symmetric key encryption - DES- The Feistel cipher structure. The avalanche effect. Modes of operations of DES algorithm. AES-S-boxes.

Module III

Public Key Encryption- RSA Cryptosystem. Primality testing-Miller-Rabin Algorithm.Key Management-Diffie- Hellman- Cryptosystem-ElGamal Scheme Elliptical Curve Cryptography and Elliptic curves over Finite Fields. Hash Algorithms- SHA 1 and SHA-512 MAC-HMAC.

Module IV

Authentication protocols, Authentication applications-Kerberos,X.509,Digital Signature, Secure e-mail, SSL,IP Security - Intruders -Malicious Software,Firewalls.

References:

1. Cryptography and Network Security – Principles and Practice: William Stallings, Pearson Education, 6th Edition.
2. Cryptography and Network Security: Atul Kahate, Mc Graw Hill, 3rd Edition.
3. Cryptography and Network Security: C K Shyamala, N Harini, Dr T R Padmanabhan, Wiley India, 1st Edition.
4. Cryptography and Network Security : Forouzan Mukhopadhyay, Mc Graw Hill, 3rd Edition.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning.
6. Principles of Computer Security: WM. Arthur Conklin, Greg White, TMH.

19-202-0712 LANGUAGE PROCESSORS LABORATORY

Course Outcomes:

On completion of this course the student will be able to:

1. *Design assemblers and macro processors .*
2. *Design deterministic finite automata for any language.*
3. *Implement lexical analyser.*
4. *Implement YACC programs for any context free grammar.*
5. *Design any top-down or bottom-up parsing algorithm.*

Cycle-I

Implementation Two Pass Assemblers,Macro Processors and Deterministic Finite Automata.

Cycle- II

Implementation of LEX programs.

Cycle-III

Implementation of YACC programs.

Cycle-IV

Implementation of parsing algorithms.

References:

1. Hopcroft J. E., Motwani,R. and Ullman J. D., Introduction to Automata Theory, Languages, and Computation, 3rd Edition, ISBN : 978-03-214-5536-9.
2. Padma Reddy, A.M., Finite Automata and Formal Languages,1st Edition,Pearson , Education ISBN 978-81-317-6047-5.
3. Mishra, K.L.P. and Chandrasekaran, N., Theory of Computer Science, Automata, Languages and Computation, 3rd Edition, PHI, 2014, ISBN 978-81-203-2968-3.
4. Peter Linz, An Introduction to Formal Languages and Automata, 4th Edition, Narosa Publishing Co., ISBN 978-81-7319-781-9.

19-202-0713 NETWORKS LABORATORY

Course Outcomes:

On completion of this course the student will be able to:

1. *Familiarise network components and structured cabling.*
2. *Write programs for various communication algorithms.*
3. *Familiarise configuration of various servers and firewalls.*
4. *Do simulations of various network protocols using network simulator such as ns3.*
5. *Design of communication system using embedded boards.*

Cycle-I

1. Familiarizing computer network components--a)Cables b)Connector c)Switches and Hub d) Router e) Network Cards etc.
2. Structured cabling, Creating VLAN using switches and routers, Experiments on subnetting and supernetting.
3. Socket programming--Implement TCP and UDP in UNIX domain, Single chatting program, Multi Chat program using Multithread, Applet chatting.

Cycle- II

4. Program to test error detection and correction codes.
5. Program to test various data compression algorithms.
6. Program to test public key and symmetric key cryptography method.
7. Program to test various message digest algorithms.

Cycle - lll

8. Simulations of CSMA / CD , Aloha and Slotted Aloha protocols.
9. Simulations to test ARP and RARP.
10. Simulation to test CSMA/CA.
11. Simulations to test congestion and flow control methods in TCP and UDP.
12. Simulations to test various routing protocols.
13. Programs using pcap libraries to packet capture and analysis.
14. Install and configure various servers- file server, ssh server, web server, database server etc.
15. ACL, firewall and use of "iptables".
16. Design of communication system using GSM, 3G,GPS and RFID modules using Raspberry-pi,Arduino or Edison Board .

References:

1. Richard Stevens,W., Unix network programming ,The Sockets Networking API,Vol.1,3rd edition, Addison-Wesley Professional ISBN:9780131411555.
2. Douglas E. Comer, Hands-on Networking with Internet Technologies, Pearson Education.
3. Todd Lammle, CCNA: Cisco Certified Network Associate Study Guide,John Wiley and Sons, ISBN:9780470410486.
4. Emad Aboelela, Network Simulation Experiments Manual, The Morgan Kaufmann Series in Networking, Elsevier. ISBN:9780123852113.
5. Jack L. Burbank, An Introduction to Network Simulator 3(ns3), Wiley-Blackwell. ISBN: 978111815899.

19-202-0714 ENTREPRENEURSHIP DEVELOPMENT

Course Outcomes:

On completion of this course the student will be able to:

1. Develop awareness about the importance of entrepreneurship opportunities available in the society.

2. Get acquainted with the challenges faced by the entrepreneur.

Excercises

1. To study the types of entrepreneurs and the factors affecting entrepreneurial growth.
2. To make an assessment of the major motives influencing an entrepreneur.
3. To make an overview of the various stress management techniques.
4. How to identify and select a good business opportunity?
5. Preparation of a techno economic feasibility report for a given project.
6. Preparation of a preliminary project report for a given project.
7. To identify the various sources of finance and management of working capital.
8. Carry out the costing and break even analysis of a proposed project.
9. Preparation of a PERT / CPM chart for the various activities involved in a project.
10. To make a study of the various causes and consequences of sickness in small business and identify corrective measures.

References:

1. Roy Rajeev, Entrepreneurship, Second edition, Oxford Latest Edition, 2011.
2. Gordon, E., & Natarajan, K., Entrepreneurship Development, Fourth edition, Himalaya, 2007.
3. Coulter, Entrepreneurship in Action, Second edition, PHI, 2008.
4. Jain, P.C., Handbook for New Entrepreneur, Oxford University Press, 2003.
5. Khanka, S.S., Entrepreneurial Development, Fifth edition, S. Chand and Co, 2013.

Note: There will only be continuous evaluation for this course. The evaluation will be based on the performance of the student in the exercises given above. A minimum of 50% marks is required for a pass.

19-202-0715 PROJECT PHASE I

Course Outcomes:

On completion of this course the student will be able to:

1. *Conduct literature survey in a relevant area of course of study and finally identify and concentrate on a particular problem.*
2. *Formulate a project proposal including the analysis and design phases through extensive study of literature and / or discussion with learned resource persons in academy or industry.*
3. *Generate a proper execution plan for the project work to be carried out in PhaseII through deliberations.*
4. *Improve presentation skills.*

The project work shall commence in the seventh semester shall be completed by the end of eighth semester. Students are expected to identify a suitable project and complete the analysis and design phases by the end of seventh semester. For those students who are doing real life projects in the industry should also have both an external guide in the industry and an internal guide in the department. The internal guides are responsible for the continuous evaluation. Each batch comprising of 3 to 5 students shall identify a project related to the curriculum of study.

At the end of the semester, each student shall submit a project synopsis comprising of the following.

• Application and feasibility of the project
• Complete and detailed design specifications
• Block level design documentation
• Detailed design documentation including algorithms/circuits
• Project implementation action plan using standard presentation tools

Guidelines for evaluation:

i.	Attendance and Regularity	10
ii.	Quality and adequacy of design documentation	10
iii.	Concepts and completeness of design	10
iv.	Theoretical knowledge and individual involvement	10
v.	Quality and contents of project synopsis	10
		Total: 50 Marks

Note: Points (i)-(ii) to be evaluated by the respective project guides and project coordinator Based on continuous evaluation. (iii)-(v) to be evaluated by the final evaluation team comprising of 3 Internal examiners including the project guide.

19-202-0716 INDUSTRIAL INTERNSHIP

Course Outcomes:

On completion of this course the student will be able to:

1. *Acquire insights into tasks and problems which are usually not experienced in an academic environment.*
2. *Get an exposure to real-world professional activities, which will help them to gain better understanding of their academic curriculum contents.*
3. *Work with various groups of professionals, managers, technicians, etc.*
4. *Polish their engineering skills by applying knowledge in trouble shooting, software development, software maintenance, etc.*
5. *Build relations with academic institutions and industry that will help mutual cooperation in long-term.*
6. *Appreciate their social and ethical responsibilities.*

Every Student shall undergo a summer internship programme of minimum two weeks duration in an IT industry /Public Sector Organization during the May-June vacation before the commencement of the VII semester and submit a report on their work. The evaluation shall be conducted based on presentation and report.

19-202-0704 ARTIFICIAL NEURAL NETWORKS

Course Outcomes:

On completion of this course the student will be able to:

1. *Analyse the working of the human brain.*
2. *Design a artificial network to mimic some functionality of the human brain.*
3. *Design neural networks for classification problems.*
4. *Design network structures suitable for a given type of problem.*
5. *Implement systems to recognize various patterns, images, sound, characters etc.*

Module I

Introduction to neural networks. Artificial neural networks. Biological neural networks- Comparison, Basic building blocks of ANN. Activation functions. McCulloch-Pitts Neuron Model, Hebb net. Learning Rules- Hebbian Learning Rules, Perceptron, Delta, Competitive,. Perceptron networks-single layer, multilayer –algorithm.

Module II

Feedback Networks, Discrete Hopfield nets,. Feed Forward Networks: Back Propagation Networks, Learning Rule, Architecture, training algorithm. Counter Propagation Network: Full CPN, Forward only CPN, architecture, training phases.

Module III

Self Organizing feature maps: Kohonen SOM, Learning Vector Quantization, Max net, Mexican Hat, Hamming net. Associative memory networks, Algorithms for pattern association Hetero associative networks, Auto associative memory networks ,Bidirectional associative memory networks.

Module IV

Special networks: Simulated Annealing, Boltzmann machine,Cauchy machine, Support Vector Machine Classifiers. Application of Neural networks In Image Processing and classification. Introduction to Fuzzy systems, Operations of fuzzy logic, fuzzy sets, Membership functions, Fuzzy techniques, Neuro fuzzy systems.

References:

1. Dr. Sivanandam, S.N., Introduction to neural networks using MATLAB 6.0, Tata McGrawHill New Delhi.,2012 , ISBN 978-0-07-059112-7.
2. Laurene Fausett, Fundamentals of neural networks, Prentice Hall, New Jersey, 2007. ISBN 81- 317-0053-4.
3. James A. Freeman, David M. Skapura, Neural Networks Algorithms,Applications and Programming Techniques, Addison-Wesley, 2003 ISBN 81-7808-108-3.

19-202-0705 ADVANCED MOBILE COMMUNICATIONS

Course Outcomes:

On completion of this course the student will be able to:

1. *Understand various generation of mobile technologies.*
2. *Analyze the latest trends in mobile communication.*
3. *Identify the research areas in 4G and 5G.*
4. *Understand core concepts used in various generations of mobi*le communications.

Module I

Overview & Classification of Mobile Communication Systems. Mobile Communication Channel. Modeling of Propagation Loss. Diversity reception. Cellular System Concepts. Ways of increasing system capacity. First Generation Cellular Telephony.

Module II

GSM Cellular Telephony. GSM Architecture. Radio Transmission Parameters of GSM. GSM Logical Channels. GSM Burst Structures. Call setup Procedures & Handover in GSM System. Data Transmission in GSM. HSCSD, GPRS, EDGE. CDMA in Mobile Communication Systems. Spreading Sequences. Basic Transmitter & Receiver Schemes in CDMA Systems. RAKE Receiver. Multi Carrier CDMA. IS- 95 System. Digital Cordless Telephony .Wireless Local Loops.

Module III

Third Generation Mobile Communication Systems. IMT 2000. Concepts of UMTS. UTRA FDD Mode, UTRA TDD Mode.WCDMA. CDMA 2000. Application of Smart Antennas in Cellular Applicable to batch upto admitted in Aug 2011 Telephony. Satellite Mobile Communication Systems. Iridium, GlobalStar, ICO Systems.

Module IV

Fourth Generation Mobile Communication Systems. Forerunner versions : 3GPP Long Term Evolution (LTE) , Mobile WiMAX (IEEE 802.16e) , TD-LTE for China market. IMT-2000 compliant 4G standards : LTE Advanced, IEEE 802.16m or Wireless MAN-Advanced . 5G : Research Constraints, Small cells, SON (self–organizing networks), future of 5G, internet and other related technologies.

References:

1. Hazyszt of Wesolowski, Mobile Communication Systems, Wiley.
2. Theodore S. Rappaport, Wireless Communications Principles & Practice, Pearson Education, Jochen Schiller, Mobile Communications, Pearson Education.
3. Raj Pandya, Mobile & Personal Communication Systems And Service, PHI.
4. Martin Sauter, 3G, 4G and Beyond: Bringing Networks, Devices and the Web Together.
5. Dr. AnwarM.Mousa, Perspective of Fifth Generation Mobile Communications University of Palestine, Gaza- Palestine.

19-202-0706 EMBEDDED SYSTEM DESIGN

Course Outcomes:

On completion of this course the student will be able to:

1. *Demonstrate the architecture of Embedded Systems.*
2. *Summarize the characteristic of Embedded Systems.*
3. *Illustrate the features of Embedded Operating Systems.*
4. *Apply the concepts of scheduling algorithms to solve scheduling problems in Embedded Systems.*
5. *Demonstrate the design procedure and analysis of Embedded Systems.*
6. *Develop solutions to simple computation problems using ARM instructions.*

Module I

Concepts of control system: Definitions-open loop system-closed loop system, Embedded computing--characteristics of embedded computing applications-challenges in embedded computing system design -embedded system design process. Instruction set--ARM processor-ARM Processor and Memory Organizations-Data Operations.

Module II

CPU- Programming input and output-supervisor mode-exceptions and trap-co-processors-CPU performance-CPU power consumption. Computing platforms- basic computing platforms-Platform hardware components-Platform software components-The CPU bus-Bus organization and protocol-DMA-System Bus Configuration

Module III

Program Design and analysis-components for embedded programs-models of program-Assembly, linking and loading-Compilation techniques-compiler optimizations. Software performance optimization -program validation and testing.

Module IV

Processes and OS-multiple tasks and multiple processes-Multirate systems-Preemption real-time OS-priority based scheduling-Rate montonic scheduling-Earliest deadline first scheduling-Interprocess communication mechanisms.Network and multiprocessors-categories of multiprocessors-MPSoCs and shared memory multiprocessors.

References:

1. MarilynWolf,ComputersasComponents,4th Edition,MorganKaufmann Publishers.
2. Raj Kamal, Embedded System, Architecture programming and Design, 3rd Edition.
3. Vahid, Embedded System Design: A Unified Hardware/Software Introduction, John Wiley &Sons.ISBN:9788126508372.
4. Jack Ganssle The Art of Designing Embedded Systems, Second Edition ,Newnes, ISBN:9780080568799.
5. Tammy Noergaard, Embedded Systems Architecture, Newnes,ISBN:978-81-8147-997-6.
6. Arun Ghosh,IntroductionToControlSystems,2nd Edition, PHILearningPvt.Ltd.,ISBN-13:9788120348202.

19-202-0707 COMPUTER VISION

Course Outcomes:

On completion of this course the student will be able to:

1. *Familiarise both theoretical and practical aspects of computing with images.*
2. *Describe the foundation of image formation, measurement and analysis.*
3. *Implement common methods for robust image matching and alignment.*
4. *Understand the geometric relationships between 2D images and the 3D world.*
5. *Gain exposure to object and scene recognition and categorization from image.*
6. *Develop the practical skills necessary to build computer vision applications.*

Module I

Image formation and Image model-Components of a vision system-Cameras-Radiometry-Light in space-Light in surface- sources, shadows and shading, Color-Human color perception-Representation of color- A model for image color-Surface color from image color. Early vision-Linear Filters and Convolution-Shift variant Linear system- Spatial Frequency and Fourier Transforms-Sampling and Aliasing-Filters as Templates-Normalized correlation and finding patterns-Edge detection-Texture Representation, Analysis and Application.Recognition Methodology: Conditioning, Labeling, Grouping, Extracting.

Module II

Multiple images-The Geometry of multiple views-Stereopsis-Affine structure from motion- Elements of Affine Geometry-Affine structure and motion from two images-Affine structure and motion from multiple images-From Affine to Euclidean images. Matching Morphological Image Processing: Introduction, Dilation, Erosion, Opening, Closing, Hit-or-Miss transformation, Morphological algorithm operations on binary images, Morphological algorithm operations on gray-scale images, Thinning, Thickening, Region growing, region shrinking.

Module III

Binary Machine Vision: Thresholding, Segmentation, Connected component labeling, Hierarchical segmentation, Spatial clustering, Split & merge, Rule-based Segmentation, Motion-based segmentation. Area Extraction: Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line fitting, Curve fitting (Least-square fitting). Middle level vision-Segmentation by clustering-Shot Boundary Detection and Background Subtraction-Image segmentation by clustering pixels-Segmentation by Graph-Theoretic clustering- Segmentation by fitting a model-The Hough Transform-Fitting lines-Fitting curves- Fitting as a probabilistic inference problem-Robustness-Segmentation and fitting using probabilistic methods.

Module IV

High level vision-:Geometric methods-Model based vision-Obtaining hypothesis by pose consistency, pose clustering and using Invariants- Verification-smooth surface and their outlines-Aspect graphs-Range data-Range Data segmentation- Range image Registration and model acquisition-Object Recognition.Shape correspondence and shape matching Principal component analysis Shape priors for recognition.

References:

1. Computer vision – A modern Approach , David A forsyth & Jean ponce , Prentice Hall ,2002.
2. Computer vision and Applications , Bernd Jahne and Horst HauBecker Academic press ,2000.
3. Robert Haralick and Linda Shapiro, "Computer and Robot Vision", Vol I, II, AddisonWesley, 1993.
4. Milan Sonka,Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision" Thomson Learning.
5. Computer Vision:Algorithms and Applications by Richard Szliski.
6. Ma, Soatto, Kosecka and Sastry (MaSKS) An Invitation to 3D Vision.

19-202-0708 MOBILE APPLICATION DEVELOPMENT

Course Outcomes:

On completion of this course the student will be able to:

1. *Outline the architectures and infrastructure used in Mobile application development.*
2. *Identify user interface and client applications.*
3. *Evaluate the security issues involved in Mobile application development.*
4. *Design and develop android and iOS applications.*

Module I

Introduction-Mobility,Developing Mobile Applications.Mobile application architectures-Client-Server,Client, Server, Connection-types,synchronization,architectural patterns, design tenets. Mobile Infrastructure-Mobile Device Types, Mobile Device Components, Connection Methods.

Module II

Mobile client user interface-User interface, Application content, User experience, best practices for developing user interface. Mobile Client Applications- Thin client, Fat Client, Web page hosting,best practices. Client-Server data transfer-HTTP and HTML, WAP and WML, Synchronization software, RDA and Merge Replication, SOAP and WEB services,Message Queues, TCP/IP

Module III

Mobilizing Existing Application Architectures-Evolution of Enterprise Architectures, Anatomy of Enterprise Web Architecture, Considerations. Security- Mobilized Enterprise Web Architecture,User to Mobile client security issues,Mobile client security issues,client-server communication security issues,existing web architectures and back-end systems security issues.

Module IV

Developing android app-Using eclipse for android development,android navigation and interface design,persistent data in android,lists in android,maps and locations in android, access to hardware and sensors in android.Developing iOS app- Using Xcode for iOS development,iOS navigation and interface design,persistent data, tables,maps and locations, access to hardware and sensors in Ios

References:

1. Valentino Lee, Heather Schneider and Robbie Schell, Mobile Applications: Architecture, Design and Development, Prentice Hall, 2004.
2. Jakob Iversen and Michael Eierman,Learning Mobile App Development,A hands-on Guide to building apps with iOS and android, Addison-wesley,2014.
3. Dawn Griffiths, Head First Android Development, O'Reilly Media, Inc, 2015.
4. Jeff McWherter, Scott Gowell, “Professional Mobile Application Development” ,Wiley India Private Limited

19-202-0709 SYSTEM MODELLING AND SIMULATION

Course Outcomes:

On completion of this course the student will be able to:

1. *Summarize the various simulation and modeling tools used.*
2. *Interpret how different modelings are done mathematically.*
3. *Outline how and when to collect simulation data for modeling.*
4. *Acquire knowledge in advancements in computer based simulation scenarios.*

Module I

Introduction to simulation: Introduction – Simulation Terminologies – Advantages and Disadvantages of simulation-Application areas – Model Classification – Types of Simulation – Steps in a Simulation study – Concepts in Discrete Event Simulation – Simulation Examples

Module II

Mathematical Models: Statistical Models – Concepts – Discrete Distribution – continuous Distribution – Poisson Process – Empirical Distributions – Queueing Models – Characteristics – Notation – Queueing Systems – Markovian Models – Properties of random numbers – Generation of Pseudo Random numbers– Techniques of generating random numbers – Testing random number generators - Generating Random – Variates – Inverse Transform technique – Acceptance – Rejection technique – Composition & Convolution Method.

Module III

Analysis Of Simulation Data: Input Modeling – Data collection – Assessing sample independence – Hypothesizing distribution family with data – Parameter Estimation – Goodness-of-fit tests – Selecting input models in absence of data – Output analysis for a Single system – Terminating Simulations – Steady state simulations. Verification and validation: Model Building – Verification of Simulation Models – Calibration and Validation of Models – Validation of Model Assumptions – Validating Input – Output Transformations.

Module IV

Simulation of Computer Systems and Case Studies:Simulation Tools – Model Input – High level computer system simulation – CPU – Memory Simulation – Comparison of systems via simulation – simulation Programming techniques – Development of Simulation models.

References:

1. Jerry Banks and John Carson, Discrete Event System Simulation, 4th Edition, PHI, 2005.
2. Geoffrey Gordon,System Simulation,2nd Edition, PHI, 2006,ISBN 978-81- 203-014005.
3. Frank L.Severance, System Modeling and Simulation, Wiley, 2001.
4. Averill M. Law and David Kelton, W.,Simulation Modeling and Analysis, 3rd Edition, McGraw Hill, 2006.
5. Jerry Banks, Handbook of Simulation: Principles, Methodology, Advances, Applications and Practice Wiley, 1998.
6. Jerry Banks, Carson, J.S., Barry L. Nelson, David, M. N., Shahabudeen, P.Discrete - Event System Simulation, Pearson 4th Edition.

19-202-0710 CYBER LAW AND ETHICS

Course Outcomes:

On completion of this course the student will be able to:

1. *Explain the different forms of IPR's and related rules and regulations and the laws applicable to computer and software related contracts.*
2. *Identify different forms of Cyber crimes and the Indian and International laws to combat Cyber crimes and facilitate e-commerce.*
3. *Reason out different situations of ethics faced in the cyber world.*
4. *Analyse the ethical issues in computer society.*

Module I

Intellectual property rights, computer software copyrights, copyright in databases and electronic publishing, trade secrets, patent laws, trademarks, industrial designs, international implications of IPR Computer contracts, liability for defective hardware and software, Contract for writing software, Licence agreements, Website development contracts, Electronic contracts and torts, Liability of ISP's.

Module II

Computer crime, computer frauds, hacking, unauthorized modification of information, piracy, cyber harassment. cyberstalking, cyber defamation. Domain names and cybersquatting.

Module III

Cyber law in India ,IT Act 2000- Objectives, Provisions under IT Act, Authentication of electronic records, Digital signature,Offences under the IT Act 2000: sections 65 to 74, Case studies, Positive aspects and grey areas of the IT Act.Protection of IPR in Cyber space in India: copyright, patents; IPR's needing protection.

Module IV

International organizations to regulate e-commerce and cyber crimes, COE convention on cyber crimes.Ethical issues in computer security, Case studies.

References:

1. D. Bainbridge, Introduction to Information Technology Law, 6/e, Pearson Education, 2007.
2. Harish Chander, Cyber Laws and IT Protection, PHI Learning Private Limited, 2012.
3. P. Duggal, Cyber law: the Indian Perspective, Saakshar Law Publications, Delhi, 2005.
4. C. P. Fleeger and S. L. Fleeger, Security in Computing, 3/e, Pearson Education, 2003.

19-202-0711 BUSINESS INTELLIGENCE AND ANALYTICS

Course Outcomes:

On completion of this course the student will be able to:

1. *Explain the basic concepts and need of Business Intelligence and Analytics.*
2. *Explain how Business Intelligence and Analytics works.*
3. *Explain EPLC and what is expected of Business Intelligence and Analytics*
4. *Relate data mining and business intelligence.*
5. *Make use of existing data for prediction in Certain, Uncertain and risky situations.*
6. *Summarize the Role of Big Data and Big Data analytics.*
7. *Summarize recent and emerging trends in this area.*
8. *Apply various modeling techniques and propose an appropriate technique.*

Module I

Introduction to Business Intelligence, Business Modeling and Analytics, History and Evolution, Data, information, knowledge and intelligence. Enterprise Performance Life Cycle (EPLC).Decision making: key issues, frameworks for computerized decision support: Classical Framework, Decision Support Systems, Business Intelligence, Business Analytics; Phases of decision making and assisting foundations and technologies.

Module II

Importance and Role of : Data Warehousing, Visualization and Visual Analytics. Data mining: Concepts, Process and Methods. Using Artificial Neural Network and Support Vector Machines: Learning Process and Prediction. Mathematical models for decision support. Case studies.

Module III

Certainty, Uncertainty and Risk; Decision Tables and Decision Trees; Heuristic Search, Simulation and Genetic Algorithms; Knowledge Management. Understanding Big Data and Big Data analytics. Familiarize tools and technologies enabling for Big Data analytics. Role of Data Scientist. Case studies.

Module IV

Analytics by mining/analysis of : Text, Web, Sentiment, Speech, Social Networks,Geospatial and location based data. Advanced Applications and emerging trends. Potential of Cloud Computing.
Ethical and Legal issues with data collection and analytics.

References:

1. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Second Edition.
2. C. M. Bishop, Pattern recognition and Machine Learning, Springer 2007.
3. M. Mitchell, Machine Learning. Publisher, McGraw Hill, Edition 1997.
4. P. Harrington, Machine learning in action, Manning Publications Co,2012.
5. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press, Second Edition.
6. Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning – Data Mining, Inference, and Prediction”, Springer, Second Edition.

19-202-0801 ADVANCED ARCHITECTURE AND PARALLEL PROCESSING

Course Outcomes:

On completion of this course the student will be able to:

1. *Summarize multiprocessors and multicomputer.*
2. *Utilize message passing mechanisms.*
3. *Outline memory hierarchy and caching mechanisms.*
4. *Elaborate pipelining and parallel programming.*

Module I

Parallel computer models-state of computing, multiprocessors and multicomputer, multivector and SIMD computers, PRAM and VLSI models, architectural development tracks. Program and Network Properties-Conditions of Parallelism, Program Partitioning and Scheduling, Program Flow Mechanism, System Interconnect Architectures. Principles of Scalable Performance-Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches.

Module II

Processors and Memory Hierarchy-Advanced Processor Technology, Superscalar and Vector Processors, Memory hierarchy technology, virtual memory technology. Bus, Cache and Shared Memory-Bus Systems, Cache Memory Organizations, Shared-Memory Organizations, Sequential and Weak Consistency Models.

Module III

Pipelining and Superscalar Techniques-Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline design, Arithmetic Pipeline Design. Multiprocessor and Multicomputer-Multiprocessor System Interconnects, Cache Coherence and Synchronization Mechanisms, Message Passing Mechanisms. Vector Processing Principles.

Module IV

Parallel Programming- Parallel Programming Models, Parallel Languages and Compilers. Instruction Level parallelism- Design issues, model of typical processor, compiler-directed instruction level parallelism, operand forwarding, Tomsula’s algorithm, branch prediction, thread level parallelism.

References:

1. Kai Hwang, Naresh Jotwani, Advanced Computer Architecture Parallelism, Scalability, Programmability, 3rd edition, McGraw-Hill Education,2011
2. Dezso Sima, Terence Fountain, Peter Karasuk, Advanced Computer Architecture-A design space approach, Pearson Education,2012
3. Sajjan G Shiva, Advanced Computer Architecture, CRC Taylor & Francis,2006.
4. David E Culler, Jaswinder Pal Singh, Anoop Gupta, Parallel Computer Architecture, Elsevier.
5. Hwang and Briggs,Computer Architecture and Parallel Processing,McGraw Hill.

19-202-0814 SEMINAR

Course Outcomes:

On completion of this course the student will be able to:

1. *Identify and familiarize with some of the good publications and journals in his/her field of study.*
2. *Acquaint with preparation of independent reports, name them based on a central theme and write abstracts, main body, conclusions and references.*
3. *Familiarize the effective use of tools for presentation and generate confidence in presenting a report before an audience.*
4. *Develop skills like time management, leadership quality and rapport with an audience.*

Students shall individually prepare and submit a seminar report on a topic of current relevance related to the field of Computers either hardware or software. The reference shall include standard journals, conference proceedings, reputed magazines and textbooks, technical reports and URLs.

The references shall be incorporated in the report following IEEE standards reflecting the state-of-the-art in the topic selected. Each student shall present a seminar for about 30 minutes duration on the selected topic. The report and presentation shall be evaluated by a team of internal experts comprising of 3 teachers based on style of presentation, technical content, adequacy of references, depth of knowledge and overall quality of the seminar report.

19-202-0815 PROJECT PHASE II

Course Outcomes:

On completion of this course the student will be able to:

1. *Apply required theory and experiments on the problem related to industry / research identified in Phase-I and solve it.*
2. *Realize various steps involved in conducting a project work, like literature survey, methodology adopted (field study / survey / experiments / numerical work), analysis of data to arrive at final results and conclusions.*
3. *Familiarize proper report writing with all of its major components with proper style of writing and preparation of distinct abstract and conclusions.*
4. *Conceive the benefits of working as a team and the wonderful results which could evolve through team-work.*
5. *Present and defend self-prepared report, verified by the project guide before a peer audience.*

The project work commencing from the seventh semester shall be completed and the project report shall be submitted by each student by the end of eighth semester. There shall be an internal examination of the project that includes a presentation, demonstration and oral examination of the project work.

Each batch of students shall develop the project designed during the seventh semester. The implementation phase shall proceed as follows:

A detailed algorithm level implementation, test data selection, validation, analysis of outputs and Necessary trial run shall be done.

Integration of hardware and software, if applicable, shall be carried out.

A detailed project report in the prescribed format shall be submitted at the end of the semester. All test results and relevant design and engineering documentation shall be included in the report. The work shall be reviewed and evaluated periodically

A committee consisting of the Project Coordinator (appointed by the Head of the Department / Division), project guide and at least one senior faculty member will carry out the assessment based on at least one Interim review and a final review just before the submission of the project report.

The final evaluation of the project shall be done by a team of minimum 3 internal examiners including the Project guide and shall include the following

Presentation of the work

Oral Examination

Demonstration of the project against design specifications

Quality and content of the project report

Guidelines for evaluation:

(i) Regularity and progress of work	40
(ii) Work knowledge and Involvement	40
(iii) Semester end presentation and oral examination	40
(iv) Level of completion and demonstration of functionality/specifications	40
(v) Project Report – Presentation style and content	40
Total	200 marks

Note: Points (i) and (ii) to be evaluated by the respective project guide and the project coordinator based on continuous evaluation. (iii)-(v) to be evaluated by the final evaluation team.

19-202-0816 COMPREHENSIVE VIVA VOCE

Course Outcomes:

On completion of this course the student will be able to:

1. *Summarize all the subjects covered during the course.*
2. *Build good knowledge of theory and practice.*
3. *Develop oral communication skills and positive attitude.*
4. *Face technical interviews with confidence.*

Each student is required to appear for a viva-voce examination at the end of the complete course work. The examination panel shall comprise of Head of the Department / Division or his / her nominee and one senior faculty of the Department / Division and an external expert. The examination panel should be appointed by the University. The examiners shall evaluate the students in terms of their conceptual grasp of the course of study and practical/analysis skills in the field.

19-202-0802 BIG DATA ANALYTICS

Course Outcomes:

On completion of this course the student will be able to:

1. *Familiarize with the big data concepts and terminologies.*
2. *Compare and classify the cloud platforms and its services.*
3. *Familiarize the various components in Hadoop and MapReduce programming model.*
4. *Compare and analyse Apache with Hadoop.*
5. *Familiarize frequent use cases of big data in industry.*
6. *Analyse how existing machine learning applications can be scaled to big data domain.*

Module I

Data mining concepts, Applications of data mining, Stages of data mining-types of data mining applications -Data pre-processing- - data normalization, data transformation- data reduction-Web mining and text mining- case studies.

Module II

Introduction to cloud computing: Differences between cloud, cluster and grid. Cloud computing fundamentals, public vs. private clouds, Types of cloud services-PaaS, SaaS, IaaS, Examples for each service. Role of virtualization in enabling the cloud, Application Development: Service creation environments to develop cloud based applications. Development environments for service development: Amazon, Azure, Google App-Social network analysis-Tools and applications-Examples.

Module III

Introduction to Big Data: MapReduce Basics: Functional Programming Roots, Mappers and Reducers,The Execution Framework, Partitioners and Combiners, The Distributed File System, Hadoop Cluster Architecture, A word count example with MapReduce.

MapReduce Algorithm Design: Local Aggregation, Combiners and In-Mapper Combining, Algorithmic Correctness with Local Aggregation, Pairs and Stripes, Computing Relative Frequencies, Secondary Sorting, Relational Joins

Module IV

Big Data and Hadoop: Introduction to Hadoop Distributed File System, Hadoop ecosystem, MapReduce Implementation with Hadoop, Big Data Management Tools: PIG: Pig's Data Model, HIVE: Hive Architecture, HIVEQL, HBASE: MapReduce Integration, ZooKeeper, SQOOP. Introduction to Spark and its architecture. Comparison of Hadoop with spark. Different databases for big data platform: Cassendra, Neo4j

Case studies: Algorithms for Mining massive datasets for various kinds of research problems and projects for e-Governance.

References:

1. Jimmy Lin and Chris Dyer, Morgan & Claypool, Data-Intensive Text Processing with Map Reduce, Synthesis Lectures, 2010.
2. Anthony T. Velte, Toby J. Velte, Elsenpeter, R., Cloud Computing a practical approach, Tata McGraw-HILL, 2010.
3. kJiawei Han & Micheline Kamber, Morgan Kaufmann, Data Mining – Concepts and Techniques -Publishers, Elsevier,2nd Edition, 2006
4. Ian H.Witten, Frank, E., Hall, M.A., Data mining-Practical machine learning tools and techniques,Third edition, Elsevier Publications.
5. Margaret H. Dunham and Sridhar, S., Data Mining: Introductory and Advanced Topics , First edition,Pearson Education.
6. Karau, H. et.al, Learning Spark: lightning-fast big data analysis , OReilly Publishers.

19-202-0803 CLOUD COMPUTING

Course Outcomes:

On completion of this course the student will be able to:

1. *Identify benefits and challenges of cloud computing and services.*
2. *Explain structure of cloud architecture.*
3. *Illustrate cloud virtualization concepts.*
4. *Discuss the challenges in cloud security.*
5. *Analyze different cloud services.*

Module I

Cloud Computing: History of Cloud Computing - Cloud Computing definition, private, public and hybrid cloud. Cloud types : IaaS, PaaS, SaaS - Cloud Architecture - Cloud Storage - Why Cloud Computing Matters - Advantages of Cloud Computing - Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud - Disadvantages of Cloud Computing - Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery - Companies in the Cloud Today - Cloud Services - Next generation Cloud Applications.

Module II

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization -Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

Module III

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development - Design Challenges - Inter Cloud Resource Management - Resource Provisioning and Platform Deployment - Global Exchange of Cloud Resources. Security Overview - Cloud Security Challenges and Risks - Software-as-a-Service Security - Risk Management - Security Monitoring - Security Architecture Design - Data Security - Application Security - Virtual Machine Security – Identity Management and Access Control -Autonomic Security.

Module IV

Web-Based Application - Pros and Cons of Cloud Service Development - Types of Cloud Service Development - Software as a Service - Platform as a Service - Web Services - On-Demand Computing - Discovering Cloud Services Development Services and Tools - Amazon EC2 - Google App Engine , Windows Azure. Programming Support - Google App Engine, Amazon AWS, Windows Azure - Cloud Software Environments - Eucalyptus, Opennebula, OpenStack, Aneka, CloudSim.

References:

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, Morgan Kaufmann Publishers, 2012.
2. John W. Rittinghouse and James F. Ransome, Cloud Computing: Implementation, Management,and Security, CRC Press, 2010.
3. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing, A Practical Approach, TMH,2009.
4. Kumar Saurabh, Cloud Computing – insights into New-Era Infrastructure,Wiley India,2011.
5. George Reese, Cloud Application Architectures: Building Applications and Infrastructure in the Cloud O'Reilly.
6. James E. Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes ,Elsevier/Morgan Kaufmann, 2005.

19-202-0804 COMPUTATIONAL LINGUISTICS

Course Outcomes:

On completion of this course the student will be able to:

1. *Identify the theoretical foundation of natural language processing in linguistics and formal language theory.*
2. *Explain the elements and applications of parts of speech tagging and parsing.*
3. *Explain the elements of semantic analysis.*
4. *Compare rule based and statistical algorithms used in NLP.*
5. *Discuss the limitations and capabilities of current natural language processing technologies.*

Module I

Words- Regular Expressions and Finite Automata-Morphology and Finite State Transducers- Probabilistic Models of Pronunciation and Spelling -N grams, HMMs and speech recognition, computational phonology and Text to speech.

Module II

Syntax- Word Classes and Part-of-Speech Tagging and chunking-HMM Taggers- probabilistic Context Free Grammars for English Syntax-Parsing with Context Free Grammars- lexicalized and probabilistic parsing- Features and Unification-Language and Complexity.

Module III

Semantics-Representing Meaning-canonical forms- FOPC-ambiguity resolution-scoping phenomena -Semantic Analysis-syntax driven semantic analysis-Lexical Semantics-Word Sense Disambiguation and Information Retrieval.

Module IV

Pragmatics- Discourse-Reference Resolution -Text Coherence -Dialog and Conversational Agents- Dialogue acts-dialogue structure, natural language generation, Statistical alignment and machine translation-clustering- text categorization.

References:

1. Daniel Jurafsky and James Martin, Speech and Language Processing, 2nd Edition, PH, 2008.
2. James Pustejovsky, Amber Stubbs, Natural language annotation for machine learning, O’Reilly, 2012.
3. Alexander Clark and Chris Fox, The Handbook of Computational linguistics and natural language processing, Wiley-Blackwell, 2012.
4. Grant S Ingersoll, Thomas Morton, Andrew L Farris, Taming Text, Manning Publications, 2013 Christopher D. Manning and Hin Rich Schutze, Foundations of statistical natural language processing, 1st Edition, MIT press, 1999.

19-202-0805 HIGH PERFORMANCE COMPUTING

Course Outcomes:

On completion of this course the student will be able to;

1. *Design a powerful and cost effective computer system.*
2. *Provide the basic concepts of parallel processing on high performance computers*
3. *Analyse the various paradigms of high performance computing and their potential for performance and programmability.*
4. *Explain different parallel processing architectures.*

Module I

Introduction to parallel processing-Trends towards parallel processing-Parallelism in uniprocessor-parallel computer structures-Architecture classification schemes,Amdahl's law,Indian contribution to parallel processing.

Module II

Principles of pipelining and vector processing-Linear pipelining-Classification of pipeline processors-General pipelines-Instruction and Arithmetic pipelines–Design of Pipelined instruction unit-Principles of Designing Pipeline Processors-Instruction prefetch and branch handling -Data Buffering and Busing Structure-Internal forwarding and register tagging-Hazard detection and Resolution, Dynamic pipelines and Reconfigurability.

Module III

Array processors -SIMD array processors-Interconnection networks-Static vs dynamic networks-mesh connected networks-Cube interconnection networks-Parallel algorithms for array processors-SIMD matrix multiplication -Parallel sorting on array processors-Associative array processing-Memory organization.

Module IV

Multiprocessor architectures and Programming-Loosely coupled and Tightly coupled multiprocessors-Interconnection networks-Language features to exploit parallelism-Interprocess communication mechanism-Process synchronisation mechanisms,synchronization with semaphores.

References:

1. Computer Architecture &Parallel Processing-Kai Hwang &FayeA.Briggs, McGraw Hill.
2. Computer architecture A quantitative approach-John L Hennessy and David A.Patterson-Elsevier,Fourth Edition.
3. Elements of Parallel computing-V. Rajaraman-PHI.
4. Parellel Processing for Super Computers & AI Kai Hwange & Douglas Degneot Mc Graw Hill.
5. HIgh Performance Computer Architecture-Harold S. Stone, Addison Wesley.
6. Advanced Computing-Vijay P.Bhatkar, Asok V.Joshi,Arirban Basu, Asok K.Sharma.

19-202-0806 MACHINE LEARNING

Course Outcomes:

On completion of this course the student will be able to:

1. *Explain various learning approaches and concepts of supervised learning.*
2. *Compare the different dimensionality reduction techniques.*
3. *Make use of theoretical foundations of decision trees to identify best split and Bayesian classifier.*
4. *Make use of clustering algorithms.*
5. *Identification of classifier models for typical machine learning applications.*
6. *Combine algorithms and analyze different algorithms.*

Module I

Introduction to machine learning: importance, identification of Problems, data sets, Types of Learning, application examples. Supervised Learning: Learning a Class, Vapnik-Chervonenkis(VC) Dimension, Probably Approximately Correct(PAC) Learning, Learning multiple Classes, Regression, Model Selection and Generalization. Bayesian Decision Theory; Parametric Methods: Maximum Likelihood Estimation, Bias and Variance, The Bayes' Estimator.

Module II

Dimensionality reduction: Subset Selection, Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis. Unsupervised Learning: Clustering, Mixture Densities, k-Means Clustering, Expectation-Maximization Algorithm, Mixtures of Latent Variable Models, Supervised Learning after Clustering, Hierarchical Clustering, Choosing the Number of Clusters.

Module III

Nonparametric Methods: Nonparametric Density Estimation, Generalization to Multivariate Data, Nonparametric Classification, Condensed Nearest Neighbor, Nonparametric regression. Decision Trees: Univariate Trees, Pruning, Rule Extraction from Trees, Learning Rules from Data, Multivariate Trees. Kernel Machines: SVM, Optimal Separating Hyperplane, Soft Margin Hyperplane, ν-SVM, Kernel Trick, Vectorial Kernels, Defining Kernels.

Module IV

Graphical models: Discrete Markov Processes and Hidden Markov models, example graphical models. Reinforcement Learning : model based and temporal difference learning. Combining multiple Learners: Ensembles, model combination schemes, Voting, Bagging, Boosting. Neural Networks: Perceptrons, Training, Learning boolean functions, Back Propagation, Multilayer Perceptrons, Deep Neural Networks. Competitive Learning, Radial Basis Function.

Design and Analysis of Machine Learning Experiments, Structural risk minimization.

References:

1. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, Second Edition .
2. C. M. Bishop, Pattern recognition and Machine Learning, Springer 2007.
3. M. Mitchell, Machine Learning. Publisher, McGraw Hill, Edition 1997.
4. P. Harrington, Machine learning in action, Manning Publications Co,2012.
5. Stephen Marsland, Machine Learning: An Algorithmic Perspective, CRC Press, Second Edition.

19-202-0807 AGENT BASED INTELLIGENT SYSTEM

Course Outcomes:

On completion of this course the student will be able to:

1. *Define the algorithmic foundation of agents and multi agent systems.*
2. *Explain theoretical foundations of agent based system.*
3. *Apply Bayesian networks for probabilistic reasoning.*
4. *Create logical agents to do inference using first order logic.*

Module I

Introduction: Definitions – Foundations – History – Intelligent Agents – Problem Solving –Searching – Heuristics – Constraint satisfaction Problems – Game Playing. Knowledge representation and reasoning: Logical agents – First order logic – First Order Inference – Unification – Chaining – Resolution Strategies – Knowledge Representation – Objects – Actions – Events.

Module II

Planning Agents: Planning Problem – State Space Search – Partial Order Planning _Graphs – No deterministic Domains – Conditional Planning – continuous Planning – Multiagent Planning.

Module III

Agents And Uncertainty: Acting under uncertainty – Probability Notation – Bayes Rule and use – Bayesian Networks – Other approaches – Time and Uncertainty – Temporal Models – Utility Theory – Decision Network – Complex Decisions.

Module IV

Higher Level Agents: Knowledge in Learning – Relevance information –Statistical Learning Methods – Reinforcement Learning – Communication – Formal Grammar – Augmented Grammars-Future of AI.

References:

1. Stuart Russell and Peter Norvig, Artificial Intelligence – A Modern Approach. 3rd Edition, Prentice Hall, 2009.
2. Michael Wooldridge, An Introduction to Multi Agent System, 2nd Edition, John Wiley,. ISBN: 978-0-470-51946-2.
3. Winston, Patrick Henry, Artificial intelligence, Addison Wesley ,2008.

19-202-0808 AUGMENTED REALITY

Course Outcomes:

On completion of this course the student will be able to:

1. *Define alternative 3D compositing techniques using computer vision.*
2. *Extend knowledge in 3D vision.*
3. *Develop applications in interactive interfaces most notably augmented reality interfaces on mobile devices.*
4. *Develop skills in the design and development of interactive augmented reality games.*

Module I

Introduction of Virtual Reality:Fundamental Concept and Components of Virtual Reality-Primary Features and Present Development on Virtual Reality.

Multiple Modals of Input and Output Interface in Virtual Reality:Input-Tracker, Sensor,Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3D Scanner etc. Output-Visual /Auditory / Haptic Devices.

Module II

Visual Computation in Virtual Reality:Fundamentals of Computer Graphics. Software and Hardware Technology on Stereoscopic Display. Advanced Techniques in CG: Management of Large Scale Environments & Real Time Rendering

Environment Modeling in Virtual Reality:Geometric Modeling, Behavior Simulation,Physically Based Simulation.Interactive Techniques in Virtual Reality:Body Track, Hand Gesture, 3D Manus, Object Grasp.

Module III

Introduction of Augmented Reality (AR):System Structure of Augmented Reality. Key Technology in AR.Development Tools and Frameworks in Virtual Reality:Frameworks of Software Development Tools in VR. X3D Standard; Vega, MultiGen, Virtools etc.

Module IV

Application of VR in Digital Entertainment :VR Technology in Film & TV Production.VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.

References:

1. Virtual Reality Technology(2nd Ed.)–Grigore C. Burdea & Philippe Coiffet.John Wiley & Sons, Inc. 2003.
2. Sherman, William R. and Alan B. Craig. Understanding Virtual Reality – Interface,Application, and Design, Morgan Kaufmann,2002.
3. Fei GAO. Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.
4. Julie Carmigniani and Borko Furht.Handbook of Augmented Reality, DOI10.1007/978-1-4614-0064-6 1.

19-202-0809 ETHICAL HACKING

Course Outcomes:

On completion of this course the student will be able to:

1. *Outline the vulnerabilities in a system or network.*
2. *Analyze and critically evaluate techniques used to break into an insecure web application and identify relevant countermeasures.*
3. *Demonstrate a critical evaluation of an advanced security topic with an independent project.*
4. *Critically evaluate the potential counter measures to advanced hacking techniques.*
5. *Explain computer forensic fundamentals.*

Module I

Ethical Hacking−Overview-Hacker types-Threats and attacks ,Vulnerabilities, Phases of hacking-Reconnaissance-Scanning-Maintaining Access with Backdoors and Rootkits-Clearing traces. System Hacking-Hacking Windows-Hacking UNIX-Remote connectivity and VoIP Hacking. Software Hacking-Hacking code-Web Hacking-Hacking the Internet User.

Module II

Password Hacking-Dictionary attack-Hybrid Dictionary attack-Brute force attack-Rainbow tables. A study on various attacks– Input validation attacks – SQL injection attacks – Buffer overflow attacks - Privacy attacks.

Module III

TCP / IP – IP Spoofing, port scanning, DNS Spoofing. Dos attacks – SYN attacks, Smurf attacks, UDP flooding, DDOS – Models. Batch File Programming.

Module IV

Overview of computer forensics technology: computer forensics services-Data seizure-Data duplication and preservation-Data recovery-Document searches-Media conversion-Expert witness services-Computer evidence service options-Other miscellaneous services.

References:

1. Hacking Exposed: Network Security Secrets & Solutions, Stuart McClure, Joel Scambray and George Kurtz, McGraw-Hill, 2005.
2. Patrick Engebretson, The Basics of Hacking and Penetration Testing, Elsevier, 2013.
3. Network intrusion alert: an ethical hacking guide to intrusion detection, Ankit Fadia, Manu Zacharia, Thomson Course Technology PTR, 2007.
4. Ethical Hacking, Thomas Mathew, OSB Publisher, 2003.
5. Network Security and Ethical Hacking, Rajat Khare, Luniver Press, 2006.
6. John R. Vacca, Computer Forensics: Computer Crime Scene Investigation, 2nd Edition.

19-202-0810 HIGH PERFORMANCE EMBEDDED COMPUTING

Course Outcomes:

On completion of this course the student will be able to:

1. *Analyze how to improve the quality of the programs on high performance embedded computer systems.*
2. *Identify the basic architectural techniques and analyze performance and energy consumption for both hardware and software.*
3. *Outline the characteristics of HPEC.*
4. *List the parallel processing methods in embedded systems.*
5. *Define the program optimization and performance analysis.*

Module I

The Landscape of HPEC- Example applications, Design Methodologies-Embedded Systems Design Flows-Standards-Based Design Methodologies-Models of Computation-Parallelism and Communication , CE Architectures.

Module II

Evaluating Processors- RISC DSP Processors, Parallel Execution Mechanisms-Superscalar SIMD and Vector Processors, Variable-Performance CPU Architectures, CPU Simulation Automated CPU Design, Code Generation and Back-End Compilation, Memory-Oriented Optimizations, Program Performance Analysis- Models of Computation and Programming.

Module III

Multiprocessor Architectures, Multiprocessor Design Techniques, Multiprocessor Architectures, Processing Elements, Interconnection Networks, Physically Distributed Systems and Networks, Multiprocessor Design Methodologies and Algorithms.

Module IV

Multiprocessor Software - RT Multiprocessor Operating Systems, Services and Middleware for Embedded Multiprocessors, Hardware and Software Co-design-Performance Analysis, Hardware/Software Co-synthesis Algorithms, Hardware/Software Co-simulation.

References:

1. Marilyn Wolf, High-Performance Embedded Computing, Second Edition, Morgan Kaufmann Publishers, ISBN: 9780124105119, 0124105114.
2. Wayne Wolf, High-Performance Embedded Computing Architectures, Applications, and Methodologies, 1st Edition, Morgan Kaufmann Publishers, ISBN 13: 978-0-12-369485-0.
3. Larry L. Peterson, Computer Networks - A System Approach 5th Edition Morgan Kaufmann Publishers, ISBN: 9789380501932.
4. Joseph .A. Fisher, Paolo Faraboschi, Cliff Young, Embedded Computing:A VLIW Approach to Architecture, Compilers and Tools, Elsevier, ISBN: 9780080477541.
5. Bruce Powel Douglass, Real-Time UML: Developing Efficient Objects for Embedded Systems, Reading MA: Addison-Wesley Longman, 1998, ISBN: 9780849371974.
6. D.R. Martinez ,High Performance Embedded Computing Handbook A Systems Perspective 1st Edition, Crc Press.

19-202-0811 CYBERSPACE AND INFORMATION SYSTEM SECURITY

Course Outcomes:

On completion of this course the student will be able to:

1. *Explain the need of security in cyberspace.*
2. *Explain the components of Information System and challenges in Information System Security.*
3. *Explain why controls are necessary in Information systems.*
4. *Explain methods of controlling Information systems.*
5. *Explain how controls are introduced in Information systems.*
6. *Choose the required controls to ensure security of an Information system.*
7. *Summarize immediate steps to be taken in the event of a cybercrime .*

Module I

Computer, Network, History of Network, Types of network, Internet, www, IP Address, E-mail working, Servers, DNS Servers, Service providers, e-commerce.Cyberspace, Cyber crime, Cyber Security, importance of Cyber Laws: National and International. Data, Information, Knowledge, Information Security, need, History and evolution of Information Security, Critical Concepts of Information Security. Information System, Components of the Information System; Balancing Information Security and Access.

Module II

Need of Security: Vulnerabilities, Threats, Attacks, Risks. SecSDLC. Supporting Tools and Technology: Cryptology, Cipher methods, Symmetric and Asymmetric algorithms, Cryptanalysis, Cryptographic Tools, Protocols supporting security, Attacks on cryptosystems. Firewalls, Intrusion Detection and Prevention Systems, Honeypots , honeynets, padded cell systems, scanning and analysis tools.

Module III

Risk Management: Overview, Identification, Assessment, Control Strategies. Planning: Practises, Procedure, Guideline, Standards, Policy, Information Security Blueprint, Importance of Education, Training and awareness programs, Continuity Strategies.

Module IV

Implementing Security Controls: Information Security Project Management, technical and non-technical aspects. Positioning and staffing security function, Employment policies and practises, considerations for non-employees.

Maintenance: Maintenance models. Digital Forensics: Evidence Collection and seizure, Duplication and preservation of evidence.

References:

1. Information Technology Amended Act, 2008, Ministry of Law and Justice, Government of India.
2. M. E. Whitman and H. J. Mattord, “Principles of Information Security,” 4th Edition.
3. Ron Weber, Information system Audit and Control, Pearson Education.
4. John R Vacca, Computer Forensics: Computer Crime Scene Investigation, 2nd Edition.

19-202-0812 SOFT COMPUTING

Course Outcomes:

On completion of this course the student will be able to:

1. *Classify the different soft computing techniques and their applications.*
2. *Define Artificial neural network and its applications.*
3. *Analyze various neural network architectures.*
4. *Demonstrate the concept of genetic algorithm and its applications.*

Module I

Introduction to Soft Computing Soft- computing versus Hard computing-Characteristics of Soft computing, Some applications of Soft computing techniques. Artificial neural networks - biological neurons, Basic models of artificial neural networks – Connections, Learning, Activation Functions, McCulloch and Pitts Neuron.

Module II

Fuzzy logic, fuzzy sets - properties - operations on fuzzy sets, fuzzy relations - operations on fuzzy relations Fuzzy membership functions,Operations on Fuzzy sets Fuzzy logic controller design.Some applications of Fuzzy logic.

Module III

Fuzzy membership functions, fuzzification, Methods of membership value assignments – intuition – inference – rank ordering, Lambda – cuts for fuzzy sets, Defuzzification methods.

Truth values and Tables in Fuzzy Logic, Fuzzy propositions, Formation of fuzzy rules - Decomposition of rules – Aggregation of rules, multi-objective optimization problems (MOOPs) and issues of solving them. Multi-Objective Evolutionary Algorithm (MOEA).

Module IV

Introduction to genetic algorithm, Basic GA framework and different GA architectures- operators in genetic algorithm - coding - selection - crossover – mutation, Stopping condition for genetic algorithm flow, Genetic-neuro hybrid systems, solving single-objective optimization problems using Gas.

References:

1. Timothy J. Ross, Fuzzy Logic with engineering applications , John Wiley & Sons, 2016.
2. S. N. Sivanandam and S. N.Deepa, Principles of soft computing – John Wiley & Sons, 2007.
3. Simon Haykin, Neural Network- A Comprehensive Foundation- Prentice Hall International, Inc.1998
4. R. Eberhart and Y. Shi, Computational Intelligence: Concepts to Implementation, Morgan Kaufman/Elsevier, 2007.
5. Driankov D., Hellendoorn H. and Reinfrank M., An Introduction to Fuzzy Control-Narosa Pub., 2001.
6. Melanie Mitchell, An Introduction to Genetic Algorithms, MIT Press, 2000.

19-202-0813 INTERNET OF THINGS

Course Outcomes:

On completion of this course the student will be able to:

1. *Familiarise IoT and its components.*
2. *Familiarise programming the microcontroller for IoT.*
3. *Get a deep insight to market perspective of IoT.*
4. *Learn data and knowledge management and use of Devices in IoT Technology.*

Module I

Introduction to Internet of Things: Introduction – Definition - phases – Foundations – Policy -Challenges and Issues – identification - security –privacy.Components in internet of things: Control Units-Sensors -Communication modules - Power Sources -Communication Technologies - RFID - Bluetooth –Zigbee – Wifi – RF links - Mobile Internet - Wired Communication.

Module II

Programming the Microcontroller for IoT: Basics of Sensors and actuators - examples and working principles of sensors and actuators - Cloud computing and lOT - Arduino/Equivalent Microcontroller platform- Setting up the board - Programming for lOT- Reading from Sensors; Communication: Connecting microcontroller with mobile devices – communication through Bluetooth and USB - connection with the internet using wifi / Ethernet.

Module III

Fundamental Concepts of Agility and Autonomy -Enabling Autonomy and Agility by the Internet of Things -23 Technical Requirements for Satisfying the New Demands in Production - The Evolution from the RFID-based EPC Network to an Agent based Internet of Things - Agents for the Behavior of Objects.

Module IV

Business Models for the Internet of Things: The Meaning of DiY in the Network Society - Sensor-actuator technologies and Middleware as a basis for a DiY Service Creation Framework - Device Integration - Middleware Technologies Needed for a DiY Internet of Things - Semantic Interoperability as a Requirement for DiY Creation –Ontology - Value Creation in the Internet of Things - Application of Ontology Engineering in the Internet of Things - Semantic Web-Ontology - The Internet of Things in Context of EURIDICE Business Impact.

References:

1. Charalampos Doukas, Building Internet of Things with the Arduino, Create space, April 2002.
2. Dieter Uckelmann et.al, “Architecting the Internet of Things”, Springer, 2011.
3. Luigi Atzor et.al, The Internet of Things: A survey, Journal on Networks, Elsevier.