Course No.	Course Name	L-T-P	Credits	Year of Introduction
08 CS 7011(A)	Unix Internals	3-0-0	3	2015

Course Objectives

To give the Student:-

- An understanding of internal working of unix operating system

Syllabus

Architecture of Unix Operating System, Kernel and Buffer, Internal representation of files in a Unix operating system, the system call interface, process management in Unix system, memory management and input/output in Unix

Expected Outcome

A student who completes this course will get knowledge on the data structures, their relationships and the major algorithms used to manage System, processes, system calls, interrupts and exceptions, virtual memory and file systems.

References

1 Maurice J Bach, "The Design of the UNIX Operating Systems"- Prentice Hall of India/ Pearson Education, New Delhi, 2004.

2 UreshVahalia, "UNIX Internals: The New Frontiers"- Prentice Hall of India / Pearson Education, New Delhi, 2002.

3 Richard Stevens, "UNIX Network Programming"- Volume I- Prentice Hall of India / Pearson Education, New Delhi, 2006.

COURSE PLAN

Module	Contents	Hours Allotted	% of Marks in End-Semester Examination
I	**Unix System Structures:** Architecture of Unix Operating System, Introduction to System Concepts , Kernel , Kernel Data Structures, Buffer Cache, Buffer Headers , Structure of Buffer Pool , Retrieval of Buffer, Reading and Writing disk blocks	8	15

II	**Internal Representation of Files:** I-node, Structure of a regular file, Directories, Conversion of a path names to an I-node , Superblock , I-node assignment to a file ,Allocation of disk blocks.	7	15
FIRST INTERNAL EXAM			
III	Open, Read, Write, File and Record Locking, Lseek, Close. File creation: Creation of special files, Changing Directory And Root, Changing Owner and mode. Pipes, Mounting and unmounting file system, Link, Unlink.	7	15
IV	**Structure of the Processes:** Process States And Transitions, Layout of System Memory ,Context of a Process, Saving The Context of the Process, Manipulation of the Process Address Space ,Process Creation ,Signals ,Process Termination, Invoking other programs , Changing the size of a process, System boot and init process, Process Scheduling	7	15
SECOND INTERNAL EXAM			
V	**Memory Management:** Swapping, Application of swap space, File swap, Demand Paging, Data structures for demand paging, Swap process in and out, page stealing , Page aging and page fault.	7	20
VI	**I/O Device Subsystem** : Driver Interface ,Disk Drivers ,Terminal Drivers ,Case Study : Linux System	6	20
END SEMESTER EXAM			

Course No.	Course Name	L-T-P	Credits	Year of Introduction
08 CS 7011(B)	Crypto Complexity	3-0-0	3	2015

Course Objectives

- To provide the students with the concepts of cryptology and complexity theory.
- Discusses the different protocols like Diffie Hellman, Elgamaletc and randomized algorithms and complexity classes.

Syllabus

Review of Relevant Mathematics, Complexity Theory, Foundations of Cryptology, Hierarchies based on NP, Randomized algorithms and Complexity classes, probabilistic Polynomial time classes, Quantifiers, Graph Isomorphism and lowness, RSA Cryptosystem, Primality Tests, Factoring Methods, Diffie Hellman's, ElGamal's and other protocols, Arthur Merlin Games and Zero knowledge.

Expected Outcome

At the end of the course student will be able to

- Select and apply cryptographic primitives appropriately for security applications.
- Design and analyze securely usable information systems

References

1. Jorg Roth, Complexity Theory and Cryptology – An introduction to cryptocomplexity, Springer, 2005.
2. 2.H. Anton, Elementary Linear algebra, John Wiley and Sons, New York, eighth edition, 2000.
3. G. Brassard. A note on the complexity of cryptography, IEEE Transactions on Information Theory, 25(2):232-233, 1979

COURSE PLAN

Module	Contents	Hours Allotted	% of Marks in End-Semester Examination
I	Review of Relevant Mathematics, Complexity Theory.	7	15
II	Foundations of Cryptology, Hierarchies based on NP.	7	15
	FIRST INTERNAL EXAM		
III	Randomized algorithms and Complexity classes, probabilistic Polynomial time classes,	7	15
IV	Quantifiers, Graph Isomorphism and lowness.	7	15
	SECOND INTERNAL EXAM		

V	RSA Cryptosystem, primality and factoring, Primality Tests, Factoring Methods, Security of RSA.	7	20
VI	Diffie Hellman's, ElGamal's and other protocols, Arthur Merlin Games and Zero knowledge.	7	20
END SEMESTER EXAM			

Course No.	Course Name	L-T-P	Credits	Year of Introduction
08 CS 7011(C)	Ethical Hacking	3-0-0	3	2015

Course Objectives

- To understand various hacking techniques and attacks
- To study how to protect information from attacks
- To evaluate and study the vulnerability of networks

Syllabus

Fundametals of computer fraud, Security in TCP/IP networks, Hacking windows, Security in Web and Intrusion Detection, Forensics

Expected Outcome

At the end of this course the student will be able to defend the system and networks against various attacks. He/she will also be able to practise and use safe techniques on the network.

References

1. Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications Taylor & Francis Group–2008.
2. Ankit Fadia " Ethical Hacking" second edition Macmillan India Ltd, 2006

COURSE PLAN

Module	Contents	Hours Allotted	% of Marks in End-Semester Examination
I	**Basics** Fundamentals of Computer Fraud – Threat concepts – Framework for predicting inside attacks – Managing the threat – Strategic Planning Process.	6	15
II	**Security in Networks** TCP / IP – Checksums – IP Spoofing port scanning, DNS Spoofing. Dos attacks – SYN attacks, Smurf attacks, UDP flooding, DDOS – Models. Firewalls	6	15
	FIRST INTERNAL EXAM		
III	Packet filter firewalls, Packet Inspection firewalls – Application Proxy Firewalls. Batch File Programming.	6	15
IV	Hacking windows – Network hacking – Web hacking – Password hacking. A study on various attacks – Input validation attacks – SQL injection attacks – Buffer overflow attacks – Privacy attacks.	8	15
	SECOND INTERNAL EXAM		
V	**Web Services and Intrusion Detection** Architecture strategies for computer fraud prevention – Protection of Web sites – Intrusion detection system – NIDS, HIDS – Penetrating testing process – Web Services– Reducing transaction risks.	8	20
VI	**Forensics:** Forensics – Computer Forensics – Journaling and it requirements – Standardized logging criteria – Journal risk and control matrix – Neural networks – Misuse detection and Novelty detection.	8	20
	END SEMESTER EXAM		

Course No.	Course Name	L-T-P	Credits	Year of Introduction
08 CS 7021(A)	Theoretical Computer Science	3-0-0	3	2015

Course Objectives

To give the Student:-

1. Introduction to the mathematical foundations of computer science which includes automata theory, the theory of formal languages, the notions of algorithm, decidability, complexity, and computability.
2. Ability to understand and conduct mathematical proofs for computation and algorithms

Syllabus

Language and Automata Theory, Turing Machines, Church's works on computability, turing computability, complexity theory, Different classes of problems and its applications.

Expected Outcome

Students who successfully complete this course will understand the fundamental concepts of automata, computability and complexity theory. Students will be able to analyze real world computational problems with practical importance in terms of computability and complexity.

References

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

2. Michael Sipser, "Introduction to Theory of Computation", Cengage Learning.

COURSE PLAN

Module	Contents	Hours Allotted	% of Marks in End-Semester Examination
I	**Language & Automata Theory :** Finite State Machines & Regular Grammar-Minimization of DFA, Pumping Lemma of Regular Languages, Push Down Automata & Context Free Grammars-Non Deterministic PDA, CYK Algorithm, Linear Bound Automata and Context Sensitive Language. Chomsky Hierarchy of Grammars and the corresponding acceptors.	9	15
II	**Turing Machine:** Turing Machines, variants of TMs, programming techniques for TMs, Non Deterministic TMs, TMs and Computers, Recursive and Recursively Enumerable Languages	6	15
	FIRST INTERNAL EXAM		
III	**Church's Computability :** Hilbert's problem, Primitive Recursive Functions, Computable Functions with examples, The Recursion Theorem,lambda calculus.	6	15

IV	**Turing Decidability:** Decidable Languages, Universal Turing Machines, Undecidablity –un decidability of Halting Problem, Rice Theorem, Post Correspondence Problem, Reducibility, Church-Turing thesis.	6	15
SECOND INTERNAL EXAM			
V	**Complexity theory:** Tractable and Intractable problems, time and space complexity of tractable problems, Classes P, NP, NP-complete and NP-Hard with examples, P=NP question	6	20
VI	**Complex Problems:** Boolean satisfiability problem, polynomial time reductions, NP-completeness of SAT, Node Cover Problem, Hamiltonian Circuit problem and TSP(with proof),PSPACE, and PSPACE-complete,polynomial hierarchy, randomized computation, parallel computation.	9	20
END SEMESTER EXAM			

Course No.	Course Name	L-T-P	Credits	Year of Introduction
08CS 7021(B)	Semantic Web	3-0-0	3	2015

Course Objectives

To introduce the advanced concepts in emerging trends in Web architecture.

Syllabus

Introduction to semantic web technology - Resource Description Framework -Web ontology language-Semantic web services and applications -Concept of OWL-S-Real world examples and applications.

Expected Outcome

At the end of the course student will be able to

1. Understand the concept structure of the semantic web technology and how this technology revolutionizes the World Wide Web and its uses.
2. Understand the concepts of metadata, semantics of knowledge and resource, ontology, and their descriptions in XML-based syntax and web ontology language (OWL).

References

1. Grigoris Antoniou, Frank van Harmelen, ―A Semantic Web Primer (Cooperative Information Systems)‖ , The MIT Press, 2009
2. Liyang Yu, Introduction to the Semantic Web and Semantic Web Services, Chapman & hall/CRC, 2007
3. Dean Allemang, James Hendler, ―Semantic Web for the Working Ontologist: Effective Modeling in RDFS and OWL‖ , Morgan Kaufmann, 2008
4. Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez-Lopez ―Ontological Engineering: with examples from the areas of Knowledge Management, e- Commerce and the Semantic Web‖ , Springer, 2004
5. John Davies, Dieter Fensel, Frank Van Harmelen, ―Towards the Semantic Web: Ontology – Driven Knowledge Management‖ , John Wiley & Sons Ltd., 2003.
6. John Davies, Rudi Studer, Paul Warren, ―Semantic Web Technologies: Trends and Research in Ontology-based ystems‖ ,Wiley Publications, 2006.
7. Steffen Staab, Rudi Studer, ―Handbook on Ontologies (International Handbooks on Information Systems)‖ , 1/e, Springer, 2004
8. Steffen Staab, Rudi Studer, ―Handbook on Ontologies (International Handbooks on Information Systems)‖ , 1/e, Springer, 2004

COURSE PLAN

Module	Contents	Hours Allotted	% of Marks in End-Semester Examination
I	Introduction to semantic web technology : Traditional web to semantic web – meta data- search engines .	6	15
II	Resource Description Framework –elements -rules of RDF – tools- RDFS core elements-Taxonomy and ontology concepts .	6	15
	FIRST INTERNAL EXAM		
III	Web ontology language: OWL: define classes- set operators – enumerations- defining properties – Validating OWL ontology.	7	15
IV	Semantic web services and applications :Web services – web services standards – web services to semantic web services- UDDI	7	15
	SECOND INTERNAL EXAM		

V	Concept of OWL-S – building blocks of OWL-S- mapping OWL-S to UDDI- WSDL	8	20
VI	Real world examples and applications :Swoogle- architecture and usage of meta data; FOAF – vocabulary – creating documents – overview of semantic markup – semantic web search engines.	8	20
END SEMESTER EXAM			

Course No.	Course Name	L-T-P	Credits	Year of Introduction
08 CS 7021(C)	Advanced Computer Architecture	3-0-0	3	2015

Course Objectives

To focus towards the various design options in the area of architecture that lays platform to develop and analyse high performance applications.

Syllabus

Control Unit Design - Data path implementation, Register Transfer Notation (RTN), Abstract RTN, Concrete RTN, Control sequence for Simple RISC computer (SRC), Memory Module Design - Conceptual view of memory cell, Memory address map, Cache memory, Instruction and Thread level parallelism, Multi-Core and Multithreading Concepts, Multi-Core Programming.

Expected Outcome

The At the end of the course the student will be able to

- Identify the need for multi-core architecture for specific applications by developing a suitable complexity measure.
- Identify needs for homogeneous or heterogeneous multi-core architectures for a given application.

References

1. John L. Hennessy and David A. Patterson "Quantitative Approach –Computer Architecture" 5th edition, Morgan Kaufmann, 2011.
2. Shameem Akhter and Jason Roberts, "Multi-Core Programming", 1st edition, Intel Press, 2006.
3. Vincent P. Heuring, Harry F. Jordan "Computer System design and Architecture" 2nd edition, Pearson, 2003.
4. David B. Kirk , Wen-mei W. Hwu, "Programming Massively Parallel Processors: A Handson Approach (Applications of GPU Computing Series)", 1st edition, Morgan Kaufmann, 2010.
5. Apman, Gabriele Jost, Ruud van van der Pas, "Using OpenMP: Portable Shared Memory Parallel Programming (Scientific and Engineering Computation)", 1st edition, MIT Press, 2007

COURSE PLAN

Module	Contents	Hours Allotted	% of Marks in End-Semester Examination
I	Control Unit Design : Overview of IAS Computer, Data path implementation, Register Transfer Notation (RTN), Abstract RTN, Concrete RTN, Control sequence for Simple RISC computer (SRC); Control unit Design, Hardwired control unit Design and Micro programmed control unit Design using control Sequences.	8	15
II	Memory Module Design : Conceptual view of memory cell, Memory address map, Memory connections to CPU, Cache memory − Cache memory management techniques, Types of cache's : Look through, look aside, write through , write around, unified Vs Split, multilevel, cache levels, Cache Misses, performance issues: Mean memory access time, Execution time, Cache Coherence Protocols, Snoopy, MSI, MESI, and MOESI.	7	15
FIRST INTERNAL EXAM			
III	Instruction and Thread level parallelism : Instruction level parallelism (ILP): Concepts - Dynamic scheduling and data hazards – Exploiting ILP using static/dynamic scheduling and speculation -Advanced techniques for instruction delivery and speculation. Thread level parallelism: Shared memory architectures centralized, distributed Synchronisation in memory, Models for memory consistency.	7	15

IV	Multi-Core Concept: Multi-processor architecture and its limitations, Need for multi-core architectures, Architecting with multi-cores, Homogenous and heterogeneous cores, Shared recourses, shared busses, and optimal resource sharing strategies Evolution of Multi-Core Technology.	8	15
SECOND INTERNAL EXAM			
V	Multithreading Concept : Basic concepts of threading and parallel computing, Concurrency, Parallelism, threading design concepts for developing an application, Correctness Concepts, Performance Concepts: Simple Speedup, Computing Speedup, Efficiency , Granularity , Load Balance, Tools Foundation – Intel® Compiler and Intel® VTune™ Performance Analyzer.	7	20
VI	Multi-Core Programming : Introduction to OpenMP, OpenMP Directives, Parallel constructs, Work-sharing constructs, Data environment constructs, Synchronization constructs, Extensive API library for finer control, benchmarking multi-core architecture: Bench marking of processors. Comparison of processor performance for specific application domains.	5	20
END SEMESTER EXAM			

Course No.	Course Name	L-T-P	Credits	Year of Introduction
08 CS 7031(P)	Seminar II	0-0-2	2	2015

Course Objectives

To assess the debating capability of the student to present a technical topic. Also to impart training to a student to face audience and present his/her ideas and thus creating self esteem and courage that are essential for an engineer.

Approach

Each student is expected to present a seminar on a topic of current relevance in Computer Science and Engineering about 30 minutes. They are expected to refer current research and review papers from standard journals like ACM, IEEE, JPDC, IEE etc. - at least three cross references must be used - the seminar report must not be the reproduction of the original paper. A committee consisting of at least three faculty members shall assess the presentation of the seminar and award marks to the students based on merits of topic of presentation. Each student shall submit two copies of a write up of the seminar topic. One copy shall be returned to the student after duly certifying it by the chairman of the assessing committee and the other will be kept in the departmental library.

Expected Outcome

Upon successful completion of the seminar, the student should be able to

1.Get good exposure in the current topics in the specific stream.
2. Improve the writing and presentation skills.
3. Explore domains of interest so as to pursue the course project.

Course No.	Course Name	L-T-P	Credits	Year of Introduction
01CS7041(P)	Project (Phase I)	0-0-12	0	2015

Course Objectives

To make students

1. Do an original and independent study on the area of specialization.
2. Explore in depth a subject of his/her own choice.
3. Start the preliminary background studies towards the project by conducting literature survey in the relevant field.
4. Broadly identify the area of the project work, familiarize with the tools required for the design and analysis of the project.
5. Plan the experimental platform, if any, required for project work.

Approach

The student has to present two seminars and submit an interim Project report. The first seminar would highlight the topic, objectives, methodology and expected results. The first seminar shall be conducted in the first half of this semester. The second seminar is the presentation of the interim project report of the work completed and scope of the work which has to be accomplished in the fourth semester.

Expected Outcome

Upon successful completion of the project phase 1, the student should be able to

1. Identify the topic, objectives and methodology to carry out the project.
2. Finalize the project plan for their course project.