UNIVERSITY OF KERALA

B. TECH. DEGREE COURSE

(2013 SCHEME)

SYLLABUS FOR

VIII SEMESTER

INFORMATION TECHNOLOGY

SCHEME -2013

VIII SEMESTER

INFORMATION TECHNOLOGY (F)

Course No	Name of subject	Credits	Weekly load, hours			C A Marks	Exam Duration Hrs	U E Max Marks	Total Marks
			L	T	D/ P				
13.801	Knowledge Representation and Reasoning (F)	3	2	1	-	50	3	100	150
13.802	E-Commerce and E-Security (F)	3	2	1	-	50	3	100	150
13.803	Embedded Systems (F)	3	2	1	-	50	3	100	150
13.804	Elective III	4	3	1	-	50	3	100	150
13.805	Elective IV	4	3	1	-	50	3	100	150
13.806	Software Testing (F)	3	2	1	-	50	3	100	150
13.807	Web Applications Lab (F)	4	-	-	4	50	3	100	150
13.808	Project Work and Viva Voce (F)	5	-	-	5	150	-	100	250
	Total	**29**	**14**	**6**	**9**	**500**		**800**	**1300**

13. 804 Elective III

13.804.1	Soft Computing (FR)
13.804.2	Cloud Computing (FR)
13.804.3	Advanced Microprocessors (F)
13.804.4	Network Programming (F)

13.805 Elective IV

13.805.1	Robotics and Computer Vision (FR)
13.805.2	Graph Theory (FR)
13.805.3	Natural Language Processing (FR)
13.805.4	Distributed Systems (F)

13.801 KNOWLEDGE REPRESENTATION AND REASONING (F)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objective:

- *To represent knowledge symbolically in a form suitable for automated reasoning.*
- *Getting familiar with the knowledge modeling concepts and knowledge representation languages developed for the web*

Module – I

Introduction: Concept of Knowledge, Representation, Reasoning, Knowledge-based systems, Need of Knowledge representation and Reasoning, Role of logic.

Language of first order logic : Syntax, Semantics, Pragmatics

Expressing Knowledge: Knowledge Engineering, Vocabulary, Basic Facts, Complex Facts, Terminological Facts, Entailments, Abstract Individuals

Module – II

Describing web resources : RDF – Basic idea- XML-based syntax -RDF Schema- Basic ideas-language – axiomatic semantics for RDF and RDF Schema – Direct inference system for RDF and RDFS – Querying in SPARQL.

Module – III

Web Ontology Language : OWL and RDF/RDFS – Sub languages of OWL- Description of OWL language – Layering of OWL -Examples.

Module – IV

Logic and Inference: Monotonic Rules – Syntax, Semantics, Description Logic Programs – Semantic Web Rules Language, Rule ML

Ontology Engineering: Constructing ontologies manually -Reusing existing ontologies – Ontology mapping.

References:

1. Ronald J Brachman, Hector J Levesque*, Knowledge Representation and Reasoning*, Morgan Kaufman Publishers, 2004.
2. Grigoris Antoniou and Frank van Harmelen, *A Semantic Web Primer*, The MIT Press, 2008.

3. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, *Foundations of Semantic Web Technologies*, Chapman & Hall/CRC, 2009.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of this course, the student will be able to design, describe and utilize web ontologies, define logic semantics and inferences and use ontology engineering approaches in semantic applications.

13.802 E-COMMERCE AND E-SECURITY (F)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objectives:

- *To understand the basic concepts in e-commerce and e-payment*
- *To understand the threats and countermeasures involved in providing electronic security*

Module – I

E-Commerce : Introduction, business models in e-commerce, B2C and B2B models, Supply Chain Management, Electronic Data Interchange.
Ethical issues, legal issues - copyrights and trademarks, warranties. Taxation, international issues, Intellectual Property Rights.

Module – II

E-payment : Payment systems – debit vs. credit, payment instructions, electronic wallet, smart cards.
Payment transaction security – user anonymity, location untraceability, payment transaction untraceability, confidentiality and non-repudiation of payment transaction, dual signature, freshness of transaction messages.
Electronic check security - Payment authorization transfer, proxies.

Module – III

Digital money security : Blind signature, exchanging coins, protection against double spending, protection against forging and stealing coins.
Framework for electronic payment – Internet Open Trading Protocol.
Web security : HTTP messages**,** HTTP headers leaking information, HTTP cache security, SSL tunneling, SHTTP, web client security, anonymous routing.

Module – IV

Protection in general purpose Operating Systems :Designing trusted Operating Systems. Database security. Security in Networks. Administering Security. Legal, privacy and ethical issues in computer security.

References:

1. Elias M. Awad, *Electronic Commerce : From Vision to Fulfillment*, 3rd Edition, Pearson Education 2008.
2. Jeffrey F. Rayport and Bernard J. Jaworski, *Introduction to Ecommerce*, 2nd Edition, Tata McGraw Hill, 2008.
3. Charles P. Pfleeger, Shari Lawrence Pfleeger, *Security in Computing*, 5th Edition, Prentice Hall 2015.

4. Vesna Hassler, *Security Fundamentals for E-commerce*, Artech House, 2000.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.
20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours Maximum Total Marks: 100

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question out of the two from each module. Each question carries 20 marks.

Course Outcome:

At the end of the course, the student will have a good understanding of the fundamental principles governing e-commerce, e-payment and the security threats and solutions involved.

13.803 EMBEDDED SYSTEMS (F)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits**: 3

Course Objectives:

- *To impart knowledge on the hardware and software aspects of an embedded system.*
- *To develop skills on how to design an embedded system, its constraints, programming, programming environment and the fundamentals of real time systems and real time Operating systems.*

Module – I

Introduction - Definition and classification – Microprocessor Vs Microcontrollers- Processors and hardware units in an embedded system –- Software embedded into the system – Embedded system-on-chip - Processor and memory organization. Internal serial communication devices - Parallel port devices - Timer and counting devices - I^2C, CAN, USB and advanced serial high-speed bus - PCI, PCI-X and advanced buses - Sensors and Actuators, Device drivers -Interrupt servicing mechanism.

Module – II

Programming concepts - Assembly language vs. high level language - C Program Elements - Queues, stacks and lists - Concepts of embedded programming in C++ - C compilers – Cross compiler – Optimization of memory usage.
Software Development Tools: Embedded Program Development - Downloading the Hex File to the Non Volatile Memory –Hardware Simulator.

Module – III

Real time systems: Introduction: Basic Model, Characteristics and applications of real time systems, Safety and Reliability, Types of Real Time Tasks, Timing Constraints.
Inter-process communication and synchronization: Multiple Processes in an application - Semaphores – Priority inversion problem -Deadlock situations – Signals – Message queues – Mailboxes – Pipes – Sockets.

Module – IV

Real time OS: Real-time operating systems - Features of Real-time operating systems, RTOS services - Structures - Resource management – File system organization and implementation – I/O subsystems – Interrupt handling – Task scheduling models - Handling of interrupt latency and deadlines - Performance metrics.

References:

1. Raj Kamal, *Embedded Systems - Architecture, Programming and Design*, 2nd Edition, McGraw Hill, 2008

2. Rajib Mall, *Real-time systems: Theory and Practice*, Pearson Education, 2009
3. Parag H Dave, Himanshu B Dave, *Embedded Systems*, Pearson education 2015.
4. Lyla B Das, *Embedded Systems An Integrated Approach*, Pearson education 2012.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project, software exercises, etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Course Outcome:

After successful completion of this course, the student will be able to:

- *Understand, design, execute and evaluate programs on embedded systems and real time systems that include both hardware and software*
- *Identify and synthesise of solutions for embedded system problems*

13.804.1 SOFT COMPUTING (FR) (Elective III)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits: 4**

Course Objective:

- *To provide a clear understanding on artificial neural networks and genetic algorithms.*
- *To solve various crisp and fuzzy set operations.*

Module – I

Introduction to Soft Computing – Artificial Neural Networks – introduction – basic models – linear separability – Hebb network – Supervised learning networks – perceptron – Adaptive Linear Neuron – back propagation network – radial basis function network – Associative Memory Network – auto associative and hetero associative memory networks – Bidirectional Associative Memory – Unsupervised learning networks – Kohonen self organizing feature maps – Learning Vector Quantization – Counter propagation networks.

Module – II

Crisp and Fuzzy sets – operations and properties – Crisp and Fuzzy relations – operations and properties – membership functions – features – methods of membership value assessment – Defuzzification – lambda cuts for fuzzy sets and fuzzy relations – Defuzzification methods – Fuzzy arithmetic – Extension principle – fuzzy measures – Fuzzy rules – fuzzy reasoning – Fuzzy inference system – Mamdani and Sugeno models – Fuzzy Logic Control Systems – control system design – architecture and operation – applications.

Module – III

Genetic Algorithm – introduction – basic operations and terminologies – general genetic algorithm – classification of genetic algorithm – genetic programming – applications.

Module – IV

Hybrid systems – neuro-fuzzy, neuro-genetic and fuzzy-genetic hybrids – Adaptive Neuro-Fuzzy Inference Systems – architecture – hybrid learning algorithm – Genetic Algorithm based Internet search technique – Soft Computing based hybrid fuzzy controllers – Soft Computing based rocket engine control.

References:

1. Sivanandam S. N, S. N. Deepa, *Principles of Soft Computing*, Wiley India, 2007.
2. Ross T. J., *Fuzzy Logic with Engineering Applications*, Wiley India, Third edition, 2009.
3. Goldberg D. E., *Genetic Algorithms: Search, Optimization and Machine Learning*, Addison Wesley, N.Y., 1989.

4. Rajasekaran S. and G. A .V. Pai, *Neural Networks, Fuzzy Logic and Genetic Algorithms,* PHI, 2003.
5. Eberhart R., P. Simpson and R. Dobbins, *Computational Intelligence - PC Tools*, AP Professional, Boston, 1996.
6. Jang J. S R., C. T. Sun and E. Mizutani, *Neuro-Fuzzy and Soft Computing*, PHI/Pearson Education 2004.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Note: *The question paper shall contain at least 30% analytical/problem solving questions.*

Course Outcome:

After the successful completion of the course students will be able to:

- *Have a clear understanding on artificial neural networks.*
- *Perform crisp and fuzzy set operations.*
- *Identify various Defuzzification methods*
- *Explain various genetic algorithms.*
- *Apply genetic algorithm to solve real world problems.*

13.804.2 CLOUD COMPUTING (FR) (Elective III)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits: 4**

Course Objective:

- *To understand the design of cloud services.*
- *To understand the concept of virtualization*
- *To apply different cloud programming models as per need.*
- *To be able to set up a private cloud.*
- *To learn to design the trusted cloud computing system*

Module - I

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

Module – II

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

Module – III

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

Module – IV

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

References:

1. Kai Hwang, Geoffrey C. Fox and Jack G. Dongarra, *Distributed and Cloud Computing*, *From Parallel Processing to the Internet of Things*, Morgan Kaufmann Publishers, 2012.
2. John W. Rittinghouse and James F. Ransome, *Cloud Computing: Implementation, Management, and Security*, CRC Press, 2010.
3. Toby Velte, Anthony Velte and Robert Elsenpeter, *Cloud Computing, A Practical Approach*, TMH, 2009.
4. Kumar Saurabh, *Cloud Computing, Insights into New-Era Infrastructure*, Wiley India, 2011.

5. George Reese, *Cloud Application Architectures: Building Applications and Infrastructure in the Cloud*, O'Reilly.
6. James E. Smith and Ravi Nair, *Virtual Machines: Versatile Platforms for Systems and Processes*, Elsevier/Morgan Kaufmann, 2005.
7. Katarina Stanoevska-Slabeva, Thomas Wozniak and Santi Ristol, *Grid and Cloud Computing, A Business Perspective on Technology and Applications*, Springer.
8. Ronald L. Krutz and Russell Dean Vines, *Cloud Security, A comprehensive Guide to Secure Cloud Computing*, Wiley, India, 2010.
9. Rajkumar Buyya, Christian Vecchiola and S.Tamarai Selvi, *Mastering Cloud Computing*, TMH, 2013.
10. Gautam Shroff, *Enterprise Cloud Computing*, Cambridge University Press, 2011.
11. Michael Miller, *Cloud Computing*, Que Publishing, 2008.
12. Nick Antonopoulos, *Cloud computing*, Springer Publications, 2010.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Note: *The question paper shall contain at least 30% analytical/problem solving questions.*

Course Outcome:

After the successful completion of the course students will be able to:

- *Have a clear understanding on cloud computing and virtualization techniques.*
- *Address core issues of cloud computing such as security, privacy, and inter-operability.*
- *Design cloud services and setup a private cloud.*
- *Design compute and storage clouds based on applications.*
- *Understand the characteristics and services provided by cloud.*

13.804.3 ADVANCED MICROPROCESSORS (F) (Elective III)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits: 4**

Course Objective:

- *To introduce students to modern microprocessors*
- *To understand the architecture, programming and interfacing of advanced microprocessors*

Module – I

Microprocessors – Internal architecture, real and protected modes, addressing modes, Using assembly language with C/C++ - using data structures, 32 bit applications, mixed assembly, C++ objects.
Programming – Modular programming, using keyboard and video display, data conversions, disk files.

Module – II

Memory interface – 16,32 and 64 bit memory interfaces, memory banks, dynamic RAM – DRAM controllers.
Basic I/O interface – Programmable peripheral interface, programmable interval timer, ADC and DAC converters.
Direct memory access, DMA-controlled I/O. Interrupts, programmable interrupt controller.

Module – III

Arithmetic coprocessor – data formats, programming.
Bus interface – Peripheral Component Interconnect, Universal Serial Bus, Accelerated Graphics Port.
Pipelined Execution – superscalar execution.
Pentium – Memory and I/O systems, timing, superscalar architecture, memory management, Pentium Pro.
PowerPC Processors: 600 Series, 700 Series, and 7400 G4

Module – IV

Pentium II – Memory and I/O systems, timing, software changes.
Pentium III – Chipsets, bus.
Pentium 4 and Core 2 – Memory interface, hyper-threading, multiple core technology, performance-monitoring registers, 64-bit extension.
64Bit Computing - G5: PowerPC 970 - understanding caching and performance.

References:

1. Jon Stokes, *Inside the Machine, An Illustrated Introduction to Microprocessors and Computer Architecture*, No Starch Press, 2015.
2. Barry B. Brey, *Intel Microprocessors – Architecture, Programming and Interfacing*, 8th Edition, Pearson Education, 2013.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Note: *The question paper shall contain at least 30% analytical/problem solving questions.*

Course Outcome:

After successful completion of this course,

- *The students understand the advances made in microprocessor architecture*
- *The students understand the basic concepts of programming and interfacing with modern microprocessors.*

13.804.4 NETWORK PROGRAMMING (F) (Elective III)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits: 4**

Course Objective:

This course introduces the students to

- *Subtleties of TCP/IP Protocols.*
- *Implementation and internals of protocol software.*
- *Interaction among protocols in the TCP/IP Suite.*

Module – I

Introduction - The structure of TCP/IP Software in an Operating System –Network Interface Layer – Address recovery and Binding.

Module – II

IP: Global Software Organization – Routing Table and Routing Algorithm – Fragmentation And Reassembly – Error Processing. UDP: User Datagrams.

Module – III

TCP: Data Structures and Input Processing – Finite State Machine Implementation - Output Processing - Timer Management – Flow Control and Adaptive Retransmission - Urgent Data Processing and the Push function.

Module – IV

Socket Level Interface - RIP- Active Route Propagation and Passive Acquisition. OSPF: route Propagation with an SPF Algorithm.

References:

D.E Comer and D. L Stevens, *Internetworking with TCP/IP – Volume II, Design, Implementation and Internals*, 3rd Edition, Pearson Education 1998.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Note: *The question paper shall contain at least 30% analytical/problem solving questions.*

Course Outcome:

At the end of the course, the students will have a good understanding of relationship among TCP/IP protocols and understand the data structures and source code which explains the principles underlying each protocol.

13.805.1 ROBOTICS AND COMPUTER VISION (FR) (Elective IV)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits: 4**

Course Objective:

To familiarize the concepts in image analysis, high-level vision and robotics.

Module - I

History, Present Status and Future Trends of Robotics: robotics and programmable automation, historical background, laws of robotics, robot definitions, robotics systems and robot anatomy, human systems and robotics, specifications of robots, present application status, machine intelligence, computer and robotics—future trends, flexible automation versus robotics technology, safety measures in robotics.

Module - II

Robot Kinematics and Dynamics : Introduction, forward and reverse kinematics (transformation) of three degrees of freedom robot arm, forward and reverse transformation of a four degrees of freedom manipulator in 3-D, homogeneous transformations, kinematic equations using homogeneous transformations, inverse kinematics of robot, robot arm dynamics.

Module - III

Vision as an information processing task, A geometrical framework for vision. 2D and 3D images interpretation, Segmentation, Binary and grey morphology operations, Thresholding, Filtering, Edge and corner detection, Features detection. Contours, Tracking edges and corners, object detection and tracking, Image data compression, Real time Image processing.

Module - IV

Robotics, Vision and Control: Position-Based Visual Servoing , Image Based Visual Servoing - Camera and Image Motion - Controlling Feature Motion- Depth- Performance Issues , Using Other Image Features - Line Features , Circle Features.

References:

1. Deb S. R. and S. Deb, *Robotics Technology and Flexible Automation*, Tata McGraw Hill Education Pvt. Ltd, 2010.
2. Peter Corke, *Robotics, Vision and Control: Fundamental Algorithms in MATLAB*, Springer Science & Business Media, 2011
3. Linda Shapiro and George Shockman, *Computer Vision,* Prentice Hall, 2001
4. Richard Szeliski, Ed., *Computer Vision: Algorithms and Applications*, Springer, 2010.

5. Simon J. D. Prince, *Computer Vision: Models, Learning, and Inference,* Cambridge University Press, 2012.
6. Mark Nixon and Alberto S. Aquado, *Feature Extraction & Image Processing for Computer Vision*, Third Edition, Academic Press, 2012.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Note: *The question paper shall contain at least 30% analytical/problem solving questions.*

Course Outcome:

After the successful completion of the course students will be able to:

- *Identify the role of inverse kinematics in position controlled robots*
- *Learn the basics of robotics to perform routine tasks.*
- *Understands the controls used in robotics.*
- *Implement various image processing algorithms.*
- *Identify the components used in computer vision.*

13.805.2 GRAPH THEORY (FR) (Elective IV)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits: 4**

Course Objective:

- *To introduce the major concept areas of graph theory.*
- *To develop an awareness regarding the applications of theorems used in graph theory.*
- *To provide practical, hands on experience in real world applications of graph theory.*

Pre-requisites: 13.303-Discrete Structures

Module – I

What is graph – Application of graphs – finite and infinite graphs – Incidence and Degree – Isolated vertex, pendent vertex, Null graph. Paths and circuits – Isomorphism, sub graphs, walks, paths and circuits, Connected graphs, disconnect graphs, Euler graphs Hamiltonian paths and circuits – Travelling salesman problem. Trees – properties, pendent vertex, Distance and centres - Rooted and binary tree, counting trees, spanning trees.

Module – II

Combinatorial versus geometric graphs, Planar graphs, Different representation of planar graphs, geometric dual, combinatorial dual, vector spaces of graph, ban2 vectors of a graph, orthogonal vectors and spaces Directed graphs – types of digraphs, Digraphs and binary relation, Euler graphs, trees with directed edges.

Module – III

Graphs theoretic algorithms and computer programming - Algorithm for computer representation of a graph, algorithm for connectedness and components, spanning tree, directed circuits, shortest path, searching the graphs, Isomorphism.

Module – IV

Graphs in switching and cording theory – contact networks, Analysis of contact Networks, synthesis of contact networks, sequential switching networks, unit cube and its graph, graphs in coding theory.

References:

1. Hararay, *Graph theory,* Narosa Publishers, 1969.
2. Narasingh Deo, *Graph theory*, Pearson publications, 2004.
3. Foulds L. R., *Graphs Theory Applications*, Narosa, Springer-Verlag, 1992.

4. John Clark and Derek Allan Hotton, *A First Look at Graph Theory*, Allied.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Note: *The question paper shall contain at least 30% analytical/problem solving questions.*

Course Outcome:

After the successful completion of the course students will be able to:

- *Demonstrate knowledge of fundamental concepts in graph theory, including properties and characterization of bipartite graphs and trees, Euclidian and Hamiltonian graphs.*
- *Understand and apply some of the classical theorems of graph theory.*
- *Represent real life situations with mathematical graphs.*
- *Develop algorithms for connectedness and components, spanning tree, directed circuits, shortest path, searching the graphs, Isomorphism.*
- *Solve real world problems by applying graph theoretic results and algorithms.*

13.805.3 NATURAL LANGUAGE PROCESSING (FR) (Elective IV)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits: 4**

Course Objective:

- *To impart conceptual and application level aspects of Natural Language Processing.*

Module – I

Natural Language Processing, Ambiguity and uncertainty in language. The Turing test, Chomsky hierarchy, regular languages, and their limitations. Finite state automata. Practical regular expressions for finding and counting language phenomena. N-gram Language Models and Information Theory: n-gram models. Entropy, relative entropy, cross entropy, mutual information, perplexity. Statistical estimation and smoothing for language models.

Module – II

Statistical Machine Translation (MT), Statistical Alignment Models and Expectation Maximization (EM) and its use in statistical MT alignment models ; complete statistical MT system decoding and A* Search.

Module – III

Information Extraction (IE) and Named Entity Recognition (NER). Information sources, rule-based methods, evaluation (recall, precision). Introduction to supervised machine learning methods. Naive Bayes (NB) classifiers for entity classification, Maximum Entropy Classifiers

Module – IV

Syntax and Parsing for Context-Free Grammars (CFGs): Parsing, treebanks, attachment ambiguities. Context-free grammars. Top down and bottom-up parsing, empty constituents, left recursion, and repeated work, Probabilistic CFGs.

References:

1. Daniel Jurafsky and James H. Martin, *Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition,* 2/e, Prentice Hall, 2008.
2. Christopher D. Manning and Hinrich Schuetze, *Foundations of Statistical Natural Language Processing*, MIT Press, 2003.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Note: *The question paper shall contain at least 30% analytical/problem solving questions.*

Course Outcome:

After the successful completion of the course students will be able to:

- *Understand the basics of Natural Language Processing and thereby figure out ambiguity and uncertainty that exist in languages.*
- *Apply the concept of N-gram models to solve problems.*
- *Become aware of the significance of Information Extraction and Named Entity Recognition in Natural Language Processing.*
- *Evaluate information retrieval methods using the concepts of precision and recall.*
- *Be thoroughly knowledgeable regarding syntax and parsing for Context Free Grammars.*

13.805.4 DISTRIBUTED SYSTEMS (F) (Elective IV)

Teaching Scheme: 3(L) - 1(T) - 0(P) **Credits: 4**

Course Objective:

This course enables the students to

- *Describe important characteristics of distributed systems and the salient architectural features of such systems.*
- *Describe the features and applications of important standard protocols which are used in distributed systems.*
- *Characterize different implementation paradigms for distributed systems.*

Module – I

Characteristics of Distributed System: Examples of distributed systems – resource sharing and web – World Wide Web – Issues in the design of distributed system. System models: Architectural models and fundamental models.

Module – II

Interprocess Communication: the API for Internet protocol – external data representation and marshalling – client server communication - group communication-Case study: inter process communication in Unix. Distributed objects and remote invocation: communication between distributed objects – remote procedure call – Events and notification.

Module – III

Operating system support: Operating system layer – protection – processes and threads-Communication and invocation – Operating system architecture. Distributed file system: File service architecture – Sun network file systems.

Module – IV

Transactions and concurrency control: Transactions, nested transactions-locks-optimistic concurrency control. Replication : System model and group Communication.

References:

1. George Coulouris, Jean Dollimore and Tim Kindberg, *Distributed Systems: Concepts and Design*, 5th Edition, Pearson Education, 2011.
2. Andrew S Tanenbaum and Maarten Van Steen, *Distributed Systems: Principles and Paradigms*, 2nd Edition, Pearson Education, 2006.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Course Outcome:

After the successful completion of the course students will have:

- *A sound understanding of the principles and concepts involved in designing distributed systems.*
- *The ability to implement a distributed application*
- *An understanding of the design issues relating to publish-subscribe, peer-to-peer networks*
- *The ability to analyse Distributed System Architecture.*

13.806 SOFTWARE TESTING (F)

Teaching Scheme: 2(L) - 1(T) - 0(P) **Credits: 3**

Course Objective:

This course enables the students to

- *Understand the concepts involved in software testing*
- *Get exposure to various types of testing tools*

Module – I

Characteristics of Software – Software Development process – Software quality Management – Processes related to software quality. Fundamentals of Software Testing – Principles of Software Testing – Structured approach to testing. Developing testing methodologies – Levels of Testing – Acceptance Testing – Special Tests – Testing Tools.

Module – II

Test planning Test strategy – Test plan templates (System testing) – Guidelines for developing test plan. Test Estimation – Test standards – Building Test data and Test cases. Test coverage – traceability matrix. Test Scenario – Test Scripts. Tools used to build test data – testing object oriented software – Testing web applications.

Module – III

Test metrics and test reports – categories of the product/project test metrics – Resources consumed in Testing – Effectiveness of testing – defect density – defect leakage ratio – residual defect density – test team efficiency – test case efficiency.
Integration test reports – System Test report – acceptance test report – Guidelines for writing and using test report, final test reporting – test status report benchmarking. Test tools used to build reports

Module - IV

Managing change - Software configuration management - change management – risk analysis and management.
Basics of automation testing – why, when and how to perform automation testing - Factors for choosing a particular tool - overview for the major functional testing tools - Overview of Test management and bug tracking tools..

References:

1. Marnie L Hutcheson, *Software Testing Fundamentals : Methods and Metrics*, Wiley 2003.
2. Louise Tamres, *Introducing Software Testing*, Addison-Wesley Professional 2002.
3. Glenford J. Myers, Corey Sandler, Tom Badgett, *The Art of Software Testing*, Wiley 2011.

Internal Continuous Assessment *(Maximum Marks-50)*

50% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, quiz, literature survey, seminar, term-project etc.

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 100*

The question paper shall consist of 2 parts.

Part A (20 marks) - Five Short answer questions of 4 marks each. All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

Part B (80 Marks) - Candidates have to answer one full question (question may contain sub-divisions), out of the two from each module. Each question carries 20 marks.

Course Outcome:

At the end of the course, the students will have

- *A sound understanding of the principles and concepts involved in software testing.*
- *An understanding of the various tools and procedures used in software testing*

13.807 WEB APPLICATIONS LAB (F)

Teaching Scheme: 0(L) - 0(T) - 4(P) **Credits**: 4

Course Objective:

This course intends to provide hands-on experience to students in designing and implementing web applications.

Exercises:

1. Implementing and deploying web applications using Servlets, HTML and JSPs.
2. Testing the application on an Application Server.
3. Debugging Web applications locally and remotely.
4. Developing applications in a team environment.
5. Retrieval of data from database using SQL and exchange of information in XML format.

Internal Continuous Assessment *(Maximum Marks-50)*

40% - Test

40% - Regular lab work and proper maintenance of lab records

20% - Regularity in the class

University Examination Pattern:

Examination duration: 3 hours *Maximum Total Marks: 150*

Questions based on the list of exercises prescribed.

Marks should be awarded as follows:

20% - Algorithm/Design

20% - Implementing / Conducting the work assigned

30% - Output/Results and inference

30% - Viva voce

Candidate shall submit the certified fair record for endorsement by the external examiner.

Course Outcome:

At the end of the course, the students would have acquired the necessary hands-on skills to design, implement and deploy web applications.

13.808 PROJECT WORK AND VIVA VOCE (F)

Teaching Scheme: 0(L) - 0(T) - 5(P) **Credits**: 5

Course Objective:

- *To provide motivation for the students to solve real world problems using mathematics and engineering principles.*
- *To motivate students to participate in group discussions and thereby exchange ideas.*
- *To serve as platform to identify research issues in existing systems.*

PROJECT WORK:

The project should be based on the core subjects of the discipline. The work can be carried out in the department under the supervision of a faculty member or with the help of an external organization. In the latter case, the motivation of the organizations should be purely academic and they should provide an external guide whose qualifications should be on par with that of a faculty member. An internal guide will be consistently interacting with the external guide and monitoring the progress of the project. There should be a mid-semester and end-semester evaluation of the project. The student has to submit a thesis in the prescribed format, duly certified by the internal guide and external guide (if any).

For the award of the sessional marks, the project report and the power point presentation of the project work shall be assessed by a panel consisting of the Head of the Department, project coordinator, project guide, and a senior faculty member. The Head of the Department shall be the chairman of the panel. The students may be assessed individually and in groups.

VIVA VOCE:

In the viva voce, the student's performance will be evaluated based on the project work, the seminar presented and the knowledge of the courses in the whole curriculum. The distribution of the marks will be in the ratio 2:1:2, respectively.
At the time of viva-voce examination, the project work has to be evaluated in addition to assessing the students' knowledge in the field of Computer Science and Engineering and other related and advanced topics. He/she is expected to present his/her academic records including project report, seminar report, etc. at the time of viva-voce examination. Evaluation is a serious process that is to be conducted under the equal responsibility of both the internal and external examiners.

Internal Continuous Assessment *(Maximum Marks-150)*

Marks by Committee: 50% *Marks by Guide: 50%*

25% - Presentation/viva, clarity in presentation, awareness to the work/topic etc.

50% - Current relevance of the work, implementation/experimentation of the work, involvement in the work etc.

25% - Evaluation of the report

University Examination Pattern:

Viva-Voce *Maximum Total Marks: 100*

Marks should be awarded as follows:

40% - General topics covered in the curriculum and other related and advanced topics.

40% - Project work.

20% - Seminar topic

Course Outcome:

After successful completion of this course, the students will be able to:

- *Apply knowledge of mathematics, science and engineering principles to solve complex real world problems bringing out economically and socially feasible solutions upholding ethical values.*
- *Participate in peer group discussions and integrate ideas.*
- *Apply the knowledge base about advanced topics pertaining to area of study to design and implement solutions to challenging problems.*
- *Test and analyze the developed system for further improvement.*
- *Identify new research problems from issues raised during implementation.*
- *Communicate problems and solutions to society through reports.*
- *Manage time and resources effectively.*