DEPARTMENT OF CSE, C.V RAMAN COLLEGE OF ENGINEERING, BHUBANESWAR

Fourth Year B. Tech Structure with effect from Academic Year 2015-16

Semester - VII

Sl. No.	Code	Subject	Type	Teaching Scheme			Credits
				L	P	T	
S1	CS40111	Embedded System	Theory – Core	3	-	1	4
S2	IT40106	Software Engineering	Theory – Core	3	-	-	3
S3	CS42170	i. Computer Graphics	Elective – I	3	-	-	3
	IT42123	ii. Wireless Sensor Networks					
	IT42181	iii. Natural Language Processing (NLP)					
	CS42175	iv. Mobile Computing					
S4	IT42115	i. Real Time Systems	Elective – II	3	-	1	4
	CS42173	ii. Distributed Operating System					
	IT42177	iii. Parallel and Distributed System					
	IT42175	iv. Bioinformatics					
P1	IT40306	Software Engineering lab	Lab – Core	-	2	-	1
P2	CS42370	i. Computer Graphics lab	Lab				1
	CS42386	ii. Wireless Sensor Networks lab					
	EC43310	iii. Natural Language Processing (NLP) lab					
	CS42375	iv. Mobile Computing lab					
P3	IN47404	Industrial Training Report & Viva voce	Lab	-	-	-	1
P4	HS 46323	Ethics for Engineers	Lab	-	2	-	1
MP	CS47497	Major Project Stage – II /	Project	-	6	-	3
			Total:	**12**	**10**	**2**	**21**

COURSE CODE: IT42175 **REF NO: To be filled by CD office**

Bioinformatics

Credits: 3 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites:

1. Design and analysis of algorithm
2. Data structures
3. Machine Learning
4. Computer programming

Objectives:

1. To know the recent evolution in biological science.
2. To make students aware about computational problems lie on biology.
3. To improve the programming skills in bioinformatics domain.

Course Details:

Unit 1
Title- Introduction to Bioinformatics:

(06 Hrs)

U1.1
Introduction to Bioinformatics and Computational Biology, Biological sequences, Biological databases, Genome specific databases, Data file formats, Data life cycle, Sequence Analysis, Pair-wise alignment.

U1.2. Self Study: Case study on a genomic database.

Unit 2
Title – Sequence alignment algorithms **(08Hrs)**

U2.1
Dynamic programming algorithms for computing edit distance, string similarity, shotgun DNA sequencing, end space free alignment. Multiple sequence alignment, Algorithms for Multiple sequence alignment, Generating motifs and profiles, Local and Global alignment, Needleman and Wunsch algorithm, Smith Waterman algorithm, BLAST and PSIBLAST algorithms.

U2.2. Self Study: Study of PHIBLAST tool and its algorithm.

Unit 3
Title – Phylogenetics and Protein structure prediction **(08 Hrs)**
U3.1
Introduction to phylogenetics, Distance based trees UPGMA trees, Molecular clock theory, Ultrametric trees, Parsimonious trees, Neighbor joining trees, trees based on morphological traits, Bootstrapping. Protein Secondary structure and tertiary structure prediction methods, Homology modeling, abinitio approaches, Threading, Critical Assessment of Structure Prediction.

U3.2. Self Study: Case study on Structural genomics.

Unit 4

Title – Applications of machine learning techniques in bioinformatics problem

(08 Hrs)

U4.1

Machine learning techniques: Artificial Neural Networks in protein secondary structure prediction, Hidden Markov Models for gene finding, Decision trees, Support Vector Machines.

U4.2. Self Study: Study of using artificial neural network for tertiary protein structure prediction

Unit 5

Title- Systems Biology and Synthetic Biology

(08 Hrs)

U5.1

Introduction to Systems Biology and Synthetic Biology, Microarray analysis, DNA computing, Bioinformatics approaches for drug discovery, Applications of informatics techniques in genomics and proteomics: Assembling the genome, STS content mapping for clone contigs, Functional annotation, Peptide mass fingerprinting.

U5.2. Self Study: Exploring other applications of informatics genomics and proteomics.

Text Books:

1. Lesk, A. K., "Introduction to Bioinformatics" 4th Edition, Oxford University Press, 2013
2. Dan Gusfield, "Algorithms on Strings, Trees and Sequences: Computer Science and Computational Biology" Cambridge University Press, 1997.
3. Durbin, R., Eddy, S., Krogh, A., and Mitchison, G., "Biological Sequence Analysis Probabilistic Models of proteins and nucleic acids" Cambridge, UK: Cambridge University Press, 1998.
4. Mount, D.W., "Bioinformatics Sequence and Genome Analysis" 2nd Edition, Cold Spring Harbor Laboratory Press, 2004

Reference Books:

1. Baldi, P. and Brunak, S., "Bioinformatics: The Machine Learning Approach" 2nd Edition, MIT Press, 2001.
2. Tindall, J., "Beginning Perl for Bioinformatics: An introduction to Perl for Biologists" 1st Edition, O'Reilly Media, 2001

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Identify all underlying computational problems in Biology.
2. Use and apply bioinformatics tools for solving computational issues.
3. Apply computational based solutions for biological perspectives.
4. Pursue higher education in this field.
5. Practice life-long learning of applied biological science.

COURSE CODE: IT42175 **REF NO: To be filled by CD office**

Bioinformatics

Credits: 3 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites:

5. Design and analysis of algorithm
6. Data structures
7. Machine Learning
8. Computer programming

Objectives:

4. To know the recent evolution in biological science.
5. To make students aware about computational problems lie on biology.
6. To improve the programming skills in bioinformatics domain.

Course Details:

Unit 1
Title- Introduction to Bioinformatics:

(06 Hrs)

U1.1
Introduction to Bioinformatics and Computational Biology, Biological sequences, Biological databases, Genome specific databases, Data file formats, Data life cycle, Sequence Analysis, Pair-wise alignment.

U1.2. Self Study: Case study on a genomic database.

Unit 2
Title – Sequence alignment algorithms **(08Hrs)**

U2.1
Dynamic programming algorithms for computing edit distance, string similarity, shotgun DNA sequencing, end space free alignment. Multiple sequence alignment, Algorithms for Multiple sequence alignment, Generating motifs and profiles, Local and Global alignment, Needleman and Wunsch algorithm, Smith Waterman algorithm, BLAST and PSIBLAST algorithms.

U2.2. Self Study: Study of PHIBLAST tool and its algorithm.

Unit 3
Title – Phylogenetics and Protein structure prediction **(08 Hrs)**
U3.1
Introduction to phylogenetics, Distance based trees UPGMA trees, Molecular clock theory, Ultrametric trees, Parsimonious trees, Neighbor joining trees, trees based on morphological traits, Bootstrapping. Protein Secondary structure and tertiary structure prediction methods, Homology modeling, abinitio approaches, Threading, Critical Assessment of Structure Prediction.

U3.2. Self Study: Case study on Structural genomics.

Unit 4

Title – Applications of machine learning techniques in bioinformatics problem

(08 Hrs)

U4.1

Machine learning techniques: Artificial Neural Networks in protein secondary structure prediction, Hidden Markov Models for gene finding, Decision trees, Support Vector Machines.

U4.2. Self Study: Study of using artificial neural network for tertiary protein structure prediction

Unit 5

Title- Systems Biology and Synthetic Biology

(08 Hrs)

U5.1

Introduction to Systems Biology and Synthetic Biology, Microarray analysis, DNA computing, Bioinformatics approaches for drug discovery, Applications of informatics techniques in genomics and proteomics: Assembling the genome, STS content mapping for clone contigs, Functional annotation, Peptide mass fingerprinting.

U5.2. Self Study: Exploring other applications of informatics genomics and proteomics.

Text Books:

5. Lesk, A. K., "Introduction to Bioinformatics" 4th Edition, Oxford University Press, 2013
6. Dan Gusfield, "Algorithms on Strings, Trees and Sequences: Computer Science and Computational Biology" Cambridge University Press, 1997.
7. Durbin, R., Eddy, S., Krogh, A., and Mitchison, G., "Biological Sequence Analysis Probabilistic Models of proteins and nucleic acids" Cambridge, UK: Cambridge University Press, 1998.
8. Mount, D.W., "Bioinformatics Sequence and Genome Analysis" 2nd Edition, Cold Spring Harbor Laboratory Press, 2004

Reference Books:

3. Baldi, P. and Brunak, S., "Bioinformatics: The Machine Learning Approach" 2nd Edition, MIT Press, 2001.
4. Tindall, J., "Beginning Perl for Bioinformatics: An introduction to Perl for Biologists" 1st Edition, O'Reilly Media, 2001

Course Outcomes:

Upon completion of the course, graduates will be able to –

6. Identify all underlying computational problems in Biology.
7. Use and apply bioinformatics tools for solving computational issues.
8. Apply computational based solutions for biological perspectives.
9. Pursue higher education in this field.
10. Practice life-long learning of applied biological science.

COURSE CODE: CS42173 **REF NO: _____**

Distributed Operating System

Credits: 3 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites:

1. Operating System.

Objectives:

- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
- To gain insight on to the distributed resource management components. The algorithms for implementation of distributed shared memory, recovery and commit protocols

Course Details:

Unit 1

Title- Process Synchronization: (06 Hrs)

U1.1.

Concept of processes, Concurrent processes, Threads, Overview of different classical synchronization problems, Monitors, Communicating sequential processes (CSP)

PROCESS DEADLOCKS: Introduction causes of deadlocks, Deadlock handling strategies Models of deadlock. Distributed deadlock algorithms for Avoidance, Prevention, and Detection.

RPC: RPC Model, Transparencies in RPC, Implementation, Stub Generation, RPC Messages, Server Management, Call Semantics, Communication Protocols

U1.2. Self Study: Classification of distributed deadlock detection algorithms, Distributed Objects: Remote Method Invocation, Case studies of existing RPC implementation.

Unit 2

Title – Basics of Distributed Operating System: (08 Hrs)

U2.1.

Architectures, Issues in Distributed operating systems, Limitations of Distributed Systems, Temporal ordering of events, Lamport's logical clock, Global states, Chandy-Lamport's global state recording algorithm.

Co-ordination: Election Algorithm: Bully Algorithm, Ring Algorithm

Basic concepts of Distributed Mutual Exclusion, Lamport's Algorithm, Ricat-Agrawala Algorithm: Basic concepts of Distributed deadlock detection

U2.2. Self Study: Network operating system: Design issues, working principles and characteristic features, case study

Unit 3
Title – Distributed Resource Management (08 Hrs)
U3.1.

DISTRIBUTED FILE SYSTEMS – Introduction, Distributed File System Design (The File Service Interface, The Directory Server Interface, Semantics of File Sharing), Distributed File System Implementation (File Usage, System Structure, Caching, Replication- Distributed Shared Memory – Algorithms for Implementing
DISTRIBUTED SHARED MEMORY– Introduction, general architecture of DSM systems, design and implementation issues of DSM, granularity, structure of shared memory space, consistency models, replacement strategy, thrashing,
LOAD BALACNING and FAULT TOLERENCE: Issues in Load Distributing – Scheduling Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Non-blocking Commit Protocol – Security and Protection.

U3.2. Self Study: Design and Implementation Issues of DSM.

Unit 4
Title – Database Operating System: (06 Hrs)
U4.1

Introduction, Requirements of Database Operating System, Concurrency Control: Database System, Concurrency Model, Problem of Concurrency Control, Serializability Theory, Distributed Database System Concurrency Control Algorithm: Basic Synchronization Primitives, Lock Based Algorithm, Timestamp Based Algorithms

U4.2. Self Study: Optimistic Algorithm, Data Replication

Unit 5
Title- Security and Protection (06 Hrs)
U5.1.

Security and Protection: Security-threats & goals. Penetration attempts, Security Policies & mechanisms, Authentication. Protections & access control Formal models of protection Cryptography, worms & viruses.

U5.2. Self Study: Threats, Attacks, Assets, Intruders, Overview of Malicious Software

Note: Five assignments to be given to the students on self study, comprising of one assignment from each unit.

Text Books:
T1. Advanced Concepts in operating Systems, Mukesh singhal and Niranjan G. Shivaratri, TMH
T2. Operating System, H.M. Beitel, Pearsons,

T3. Operating System Concepts & Design, Milan Milenkovic, McGraw Hill Higher Education,1987.

Reference Books:

R1. Applied Operating System Concepts, Wiley, 2000,A. Silberschatz
R2. G. Coulororis, J. Dollimore & T. Kindberg, Distributed Systems: Concepts and Design, Addison-Wesley.
R3. Operating System Principles, Lubemir F Bic and Alan C. Shaw Pearson Education, 2003

Course Outcome:

Upon completion of the course, graduates will be able to –

1. Ability to solve various synchronization and deadlock problems.
2. Analyze the design issues of distributed system and demonstrate the mutual exclusion problems.
3. Identify the different features of distributed resource management protocols.
4. Evaluate the design issues of distributed operating system.
5. Identify security and protection issues of distributed operating system.

COURSE CODE: CS42173 **REF NO: _____**

Distributed Operating System

Credits: 01 **Teaching Scheme: -** Tutorial 01 Hrs/Week

Prerequisites:

1. Operating System.

Objectives:

- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
- To gain insight on to the distributed resource management components. The algorithms for implementation of distributed shared memory, recovery and commit protocols

Course Details:

List of Contents

Tutorial No. 1: Basics of Process synchronization

Tutorial No. 2: Deadlock in Distributed system.

Tutorial No. 3: Basics of distributed Mutual exclusion.

Tutorial No. 4: Election Algorithm.

Tutorial No. 5: Understanding of Distributed File System Design.

Tutorial No. 6: Overview of Distributed Shared memory.

Tutorial No. 7: Concepts of Load balancing algorithm and fault tolerance.

Tutorial No. 8: Understanding of Database Operating System and distributed Concurrency Control.

Tutorial No. 9: Understanding Security-threats and possible protection mechanism

Tutorial No. 10: Overview of cryptography. ,

Text Books:

T1. Advanced Concepts in operating Systems, Mukesh singhal and Niranjan G. Shivaratri, TMH
T2. Operating System, H.M. Beitel, Pearsons,
T3. Operating System Concepts & Design, Milan Milenkovic, McGraw Hill Higher Education,1987.

Reference Books:

R1. Applied Operating System Concepts, Wiley, 2000,A. Silberschatz
R2. G. Coulororis, J. Dollimore & T. Kindberg, Distributed Systems: Concepts and Design, Addison-Wesley.
R3. Operating System Principles, Lubemir F Bic and Alan C. Shaw Pearson Education, 2003

Course Outcome:

Upon completion of the course, graduates will be able to –

1. Ability to solve various synchronization and deadlock problems.
2. Analyze the design issues of distributed system and demonstrate the mutual exclusion problems.
3. Identify the different features of distributed resource management protocols.
4. Evaluate the design issues of distributed operating system.
5. Identify security and protection issues of distributed operating system.

COURSE CODE: CS40111 **REF NO: To be filled by CD office**

Embedded System

Credits: 3 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites:

1. Computer Organization
2. Operating Systems
3. Computer Programming

Objectives:

1. To expose the students to the fundamentals of embedded systems
2. To demonstrate in-depth knowledge in hardware and software used in embedded systems
3. To analyze the various scheduling aspects of real time systems
4. To understand the design procedure of embedded firmware
5. To know about the embedded software development procedure and testing methods.

Course Details:

Unit 1

Title – Introduction to Embedded System: (06 Hrs)

U1.1.

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Basic Characteristics of an Embedded System.

U1.2. Self Study: Operational and non-operational quality attributes

Unit 2

Title – Overview of Processors and Hardware Concepts: (9 Hrs)

U2.1.

General purpose processors and Domain Specific Processors, Microcontrollers, ARM-based Systems on a Chip (SoC), Application-Specific Circuits (ASICs), VHDL, Sensors, A/D-D/A converters, Actuators, Interfacing using UART, USB, CAN bus, SRAM and DRAM, Flash memory.

U2.2. Self Study: Microprocessor Vs Microcontroller, Levels of hardware modelling

Unit 3

Title - Real Time Task Scheduling: (9 Hrs)

U3.1.

Basic Concepts and Terminologies, Classification of Real Time Task Scheduling Algorithms, Clock Driven Scheduling, Event Driven Scheduling, Earliest Deadline First (EDF) Scheduling, Rate Monotonic Algorithm (RMA) Scheduling, Issues Associated with RMA, Hybrid schedulers.

U3.2. Self-Study: Case studies on Commercial Real Time Operating Systems: General Concepts, Unix and Windows as RTOS.

Unit 4

Title – Embedded System Development and Design: (06 Hrs)

U4.1.

Embedded system development life cycle, General language characteristics , Features of MISRA C for embedded programming, Hardware/Software Co-design, Hardware/software partitioning.

U4.2. Self Study: State charts, Trends in embedded industry

Unit 5
Title – Testing Embedded Systems: (06 Hrs)
U5.1.
Software Tools, Host and Target Machines, Linkers/Locators for Embedded Software, Getting Software into the Target System, Embedded systems Testing, Design for testability and Self-test.

U5.2. Self Study: Simulation and Debugging Tools and Techniques

Text Books:
T1. Rajkamal, "Embedded Systems Architecture, Programming and Design", TATA McGraw-Hill
T2. Frank Vahid and Tony Givargis," Embedded Systems Design – A unified Hardware /Software Introduction", John Wiley, 2002
T3. Rajib Mall, "Real-Time Systems Theory and Practice", PearsonEducation

Reference Books:
R1. Shibu KV, "Introduction to Embedded Systems", TMH
R2. S. Chattopadhyay, "Embedded System Design", PHI
R3. David E.Simon," An Embedded Software Primer", Pearson Education Asia, First Indian Reprint 2000

Upon completion of the course the graduates will be able-

Course Outcomes:

CO1. To understand the basics and importance of embedded systems
CO2. To understand the selection procedure of processors in the embedded domain
CO3. To visualize the role of real time operating systems in embedded systems
CO4. To contributepositively in developing solutions with embedded systems for multidisciplinary scientific problems with open mindedness, objectivity and rational approach
CO5. To analyze the various techniques and tools used for testing and debugging

COURSE CODE: CS40111 **REF NO: To be filled by CD office**

Embedded System (Tutorial)

Credits: 1 **Teaching Scheme: -** Tutorial 01 Hrs/Week

Prerequisites:

1. Computer Organization
2. Operating Systems
3. Computer Programming

Objectives:

1. To expose the students to the fundamentals of embedded systems
2. To demonstrate in-depth knowledge in hardware and software used in embedded systems
3. To analyze the various scheduling aspects of real time systems
4. To understand the design procedure of embedded firmware
5. To know about various development tools and programming concepts

Course Details:

List of Contents

Tutorial No. 1: Understanding the basic characteristics of an Embedded System

Tutorial No. 2: Study on the classification of embedded systems and their application areas.

Tutorial No. 3: Understanding the different types of processors used in Embedded System.

Tutorial No. 4: Study on the hardware and software used in Embedded System.

Tutorial No. 5: Understanding the basic concepts in Real Time Operating Systems.

Tutorial No. 6: Problem solving on clock driven and event driven scheduling algorithms.

Tutorial No. 7: Understanding the Embedded System Development Lifecycle.

Tutorial No. 8: Study on the hardware / software partitioning.

Tutorial No. 9: Understanding the process of getting software into the target system.

Tutorial No. 10: Study on Embedded System Testing.

Text Books:

T1. Rajkamal, "Embedded Systems Architecture, Programming and Design", TATA McGraw-Hill
T2. Frank Vahid and Tony Givargis," Embedded Systems Design – A unified Hardware /Software Introduction", John Wiley, 2002

Reference Books:

R1. Shibu KV, "Introduction to Embedded Systems", TMH
R2. S. Chattopadhyay, "Embedded System Design", PHI
R3. David E.Simon," An Embedded Software Primer", Pearson Education Asia, First Indian Reprint 2000

Upon completion of the course the graduates will be able-

Course Outcomes:

CO1. To understand the basics and importance of embedded systems
CO2. To understand the selection procedure of processors in the embedded domain
CO3. To visualize the role of real time operating systems in embedded systems
CO4. To contribute positively in developing solutions with embedded systems for multidisciplinary scientific problems with open mindedness, objectivity and rational approach
CO5. To analyze the various techniques and tools used for testing and debugging

MB41301: Ethics for Engineers Lab

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Philosophy of Engineering

Course Objectives:

- To create awareness on Professional Ethics and Human Values.
- To provide basic knowledge about Morality, Ethical Dilemmas, and Professional Virtues.
- To create awareness about code of ethics and industrial standards.
- To inculcate knowledge about social aspects of Business and Environment.

Lab 1: Introduction to Professional Ethics – Nature, Scope and Importance: Discussion & Case Study 1 (2hrs)

Lab 2: Ethical Dilemma and Problems: Discussion & Case Study 2 (2hrs)

Lab 3: Ethics in Marketing (Pricing and Advertising): Discussion & Case Study 3 (2hrs)

Lab 4: Ethics in Finance (Insider Trading, Green Mail, Golden Parachute): Discussion & Case Study 4 (2hrs)

Lab 5: Ethics in Human Resource Management (Worker Rights and Duties, Workplace Safety, Sexual Harassment and Whistle Blowing): Discussion & Case Study 5 (2hrs)

Lab 6: Ethics in Engineering and Technology (Accuracy, Privacy, Property, Accessibility): Discussion & Case Study 6 (2hrs)

Lab 7: Ethical Issues in Society (Black Marketing, Bribery and Corruption): Discussion & Case Study 7 (2hrs)

Lab 8: Ethics in Corporate Social Responsibility: Discussion & Case Study 8 (2hrs)

Lab 9: Role of Ethical Codes and their implementation: Discussion & Case Study 9 (2hrs)

Lab 10: Ethical Practices in different organizations: Discussion & Case Study 10 (2hrs)

Course Outcome:

After completion of the course the students will:

CO1. Understand various social issues, industrial standards and importance of ethics in the engineering domain.

CO2. Aware of ethical responsibilities of an engineer.

CO3. Acquire professional behavior that requires adherence to the highest principles of ethical conduct.

Text Book:

1. Business Ethics – Text & Cases, C.S.V. Murthy, 1st Edition, HPH, 2017.
2. Ethics in Engineering, M.W. Martin, 4th Edition, McGraw Hill

Reference Book:

1. Professional Ethics, R. Subramanian, 2nd Edition, Oxford

COURSE CODE:CS42170 **REF NO: _____**

Computer Graphics

Credits: 3 **Teaching Scheme: -** Theory 3 Hrs/Week

1. Computer Programming.
2. Design & Analysis of Algorithms.

Objectives:

1. Estimate hardware issues related to computer graphics in order to determine the significant software interfaces to realize graphical solutions.
2. Utilize algorithms to implement graphics primitives to perform geometric transformations.
3. Interpret graphical objects hierarchies in the design of graphics applications.
4. Defend the formulized solutions incorporating graphical algorithms in order to judge the complexity levels.
5. Derive interpretations from the animations generated for the identified problem.
6. Devise and frame new set of algorithmic principles so as to envisage scientific solutions useful to computing community.

Course Details:

Unit 1

Title- Basic Concepts **(06 Hrs)**

U1.1.

Graphics Primitives: Introduction to computer graphics, Display adapters, Display modes, Pixel, Frame Buffer, Display file structure, Display file interpreter, Raster scan & random scan displays, Aspect Ratio. Mathematical foundations: Lines and line representations, Vectors, Intersection of lines, Normalized Device Coordinates.Scan conversions: DDA and Bresenham's line drawing algorithms and Bresenham and Midpoint circle drawing algorithms.Introduction to OpenGL and its benefits.

U1.2. Self Study: Bresenham's line drawing algorithm using OpenGL.Display devices, Interactive devices.

Unit 2

Title – Polygons and 2D Transformation **(06Hrs)**

U2.1.

Polygons: Introduction, Types of polygons, Inside-outside test of polygon, Polygon filling: Flood fill, Boundary fill, Edge fill, Scan line fill algorithm.2D Transformations: Introduction, Basic transformations such as- Scaling, Rotation, Translation, Homogeneous coordinates for transformations, Other transformations like – Reflection, Shearing Transformations, Transformations about an arbitrary point, Inverse transformations.

U2.2. Self Study: Numerical problems on transformation, Problems on 2D transformation.

Unit 3

Title – Clipping, Animation and Aliasing **(06 Hrs)**

U3.1

Windowing and Clipping: Introduction, viewing transformation, Line clipping: CohenSutherland algorithm, Mid-point line clipping algorithm, Polygon clipping: Sutherland, Hodgeman algorithm, Weiler Atherton algorithm, Text clipping. Aliasing and Antialiasing, Character Generation techniques. Halftoning and dithering.

Computer Animation: Types of Animation, Key frame Vs. Procedural Animation, methods of controlling Animation, Morphing.

U3.2.Self Study: Liang-Barsky algorithm,Interior and Exterior clipping.

Unit 4

Title – 3D Transformations and Projections **(06 Hrs)**

U4.1

3D Transformations: Introduction, 3D point representation, Left handed system, Right handed system, Basic 3D transformations- Scaling, Rotation, Translation, Matrix representation, Derivation of Rotation matrices along the main axis, Rotation about anarbitrary axis, Reflection

transformation with respect to main axes. Projection: Projection concept, parallel and perspective projections, Viewing parameters, 3D windowing and clipping.

U4.2. Self Study: Problems based on 3D transformations

Unit 5

Title- Hidden Surfaces, Curves and Fractals (06 Hrs)

U5.1

Introduction, Back-face removal algorithm, Z buffers, Painters algorithm, Scan line algorithm for Depth Comparison, Curve generation, Curve continuity, Interpolation, Spline curve representation, B Spline Curves, Bezier Curves, Fractals, Fractal lines.

Introduction to light, Light Illumination models (Diffuse, Ambient, Specular), Point source illumination, Shading Algorithms (Phong, Gourad), Color, RGB Color Model.

U5.2

Self Study: Fractal surfaces, CMY and HSV color

Note: Five assignments to be given to the students on self study, comprising of one assignment from each unit.

Text Books:

1. "Computer Graphics with Open GL" (*4th Edition*) D. Hearn, M. Baker, Warren Carithers, Pearson Education, 2013,ISBN 81-7808-794-4.
2. "Procedural Elements for Computer Graphics", D. Rogers, 5th Edition, Tata McGraw-Hill Publication, 2001, ISBN 0-07-047371-4.

Reference Books:

1. "Computer Graphics", S. Harrington, 2nd Edition, McGraw-Hill Publications, ISBN 0 - 07 -100472 -6.
2. "Computer Graphics Principles and Practice", J. Foley, V. Dam, S. Feiner, J. Hughes, 2nd Edition, Pearson Education, 2003, ISBN 81-7808-038-9.

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Review basics of computer graphics, different graphics systems and applications of computer graphics.
2. Analyze various algorithms for scan conversion and filling of basic objects, analysis and use of geometric transformations on variouscomposite objects.
3. Extract scene with different clipping methods and its transformation to graphics display device, by applying different antialiasing methods.
4. Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.
5. Render projected objects to naturalize the scene in 2D view and use of illumination models for this.

COURSE CODE: CS30370 **REF NO: To be filled by CD office**

Computer Graphics Lab

Credits:01 **Teaching Scheme: -** Laboratory 02Hrs/Week

Prerequisites:

1) Computer Programming.
2) Linux OS.

Objectives:

- To understand basics of computer graphics.
- To give more emphasis on implementation aspect of Computer Graphics Algorithm.
- To prepare the student for advance courses like multimedia / Image Processing.

Course Details:

List of Practicals

1. Write a Program to implement DDA and Bresenham Line drawing algorithm.

2. Write a Program to implement Bresenham's Circle drawing algorithm.

3. Write a Program to implement Polygon fill algorithm.

4. Write a Program to implement Scaling, rotation and translation of a 2D object.

5. Write a program to achieve animation by using segmentation.

6. Write a Program to implement Cohen Sutherland line clipping algorithm.

7. Write a Program to implement Polygon clipping algorithm.

8. Write a Program to implement Scaling, reflection about planesand axes of a 3Dobject.

9. Write a Program to draw a Bezier curve.

10. Implementation of Fractal line and Surface Algorithm and familier with OpenGL.

Text Books:

1. "Computer Graphics with Open GL" (*4th Edition*) D. Hearn, M. Baker, Warren Carithers, Pearson Education, 2013,ISBN 81-7808-794-4.
2. "Procedural Elements for Computer Graphics", D. Rogers, 5th Edition, Tata McGraw-Hill Publication, 2001, ISBN 0-07-047371-4.

Reference Books:

1. "Computer Graphics", S. Harrington, 2nd Edition, McGraw-Hill Publications, ISBN 0 - 07 -100472 -6.
2. "Computer Graphics Principles and Practice", J. Foley, V. Dam, S. Feiner, J. Hughes, 2nd Edition, Pearson Education, 2003, ISBN 81-7808-038-9.

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Review basics of computer graphics, different graphics systems and applications of computer graphics.
2. Analyze various algorithms for scan conversion and filling of basic objects, analysis and use of geometric transformations on variouscomposite objects.
3. Extract scene with different clipping methods and its transformation to graphics display device, by applying different antialiasing methods.
4. Explore projections and visible surface detection techniques for display of 3D scene on 2D screen.
5. Render projected objects to naturalize the scene in 2D view and use of illumination models for this

COURSE CODE: CS42175 **REF NO:**

Mobile Computing

Credits:3 **Teaching Scheme:** - Theory 3 Hrs/Week

Prerequisites:

1. Java Programming
2. HTML and XML scripting language
3. Data Communication and Computer Networks

Objectives:

1. To develop the skills required to create applications for mobile phone
2. To learn how to effectively use application architectures to build a variety of Mobile Apps.
3. To develop skills for processes for mobile software engineering

Course Details:

Unit 1 **(8 Hrs)**

Title- Fundamentals of Mobile Technology

U1.1

Basic wireless technology, overview of cellular communications, components of cellular system (BTS,BSC,MSC), protocol stack and information flow (call processing, MOC and MTC), SMS concept, Network Architeture, message processing, Overview of CDMA (Concept, network components, architecture), Digital techniques using spread spectrum, advantages and disadvantages. Overview of 2.5G and 3.0G, Need,concepts, architecture and applications (GPRS,UMTS, 3GPP, WCDMA, HSCSD), Introduction to GSM, standards, services offered,architecture, functionalities of components, mobile registration process, Handover,GSM channels, traffic, control channel, Radio frequency power levels, Timimg in advance and power control, burst structure (normal and random access),

U1.2

Self Study: frequency correction and synchronization, frame structures (traffic channel, signaling frame), different call scenarios along with traffic and control channels.

Unit II
Title- Mobile Communication and Management:

(8 Hrs)

U2.1
Mobile originated voice call, terminated voice call, location update procedure, sending and receiving SMS, speech and channel coding, control channel / logic channels, BCCH,CCCH,RACH,SDCCH,AGCH,PCH,SAACH,FACCH, 2.5G /3G system, evolution of GPRS, Its network elements, applications, architecture, QOS, mobility management, comparison with HSCSD, spread spectrum for 3G, network elements, data speeds, applications,WLAN (standard a/b/g), security, applications, IAPP, mobile IP, VOIP (Functionality, shortcomings, legal issues), NFC.

U2.2

Self Study: Introduction to QoS, integration with GPRS, Bluetooth and 3G

Unit III **(7 Hrs)**

Title- Android, Its Applications and Services

U3.1

Introduction to android, why android, activities and tasks, android SDK features,development environment of SDK, creating android activities, fundamental android UI design, Intent, adapter, dialog, android technique for saving data, data base in android, data storage and contents providers, maps, Geocoding, location based services, Toast, alarms, instant messaging using Bluetooth, telephony using Bluetooth, introduction to sensor manager, managing network and wi-fi connection, advanced android development.

U3.2

Self Study: UI based design (chat, and mail application).

Unit IV **(7 Hrs)**

Title- Application Development using Android

U4.1

Linux kernel security, implement AIDL interface, play audio and video, playing from raw resource, file or stream, audio capture, simple graphics inside a view, Gaming development-: introduction to OpenGL, scalable 2D / 3D graphics API, drawables, shape drawable, web services API(JSR-172), creating from resource images, resource XML, Nine-patch,tween animation, frame animation

U4.2

Self Study: web services API its applications and usability

Unit V **(6 Hrs)**

Title- Activity,Process and service

U5.1

Activity lifecycle, configuration changes, starting activity and getting results, saving persistent state, permissions,process lifecycle,process to set default actions for activities,passing information between activities, content provider basics,modifying data in a provider, creating a content provider, content URI summary, receiver lifecycle,permissions, introduction to service, service lifecycle, permissions, local service sample, remote messenger service sample.

U5.2

Self Study: Augmented reality of application, integration with social networking website

Text Books

T1.”Android Application Developmet”Rick Roger, O’reilly, 2009

T2. “Mobile and wireless Design Essential”, Martyn Mallick, John, Wiley & Sons 3rd Edition.

Reference Books

R1. Introduction to Android Application Development Joseph Annuzzi, Jr. Lauren Darcey

Shane Conder, Addison-Wesley 4th Edition.

R2. Fundamentals of mobile computing, Prasant Kumar Pattnaik and Rajib Mall, PHI.

R3. Wireless Communications & Networks, William Stallings, Pearson

Course Outcomes:

Upon completion of the course, graduates will be able –

CO1: Interpreting the fundamental technology of mobile technology and its enhancement

CO2:Differentiating the mobile communication and its management by techniques and methods

CO3: Exemplifying and Summarizing the functionality and services of android for mobile application development.

CO4: Implementing and Executing advanced application developments.

CO5: Attributing and Organizing activity, process and services of reality of applications

NATURAL LANGUAGE PROCESSING

PREREQUISITES

1. A previous course on Artificial Intelligence will help.
2. Courses of Data Structures and Algorithms should have been done.
3. Exposure to Linguistics is useful, though not mandatory.

Course Overview

1. The intent of the course is to present a fairly broad graduate-level introduction to Natural Language Processing, the study of computing systems that can process, understand, or communicate in human language. The primary focus of the course will be on understanding various NLP tasks as listed on the course syllabus, algorithms for effectively solving these problems, and methods for evaluating their performance.

Unit - 1

Introduction and Overview
What is Natural Language Processing? Ambiguity and uncertainty in language. The Turing test. Phases in natural language processing, applications.

Regular Expressions
Chomsky hierarchy, regular languages, and their limitations. Finite-state automata. Practical regular expressions for finding and counting language phenomena. A little morphology.

Context Free Grammars
Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing, and the problems with each. The desirability of combining evidence from both directions.

Unit - 2

Non-probabilistic Parsing
Efficient CFG parsing with CYK, another dynamic programming algorithm. Also, perhaps, the Earley parser. Designing a little grammar, and parsing with it on some test data.

Probability
Introduction to probability theory--the backbone of modern natural language processing. Events, and counting. Joint and conditonal probability, marginals, independence, Bayes rule, combining evidence. Examples of applications in natural language.

Language modeling and Naive Bayes
Probabilistic language modeling and its applications. Markov models. N-grams. Estimating the probability of a word, and smoothing. Generative models of language. Their application to building an automatically-trained email spam filter, and automatically determining the language (English, French, German, Dutch, Finnish, Klingon?).

Unit – 3

Part of Speech Tagging
The concept of parts-of-speech, examples, usage. The Penn Treebank and Brown Corpus. Probabilistic (weighted) finite state automata.

Applications of NLP and Machine Translation
Spell-checking, Summarization Information Retrieval- Vector space model, term weighting, homonymy, polysemy, synonymy, improving user queries. Machine Translation– Overview.

Textbook:

1. Daniel Jurafsky and James H Martin. Speech and Language Processing, 2e, Pearson Education, 2009

Reference Books:

2. Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.
3. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
4. Jurafsky, Dan and Martin, James, Speech and Language Processing, Second Edition, Prentice Hall, 2008.
5. Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

Unit – 1

Introduction

NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity. The role of machine learning. Brief history of the field.

N-gram Language Models

The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models.

Part Of Speech Tagging and Sequence Labeling

Lexical syntax. Hidden Markov Models (Forward and Viterbi algorithms and EM training).

Unit - 2

Basic Neural Networks

Any basic introduction to perceptron and backpropagation such as section 18.7 in Artificial Intelligence: A Modern Approach (3rd ed), Chapter 4 of *Machine Learning*, or sections 5.0 - 5.3.3 of Pattern Recognition and Machine Learning.

LSTM Recurrent Neural Networks

"Understanding LSTM Networks" blog post, optionally the original paper Long Short Term Memory.

Syntactic parsing

Grammar formalisms and treebanks. Efficient parsing for context-free grammars (CFGs). Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs. Neural shift-reduce dependency parsing (see this paper).

Unit - 3

Semantic Analysis

Lexical semantics and word-sense disambiguation. Compositional semantics. Semantic Role Labeling and Semantic Parsing.

Information Extraction (IE)

Named entity recognition and relation extraction. IE using sequence labeling.

Machine Translation (MT)

Basic issues in MT. Statistical translation, word alignment, phrase-based translation, and synchronous grammars.

Textbook:

1. Daniel Jurafsky and James H Martin. Speech and Language Processing, 2e, Pearson Education, 2009

Reference Books:

2. Allen, James, Natural Language Understanding, Second Edition, Benjamin/Cumming, 1995.
3. Charniack, Eugene, Statistical Language Learning, MIT Press, 1993.
4. Jurafsky, Dan and Martin, James, Speech and Language Processing, Second Edition, Prentice Hall, 2008.
5. Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

COURSE CODE: IT 42177 **REF NO: To be filled by CD office**

Parallel and Distributed Systems

Credits: 3 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites:

1. Computer Organization
2. Data Communications and Computer Networks
3. Operating Systems
4. Computer Programming

Objectives:

1. To develop and apply knowledge of parallel and distributed computing techniques and methodologies.
2. To gain experience in the design, development, and performance analysis of parallel and distributed applications.
3. To gain experience in the application of fundamental Computer Science methods and algorithms in the development of parallel applications.
4. To understand the design, testing, and performance analysis of a software system, and to be able to communicate that design to others.

Course Details:

Unit 1
Title- Introduction to Parallel Computing: (06 Hrs)
U1.1.

Parallel programming platforms: Trends in microprocessor architectures, Limitations of memory system performance, Dichotomy of parallel computing platforms, physical organization of parallel platforms, communication costs in parallel machines.
Routing mechanisms for interconnection network, Impact of process processors mapping and mapping techniques.

U1.2. Self Study: Pipelining and Superscalar Architecture. Flynn's Classification. Cache coherence problem.

Unit 2
Title – Parallel Algorithm Design: (06Hrs)

U2.1.
Principles of parallel algorithm design: Decomposition techniques, Characteristics of tasks and interactions, mapping techniques for load balancing, parallel algorithm- models like, Data parallel model, Task graph model, Work pool model, Master slave model , Producer consumer or pipeline model, Hybrid model.

U2.2. Self Study: Methods for containing interactions overheads.

Unit 3
Title – Basic communication operations (08 Hrs)
U3.1
Introduction, One-to-All Broadcast and All-to-One Reduction, All-to-All broadcast and reduction, All-Reduce and prefix sum operations, scatter and gather, All-to-All personalized communication, circular shift.

U3.2. Self Study: Methods of improving the speed of some communication operations.

Unit 4
Title – Analytical modeling of parallel programs: (06 Hrs)
U4.1
Performance metrics for parallel systems, Effect of granularity of performance, Scalability of parallel system, Minimum execution time and minimum cost-optimal execution time, asymptotic analysis of parallel programs, other scalability metrics.

U4.2. Self Study: Comparison between best known sequential algorithm and parallel algorithm in terms of different performance metrics.

Unit 5
Title- Message Passing Paradigm (08 Hrs)
U5.1.
Principle of message – Passing programming, send and receive operations, The Message Passing Interface, Topologies and embedding, Overlapping communication with computation, collective communication and computation operations, Groups and communicators. Dense matrix algorithm: Matrix-vector multiplication, Matrix-matrix algorithm: DNS Algorithm, Canon's Algorithm.

U5.2. Self Study: Sorting Algorithms.

Text Books:

T1. "Introduction to Parallel Computing", Second Edition, Ananth Gram, Anshul Gupta, George Karypis, Vipin Kumar, Pearson Education.

T2. "Parallel computing Theory and Practice", Second Edition, Michael J. Quinn, TMH.
T3. "programming Massively Parallel Processors A Hands on Approach", David B. Kirk and Wen-mei W. Hwu , Morgan Keifmann, Elsevier.

Reference Books:

R1. "Parallel and Distributed Systems", Arun Kulkarni, Nupur Prasad Giri, Nikhilesh Joshi, Bhushan Jadhav, Wiley India Private Limited.
R2. "Using MPI: Portable Parallel Programming with the Message-Passing Interface", William Gropp, Ewing Lusk, Anthony Skjellum, 3rd Edition, MIT Press.

Course Outcomes:
Upon completion of the course, graduates will be able to –

1. Design and analyze parallel computing architecture.
2. Describe the various design issues in a parallel algorithms.
3. Evaluate the impact of interconnection network on parallel/distributed algorithms.
4. Analyze parallel and distributed algorithms in problem solving and apply performance metrics.
5. Describe the different principles of message passing programming, and study the behavior of parallel programs.

COURSE CODE: IT42177 **REF NO: To be filled by CD office**

Parallel and Distributed Systems(Tutorial)

Credits: 1 **Teaching Scheme: -** Tutorial 01 Hrs/Week

Prerequisites:

1. Computer Organization
2. Data Communications and Computer Networks
3. Operating Systems
4. Computer Programming

Objectives:

1. To develop and apply knowledge of parallel and distributed computing techniques and methodologies.
2. To gain experience in the design, development, and performance analysis of parallel and distributed applications.
3. To gain experience in the application of fundamental Computer Science methods and algorithms in the development of parallel applications.
4. To understand the design, testing, and performance analysis of a software system, and to be able to communicate that design to others.

Course Details:

List of Contents

Tutorial No. 1: Understanding Parallel programming platforms

Tutorial No. 2: Problem solving on physical organization of parallel platforms

Tutorial No. 3: Understanding the principles of parallel algorithm design

Tutorial No. 4: Problem solving on task dependency & decomposition

Tutorial No. 5: Understanding basic communication operations i.e. broadcast & reduction

Tutorial No. 6: Problem solving based on different communication operations applied on different networks such as ring, mesh or hypercube.

Tutorial No. 7: Understanding asymptotic analysis of Parallel Programs

Tutorial No. 8: Problem solving on speed up (Amdahl's law, super linear speed up)

Tutorial No. 9: Understanding message passing paradigm

Tutorial No. 10: Problem solving on message transfer protocols and other communication operations.

Text Books:

T1. "Introduction to Parallel Computing", Second Edition, Ananth Gram, Anshul Gupta, George Karypis, Vipin Kumar, Pearson Education.

T2. "Parallel computing Theory and Practice", Second Edition, Michael J. Quinn, TMH.

T3. "programming Massively Parallel Processors A Hands on Approach", David B. Kirk and Wen-mei W. Hwu , Morgan Keifmann, Elsevier.

Reference Books:

R1. "Parallel and Distributed Systems", Arun Kulkarni, Nupur Prasad Giri, Nikhilesh Joshi, Bhushan Jadhav, Wiley India Private Limited.

R2. "Using MPI: Portable Parallel Programming with the Message-Passing Interface", William Gropp, Ewing Lusk, Anthony Skjellum, 3rd Edition, MIT Press.

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Design and analyze parallel computing architecture.
2. Describe the various design issues in a parallel algorithms.
3. Evaluate the impact of interconnection network on parallel/distributed algorithms.
4. Analyze parallel and distributed algorithms in problem solving and apply performance metrics.
5. Describe the different principles of message passing programming, and study the behavior of parallel programs.

COURSE CODE: IT30377 **REF NO: To be filled by CD office**

Parallel Computing Lab

Credits: 1 **Teaching Scheme: Laboratory (2Hrs /Week)**

Prerequisites:

1. Computer Organization
2. Data Communications and Computer Networks
3. Operating Systems
4. Computer programming

Objectives:

1. To provide students with contemporary knowledge in parallel computing.
2. To equip students with skills to design and analyze parallel algorithms in different applications.
3. To understand, appreciate and apply parallel algorithms in problem solving.
4. To gain knowledge on how to improve performance metrics using parallel programs.

Laboratory Experiments:

Experiment 1. Parallel GPU implementation of addition up to 'n' numbers, vector-vector operations, vector-Matrix operations

Experiment 2. Parallel computation of binomial coefficient matrix, Matrix-Matrix operations

Experiment 3. Assignment focusing on optimization of data transfer between CPU and GPU: using page locked host memory and to avoid the data transfer

Experiment 4. Assignment focusing on memory optimization: use of GPU shared, constant and texture memory.

Experiment 5. Parallel GPU implementation involving kernel looping.

Experiment 6. Parallel computation of set of multi-indices on GPU.

Experiment 7. Parallel optimization of algorithms on OpenAcc.

Experiment 8. Parallel implementation using MPI, OpenMP

Experiment 9. Exercise using parallel compilers.

Text books:

T1. "Introduction to Parallel Computing", by Ananth Grama, George Karypis , Vipin Kumar, Anshul Gupta , second edition, Addison Wesley, 2003, ISBN: 0201648652

T2. "CUDA by Example: An Introduction to General-Purpose GPU Programming", by Jason Sanders, Edward Kandrot

T3. "Programming Massively Parallel Processors", by Kirk & Hwu,2nd edition,ISBN:9780124159921

Reference Books:

R1**.** " Introduction to Parallel Processing: Algorithms and Architectures", by Behrooz Parhami **.**

R2. " Computer Architecture and Parallel Processing", by Kai Hwang , Faye A. Briggs

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Explain large scale parallel systems and architectures
2. Write parallel programs for large scale parallel systems, shared address space platforms, and heterogeneous platforms.
3. Design efficient parallel algorithms and applications.
4. Analyze performance and model parallel programs.

COURSE CODE: IT42115 **REF NO: _____**

Real Time Systems

Credits: 3 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites:

1. Operating Systems
2. Computer Organization
3. Data Communication & Computer Network
4. Computer Programming

Objectives:

1. To expose the students to the fundamentals of real time systems
2. To analyze the various scheduling aspects of real time systems
3. To study about the resource access control and synchronization in real time systems
4. To introduce the fundamentals of real time communication
5. To study the data management system for real time

Course Details:

Unit 1

Title - Introduction: (08 Hrs)

U1.1.

Introduction to Real Time Systems, Characteristics of Real Time System, Applications of Real Time Systems, A Basic Model of a Real Time System, Types of Real Time Systems, Fault Tolerance Techniques in Real Time Systems: Hardware Fault Tolerance and Software Fault Tolerance, Timing Constraints: Classification and Examples of Different Types of Timing Constraints.

U1.2. Self Study: Modelling of Timing Constraints

Unit 2

Title - Real Time Task Scheduling: (8 Hrs)

U2.1.

Basic Concepts and Terminologies, Classification of Real Time Task Scheduling Algorithms, Clock Driven Scheduling, Event Driven Scheduling, Earliest Deadline First (EDF) Scheduling, Rate Monotonic Algorithm (RMA) Scheduling, Issues Associated with RMA.
Commercial Real Time Operating Systems: General Concepts, Unix and Windows as RTOS.

U2.2. Self Study: Hybrid schedulers, Survey on Commercial Real Time Operating Systems

Unit 3

Title - Resource Sharing and Multiprocessor Scheduling in RTOS: (8 Hrs)

U3.1.

Resource Sharing Among Real Time Tasks, Priority Inversion, Priority Inheritance Protocol (PIP), Highest Locker Protocol (HLP), Priority Ceiling Protocol (PCP),Types of Priority Inversions Under PCP, Important Features of PCP.
Scheduling Real Time Tasks in Multiprocessor and Distributed Systems: Multiprocessor Task Allocation, Dynamic Allocation of Tasks, Clock Synchronization.

U3.2. Self Study: Handling Task Dependencies, Issues in Using a Resource Sharing Protocol

Unit 4

Title - Real Time Communication: (06 Hrs)

U4.1.

Basic Concepts, Real Time Communication in a LAN: Hard Real Time Communication and Soft Real Time Communication, Real Time Communication over Packet Switched Networks.

U4.2. Self Study: QoS Framework

Unit 5

Title - Real Time Databases: (06 Hrs)

U5.1.

Review of Basic Database Concepts, Real Time Databases, Concurrency Control in Real-Time Databases.

U5.2. Self Study: Characteristics of Temporal Data, Example Applications of Real-Time Databases

Note: Five assignments to be given to the students on self study, comprising of one assignment from each unit.

Text Books:

1. Rajib Mall, "Real Time Systems Theory and Practice", Pearson Publication, 2008
2. Jane W.S. Liu, "Real Time Systems", Pearson Education, 2000

Reference Books:

1. C.M. Krishna and K.G. Shin, "Real-Time Systems", TMH
2. R.J.A Buhur, D.L Bailey, "An Introduction to Real – Time Systems", Prentice – Hall International, 1999
3. Phillip A. Laplante, "Real-Time Systems Design and Analysis", Wiley Publishers

Course Outcomes:

1. Understand the basics and importance of real time systems
2. Develop real time algorithm for task scheduling
3. Apply formal methods to the analysis and design of real time systems
4. Explain the additional problems that arise in developing distributed and networked real-time systems
5. To work on design and development of protocols related to real time communication
6. To know the details of real time databases and applications

COURSE CODE: IT42115 **REF NO: _____**

Real Time Systems Tutorial

Credits: 1 **Teaching Scheme: -** Tutorial 01 Hrs/Week

Prerequisites:

1. Operating Systems
2. Computer Organization
3. Data Communication & Computer Network
4. Computer Programming

Objectives:

1. To expose the students to the fundamentals of real time systems
2. To analyze the various scheduling aspects of real time systems
3. To study about the resource access control and synchronization in real time systems
4. To introduce the fundamentals of real time communication
5. To study the data management system for real time

Tutorial No. 1: Development of different Timing Constraint Model.

Tutorial No. 2: Concept of Clock-Driven Scheduling with numerical on Table-Driven Scheduling and Cyclic Scheduler.

Tutorial No. 3: Understanding the concept of Event-Driven Schedulers using problematic approach: Earliest Deadline First (EDF) and Rate Monotonic Algorithm (RMA).

Tutorial No. 4: Understanding the need of DMA with/without using Context Switching Overhead and Self Suspension.

Tutorial No. 5: Concept of resource sharing among real-time system using Priority Inversion, Priority Inheritance Protocol and Highest Locker Protocol.

Tutorial No. 6: Understanding the concept of Priority Ceiling Protocol and Handling Task Dependencies.

Tutorial No. 7: Developing the concept of Multiprocessor and Dynamic Allocation of Task in real time system.

Tutorial No. 8: Working of Centralized and Distributed clock synchronization techniques.

Tutorial No. 9: A Survey of Contemporary Real-Time Operating Systems.

Tutorial No. 10: Understanding the concept of Centralized and Distributed clock synchronization techniques.

Tutorial No. 11: Understanding soft and hard real time communication in a LAN.

Tutorial No. 12: Understanding the application of real-time database using a commercial real-time database.

Text Books:

1. Rajib Mall, "Real Time Systems Theory and Practice", Pearson Publication, 2008
2. Jane W.S. Liu, "Real Time Systems", Pearson Education, 2000

Reference Books:

1. C.M. Krishna and K.G. Shin, "Real-Time Systems", TMH
2. R.J.A Buhur, D.L Bailey, "An Introduction to Real – Time Systems", Prentice – Hall International, 1999
3. Phillip A. Laplante, "Real-Time Systems Design and Analysis", Wiley Publishers

Course Outcomes:

1. Understand the basics and importance of real time systems
2. Develop real time algorithm for task scheduling
3. Apply formal methods to the analysis and design of real time systems
4. Explain the additional problems that arise in developing distributed and networked real-time systems
5. To work on design and development of protocols related to real time communication
6. To know the details of real time databases and applications

COURSE CODE: IT40106 REF NO: To be filled by CD office

Software Engineering (SE)

Credits: 3 **Teaching Scheme: - Theory 3 Hrs/Week**

Prerequisites: Computer Programming, Object-Oriented Concepts, Concepts of Data Modeling

Objectives: This course helps to

- Apply basic principles and techniques of software development in actual problem domain
- Understand theories, methods, and technologies applied for professional software development.
- Model and test real world problems
- Gain knowledge on the emerging software engineering trends

Unit 1: Software Development Life Cycle (10 Hrs)

U1.1 Life Cycle Models: Introduction to Information System and software Engineering, Software Processes, Software Development Life Cycle Models: Waterfall Model, Iterative Waterfall Model, Incremental Models, Evolutionary model, Prototyping Model, Agile process, XP and Scrum
U1.2: Requirement Engineering: Inception, Elicitation, Elaboration, Negotiation, Specification, Validation, management, Software project estimation: LOC and FP

U1.2. Self Study: V Model, DSDM, COCOMO method for estimation

Unit 2 Function-Oriented Analysis & Design (06 Hrs)

U2.1. Function-oriented Design: Introduction to Structured Analysis, Data Flow Diagram, Process Specification, Structured Design Methodologies: Coupling and Cohesion, Structure Chart, Mapping DFD into Structure Chart, Metrics.

U2.2. Self Study: High Level Design Metrics, Component Level Design Metrics

Unit 3 Object-Oriented Analysis & Design (10 Hrs)

U3.1 Modelling Techniques using UML: The Unified Approach to Modelling, Unified Modelling Language (UML) overview, Class and Object diagram, Class relationship: Association, Aggregation, Composition, Generalization, Activity diagram, State diagram, Interaction diagrams, Sequence diagram, Collaboration / Communication Diagram, Component Diagram, and Deployment Diagram.

U3.2 Object-Oriented Analysis & Design: Use-Case Modeling, Use-Case Realization, Types of Classes: Class Classification Approaches: Noun Phrase Approach, CRC Card Approach, Use-case Driven Approach Identification of Classes, Relationship, Attributes and Method, Design Patterns.

U3.3 Self Study: Booch OOD Model, Rumbaugh's OMT model, Jacobson's OOSE model, Timing diagrams, Design Patterns

Unit 4: Implementation and Quality Assurance (06 Hrs)

U4.1. Implementation: Coding standards and guidelines, Human computer interface, Code review and inspection.

U4.2. Quality Assurance: Testing Fundamentals, Verification & Validation, Black Box Testing, White Box Testing, Test Case preparation, McCabe's complexity, Unit Testing, Integration Testing, System

Testing, Performance Testing. Quality management system.

U4.3. Self Study: Regression Testing, Object-Oriented Integration and System Testing.

Unit 5 Software Architecture trend (04 Hrs)

U5.1. Architecture Styles: Repository, Layered, Pipe-Filter, Call-Return, Peer-Peer, Publish-Subscribe, Client-Server, Two-Tier, Three-Tier, N-Tier, and Heterogeneity in Architecture, CORBA, COM/DCOM.

U5.3. Self Study: Service Oriented Architecture (SOA), Software as a Service (SaaS), Model Driven Design (MDD).

Note: Five assignments to be given to the students on self study, comprising of one assignment from each unit.

Course Outcome:

Upon completion of the course, graduates will be able to –

1. Use suitable process model for software development, and carry out requirement engineering process.
2. Carry out Analysis and Design activities using function oriented analysis and design methodologies.
3. Carry out Analysis and Design activities using Object oriented modelling techniques.
4. Use the techniques, skills for software development and software testing.
5. Differentiate different architecture trends.

Text Books:

T1. "Software Engineering: A Practitioner's Approach", Roger S. Pressman, McGraw Hill, 6/e, 2005.

T2. "Fundamentals of Software Engineering", Rajib Mall, PHI, 3rd Edition, 2009.

T3. "Object-Oriented Modeling and Design with UML, Michael R Blaha, James R Rambaugh, Pearson, LPE

Reference Books:

R1. "Software Engineering", Ian Sommerville, Addison-Wesley, 9th Edition, 2010, ISBN- 13: 978-0137035151.

R2. "System Analysis, Design, and Development: Concepts, Principles, and Practices", Charles S. Wasson,, John Wiley & Sons, Inc.,ISBN-13 978-0-471-39333-7, 2006.

R3. "Unified Modeling Language Users Guide", Grady Booch, James Rambaugh, Ivar Jacobson, 2nd Edition, Addison- Wesley, ISBN – 0321267974

R4. "Unified Modeling Language Reference manual", Grady Booch, James Rambaugh, Ivar Jacobson, Pearson India, ISBN – 9788177581614

R5. Scrum Essentials: Agile software Development for Project Managers, Scrum Masters, Product Owners, and Stakeholders", Troy Dimes, Create Space Independent publishing Platform, ISBN: 9781500970512

COURSE CODE: IT40106 REF NO: To be filled by CD office

SOFTWARE ENGINEERING-TUTORIALS

Credits: 01 **Teaching Scheme:** Tutorial 01 Hrs/Week

Prerequisites: Computer Programming, Object-Oriented Concepts, Concepts of Data Modeling

Objectives: This course helps to

- Apply basic principles and techniques of software development in actual problem domain
- Understand theories, methods, and technologies applied for professional software development.
- Model and test real world problems
- Gain knowledge on the emerging software engineering trends

List of Tutorials

Tutorial No. 1: Develop requirements specification for a given problem (The requirements specification should include both functional and non-functional requirements.

(For a set of about 20 sample problems, see the questions section of Chapter 6 of Fundamentals of Software Engineering Book by Rajib Mall)

Tutorial No. 2: Develop DFD Model (Level 0, Level 1 DFD and Data Dictionary) of the sample problem

Tutorial No. 3: Develop Structured Design for the DFD model developed

Tutorial No. 4: Design test cases using Equivalence class partitioning and Boundary value analysis technique for given problems

Tutorial No. 5: Develop UML Use Case model for a problem

Tutorial No. 6: Develop Class diagrams

Tutorial No. 7: Develop Sequence diagrams from the identified Class diagrams

Tutorial No. 8: Develop State Transition diagram for an object from a given class diagram

Tutorial No. 9: Develop the Activity diagram.

Tutorial No. 10: Analysis of Architecture style

Course Outcome:

Upon completion of the course, graduates will be able to –

1. Use suitable process model for software development, and carry out requirement engineering process.

2. Carry out Analysis and Design activities using function oriented analysis and design methodologies.
3. Carry out Analysis and Design activities using Object oriented modelling techniques.
4. Use the techniques, skills for software development and software testing.
5. Differentiate different architecture trends.

Text Books:

T1. "Software Engineering: A Practitioner's Approach", Roger S. Pressman, McGraw Hill, 6/e, 2005.
T2. "Fundamentals of Software Engineering", Rajib Mall, PHI, 3rd Edition, 2009.
T3. "Object-Oriented Modeling and Design with UML, Michael R Blaha, James R Rambaugh, Pearson, LPE

Reference Books:

R6. "Software Engineering", Ian Sommerville, Addison-Wesley, 9th Edition, 2010, ISBN- 13: 978-0137035151.
R7. "System Analysis, Design, and Development: Concepts, Principles, and Practices", Charles S. Wasson,, John Wiley & Sons, Inc.,ISBN-13 978-0-471-39333-7, 2006.
R8. "Unified Modeling Language Users Guide", Grady Booch, James Rambaugh, Ivar Jacobson, 2nd Edition, Addison- Wesley, ISBN – 0321267974

COURSE CODE: IT40306 **REF NO: To be filled by CD office**

SOFTWARE ENGINEERING-LAB

Credits: 1 **Teaching Scheme: - Laboratory**

Prerequisites: Object Oriented Concepts, Programming in C or Java

Objectives:

- Apply basic principles and techniques of software engineering in actual problem domain
- Develop skills in modelling tools
- Develop design models for software solution to different problems

Course Details:

List of Laboratory Exercises:

Following laboratory experiments will be done based on the case study or problem statement to be given by the teacher.

Experiment 1: Study of specific problem case, prepare the system requirement specification, and the context diagram.

Experiment 2: Analyze the problem and create the Data Flow Diagram (at least up to 2 levels). Write the data dictionary.

Experiment 3: Develop the module structure chart for the problem.

Experiment 4: Develop UML Use Case model for a problem

Experiment 5: Identify entity objects and classes and develop class diagram. Depict the class relationship using UML.

Experiment 6: To depict the dynamic behaviour using Activity diagram.

Experiment 7: To depict the dynamic behaviour of the target system using sequence diagram.
The Sequence diagram should be based on the Scenarios generated by the inter-object Communication. The model should depict:

a. Discrete, distinguishable entities (class).
b. Controller classes as required
c. Events (Individual stimulus from one object to another)
d. Conditional events and relationship representation.

Experiment 8: Draw the collaboration / Communication diagram

Experiment 9: To depict the state transition with the life history of objects of a given class model. The model should depict:

a. Possible ways the object can respond to events from other objects.
b. Determine of start, end, and transition states.

Experiment 10: Develop test cases for the Java code and execute using JUnit.

(Model drawing tools like Magic Draw &Smart Draw etc. and open source graphics editing tools will be used)

Text Books:

T1. Rajib Mall, "Fundamentals of Software Engineering", PHI, 4th Edition, 2014.

T2. Grady Booch, James Rambaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison- Wesley, ISBN – 0321267974

Reference Books:

R1. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, "Design Patterns: Elements of Reusable Object-Oriented Software" (Addison-Wesley Professional Computing Series), 1994.

R2. Steven Kelly, Juha-Pekka Tolvanen, Domain-Specific Modeling: Enabling Full Code Generation, John Wiley & Sons, Inc., ISBN 978-0-470-03666-2, 2008

R3. Mellor, Scott, Uhl, Weise, "MDA Distilled", Pearson Education, ISBN 81-297-0529X

R4. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design.", 2nd Edition, Addison- Wesley, ISBN – 0321321278.

R5. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049

Note: At least one Text Book and one Reference Book must be from Foreign Author/Foreign Publisher.

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Identify the Requirements from a given problem
2. Design DFD model of a system
3. Develop different UML diagrams
4. Develop test cases for validation of requirement specification and design

COURSE CODE: IT42123 **REF NO: To be filled by CD office**

WIRELESS SENSOR NETWORK

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites:

1. Data Communication and Computer Networks
2. Computer Programming
3. Design & Analysis of Algorithms
4. Operating System

Objectives:

A wireless sensor network (WSN) is a network of spatially distributed autonomous sensors those monitor physical or environmental conditions and cooperatively pass their data through the network to a main location. This course introduces the wireless sensor networks technology and discusses challenges in the design and management of wireless sensor networks.

Course Details:

Unit 1 Title: Overview of WSN (6 Hrs)

U1.1 Introduction to WSN: Introduction, Challenges of WSN, Advantages of WSN over Ad Hoc wireless Network, WSN applications - structural health monitoring, traffic control, healthcare, pipeline monitoring, precision agriculture, active volcano, underground mining, Wireless sensor node architecture: hardware and software components of a sensor node. Embedded operating systems structure and execution environments. Programming paradigms and application programming interfaces.

U1.2 Self Study: Sensor Node Hardware – Berkeley Motes, C Motes etc., Programming Challenges, Node-level, software platforms, Node-level Simulators, TinyOS and nesC.

Unit 2 Title: WSN Architecture (7 Hrs)

U2.1 WSN Architectural Framework: Sensor network Senarios: types of sources and sinks, single-hop versus multi-hop networks, types of mobility (node, sink & event) and optimization goals, Physical layer transceiver design consideration in WSNs. Fundamentals of wireless MAC protocols, Low duty cycle protocols and wakeup concept, contention-based protocols, Schedule-based protocols. Network layer – routing metrics, flooding and gossiping, routing protocols. Transport Layer - Data-Centric and Contention-Based Networking, QoS in Wireless Sensor Networks – Congestion Control, QoS management: Basic functions, centralized solution, Topology control, Sensor mode selection.

U2.2 Self Study: Physical layer – Wireless channel and communication fundamentals: Channel models, wave propagation effects and noise, IEEE 802.15.4 MAC protocol,

Unit 3 Title: Time Synchronization and Localization in WSN (7 Hrs)

U3.1 Node and Network Management: power management – local power management, dynamic power management, clock synchronization in WSN – challenges, design principle, classification and protocols (Lightweight Tree-Based Synchronization, Time-diffusion based synchronization, Asynchronous diffusion based). Localization – classification of localization,

localization algorithms: ranging techniques, range-based localization, range-free localization, event-driven localization.

U3.2 Self Study: Application of Clock synchronization and localization algorithms in WSN, Beacon based distributed localization

Unit 4 Title – Wireless Security (7 Hrs)

U4.1 WSN Security: Security fundamentals and challenges, Static and dynamic key distribution, security attacks, protocols and mechanisms for security. Different types of attacks in WSN, WPA-EAP, Attacking 802.11 Networks- Basic Types Of Attacks, Security Through Obscurity, Defeating WEP, WEP attacks, 802.11 Authentication Types, Attacking WPA Protected 802.11, Breaking WPA, LEAP, EAP-TLS, Tunnelling EAP Techniques, Hacking Attacking 802.11i wireless technologies- Hacking hotspots, client attacks resources, threats of Bluetooth.

U4.2 Self Study: Advanced attacks- layer 2 fragmentations breaking the silence, layer 2 and layer 3 resolutions.

Unit 5 Title – Programming in WSN (7 Hrs)

U5.1 Sensor network programming: Radio basics, introduction to ZigBee – network topology, addressing basics, PAN addresses, channels, basic ZigBee chat, advanced ZigBee, introduction to Arduino, Embedded system programming concept and I/O interfacing using Arduino. Inter building WSN with Zigbee and Arduino. Important roles of Arduino based systems in smart cities.

U5.2 Self Study: Practical implementation of WSN on environment monitoring, Mobile Robot motion control using Arduino based system.

Text Books:

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

Reference Books

1. Ian F. Akyildiz, Mehmet Can Vuran, *Wireless Sensor Networks in Communications and Networking*, Wiley, 2011.
2. Robert Faludi , *Building Wireless Sensor Networks: with ZigBee, XBee, Arduino, and Processing*, O'Reilly Media, 2010.
3. Ibrahiem M. M. El Emary, S. Ramakrishnan, *Wireless Sensor Networks: From Theory to Applications*, CRC Press, 2013.
4. Waltenegus Dargie, Christian Poellabauer, *Fundamentals of Wireless Sensor Networks: Theory and Practice*, Wiley-Blackwell, 2010.

Course Outcomes:

Upon completion of the course the student will be able to-

CO1 : Identify the unique issues in sensor networks.
CO2: Implement and deploy current technology trends for wireless sensor networks.

CO3: Analyze the challenges in designing MAC, routing and transport protocols for wireless sensor networks.
CO4: Understand and apply various security issues pertaining to wireless sensor networks.
CO5: Comprehend and exploit the various sensor network Platforms, tools and applications.

COURSE CODE: IT42323 **REF NO:** To be filled by CD office

WIRELESS SENSOR NETWORK LABORATORY

Credits: 01 **Teaching Scheme:** Laboratory 02Hrs/Week

Prerequisites:
Data Communication and Computer Networks
Computer Programming
Design & Analysis of Algorithms
Operating System

Objectives:
1. To understand the fundamental principles of wireless sensor networks.
2. To create different topologies in wireless sensor network
3. To simulate different algorithms by using simulation software

List of Experiments:
Experiment No. 1
- Introduction to Sensor node: To study the various components of a sensor node and their functionalities.

Experiment No. 2 (NS2/NS3)
- Introduction to Simulator: Study on various features of the simulator to design a sensor network.

Experiment No. 3 (NS2/NS3)
- Write the simple programs to create an arbitrary topology sensor network.

Experiment No. 4 (NS2/NS3)
- Write a program to send data (Hello Message) among the sensor nodes using unicast, broadcast and multicast techniques.

Experiment No. 5
- Write a program to implement the Ad-Hoc on Demand Distance Vector routing algorithm.

Experiment No. 6
- Write a program to implement various propagation loss models on the sensor network.

Experiment No. 7

- Write a program to calculate the energy of the sensor nodes after transmitting n number of messages.

Experiment No. 8

- Write a program to measure the various network performance parameters (such as delay, clock time of the sensor node, network life time, throughput etc.) of the sensor nodes after transmitting N number of messages.

Experiment No. 9

- Design an arbitrary topology sensor network of N senor nodes using C Mote or IR sensor nodes.

Experiment No. 10

- Write a program to collect the environment data (such as temperature, pressure, humidity etc.) from the sensor node and send it to the base station for further processing.

Text Books:

T1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
T2. https://www.nsnam.org /

Course Outcome:

After taking this course the graduate students will be able to:

1. Identify different features supported by the sensor networks.
2. Design and implementation of sensor network using simulation software.
3. Analyze and implement data communication and routing using socket programming concepts
4. Design and implementation of sensor network using sensor nodes

DEPARTMENT OF CSE, C.V RAMAN COLLEGE OF ENGINEERING, BHUBANESWAR

Fourth Year B. Tech Structure with effect from Academic Year 2015-16

Semester - VIII

Sl. No.	Code	Subject	Type	Teaching Scheme			Credits
				L	P	T	
S1	IT40108	Computational Intelligence	Theory – Core	3	-	-	3
S2	IT40105	IT Service Management	Theory – Core	3	-	1	4
S3	IT42180	i. Software Testing	Elective – I	3	-	-	3
	CS42176	ii. Pervasive Computing					
	CS42172	iii. Digital Image Processing					
	IT42110	iv. Software Project Management					
S4	MB43102	i. Entrepreneurship Development	Elective – II	3	-	1	4
	MB43101	ii. Principle of Management					
	MB43105	iii. Organizational Behaviour					
	MB43103	iv. Marketing Management					
	EC43110	v. Digital Signal Processing					
P1	IT40308	Computational Intelligence Lab	Lab – Core	-	2	-	1
P2	IT42180	i. Software Testing Lab	Lab-Elective-I	-	2	-	1
	CS42376	ii. Pervasive Computing Lab					
	IT42315	iii. Digital Image Processing Lab					
	IT42310	iv. Software Project Management Lab					
MP	CS47398	Major Project Stage – III	Project	-	8	-	5
			Total:	**12**	**12**	**2**	**21**

COURSE CODE: IT40108 **REF NO: ----------**

Computational Intelligence

Credits: 3 **Teaching Scheme: Theory** 3 Hrs/Week

Prerequisites:

1. Design & Analysis of Algorithm
2. Discrete Mathematics
3. Probability & Statistics

Objectives:

1. To make the students familiarize with fundamental understanding of Soft Computing principles.
2. To enable students, using Soft-Computing tools solve some real life problems.
3. To make students able to analyse and apply various hybrid soft computing methods in different problem domains and find their applications.
4. To evaluate the power and limitation of Swarm Intelligence in solving computational problems.

Course Details:

Unit-1 Title- Neural Network **(8 Hrs)**

U 1.1 Introduction: Introduction to Soft Computing(SC), Type of applications, Constituents of SC, Soft computing and hard computing

U1.2: Artificial Neural Network(ANN): Introduction and Role of Neural Network (NN), Basic Models of an artificial Neuron, Neural Network Architecture, Learning methods, Terminologies of ANN, Hebb network, Supervised Learning Networks: Perceptron, MLP, Architecture of a Back propagation Network : back propagation, Learning Effect of Tuning parameters of the Back propagation,

U1.3 Self study: Solving Problems based on Hebb Network, MLP & Back propagation algorithms.

Unit-2 Title- Fuzzy Logic **(6 Hrs)**

U 2.1 Fuzzy Set Theory: crisp sets, fuzzy sets, crisp relations, fuzzy relations, **Fuzzy Systems:** Crisp logic predicate logic,fuzzy logic, fuzzy Rule based system, Defuzzification Methods, Fuzzy rule based reasoning

U 2.2 Self study: Different fuzzy Models

Unit-3 Title- Genetic Algorithm **(6 Hrs)**

U.3.1 Fundamentals of Genetic Algorithms: Encoding, Fitness functions, Reproduction. Genetic Modelling : Cross cover, Inversion and deletion, Mutation operator, Bit-wise operators, Bitwise operators used in GA. Convergence of Genetic algorithm. Applications , Real life Problems.

U.3.2 Self Study: Implement genetic programming for solving various optimization problems.

Unit-4 Title- Swarm Intelligence **(8 Hrs)**

U.4.1 Swarm Intelligence: Introduction to Swarm Intelligence, Key Principles, Swarm Optimization as a feature optimization tool.

U.4.2 Ant Colony Optimization: From Real to Artificial Ants, Ant Colony Optimization algorithm, Application in Travelling Salesman Problem.

U4.3 Particle swarm Optimization: Concepts and Parameters understanding, Algorithm in detail, Application in Medical domain.

U.4.4 Self Study: Analysis and Implementation of Fish Swarm Optimization in feature optimization problems.

Unit-5 Title- Hybridization **(6 Hrs)**

U.5.1 Hybrid Soft Computing Techniques: Hybrid system, neural Networks,fuzzy logic and Genetic algorithms hybrids. Genetic Algorithm based Back propagation Networks: GA based weight determination applications: Fuzzy logic controlled genetic Algorithms soft computing tools, Applications.

U.5.2 Self Study: Implement ANFIS for a real life problem

Text Books:

T1. Principles of Soft Computing- S.N.Sivanandan and S.N.Deepa, Wiley India, 2nd Edition,2011

T2. Neuro Fuzzy and Soft Computing, J. S. R. JANG,C.T. Sun, E. Mitzutani, PHI

T3. Swarm Intelligence (The Morgan Kaufmann Series in Evolutionary Computation) - Russell C. Eberhart , Yuhui Shi, James Kennedy.

Reference Books:

R1. Neural Networks, Fuzzy Logic, and Genetic Algorithm (synthesis and Application) S.Rajasekaran, G.A. Vijayalakshmi Pai, PHI

R2. Haykin, S., Neural Networks - A Comprehensive Foundation (2nd Edition).

Macmillan, 1999.

R3. Randy L.Haupt and Sue Ellen Haupt , Practical Genetic Algorithms.

Course Outcome:

Upon completion of the course, graduates will be able –

CO1. Investigate and analyze optimization problems and apply the concepts of Artificial Neural Network (ANN).

CO2. Design Fuzzy system using the concepts of Fuzzy set theory.

CO3. Apply Genetic algorithms for solving various real life engineering and societal problems.

CO4. Use swarm Intelligence for solving optimization problems in societal application.

CO5. Apply Hybrid Soft Computing Techniques for some real life applications.

COURSE CODE: IT40308 **REF NO: _____**

Computational Intelligence Lab

Credits:1 **Teaching Scheme:** Laboratory **2Hrs/Week**

Pre requisites:

1. Computer Programming using C and Data Structures
2. Design & Analysis of Algorithm
3. Basic knowledge of MATLAB/SCILAB/PYTHON is desirable

Objectives:

1. To make the students familiarize with fundamental understanding of MATLAB/SCILAB/PYTHON.
2. To enable students design and simulate CI based models to solve real life problems
3. To implement computational learning models for classification, optimization and decision making using soft computing techniques

List of Experiments

Experiment No.1: Writing simple programs using MATLAB or SCILAB or PYTHON such as: Print Hello World, Vector & Matrix Operations, Using Control Structures, Reading and writing image files, using system defined functions, writing user defined functions.

Experiment No.2: To perform fuzzy Union, Intersection, and Complement operations.

Experiment No.3: To plot various fuzzy membership functions

Experiment No.4: To implement FIS Editor. Use Fuzzy toolbox to model tip value that is given after a dinner based on quality and service

Experiment No.5: To Implement Back propagation algorithm for classification problem

Experiment No.6: To Implement genetic algorithm for function optimization

Experiment No.7: To implement De-Morgan's Law using fuzzy sets.

Experiment No.8: To implement perceptron net for an AND function with bipolar inputs and targets

Experiment No.9: To Implement Hebb Network to classify two dimensional input patterns in bipolar with given targets.

Experiment No.10: To Implement different fuzzy composition operations

Experiment No.11: To store vector in an auto-associative net. Find weight matrix & test the net with input

Experiment No.12: Perform optimization using PSO or ACO

Note: At least 10 experiements to be done as per the above list.

Text books:

Reference Books:

Course Outcomes:

Upon completion of the course, graduates will be able to –

1) Use MATLAB/SCILAB for mathematical problem solving with Fuzzy approach
2) Develop MATLAB/SCILAB programs to implement CI models such as ANN, GA
3) Develop MATLAB/SCILAB programs to implement other optimization algorithms to solve problems.

COURSE CODE: CS42172 **REF NO: To be filled by CD office**

DIGITAL IMAGE PROCESSING

Credits: 03 **Teaching Scheme:** Theory 03 Hrs/Week

Prerequisites: Knowledge on engineering mathematics, programming and algorithms.
Knowledge on Digital signal processing is preferable.

Objective:

- To gain knowledge on the different techniques used for digital image processing
- To apply DIP techniques for solution of different type of problem domain.

Course Details:

Unit I: Digital Image fundamentals **(6Hrs)**

U1.1 Introduction: Image sampling and quantization, relationship between pixels, Intensity transformations and spatial filtering, some basic intensity transformation functions, Histogram processing, spatial filters for smoothing and sharpening (Chapters: 2 & 3 of Text book 1)

U1.2. Self Study:

Visual Perception, Image acquisition, using fuzzy sets for intensity transformation and spatial filtering

Unit 2: Frequency Domain Filtering and Image Restoration (8Hrs)

U2.1 Filtering in the Frequency Domain: preliminary concepts, 2D DFT and its properties, basic filtering in the frequency domain, image Smoothing- Ideal LPF, Butterworth LPF, image Sharpening- Ideal HPF, Butterworth HPF (Chapter: 4 of Text book 1)

U2.2 Image Restoration and Reconstruction: Noise models: Spatial and frequency properties of noise, Noise PDF, estimation of Noise parameters,, restoration in the presence of noise only-Mean and Order Statistics filters, estimating the degradation function (Chapter: 5 of Text Book 1)

U2.3. Self Study

Bandpass and Bandreject Filters, Separability of 2-D DFT and FFT, Adaptive restoration, Inverse Filtering

Unit3: Color processing and Multi-resolution processing (6Hrs)

U3.1 Color Image Processing: Color models, Color transformation (Chapter: 6 of Text book 1)

U3.2 Wavelets and Multi-resolution Processing: multi-resolution expansions, wavelet transforms in one and two dimension (Chapter: 7 of Text book 1)

U3.3 Self Study:

Color image smoothing and sharpening, Fast Wavelet Transform

Unit 4: Image Compression and Morphological image processing (8 Hrs)

U4.1: Image Compression: Fundamentals, Some basic compression methods – Huffman Coding, Arithmetic Coding, LZW coding, Run-Length coding, Block transform coding (Chapter: 8 of Text book 1)

U4.2: Morphological Image Processing: Erosion and Dilation, Basic morphological algorithms- boundary extraction, hole filling, connected components, Opening and Closing (Chapter: 9 of Text book 1)

U4.3 Self Study:

Bit –Plane coding, Predictive coding, Compression using Wavelet transforms, Thinning, Thickening, Pruning

Unit 5: Image Segmentation (6 Hrs)

U5.1: Point, Line and Edge Detection: Isolated points, Line Detection, Edge models, Edge linking and boundary detection, Global thresholding, Multiple and variable thresholding

U5.2: Region based segmentation: Region growing, Region splitting and merging

U5.3 Self Study

Watershed Segmentation algorithm, Use of motion in segmentation (spatial and frequency techniques)

Text Books:

1. "*Digital Image Processing"*, R.C. Gonzalez, R.E. Woods, 3rd Edition, Pearson Education
2. "*Digital Image Processing using Matlab"*, R C Gonzalez, Woods and Eddins, 2nd Edition, Tata McGraw Hill

References:

1. "*Digital Image Processing"*, S.Sridhar, Oxford University Press, 2011

Course Outcomes:

Upon completion of the course the graduate students will be able to

1. Use intensity transformation functions and perform spatial filtering for smoothing and sharpening of digital images
2. Design low pass, high pass and band pass frequency domain filtering. Apply noise modeling and restoration techniques for reconstruction of original images from noisy image.
3. Understand color image models. Use the wavelet concept to design image processing filters.
4. Use coding techniques for image compression. Apply morphological operations for image understanding, reconstruction and object detection.
5. Analyze and perform suitable segmentation method for detection image objects.

COURSE CODE: IT40105 **REF NO: To be filled by CD office**

IT SERVICE MANAGEMENT

Credits: 3 **Teaching Scheme: -** Theory 3 **Hrs/Week**

Prerequisites:

1. Cloud Computing/IT Infrastructure
2. Data Communication and Computer Networks
3. Linux

Objectives:

1. Determine current IT infrastructure, services and processes
2. Come up with futuristic IT management practices
3. Design a roadmap to elevate the business from "current state" to "desired state"
4. Formulate steps for the roadmap

Course Details:

Unit 1

Title: Introduction to IT Service Management: (06 Hrs)

U1.1
Introduction to IT Service Management, The Service Lifecycle: Service strategy, Service design, Service transition, Service operation, continual service improvement.

U1.2. Self Study: ITIL security management, Supply management (procurement)

Unit 2
Title: Introduction to Data centre:

U2.1
Data centre Architecture, Data centre Requirements (Computational capability, transformation, merger, etc.), Data centre prerequisites, Data centre Structure

(08 Hrs)

U2.2. Self Study: Floor design and Deployment of Data centre

Unit 3
Title: Infrastructure in Data Centre:

(08 Hrs)

U3.1
ISP Network infrastructure, ISP WAN links, Network Operation Centre, Network Monitoring, Reasons of Data centre consolidation, server consolidation, Network service consolidation process, data centre server.

U3.2. Self Study: S**erver capacity planning.**

Unit 4
Title: Virtualization for Data Center Management:

(08 Hrs)

Unit 4.1

Introduction of Virtualization, Different types of Virtualization: Hardware virtualizaion, Software virtualization, Storage virtualization, Os virtualization: windows and Linux virtualizaion, virtual private cloud setup method. Software define data center.

U4.2. Self Study: server virtualization

Unit 5
Title: Security Issues:
Unit 5.1

(08 Hrs)

Security Guidelines: Unix security, internet security, source security issues, System Administration Work Automation, Cluster Architecture

Unit 5.2: Self Study: Cluster Requirements

Text Books:

T1. IT Infrastructure and its Management by Phalguni Gupta, Surya prakash and Umarani Jayaraman, TMH.

T2. IT System Management by Rich Schiesser,2nd edition, prentice Hall.
T3. IT Service Management by Ernest Brewster, Richard Griffiths, Aid an Lawes, John Sansbury, Viva Books Private Limited.
T4. IT Service Management from Hell Based On Not ITIL by B. Johnson, P. Wilkinson, Van Haren Publishing

Reference Books:

R1. IT System Management for Newbies: Expert Guidance for beginners, kindle edition by William Edwards
R2. Foundation of IT Service Management by Brady Orand.

Course Outcomes:
Upon completion of the course, graduates will be able to –

1. Analyze the IT Service Management and their different service lifecycle.
2. Create data centre architecture and design based on service requirement.
3. Plan data centre infrastructure based on its operation.
4. Analyze and deploy different types of virtualizations.
5. Deal with server security and deployment of cluster.

COURSE CODE: IT40105 **REF NO**: To be filled by CD office

IT Service Management Tutorial

Credits: 01 **Teaching Scheme: -** Tutorial 01 Hrs/Week

Prerequisites:
1. Cloud Computing/IT Infrastructure
2. Data Communication and Computer Networks
3. Linux

Objectives:

1. Determine current IT infrastructure, services and processes
2. Come up with futuristic IT management practices
3. Design a roadmap to elevate the business from “current state” to “desired state”
4. Formulate steps for the roadmap

Course Details:

List of Contents

Tutorial No. 1: IT Service Management and Service Strategy.

Tutorial No. 2: Service Design and Operation.

Tutorial No. 3: Data centre Structure and Architecture.

Tutorial No. 4: Data centre Requirements and its Deployment.

Tutorial No. 5: Data centre consolidation and Network service consolidation process.

Tutorial No. 6: Server capacity planning.

Tutorial No. 7: Virtualization for Data Center Management

Tutorial No. 8: Windows and Linux Virtualization

Tutorial No. 9: Security challenges in IT Management.

Tutorial No. 10: System Administration and Work Automation.

Text Books:

T1. IT Infrastructure and its Management by Phalguni Gupta, Surya prakash and Umarani Jayaraman,TMH
T2. IT System Management by Rich Schiesser,2nd edition, prentice Hall.
T3. IT Service Management by Ernest Brewster, Richard Griffiths, Aid an Lawes, John Sansbury, Viva Books Private Limited.
T4. IT Service Management from Hell Based On Not ITIL by B. Johnson, P. Wilkinson, Van Haren Publishing

Reference Books:

R1. IT System Management for Newbies: Expert Guidance for beginners, kindle edition by William Edwards
R2. Foundation of IT Service Management by Brady Orand.

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Analyze the IT Service Management and their different service lifecycle.
2. Create data centre architecture and design based on service requirement.
3. Plan data centre infrastructure based on its operation.
4. Analyze and deploy different types of virtualizations.
5. Deal with server security and deployment of cluster.

COURSE CODE: CS42176 **REF NO: To be filled by CD office**

Pervasive Computing

Credits: 3 **Teaching Scheme:** - Theory 3 Hrs/Week

Prerequisites:

4. Computer Programming
5. Data Communication and Commuter Networks

Objectives:

1. To introduce the characteristics, basic concepts and systems issues in mobile and pervasive computing
2. To illustrate architecture and protocols in pervasive computing and to identify the trends and latest development of the technologies in the area
3. To give practical experience in the area through the design and execution of a modest research project
4. To design successful mobile and pervasive computing applications and services
5. To expose to the wearable computing and security expects.
6. To learn to develop applications in mobile and pervasive computing environment

Course Details:

Unit 1 **(6 Hrs)**

Title- INTRODUCTION TO PERVASIVE COMPUTING

U1.1

Pervasive Computing and Its significance, Principles of Pervasive Computing , Categories of Pervasive computing, Research trends in pervasive computing and networking, Applications and services

U1.2

Self Study: Personal Communications Services (PCS): PCS Architecture

Unit II **(9 Hrs)**

Title- INTRODUCTION TO MOBILE COMPUTING AND WIRELESS NETWORKING

U2.1

Mobility management, Global System for Mobile Communication (GSM): Overview, Architecture, Network signaling, Channels, Mobility Management. General Packet Radio Services (GPRS): Architecture, GPRS Interfaces, Network Protocols

Wireless LAN (WLAN): Application, Requirement.

U2.2

Self Study: Migration to 3G Networks IMT 2000 and UMTS, UMTS Architecture.

Unit III **(7 Hrs)**

Title- SENSOR AND MESH NETWORKS

U3.1

Mobile Agent Technology, Sensor Networks and Its Role in Pervasive Computing, Collaboration and Interoperability among Sensor Networks Applications, Models for Service and Resource Discovery in Pervasive Computing, Pervasive Learning Tools and Technologies , Service management in pervasive Computing Environments, Multi-Hop Cognitive Radio Networks-An Opportunistic Pervasive Networking Paradigm, Smart Devices, Systems and Intelligent Environments, Autonomic and Pervasive Networking.

U3.2

Self Study: Wireless Sensor Cooperation for a Sustainable Quality of Information, Pervasive Networking and Communication.

Unit IV **(7 Hrs)**

Title- WEARABLE COMPUTING and SECURITY

U4.1

Wearable Computing and Sensor Systems for Healthcare: Health BAN- Medical and Technological Requirements-Wearable Sensors .Standards and Implementation of Pervasive Computing Applications, Pervasive Networking Security, Security and privacy in Pervasive Networks, Understanding Wormhole Attacks in Pervasive Networks.

U4.2

Self Study: An Experimental Comparison of Collaborative Defense Strategies for Network Security.

Unit V **(7Hrs)**

Title- APPLICATION DEVELOPMENT

U5.1

An Adaptive Architecture of Service Component for Pervasive Computing On Probabilistic k-Coverage in Pervasive Wireless Sensor Networks, Performance Evaluation of Pervasive

Networks Based on WiMAX Networks, Implementation Frameworks for Mobile and Pervasive Networks.

U5.2

Self Study: On the Usage of Overlays to Provide QoS Over IEEE 802.11b/g/e Pervasive and Mobile Networks. Case Studies.

Text Books

T1. "Fundamentals of Mobile and Pervasive Computing", Frank Adelstein Sandeep K. S. Gupta Golden G. Richard III Loren Schwiebert, McGraw-Hill, 2005

T2. "Ubiquitous Computing: Smart Devices, Environments and Interactions", Stefan Poslad, Wiley,2009

Reference Books

R1. "Mobile Computing: Technology,Applications and Service Creation", 2nd , Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, Tata McGraw Hill, 2010.

R2. "Pervasive Computing: Technology and Architecture of Mobile Internet Applications", John wiley, Jochen Burthardt et al, Pearson Education, 2003

R3. "Pervasive Computing and Networking", Mohammad s. Obaidat et al, wiley.

Course Outcomes:

Upon completion of the course, graduates will be able –

CO1: to analyze a basic architecture for a pervasive computing environment.

CO2: to design and allocate the resources on the 3G-4G wireless networks.

CO3: to analyze the role of sensors, mesh networks and smart devices in pervasive computing environment.

CO4: to develop and analyze mobile computing application based wearable computing and security of pervasive networks.

CO5: to deploy the architecture and context information for application development in a pervasive computing environment.

COURSE CODE: IT40310 **REF NO: To be filled by CD office**

SOFTWARE PROJECT MANAGEMENT-LAB

Credits: 1 **Teaching Scheme: - 2 Hrs/ week Laboratory**

Prerequisites: Computer Programming (C/Java/Python/C++), Microsoft Excel

Objectives:

- To develop Graphical User Interface (GUI) based applications for various estimation techniques.
- To make the studentsfamiliar with open source tools for activity scheduling techniques.
- To use open source tool for software configuration management.

Course Details:

1. Implementation of estimation techniquesany programming language.
2. Study of ProjectLibre tool for activity scheduling techniques.
3. Study of GanttProject tool for activity scheduling techniques.
4. Study of Git tool for software configuration management.

List ofLaboratory Exercises:

Experiment 1: Compute function pointsand COCOMO using online tool such as Tiny Calculator and STRS COCOMO calculator.

Experiment 2: Implement function points computation using any programming language.

Experiment 3: Implement COCOMO estimation using any programming language.

Experiment 4: Implement Halstead's software science using any programming language.

Experiment 5: Creating Work Breakdown Structure (WBS) using ProjectLibre tool.

Experiment 6: Draw Gantt chart and find critical path using ProjectLibre tool.

Experiment 7: Draw Gantt chart and find critical path using GanttProject tool.

Experiment 8: Draw Gantt chart using Microsoft Excel.

Experiment 9: Implement cost-benefit analysis using any programming language.

Experiment 10: Perform cost-benefit analysis usingMicrosoft Excel.

Experiment 11: Track different versions of a software using Git tool.

Text Book

1. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", 6th Edition, Tata McGraw Hill, 2017.

References:

1. Royce, "Software Project Management", Pearson Education, 1999.
2. Robert K. Wysocki, Effective Software Project Management, Wiley, 2009.
3. Tiny tool for Function point and COCOMO calculation.
http://groups.umd.umich.edu/cis/course.des/cis525/js/f00/gamel/cocomo.html
4. STRS COCOMO calculation. https://strs.grc.nasa.gov/repository/forms/cocomo-calculation/
5. ProjectLibre. https://sourceforge.net/projects/projectlibre/
6. GanttProject.http://www.ganttproject.biz/download
7. Git.https://git-scm.com/download/win
8. Pro Git Book.https://git-scm.com/book/en/v2

Course Outcomes:

Upon completion of the course, graduates will be able to –

1. Use programming languages to develop estimation based softwares.
2. Identify the usage of various activity scheduling tools.
3. Identify the usage of software configuration management tool such as Git.
4. Use Microsoft Excel to perform cost benefit analysis and activity scheduling.

COURSE CODE: IT42110 **REF NO: To be filled by CD office**

SOFTWARE PROJECT MANAGEMENT

Credits: 03 **Teaching Scheme:** Theory 03 Hrs/Week

Prerequisites:

1. Software Engineering

Objective:

- To understand the methods used to evaluate and select projects for investment of funds
- To gain knowledge on the principles and techniques of software project management
- To introduce organization behavior and general management techniques used for project management

Course Details:

Unit I: Project Evaluation (8Hrs)

U1.1 Software Project Definitions

Software Project Categorization, Software VS other projects, Stakeholders, Project Success and Failure, Software project Activities, Practices & Standards, Selecting Process Models (Spiral, Incremental, Prototyping, RAD, Agile)

U1.2. Estimation & Evaluation Techniques

Business Case & Cost Benefit Analysis, Cash Flow Forecasting, Cost-Benefit Evaluation Techniques (NP, CBR, ROI, NPV, IRR), Risk Analysis for Project Evaluation, Program management, Project effort

and cost estimation; Basis of estimation, Estimation method categorization, SLOC, Analogy, Delphi technique, FP Analysis, COCOMO II, Staffing pattern; Norden's & Putnam's work, Schedule compression

U1.3. Self Study
Portfolio management, Program management, Estimation using FP Mark II / COSMIC FP, Capers Jones rules of thumb

Unit 2: Project Planning and Risk Management (8Hrs)
U2.1 Project Planning

Stepwise planning, Identification of Project product and activities (PBS & PFD), Activity based approach (WBS), Sequencing and Scheduling of Activities, Precedence Network Diagram: AON and AOA conventions, Network Planning, CPM technique

U2.2: Risk Management
Nature and Types of Risks, Risk Management framework, Hazard Identification, Hazard Analysis, Risk Planning and Control, Schedule Risk, PERT Technique

U2.3. Self Study
Project Planning Tools (such as GanttProject, LibreProject, MSProject), SPMP documentation, Monte Carlo Simulation techniques, Risk matrix, Measuring Risk Exposure

Unit3: Project Monitoring and Control (8Hrs)
U3.1 Schedule and Cost Monitoring
Collecting Data & Reporting, Graphical Visualization techniques, Cost Monitoring, Earned Value analysis, Requirements management, Change Control.

U3.2 Contract Management:
Types of Contracts, Stages in Contract Placement, Typical Terms of a Contract, Contract Management and Acceptance.

U3.3 Self Study:
Software Configuration Management (SCM), SCM Tools, Project Reviews

Unit 4: Software Quality Management (4 Hrs)
U4.1: Software Quality:
Testing and Software Reliability, Metrics, ISO and CMMI Quality management models, Quality enhancement techniques (Review, Inspection, Formal methods, Best practices and Lessons learnt report)

U4.2 Self Study:
Test automation, Six Sigma, PSP/TSP, Quality Circle

Unit 5: People Management (8 Hrs)
U5.1: Organizational Behavior, Safety and Ethics:
Selecting the right person for a job, Motivation (Taylor's model, expectancy theory), Job characteristic models, Leadership styles, Stress, Health and Safety, Professional Ethics
U5.2: Organization & Project team Structure:
Working in Groups, Decision Making, Organizational structure and Project team structures,
U5.3 Self Study
Maslow's need hierarchy, Herzberg's two factor theory, Safety & Security Standards, Professional Code of Conduct

Text Book

1. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", 6th Edition, Tata McGraw Hill, 2017.

References:

1. Royce, "Software Project Management", Pearson Education, 1999.
2. Robert K. Wysocki, Effective Software Project Management, Wiley, 2009.

Course Outcomes:

Upon completion of the course the graduate students will be able to

1. Estimate project cost and perform cost-benefit evaluation among projects
2. Perform project scheduling, activity network analysis and risk management
3. Apply schedule and cost control techniques for project monitoring including contract management.
4. Apply quality models in software projects for maintaining software quality and reliability.
5. Use suitable project organization structure, leadership, decision and motivation styles, proper safety and ethical practices and be responsible to the society.

COURSE CODE: IT42180 **REF NO: To be filled by CD Office**

Software Testing

Credits: 3 **Teaching Scheme:-** Theory 3 Hrs/Week

Prerequisite:

Object-Oriented Concepts, Software Engineering.

OBJECTIVES:

1. To know the behaviour of the testing techniques to detect the errors in the software
2. To understand standard principles to check the occurrence of defects and its removal.
3. To learn the functionality of automated testing tools
4. To understand the models of software reliability.

COURSE DETAILS:

UNIT I **(7 hours)**

Title – TESTIING ENVIRONMENT AND TEST PROCESSES

World-Class Software Testing Model – Building a Software Testing Environment - Overview of Software Testing Process – Organizing for Testing – Developing the Test Plan – Verification Testing – Analyzing and Reporting Test Results – Acceptance Testing.

Levels of Testing - Unit Testing – Integration Testing - Defect Bash Elimination. System Testing - Usability and Accessibility Testing – Configuration Testing - Compatibility Testing.

Self Study- Operational Testing – Post Implementation Analysis, Agile Testing (Test Plan, Strategies).

UNIT II **(9 hours)**

Title – TESTING TECHNIQUES

Using White Box Approach to Test design - Static Testing Vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs, Coverage based testing techniques, Macabe's Cyclomatic Complexity, Mutation Testing, Data flow testing – Using Black Box Approaches to Test Case Design –

Equivalence partitioning, BVC, Random Testing – Requirements based testing –Decision tables –State-based testing – Cause-effect graphing – Error guessing

Non functional Testing like Compliance Testing, Load Testing, Performance Testing and Security Testing.

Self Study- Case study for White box testing and Black box testing techniques. Non functional Testing like Endurance Testing, Recovery Testing, Scalabilty Testing.

UNIT III **(7 hours)**

Title – INCORPORATING SPECIALIZED TESTING RESPONSIBILITIES

Testing Client/Server Systems – Rapid Application Development Testing – Testing in a Multiplatform Environment – Testing Software System Security - Testing Object-Oriented Software – Object Oriented Testing – Testing Web based systems – Web based system – Web Technology Evolution – Traditional Software and Web based Software.

Self Study- Challenges in Testing for Web-based Software – Testing a Data Warehouse - Case Study for Web Application Testing.

UNIT IV **(7 hours)**

Title – TEST AUTOMATION

Selecting and Installing Software Testing Tools - Software Test Automation – Skills needed for Automation – Scope of Automation – Design and Architecture for Automation – Requirements for a Test Tool – Challenges in Automation.

Self Study- Tracking the Bug – Debugging – Case study using Bug Tracking Tool.

UNIT V **(7 hours)**

Title – SOFTWARE TESTING AND QUALITY METRICS

Testing Software System Security - Six-Sigma – TQM - Complexity Metrics and Models – Quality Management Metrics - Availability Metrics - Defect Removal Effectiveness - FMEA - Quality Function Deployment – Taguchi Quality Loss Function – Cost of Quality.

Self Study- Case Study for Complexity and Object Oriented Metrics.

TEXT BOOKS:

T1. William Perry, "Effective Methods of Software Testing", Third Edition, Wiley Publishing.
T2. Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education,.

REFERENCES:

R1. Naresh Chauhan , "Software Testing Principles and Practices " Oxford University Press , New Delhi .
R2. Dale H. Besterfiled et al., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint .
R3. Stephen Kan, "Metrics and Models in Software Quality", Addison – Wesley, Second Edition.
R4. Llene Burnstein, " Practical Software Testing", Springer International Edition.
R5.Renu Rajani,Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", Tata McGraw Hill.

COURSE OUTCOMES:

Upon completion of the course, graduates will be -

CO1: Able to apply testing techniques to test the software to deliver a product free from bugs
CO2: Able to evaluate the web applications using bug tracking tools.
CO3: Able to investigate the scenario and select the proper testing technique
CO4: Able to explore the test automation testing concepts and tools
CO5: Able to apply standards such as TQM, Six Sigma to deliver quality product to the clients
CO6: Able to evaluate the estimation of cost, schedule based on standard metrics

COURSE CODE: IT42380 **REF NO: To be filled by CD Office**

Software Testing Lab

Credit: 01 **Teaching Scheme:** Laboratory 02 Hrs / Week

Prerequisites:

Object-Oriented Concepts, Software Engineering, Knowledge of Java development IDE

Objectives:

1. To make the student familiar with test case preparation.
2. To teach the student to use open source tools for different testing techniques.

Course Details:

1. Study of mutation testing using Jumble tool.
2. Study of code coverage testing using Jabuti tool.
3. Study of performance testing using JMeter tool.
4. Study of security testing using Peach tool.
5. Study of web application testing using Selenium IDE, Selenium RC, Selenium Web Driver.

List of Practical:

Experiment No. 1: Deriving test cases using Jumble tool.

Experiment No. 2: Mutation testing using Jumble tool.

Experiment No. 3: Code coverage analysis and generation of test cases using Jabuti tool.

Experiment No. 4: Deriving complexity metrics using Jabuti tool.

Experiment No. 5: Deriving slicing metrics using Jabuti tool.

Experiment No. 6: Unit testing in Java environment using JUnit framework.

Experiment No. 7: Performance testing using JMeter.

Experiment No. 8: Conduction of web application testing and generation of test cases using Selenium IDE.

Experiment No. 9: Conduction of web application testing and generation of test cases using Selenium Remote Control (RC).

Experiment No. 10: Conduction of web application testing and generation of test cases using Selenium Web driver.

Experiment No. 11: Conduction of security testing and using Peach tool.

Text Books:

1. Software Testing: Principles and Practice by Gopalaswamy Ramesh and Srinivasan Desikan, Pearson Education
2. Foundations of Software Testing, by Dorothy Graham and Erik P. W. M. Veenendaal, **Cengage**

Reference Books:

1. Implementing Automated Software Testing by Bernie Gauf, Elfriede Dustin, and Thom Garrett, Pearson Education
2. A Practitioner's Guide To Software Test Design by Lee Copeland, Artech House

Course Outcomes:

Upon completion of the course, graduates will be able to-

5. Identify the usage of various testing tool.
6. Derive test cases based on various testing tool.
7. Generate different complexity metrics using tools.
8. Use JUnit framework for unit testing.
9. Design and conduct test suites using Selenium IDE, Selenium RC, Selenium Webdriver.

COURSE CODE: EC43169 **REF NO: To be filled by CD office**

Digital Signal Processing

Credits: 3-0-0 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Mathematics-I, Mathematics-II, Signals and Systems

Co-requisites: Digital Communication Technique

Post requisite: Advanced Digital Signal Processing, Adaptive Signal Processing

Objectives: The course Digital Signal Processing aims to provide with the concept of transformation techniques used to get the hidden information. Comparison of different digital filters like FIR and IIR are studied with demonstration of its behaviors. The students will able to analyze the multi-rate signal processing. Students can able to differentiate the properties of fixed filters and adaptive filters.

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Course Details:

Unit 1

The Discrete Fourier Transform and its Efficient Computation (08 Hrs)

U1.1. Frequency Domain sampling: The Discrete Fourier Transform, Properties of the DFT, Linear Filtering method based on DFT, Discrete Cosine Transform, Efficient Computation of DFT: Fast Fourier Transform : Radix-2 FFT Algorithms-Decimation in Time, Decimation in Frequency, Implementation of FFT Algorithm.[T1: Chapters 7.1.1,7.1.2,7.1.3,7.2.1,7.2.2,7.3,7.5, 8.1.1,8.1.3,8.1.6]

U1.2. Relationship of DFT to other Transforms, Additional DFT Properties, Applications of FFT Algorithm.[T1: Chapters 7.1.4, 7.2.3,8.2]

Unit 2

Implementation of Discrete Time Systems (06 Hrs)

U2.3. Structures for the Realization of FIR Systems, Structures for FIR Systems-Direct Form, Cascade Form, Frequency Sampling, Structures for IIR Systems- Direct Form Structures, Signal Flow Graphs and Transposed Structures, Cascade- Form Structures, Parallel-Form Structures [T1: Chapters 9.2.1,9.2.2,9.2.3,9.3.1,9.3.2,9.3.3,9.3.4]

U2.4. Structure for Realization of FIR Systems by Lattice structure. Lattice and Lattice-Ladder Structures of IIR Systems.[T1: Chapters 9.2.4,9.3.5]

Unit 3

Design of Digital Filters (10 Hrs)

U3.1. General Considerations: Causality and its implications, Characteristics of Practical Frequency-Selective Filters, Design of FIR Filters- Symmetric and Anti-symmetric FIR Filters, Design of Linear Phase FIR Filters using Windows(Rectangular, Bartlett), Design of Linear Phase FIR Filters by the Frequency-Sampling Method, Frequency Transformations-Frequency transformations in Analog Domain, Design of IIR Filters-Characteristics of commonly used analog filters, IIR filter design by Impulse Invariance, IIR Filter design by the Bilinear Transformation. [T1: Chapters 10.1.1,10.1.2,10.2.1,10.2.2,10.2.3,10.4.1,10.3.2,10.3.3]

U3.2. Design of Linear Phase FIR Filters using Windows(Hanning, Hamming, Blackman)Frequency Transformation in Digital Domain, IIR Filter design by the Approximation of Derivatives. [T1: Chapters 10.2.2, 10.4.2, 10.3.1]

Unit 4

Adaptive Filters (06 Hrs)

U5.1. Applications of Adaptive Filters-System Identification or System Modeling, Adaptive Channel Equalization, Echo Cancellation in Data Transmission over Telephone Channels, Adaptive Line Enhancer, Adaptive Noise Cancelling. Adaptive Direct- Form FIR Filters-The LMS Algorithm: Minimum mean square error criteria, The LMS Algorithm, properties of the LMS Algorithm.[T1: Chapters 13.1.1,13.1.2,13.1.3,13.1.5,13.1.6,13.2.1,13.2.2,13.2.4]

U5.2. Applications of adaptive filters- Linear Predictive Coding of speech signals, Adaptive arrays, Related Stochastic Gradient Algorithms.[T1: Chapters 13.1.7,13.1.8,13.2.3]

Unit 5

Multirate Digital Signal Processing (06 Hrs)

U4.4. Introduction, Decimation by a Factor D, Interpolation by a Factor I, Implementation of Sampling Rate Conversion –Polyphase Filter Structures, Interchange of Filters and Downsamplers/Upsamplers, Multistage Implementation of Sampling Rate Conversion, sampling Rate conversion of Bandpass signals.[T1: Chapters 11.1,11.2,11.3,11.5.1,11.5.2,11.6,11.7]

U4.5. Applications of Multirate Signal Processing[11.9]

Text Books:

T4. "Digital Signal Processing", John G. Proakis, Dimitris G. Manolakis, Pearson, Fourth Edition, 2011

Reference Books

R9. "Discrete-Time Signal Processing", Alan V. Oppenheim, Ronald W. Schafer, John R. Buck, Prentice Hall, Second Edition, 1989.

R10. "Digital Signal Processing", P. Ramesh Babu, Scitech, Second Edition, 2003.

R11. "Applied Digital Signal Processing", Dimitris Manolakis, Vinay Ingle,Cambridge University Press, First Edition, 2011.

Course Outcome:

Upon completion of the course, graduates will be able to –

Upon successful completion of the course, the students will be able to

CO1: Apply Discrete Fourier Transform and Fast Fourier Transform to analyze the discrete time signals.

CO2: Implementation and design of Digital Filters.

CO3: Analyze the multi-rate signal processing.

CO4: Read voluntarily to enhance the knowledge of Digital Signal Processing

MB43101: PRINCIPLES OF MANAGEMENT

Credits: 3 **Teaching Scheme:** Theory 3 Hrs/Week

Prerequisites: Students pursuing B.Tech

Course Objectives:

The course aims at introducing the basic concepts of management and to give an overview of various functional areas of an organisation.

Course Details:

Unit 1 Introduction to Management (7Hrs)

U1.1 - Concept of Management; Nature and Scope of Management; Functions of Management; Levels and Types of Management; Roles and skills of Managers; Management is concerned with ideas, things and people; How a manager induces workers to put in their best.

U1.2 - Self-Study Topic – Good Managers are born, not made

Unit 2 Evolution of Management Thought (5Hrs)

U2.1- Contributions of management thinkers towards the field of management: F.W. Taylor, Henry Fayol, Elton Mayo, Mc Gregor, Peter Drucker, Chester Bernard and C.K. Prahlad.

U2.2- Self- Study Topic- Contribution of Rensis Likert towards the field of management

Unit 3 Marketing Functions (6Hrs)

U3.1- Concept of Marketing, The functional classification of marketing, Marketing mix, fundamental needs of customers, Advertising, Concept of Distribution Channels, role of distribution channels in marketing, Concept of Consumerism and Environmentalism.

U3.2. Self-Study Topic- *A case study on promotion strategy*

Unit 4 Financial Functions (5Hrs)

U4.1. Concept of Financial Management, Functions of Financial Management, Project Appraisal: Concept, Elements, Tools of Financial decision making, Overview of Working Capital.

U4.2. Self-Study Topic – Roles of Financial Manager

Unit-5 HRM Functions (7Hrs)

U5.1 – Human Resource Management: meaning, importance; Overview of Job Analysis, Job Description, Job Specification, Manpower Planning, Recruitment, Selection, Induction, Placement, Training and Development, Wage and Salary Administration, Performance Appraisal.

U5.2. **Self-Study Topic**: *A case study on Recruitment/Selection/Induction*

Text Books:

T5. Business Organization and Management, CR Basu, McGrawHill Education,1st Edition

T6. Business Organization & Management, Tulsia, Pandey, Pearson, 7th Edition

T7. Marketing Management, Kotler, Keller, Koshi, Jha, Pearson, 14th Edition

Reference Books

R12. Financial Management, I.M. Pandey, Vikas,10th Edition

R13. Human Resource Managemnt, Aswathapa, TMH, 7th Edition

R14. Principles and Practice of Management,P.C. Rath, Seven Seas, 1st Edition, 2012

Course Outcome: After completion of the course the student would be able to:

1. Understand the fundamentals of management
2. Gain an insight into the management thoughts and its implication in practice.
3. Apply the theoretical aspect of marketing in present market scenario.
4. Understand the fundamentals of financial management and its significance in financial decision making.
5. Gain an insight into the various HRM practices in organizations.

MB43101 PRINCIPLES OF MANAGEMENT

Credits: 3 **Teaching Scheme: -** Theory 1 Hrs/Week

Prerequisites: Students pursuing B.Tech

Objectives:

This course is designed to give an overview of the major functions of management and various functional areas of an organisation.

Course Details:

List of Contents

Tutorial No. 01: Functions of Management

Tutorial No. 02: Levels of Management

Tutorial No. 03: Evolution of Management thought

Tutorial No. 04: Advertising

Tutorial No. 05: Marketing mix.

Tutorial No. 06: Role of distribution channels in marketing

Tutorial No. 07: Elements of Project appraisal

Tutorial No. 08: Tools of Financial decision making

Tutorial No. 09: Working capital requirement

Tutorial No. 10: Wage and Salary Administration

Tutorial No. 11: Performance Appraisal

Tutorial No. 12: Labour Turnover and Welfare Aspect

Text Books:

T8. Business Organization and Management, CR Basu, McGrawHill Education,1st Edition
T9. Business Organization & Management, Tulsia, Pandey, Pearson, 7th Edition
T10. Marketing Management, Kotler, Keller, Koshi, Jha, Pearson, 14th Edition

Reference Books

R15. Financial Management, I.M. Pandey, Vikas,10th Edition
R16. Human Resource Managemnt, Aswathapa, TMH, 7th Edition
R17. Principles and Practice of Management,P.C. Rath, Seven Seas, 1st Edition, 2012

MB43105: Organizational Behaviour

Credits: 03 **Teaching Scheme: -**Theory 3Hrs/Week

Prerequisites: Students pursuing B.Tech

Course Objectives:

1. To develop an understanding of the behavior of individuals, and groups inside organizations.
2. To enhance skills in understanding and appreciating individuals, interpersonal and group process for increased effectiveness both within and outside of organizations.

Course Details:

Unit1: Foundation for Organizational Behaviour (4hrs)

U 1.1: Definition and Meaning of OB, Nature and Scope of OB, why study OB, Disciplines contributing to OB, Various man Models of OB, Challenges for OB.

U 1.2: Self Study-Importance OB

Unit 2: Individuals in the Organisation (8hrs)

U 2.1. Personality - Concept, Determinants, personality Traits, Perception – Concept, Process, Distortion, Selectivity, Implications. Learning – Theory, Reinforcement Principles, Behaviour Modification, Attitude and Values – Formation, Measurement,

U 2.2: Case Study- A case study on Attitude change.

Unit 3: Groups in the Organization (8hrs)

U 3.1: Groups in the Organization: Group – Concepts, Features, Types, Stages, Group Cohesiveness, Communication – Process, Barriers, Effective Methods. Leadership – Concept, Theories – Trait, Behavioural, Situational, Styles, importance, Gateways and Barriers to Communication,

U 3.2. ***Self Study Topic***: Communication as a tool to improve interpersonal effectiveness,

Unit 4: Organizational Culture and Change (6hrs)

U 4.1 Organizational cultures: Meaning & definition of Organizational Culture, Creating and Sustaining Organizational Culture, Types of culture (Strong vs. Weak, Formal vs. Informal culture)

Organizational Change- Meaning, Planned Change, Force-field analysis, Three Phase of Change process.

U 4.2 ***Self Study Topic***: Importance of Change,

Unit 5: Human Resource policies and Practices (4hrs)

U 5.1 Introduction to Human Resource Management: Concept of HRM, Human Resource Planning, Recruitment, Selection, Orientation, Training and Development, performance Appraisal

U ***5.2*** **Case Study:** A case study on Performance appraisal**.**

Course Outcome:

After completion of this course students would able to**:**

1. Understand the concept and importance of OB
2. Understand the various factors determining human personality.
3. Application of behavioral aspects of individual and groups in organizational context.
4. Understand the impact of culture on organizational change.
5. Realise the significance of different key aspects of HRM in an organization.

Text Books:

T-1 Foundations, theories and analyses, john, B. Miner, oxford, 1st ed, 2002.

T-2 Organizational Behavior, K. Aswathapa, HPH, 10th, 2012

T-3Organizational Behaviour, V S P Rao, Excel Books, 1st ed, 2009

T-4 Strategic Human Resource Management, Rajesh Viswanathan, HPH, 1st ed., 2010

Reference Books

R-1 Organizational Behaviour, Fred Luthans, McGrw Hill, 3rded.2010

R-2 Understanding Organizational Behavior, Parek, Oxford, 3rd ed, 2011

R-3 Organizational Behavior**,** Stephen P. Robbins, Timothy A. Judge, Pearson, 16th ed, 2015

MB43105 Organizational Behaviour

Credits: 03 **Teaching Scheme: -**Theory 1hr/Week

Prerequisites: Students pursuing B.Tech

Objectives:

1. To develop an understanding of the behavior of individuals, and groups inside organizations.
2. To enhance skills in understanding and appreciating individuals, interpersonal and group process for increased effectiveness both within and outside of organizations.

3. To develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Course Details:

List of Contents

Tutorial No. 01: Challenges for OB.

Tutorial No. 02: Determinants of personality

Tutorial No. 03: Perceptual selectivity

Tutorial No. 04: Stages of group formation

Tutorial No. 05: Group cohesiveness

Tutorial No. 06: Strong vs. Weak culture

Tutorial No. 07: Formal vs Informal Culture

Tutorial No. 08: Three Phase of Change process

Tutorial No. 09: Human Resource Planning

Tutorial No. 10: Selection Procedure

Tutorial No. 11: Orientation

Tutorial No. 12: Methods of Performance Appraisal

Text Books:

T1**:** Organizational Behavior: Foundations, theories and analyses, john, B. Miner, oxford, 1st ed, 2002
T2: Organizational Behavior, K. Aswathapa, HPH, 10th, 2012
T3: Organizational Behaviour, V S P Rao, Excel Books, 1st ed, 2009.

Reference Book:

R1: Organizational Behaviour, Fred Luthans, McGrw Hill, 3rded.2010
R-2 Understanding Organizational Behavior, Parek, Oxford, 3rd ed, 2011
R-3 Organizational Behavior**,** Stephen P. Robbins, Timothy A. Judge, Pearson, 16th ed, 2015

MB43103 : MARKETING MANAGEMENT

Credits: 3 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Students pursuing BTech

Objectives:

The course aims at introducing the basic concepts of marketing to the undergraduate students in engineering. The learning shall help the students in better designing, manufacturing and selling product/ service packages keeping competitive market, customers and cost in view.

Course Details:

Unit 1 – Concepts of Marketing Management

(06Hrs)

U 1.1 - Marketing Management: Concept, Process, Functions and relevance in the current context; Marketing Environment: Elements of micro and macro environment; Competition Analysis: Identifying and analyzing competitors, Porter's Five forces model.

U1.2 – Case Study – *A case study on Marketing Success Stories of Indian Brands*

Unit 2 – Consumer Behaviour & STP Strategies

(06Hrs)

U 2.1 Consumer Behavior: Factors influencing consumer behaviour, consumer decision process. Concept of Marketing Mix, Market Segmentation, Targeting and Positioning: Definition, Bases of Segmentation, Targeting and Positioning.

U2.2 – Case Study – *A case study on Price-Quality Value Proposition*

Unit 3 – Fundamentals of Product and Pricing

(08Hrs)

U 3.1 - Product Life Cycle, New Product Development Process; Branding Concepts: Brand Equity, Packaging and Labeling, Product-Mix and Product Line; Pricing Decision: Objectives and Factors influencing pricing, Pricing methods and strategies.

U3.2 – Case Study – *A case study on Brand/Product Differentiation*

Unit 4 - Fundamentals of Promotion and Place

(06Hrs)

U 4.1 - The Marketing Communication process, Promotion Mix – Introduction, Concept, elements of promotion mix; Channels of Distributions – Meaning, Concept, Types of intermediaries and Functions of distribution channels.

U4.2 – Case Study – *A case study on Promotion and Positioning success*

Unit 5 - Marketing Planning and Control

(04Hrs)

U 5.1 - Designing Distribution Channels; Concept of Supply Chain Management; Trends in Marketing (Concept): Customer Relationship Management, E-marketing, Rural Marketing and Service Marketing.

U5.2 – Case Study – *A case study on Experience Marketing*

Course Outcome:

After the completion of the course, the students would be able to:

1. Have a basic understanding of the key concepts in marketing and application of marketing theories in managerial practices.
2. Understand basic consumer psychology and analyze consumption patterns of buyers.
3. Formulate product & pricing related decisions and strategies.
4. Develope promotional strategies and identify the role of channel of distribution in smooth flow of products/services.
5. Identify emerging areas and recent developments in marketing trends.

Text Books:
T1 - Etzel, Walker, Stanton and Pandit, Marketing, 14/e, Tata McGraw Hill.
T2 - Saxena, "Marketing Management" Tata McGraw Hill, 4/e.
T3 - Karunakaran "Marketing Management", Himalaya Publishing House, 2010/e.

Reference Books -
R1 - Grewal, Levy, 'Marketing' Tata McGraw Hill, special Indian edition.
R2 - Kotler, Keller, Koshy and Jha, "Marketing Management", 13/e, Pearson Education.

MB43103: MARKETING MANAGEMENT

Credits: 3 **Teaching Scheme: -** Theory 1 Hrs/Week

Prerequisites: Students pursuing BTech

Objectives:
The course aims at introducing the basic concepts of marketing to the undergraduate students in engineering. The learning shall help the students in better designing, manufacturing and selling product/ service packages keeping competitive market, customers and cost in view.

Course Details:

List of Contents

To be filled in by concerned Department.

Tutorial No. 01: Introduction to Marketing Environment.

Tutorial No. 02: Discuss Elements of micro and macro environment

Tutorial No. 03: Factors influencing consumer behaviour

Tutorial No. 04: Competition Analysis: Identifying and analyzing competitors.

Tutorial No. 05: Competition Analysis: Factors contributing to competition.

Tutorial No. 06: Branding Strategy: Positioning a Brand

Tutorial No. 07: Pricing Decision: Objectives and Factors influencing pricing.

Tutorial No. 08: Pricing method and strategies.

Tutorial No. 09: Channels of Distributions - Concept

Tutorial No. 10: Types of intermediaries and Functions of distribution channels

Tutorial No. 11: Service Marketing - Concept.

Tutorial No. 12: Customer Relationship Management - Concept

Text Books:
T1 - Etzel, Walker, Stanton and Pandit, Marketing, 14/e, Tata McGraw Hill.
T2 - Saxena, "Marketing Management" Tata McGraw Hill, 4/e.
T3 - Karunakaran "Marketing Management", Himalaya Publishing House, 2010/e.

Reference Books -
R1 - Grewal, Levy, 'Marketing' Tata McGraw Hill, special Indian edition.
R2 - Kotler, Keller, Koshy and Jha, "Marketing Management", 13/e, Pearson Education.

MB43102: ENTREPRENEURSHIP DEVELOPMENT

Credits: 3 **Teaching Scheme: -** Theory 3 Hrs/Week
Prerequisites: Students pursuing B.Tech
Course Objectives:
- Identify and apply the elements of entrepreneurship and entrepreneurial processes.
- Recognize the importance of entrepreneurs and their role in economic growth;
- Develop skills to identify Business Opportunity.

Course Details:

Unit 1 Understanding Entrepreneurship (8Hrs)

U1.1 - Concept of Entrepreneurship: Meaning, Definition, Motivation for Economic Development, Entrepreneurial Achievement: Case Study, Enterprise and Society, Entrepreneurial Traits and Skills, Environmental Dynamics and Change

U1.2 - Self-Study Topic - Mind vs Money in commencing new venture

Unit 2 Entrepreneurial Process (3Hrs)

U2.1 - Step by Step approach to Entrepreneurial Start Up, Decision for Entrepreneurial Start Up
U2.2 - **Self- Study Topic**- Entrepreneurial Success & Failures Factors

Unit 3 Setting Up of a Small Business Enterprise (8Hrs)

U3.1 - Identifying Business Opportunity, Environmental pollution and allied regulatory and non-regulatory clearances, Formalities for setting up small enterprises in service sectors, Writing Business Plan Format, Components of a Business Plan
U3.2. Self-Study Topic- Determining Bankability of the Project

Unit 4 Institutional Support for SME (6Hrs)

U4.1 - Central/State Level Institutions promoting SME, Financial Management in Small Business
U4.2 - Self-Study Topic - Marketing Management Problems and Strategies

Unit-5Problems and Sickness in Small Enterprises (5Hrs)

U5.1 – Problems of HRM, Relevant Labour Laws, Causes of Sickness, Govt. Policies on revival of Sickness and remedial measures
U5.2 - Self-Study Topic: Symptoms of Sickness

Course Outcome:
After completion of the course, the students would be able to:
1. Analyze the internal/external factors affecting a business environment.
2. Understand the steps involved in entrepreneurial process.
3. Identify entrepreneurial opportunities for a new business venture and develop a well presented Business Plan that is feasible and sustainable.
4. Understand the role of Government machinery, regulatory institutions and support system in smooth functioning of a new business venture.
5. Know the Govt. policies on revival of sickness and remedial measures.

Text Books:
T11. "Entrepreneurship", R.D. Hisrich, M.P. Peters, D.A. Shepherd, Tata McGraw Hill, 6th Edition,2011
T12. "Entrepreneurship", David H. Holt, PHI Learning Private Limited, 2011
T13. "Entrepreneurship Development Small Business Enterprises", Poornima M Charantimath, Pearson,2012, Seventh Impression
Reference Books
R18. "Entrepreneurship Development", S.S. Khanka, S.Chand, 4th Edition 2010
R19. "Entrepreneurship Development and Management", Dr. Vasant Desai and Dr. Kulveen Kaur , Himalaya Publishing House, First Edition,2013.
R20. "Entrepreneurship Development", Dr. S.L. Gupta, Dr. Arun Mittal, International Book House, Second Edition,

MB43102: Entrepreneurship Development

Credits: 03 **Teaching Scheme: -** Tutorial 01 Hrs/Week
Prerequisites: Students pursuing B.Tech
Objectives:
- Identify and apply the elements of entrepreneurship and to entrepreneurial processes
- Recognize the importance of entrepreneurship and identify the profile of entrepreneurs and their role in economic growth;
- Use the entrepreneurial mind-set and behave responsibly and ethically in their roles as entrepreneurs.
- Analyze the business environment, opportunity recognition, and the business idea-generation process.

Course Details:

List of Contents
Tutorial No. 1: Role of Entrepreneur in Economic Development
Tutorial No. 2: Environmental Dynamics and Change
Tutorial No. 3: Entrepreneurial Achievement
Tutorial No. 4: Entrepreneurial decision making
Tutorial No. 5: Entrepreneurial Start up
Tutorial No. 6: Formalities in setting up small enterprises in manufacturing and services
Tutorial No. 7: Components of Business Plan

Tutorial No. 8: Bankability of the project
Tutorial No. 9: Problems of HRM- Relevant Labour Laws
Tutorial No. 10: Causes and Symptoms of sickness
Tutorial No. 11: Cures of Sickness
Tutorial No. 12: Remedial Measures of sickness in small enterprises

Text Books:

T1. "Entrepreneurship", R.D. Hisrich, M.P. Peters, D.A. Shepherd, Tata McGraw Hill, 6th Edition,2011
T2. "Entrepreneurship", David H. Holt, PHI Learning Private Limited, 2011
T3. "Entrepreneurship Development Small Business Enterprises", Poornima M Charantimath, Pearson,2012, Seventh Impression

Reference Books

R1. "Entrepreneurship Development", S.S. Khanka, S.Chand
R2. "Entrepreneurship Development and Management", Dr. Vasant Desai and Dr. Kulveen Kaur , Himalaya Publishing House, First Edition,2013.
R3. "Entrepreneurship Development", Dr. S.L. Gupta, Dr. Arun Mittal, International Book House, Second Edition,