MASTER OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

2 YEARS PROGRAMME

Choice Based Credit System
w. e. f. July 2015
(70:30)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE & TECHNOLOGY

HISAR-125001, HARYANA

Vision and Mission of the Department

VISION

The vision of the Department is to become a centre of excellence for education in Computer Science, Engineering and Applications. We visualize ourselves as an agency to nurture young minds into leaders of tomorrow in the field of higher education, research and development, and corporate world. We aim to produce creators and innovators who will work towards the overall well being of the society.

MISSION

- To impart state-of-the-art knowledge in Computer Science and Engineering, Information Technology and Computer Applications.
- To ensure our students graduate with a sound theoretical basis and wide-ranging practical experience.
- To foster linkages between the Department and public and private sectors, traversing research establishments as well as Information Technology industry.
- To promote ethical research of high quality.
- To adopt the best pedagogical methods in order to maximize knowledge transfer.
- To inculcate a culture of free and open discussions in the Department.
- To engage students in learning, understanding and applying novel ideas.
- To infuse scientific temper, professionalism, enthusiasm and team spirit.
- To inspire a zest into students for lifelong learning.
- To promote democratic values, an environment of equal opportunity for everyone irrespective of gender, religion and cast.
- To attract and retain the talented and dedicated teaching and supporting staff, and students.

Programme Educational Objectives (PEOs)

The educational objectives of the M. Tech. (CSE) Programme are:

PEO1. To set high academic goals for the graduating students and to train them in applying and extending the knowledge to the benefit of the society at large.

PEO2. To produce post-graduates with a sound theoretical and practical knowledge in the discipline of Computing Science and Engineering.

PEO3. To create knowledgeable and enthusiastic teaching professionals to engage in higher education institutions.

PEO4. To craft technically competent, proficient and responsible professionals for IT and its related industries.

PEO5. To establish a research tradition that supports our post-graduates for pursuing research careers in premier universities and research institutes/organisations in India and abroad.

Programme Outcomes (POs)

In order to achieve the PEOs, we expect our students to attain the following outcomes by the time of their graduation. The Programme graduates will have:

PO1. an ability to understand and apply mathematical concepts, algorithmic principles and computer science theory in solving computing based real world problems.

PO2. an ability to understand and apply advanced networking and security of information systems' concepts.

PO3. an ability to understand, apply and design Computationally Intelligent techniques/algorithms to solve problems that do not map to mathematical models.

PO4. an ability to understand and apply database design and knowledge mining techniques for complex predictive and descriptive modeling tasks.

PO5. an ability to understand and apply the principles of computer architecture and micro-processors based systems.

PO6. an ability to grasp and specify the requirements of resources to solve a computing problem and further model, design, implement and validate the provided computing solution to meet the specified requirements subject to real-world constraints on time and finance.

PO7. an ability to critically analyze/examine/judge the existing knowledge about a research problem/domain, identify and formulate a research problem and subsequently select appropriate research methodologies and tools to address the problem.

PO8. ability to design and conduct research experiments, analyze and interpret data and results related to Computer Science and Engineering problems.

PO9. an ability to propose original ideas and design novel solutions and communicate them effectively to the stakeholders verbally as well as in writing.

PO10. an ability to learn and apply modern engineering tools and software to solve problems, to understand the limitations of various tools in context of the domain of the problem and overcome them by extending the functionalities of the available tools or building an interface between different tools.

PO11. an ability to work individually or in a team exhibiting the leadership qualities.

PO12. an ability to engage in lifelong learning and tackle unforeseen problems.

PO13. reflect true professionalism and ethical behaviour in his/her work and understand contemporary issues and the impact of engineering solutions in a global, economic, environmental and societal context.

M. Tech. (CSE)
(TWO YEAR PROGRAMME)
SCHEME OF EXAMINATION
Choice Based Credit System w. e. f. July 2015

SEMESTER-I

Course Code	Nomenclature of the Courses	Credits
CSL711	Advanced Computer Networks	4
CSL712	Advanced Microprocessors	4
CSL713	Advanced Database Management Systems	4
CSL714	Theory of Computation	4
CSL715	Advanced Software Engineering	4
CSP711	Computer Networks Lab.	2
CSP712	Microprocessor Lab.	2
	Total Credits	24

SEMESTER-II

Course Code	Nomenclature of the Courses	Credits
CSL721	Soft Computing Concepts and Techniques	4
CSL722	Digital Image Processing	4
CSL723	High Speed Networks and Mobile Technologies	4
CSL724	Cloud Computing	4
	Departmental Elective I	4
CSP721	Soft Computing Lab.	2
CSP722	Digital Image Processing Lab.	2
	Total Credits	24

List of Departmental Electives I *

1. CSL725 Research Methods
2. CSL726 Security of Information Systems
3. CSL727 Sensor Networks
4. CSL728 Computational Geometry
5. CSL729 Mathematical Concepts for Computer Science
6. CSL730 Analysis and Design of Computer Algorithms

*Departmental elective paper would be offered only if a minimum of 15 students opt for it.

SEMESTER-III

Course Code	Nomenclature of the Courses	Credits
CSL731	Technical Writing and Effective Communication Skills	Qualifying
	Departmental Elective II	4
CSD731	Dissertation and Seminar-I	4
Open Elective		3
CSP731	Research Tools for Computer Science and Engineering Lab.	2
	Total Credits	13

List of Departmental Electives II*

1. CSL732 Data Mining Concepts and Techniques
2. CSL733 Performance Evaluation
3. CSL734 Machine Learning and Pattern Recognition
4. CSL735 Software Project Management
5. CSL736 Bio-informatics
6. CSL737 Introduction to Natural Language Processing

* Departmental elective paper would be offered only if a minimum of 15 students opt for it.

CSD731 (Dissertation and Seminar-I) **:
To be evaluated by a committee constituted by the Chairperson, CSE.

Open Electives (#) offered by other Departments

1. BME700 Bio-medical Instrumentation
2. ECE700 Advancements in Communication Systems
3. ME700 Computer Aided Design and Manufacturing
4. MTPT700 Advanced Printing Technologies

The minimum number of students in an open elective offered by any Engineering Department will be 15 subject to a maximum of 40 students per section.

SEMESTER-IV

Course Code	Nomenclature of the Course	Total credits
CSD741	Dissertation and Seminar-II**	9

** M. Tech. dissertation workload of two hours per week should be assigned to the faculty members supervising M.Tech. dissertation(s). The workload on this account cannot exceed 2 hours per week.

CSD741 (Dissertation and Seminar-II):
To be evaluated jointly by internal supervisor and external examiner appointed by COE.

The research problem formulated after review of literature done in 3^{rd} semester should be continued in the 4^{th} semester. A student is required to publish a research paper related to his/her dissertation work in a Seminar/Conference/Symposium/Journal. The M.Tech. dissertation cannot be submitted without acceptance/publication of a research paper.

Total credits of all semesters **70**

Advanced Computer Networks

General Course Information:

Course Code: CSL711 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Undergraduate Computer Networks course.

About the Course and its Objectives & Outcomes:

This course has been designed with an aim to provide a broad coverage of introductory and advanced topics in the field of computer networks.

By the end of the course a student is expected to:

By the end of the course a student is expected to:

1. To have depth knowledge of computer networks.
2. Recognize the different internetworking devices and their functions.
3. Explain the role of protocols in networking.
4. Analyze the services and features of the various layers of data networks.
5. Design, calculate, and apply subnet masks and addresses to fulfill networking requirements.
6. Analyze the features and operations of various application layer protocols such as Http, DNS, and SMTP.

Syllabus

Unit I

Introduction

Network architecture- Layers, services, protocols, layer entities, service access points, Networking principles, Reference Models, Topology designs.

Physical Layer

The Theoretical Basis of Data Communications—Transmission impairments and channel capacity. Transmission Media, The Public Switched Telephone Network, Structure of Telephone network, The Local Loop, Modems, Cable Modems, ADSL, Multiplexing and Switching.

Unit II

Data Link Layer

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols, Example Data Link Protocol: HDLC- High Level Data Link Control, PPP-point to point protocol.

Medium Access Control Sub-Layer

Introduction, The Channel Allocation Problem, The Binary Exponential Back-off Algorithm, Multiple Access protocols-ALOHA, Carrier Sense Multiple Access Protocols, Carrier Sense Multiple Access Protocols/Collision detection protocol, Collision Free Protocols.

Ethernet: Ethernet Cabling, Manchester Encoding, The Ethernet MAC Sub-layer Protocol, Performance. Data Link Layer Switching: Local Internetworking, Hubs, Repeaters, Bridges: Spanning Tree Bridges, Transparent Bridges, Remote Bridges, Switches- Virtual LAN's, Gateways, Routers.

Unit III

The Network Layer

Network Layer Protocol: IPV4:- IP Protocol, IP Addressing (Classful Addressing, Private IP Addresses, APIPA Addresses, Classless Addressing: Sub-netting and Super-netting, NAT: Network Address Translation), IPV6:- Basics, Address Expressions, Address Types, Auto- configuration, Dual Stacking and Tunnelling.

Routing: Introduction, Administrative Distance, Types of Routing: Default Routing, Static Routing, IGP & EGP. Mobile IP, Internet Control Protocols, Congestion Control Algorithm, Introduction to Voice over IP.

Unit IV

The Transport Layer

Elements of Transport Protocols, Introduction to Internet Transport Protocols: UDP, TCP - Introduction, TCP Service Model, TCP Protocol, TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP congestion control, TCP timer management.

The Application Layer

Introduction to DNS, FTP, TELNET, HTTP, SMTP, Electronic Mail, WWW and Multimedia.

Text and Reference Books:

1. Andrew S Tanenbaum, Computer Networks, 5th Edition, Pearson, 2010.
2. Forouzan, Data Communication and networking, 5th Edition, TMH, 2012.
3. William Stalling, Data & Comp. Communication, 6th edition, LPE Pearson Education, 2013.
4. Todd Lammle, CCNA Study Guide, 6th Edition, 2013.
5. RFCs and Internet Drafts, available from Internet Engineering Task Force.

Advanced Microprocessors

General Course Information:

Course Code: CSL712 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of Digital Electronics, Computer Organization

About the Course and its Objectives & Outcomes:

A microprocessor incorporates the functions of a central processing unit (CPU) on a single integrated circuit. The advent of microprocessors and their increased capacity made them to be used in everything be it a smallest embedded system or handheld device, or the largest mainframe and supercomputer. It is being used in variety of applications such as process control systems, security systems, household appliances, and mobile phone technologies. This course aims to introduce the architecture, programming and interfacing of various hardware circuits with microprocessors. It would help the students learn the advanced techniques in the modern microprocessors and give them exposure to memory interfacing and management, monitoring and control applications, and the latest technologies.

The objectives of this course are to:

1. provide the insight and develop the understanding of the architectures of microprocessors including the advanced ones.
2. cultivate the ability to write the programs by mastering the assembly language programming using various concepts like addressing modes, assemblers, directives, operators, interrupts.
3. understand the hardware specifications of various processors and demonstrate the basic understanding of operations between the microprocessor and input/output and/or memory devices.
4. provide the understanding of interfacing I/O devices using peripheral devices to microprocessors and foster the ability to design microprocessors based applications.
5. provide the need and understanding of using interrupts and interrupt structure.
   make them understand the advanced technologies in the field of microprocessors.

By the end of the course a student is expected to:

1. describe the features and use of the real and protected modes of microprocessors.
2. explain the internal architecture of the 16, 32, and 64-bit microprocessors and compare and contrast the features of different Intel microprocessors.
3. analyse memory, input/output and interrupt interfaces to the microprocessors.
4. design the microprocessor based control systems and can develop the software to control them.
5. compare the state-of-the-art technologies in the field of microprocessors.

Syllabus

Unit I

Microprocessor, Internal architecture, Real mode memory addressing, Protected mode memory addressing, Memory paging, Data addressing modes, Program memory addressing modes, Stack memory addressing modes, Directives and operators, Data transfer instructions, Arithmetic & logic instructions, Program control instructions, Data conversions, Assembly language programming.

Unit II

The Pin-Outs and pin functions of 8086/8088 microprocessors, Clock generator, Bus buffering and latching, Bus timings, READY and WAIT state, maximum mode and minimum mode configuration, Memory devices, Memory interface, Address decoding, 16 bit, 32 bit and 64 bit memory interface, I/O Progamming, Programmed I/O, Interrupt I/O and DMA, I/O addresses and I/O ports .

Unit III

Interfacing chips, Programmable peripheral interface (8255), Mode 0, Mode 1 and Mode 2, Interrupts, Interrupt instructions, Hardware interrupts, 8259A Programmable interrupt controller, Initializing command words, operation command words, Interrupt system based on single 8259A, multiple 8259A, 16550 Programmable communications interface, Asynchronous serial data, Interfacing with A/D and D/A Converters, Data acquisition system, Temperature monitoring system etc

Unit IV

Pentium processor, The memory system, I/O system, Branch prediction logic, cache structure, superscalar architecture, special Pentium registers, Pentium memory management, Introduction to Pentium pro, Pentium II, Pentium III, Pentium IV and Core 2 microprocessors, Multi-core microprocessor architecture, Intel Hyper-Threading technology, Turbo Boost technology, state-of-the-art multi-core microprocessors.

Software and Tools to be learnt: MASM / TASM

T**ext and Reference Books:**

1. Barry B. Brey, "INTEL Microprocessors", 8th Edition, Prentice-Hall Inc., U.S.A., 2008.
2. Yu-cheng Liu, Glenn A. Gibson, “Microcomputer systems: The 8086 /8088 Family architecture, Programming and Design”, Second Edition, Prentice Hall of India, 2003
3. Walter A. Triebel, "The 80386, 80486, and Pentium Microprocessor: Hardware, Software, and Interfacing", Prentice-Hall Inc., U.S.A., 1998.
4. K. Ray and K.M. Bhurchandi, "Intel Microprocessors: Architecture, Programming and Interfacing", McGraw Hill Inc., 2001.
5. Shameem Akhter and Jason Roberts, "Multi-Core Programming", Intel Press, 2006.
6. John Paul Shen, "Modern Processor Design", McGraw-Hill Professional, 2004.
7. Douglas V. Hall, “Microprocessors and Interfacing: Programming and Hardware”,
8. James L. Antonakos , “ The Pentium Microprocessor ‘’ Pearson Education , 1997.

Advanced Database Management Systems

General Course Information:

Course Code: CSL713 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: One should have the basic knowledge of Database System concepts and basic queries of SQL.

About the Course and its Objectives & Outcomes:

Objectives of this course are to:

1. educate students with fundamental concepts of Database Management System.
2. study Database Design methodology.
3. design Database and Normalize data.
4. understand the concept of Recovery, Data Mining and Data Warehouse.

By the end of the course a student is expected to:

1. be able to understand the concept of Normalization in order to remove anomalies of the database.
2. have the knowledge and apply various Locking Protocols and Techniques to control the concurrency for Database Manage System.
3. Analyze the classification of failure and apply recovery techniques for database recovery.
4. be able to design and manage database effectively using advanced queries of Oracle.

Syllabus

Unit I

Introduction to Database System: Database System Applications, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF and 5NF, SQL Queries, Database Users and Administrators.

Unit II

Transaction Management: Transactions and Its Properties, Serializability: Conflict Serializability, View Serializability, Testing for Serializability, Concurrency Control Techniques: Lock-Based Protocols, Timestamp Based Protocols, Validation Based Protocol, Deadlock Detection and Recovery.

Unit III

Recovery System: Failure Classification, Storage Structure: Types, Stable Storage Implementation, Data Access, Log Based Recovery, Advanced Recovery Techniques: Logical Undo Logging, Transaction Rollback, Checkpoints, Remote Backup Systems.

Unit IV

Oracle Concepts: Introduction to SQL *PLUS, Referential Integrity, SQL *PLUS Reports, Introduction to PL/SQL, Cursors, Triggers, Procedures, Functions, Packages, Large Objects, Creating Users, Remote Data Access.

Software and Tools to be learnt: SQL, Oracle

T**ext and Reference Books:**

1. Henry F. Korth, Database System Concepts, Fifth Edition, McGraw-Hill, 2006.
2. Navathe, Fundamentals of Database Systems, Fourth Edition, Pearson Education, 2008.
3. P.S. Deshpande, SQL & PL/SQL for Oracle, Black Book, Dreamtech Press, 2006.
4. Juneau J., Oracle PL/SQL Recipes: A Problem Solving Approach, APress, 2010.

Theory of Computation

General Course Information:

Course Code: CSL714 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of Mathematical Induction, Structural Induction, Predicate logic and Set Theory.

About the Course and its Objectives & Outcomes:

The language has been very important for the interaction and development of mankind. Study of grammar plays important role in the design of languages for human being or programming language for computer. The theory of computation is about the study of theoretical computer science and it has to be a formal, i.e. mathematical investigation of general questions raised about algorithmic studies. This course is going to include Automata, Regular Expression, Context Free Grammar, Push down Automata, Turing Machine and Undecidability.

Objectives:

1. To be able to construct FSA and the equivalent regular expressions.
2. To be able to construct PDA and equivalent CFG.

By the end of the course a student is expected to be able to:

1. Understand mathematical and computational principals that are foundations of the Computer Science.
2. Understand the relationship between Automata and Regular Expressions, and Context Free Grammar and Push down Automata, Abstract model of computation in the form of Turing Machine and application of Turing Machine.
3. Construct pushdown automata and equivalence context free grammars.
4. Understand and apply the theory of finite automata and context free grammars in the design of programming language and compilers.

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Syllabus

Unit I

Introduction: Motivation for studying theory of computation, a quick overview of the subject. Notion of formal language. Language membership problem, why this is taken as the central problem of the subject. Finite automata and regular expressions: DFA, NFA (with and without null transitions), their equivalence. Definition of regular expressions. Proof that FAs. recognize, and regular expressions denote the same class of languages, viz., regular languages.

Unit II

Properties of regular languages: Pumping lemma and its use to prove non-regularity of a language, closure properties of class of regular languages, decision properties: convert- ing among representations, testing emptiness, etc. Minimization of DFAs, Myhill-Nerode theorem.

Context-free grammars and languages: Derivation, parse trees. Language generated by a CFG. Eliminating useless symbols, unit productions. Chomsky normal form.

Unit III

Pushdown automata: Definition, instantaneous description as a snapshot of PDA computation, notion of acceptance for PDAs: acceptance by nal states, and by empty stack; the equivalence of the two notions. Proof that CFGs generate the same class of languages that PDAs accept.

Properties of context-free languages: Pumping lemma for context-free languages and its use to prove a language to be not context-free. Closure properties of the class of context- free languages. CYK algorithm for CFL membership.

Unit IV

Turing machines: Historical context, informal proofs of undecidability. Definition of TM, instantaneous description as a snapshot of TM computation, notion of acceptance. Generalizations: multi-track, multi-tape, nondeterministic, etc. Restrictions: semi-infinite tape, counter machines. Church-Turing hypothesis.

Undecidability: Definitions of regular expressions and recursive languages. Turing machine codes, the diagonalization language and proof of that it is not regular expression. Universal Turing machine. Universal language, its semi-decidability. Reducibility and its use in proving undecidability. Rices theorem. Undecidability of Posts correspondence problem.

Text and Reference Books:

1. J Hopcroft, JD Ullman, R Motwani, Introduction to Automata Theory, Languages and Computation, 3rd Ed., Pearson, 2008.
2. M Sipser, Introduction to the Theory of Computation, 2nd Ed., Thomson, 2005.
3. Peter Linz, Introduction to Formal Languages & Automata, Narosa, 2001.

Advanced Software Engineering

General Course Information:

Course Code: CSL715 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic Knowledge of software engineering principles, software development life cycles and software models.

About the Course and its Objectives & Outcomes:

This course covers advanced theoretical concepts in software engineering. The course will introduce basic of software engineering, object oriented software engineering, component based software engineering, aspect oriented software engineering and finally end with re-engineering and reverse engineering.

The objective of this course is to

Expose the student to technical issues related with the advancement of software engineering. Students will apply the software engineering techniques to home work assignments and mini-projects throughout the course. Both individual-and group-oriented exercises will be assigned.

Expected outcomes of the course are as follows:

1. Students will be able to develop and /or improve their technical writing and software development skills after the completion of the course.
2. Students are expected to be proficient in methodologies related to object oriented software engineering, component based software engineering, and aspect oriented software engineering.
3. Students will be able to apply the concepts reverse engineering and re-engineering widely used in software industry to increase reliability and minimize maintenance efforts.
4. Student will be in position to develop small projects as Case Study.

Syllabus

Unit I
Introduction to software engineering, Software Development Life Cycle, software process models, requirement analysis and design, software design process, coding, software testing, implementation and maintenance, software metrics.

Unit II
Object-Oriented Software Engineering, object-orientated paradigm, object modeling languages, object-oriented analysis, object-oriented design, object-oriented programming, object-oriented metrics, object-oriented case tools, object-oriented software testing. Component-Based Software Engineering (CBSE), CBSE and software reuse, CBSE vs. object-oriented software engineering, CBSE processes, domain engineering, component engineering, component-based software development life cycle, component vs. object, component-oriented programming, component-oriented programming vs. object-oriented programming, component-based technology, component-based software testing, component-oriented metrics.

Unit III
Software engineering with aspects, aspects, aspect vs. object, aspect vs. component, join points and pointcuts, separation of concerns, crosscutting concerns, scattering and tangling, aspect-oriented programming, aspect-oriented software testing.

Unit IV

Re-engineering concept and approaches, redevelopment vs. reengineering, reengineering process, software re-engineering techniques, reverse engineering, levels of reverse engineering: re-documentation, design recovery, specification recovery, conditions for reverse engineering, forward engineering, restructuring, re-engineering, benefits of reverse engineering.

Text and Reference Books:

1. K K Aggarwal and Yogesh Singh, Software Engineering, 3rd Edition, New age International Publishers, 2008.
2. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publishing House, New Delhi 1997.
3. Ian Sommerville, Software Engineering, Pearson Education, 2009.
4. Pressman Roger S., Software Engineering: Practitioner's Approach, McGraw-Hill Inc., 2004.
5. N. S. Gill, Software Engineering: Software Reliability, Testing and Quality Assurance, Khanna Book Publishing Co (P) Ltd., New Delhi, 2002.
6. Yogesh Singh and Ruchika Malhotra, Object Oriented Software Engineering, PHI Learning Pvt. Ltd., 2012.
7. J. Rumbaugh, M. Blaha, W. Premerlani, Object-Oriented Modeling and Design, PHI, 1991.
8. George T. Heineman, William T. Councill, Component-Based Software Engineering: Putting the Pieces Together, Addision Wesley, 2001.
9. Robert E. Filman, Tzilla Elrad, Siobhán Clarke, Mehmet Aksit, Aspect-Oriented Software Development Addison-Wesley Professional, 2004.

Computer Networks Lab.

General Course Information:

Course Code: CSP711 *Course Credits: 2 Type: Compulsory Contact Hours: 4 hours/week Mode: Experimental Lab. *In lab. work one credit is equivalent to two hours	**Course Assessment Methods (internal: 30; external: 70)** An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Pre-requisites: Programming in C/java.

The objectives of this lab. course are to:

1. develop skills to design and analyze the basic scenarios.
2. develop skills to configuring network devices (Switches, Routers etc), establishing Local area networks (LAN), implement different routing and wide area network (WAN) protocols.

By the end of the course a student is expected to:

1. Able to understand different models used for study of computer networks and ability to identify different designs.
2. Able to understand, how information transforms while moving through network and understand different technologies used to improve efficiency of communication.
3. Able to design and engineer routes to create interconnect of nodes.
4. Able to build some simple networking models using the Network Simulator.

Students are required to do eight to ten assignments. The lab. assignments are evenly spread over the semester. Every students is required to prepare a file of lab. experiments done.

Microprocessor Lab.

General Course Information:

Course Code: CSP712 *Course Credits: 2 Type: Compulsory Contact Hours: 4 hours/week Mode: Experimental Lab. *In lab. work one credit is equivalent to two hours	**Course Assessment Methods (internal: 30; external: 70)** An internal evaluation is done by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Pre-requisites: Knowledge of assembly language

The objectives of this laboratory course are to:

1. make students write 8086 assembly language programs using different types of instructions.
2. learn the code conversion while inputting the data from keyboard and displaying it on monitor.
3. understand the uses of different interrupt functions.

By the end of the course a student is expected to:

1. describe the internal architecture of an X86 processor showing the general purpose registers, the segment registers, the ALU, the flags register, the instruction pointer (IP) register, and the instruction register.
2. write code for interfacing of peripherals/devices with processor
3. develop the assembly language programs.
4. design microprocessor controlled system.

Students are given eight to ten laboratory assignments with soft and hard deadlines. The lab. assignments are evenly spread over the semester. The assignments may include a mini project. Every student is required to prepare a file of laboratory experiments done.

Software and Tools to be learnt: MASM/TASM

Soft Computing Concepts and Techniques

General Course Information:

Course Code: CSL721 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of Probability Theory, Set Theory, programming skills and Data Structure and Computer Algorithms

About the Course and its Objectives & Outcomes:

Humans are better at processing perception based information on the basis of their experience, intuition and approximate reasoning. Most of the time humans work with qualitative data without much computing. There are many problems like recognizing speech, recognizing hand written text and driving a car in the city for which no straight mathematical formulations exist. We cannot simply write deterministic algorithms for such problems. We need to learn soft computing techniques to make intelligent machines that possess human like abilities to reason, learn and handle the uncertainty and vagueness often inherent in real world problems. Unlike conventional computing, soft computing techniques are tolerant of imprecision, uncertainty and approximations, and provide low cost, robust and tractable solutions to the complex real world problem where conventional methods fails to do so. This course on soft computing is going to cover Genetic Algorithms, Artificial Neural Networks and Fuzzy Logic. The course is primarily an applied one with solid emphasis on computational formulations and their applications.

The objectives of this course are to:

1. provide in-depth knowledge and understanding of the soft computing techniques.
2. develop the ability to design soft computing solutions to real world problems.
3. implement the soft computing solutions using appropriate tools.

By the end of the course a student is expected to:

1. to know and the terminology and concept of the soft computing techniques.
2. to understand and appreciate the soft computing techniques and to identify the situations where soft computing techniques are applicable.
3. to be able to apply Soft Computing techniques as computational tools to solve a variety of problems related to optimization and machine learning.
4. to be able to design and experiment with variations of Genetic Algorithms.
5. use efficiently tools like MATLAB, R, GALIB and KEEL, NeuroXL etc. available to implement the GAs, ANN and FL systems.

Syllabus

Unit I

Working of a simple Genetic Algorithm and the related definitions: Representation/Encoding Schemes, initialising a GA population, evaluation function, genetic operators, study of parameters of genetic algorithms and its performance, sampling and selection mechanisms, mathematical foundations of genetic algorithms, schemata theorem and building block hypothesis, Optimizing numerical functions using GA.

Unit II
Genetic Algorithm variations: Scaling fitness, Niching and speciation, Crowding Technique for Multimodal Problems, Multi-Objective Genetic Algorithms, Master Slave and Distributed Genetic Algorithms, Designing GAs for numerical optimization, knapsack problem, travelling salesperson and other similar problems.

Unit III
Neural networks: Basic terminology and definitions, Model of an artificial neuron, Sigmoid function, Neural Network Architectures, Characteristics of neural networks, Learning methods, Rosenblatt's Perceptron, Fixed increment perceptron learning algorithm for a classification problem, Examples of learning of AND/OR gate by perceptron, XOR problem.
Back Propagation Neural Networks: Architecture of a backpropagation network, Model for multi-layer perceptron, Back propagation learning, Delta or gradient descent learning rule and effect of learning rate, Back propagation learning algorithm.

Unit IV
Fuzzy sets: Basic terminology and definitions, Operations on Fuzzy sets, MF formulations and parameterisation, Derivatives of parameterised MFs, Fuzzy numbers, Extension principal and fuzzy relations, Linguistic variables, Fuzzy If-Then Rules, Fuzzy reasoning and compositional rule of inference.

Software and Tools to be learnt: MATLAB tool boxes on global optimization, neural networks and fuzzy logic, R Programming, GALIB 247 and KEEL

T**ext and Reference Books:**

1. David.E. Goldberg, Genetic Algorithms in Search, Optimization and machine learning, Addison Wesley, 1999.
2. Zbigniew Michalewicz, Genetic algorithms +Data Structures = Evolution Programs, Springers-Verlag, 1999.
3. M. Mitchell, An Introduction to Genetic Algorithms, Prentice-Hall, 1998.
4. S. Rajasekaran & G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, PHI, 2003.
5. S. N. Sivanandam & S. N. Deepa, Principles of Soft Computing, Wiley - India, 2007.
6. J-S. R. Jang, C.-T. Sun, E. Mizutani, Neuro-Fuzzy and Soft Computing, PHI, 1997.
7. Simon O. Haykin, Neural Networks, A Comprehensive Foundation, PHI, 1994.

Digital Image Processing

General Course Information:

Course Code: CSL722 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Knowledge of basic linear algebra, probability theory; Exposure to programming techniques, Fourier Transforms, and working knowledge of Matlab.

About the Course and its Objectives & Outcomes:

Visual information has its own role in our life. Most of the time, we find that much of this information is represented by digital images. Digital image processing is omnipresent, with applications including television, tomography, photography, printing, robot perception, and remote sensing. Through this course we expect to cover the topics like image acquisition and display, colour representations, image sampling and quantization, point operations, linear image filtering and correlation, image transforms, enhancement, image restoration, image compression, segmentation and image representation. This course would provide the students sufficient knowledge of mathematical concepts that would help them in self study of advanced topics such as computer vision systems, biomedical image analysis etc.

The objectives of this course are to:

1. develop a theoretical foundation of digital image processing concepts.
2. provide mathematical foundations for digital manipulation of images, image acquisition, preprocessing, enhancement, segmentation, and compression.
3. implement algorithms that perform basic image processing operations (e.g., histogram processing, noise removal and image enhancement and restoration);
4. implement algorithms for image analysis (e.g., image compression, image segmentation and image representation);
5. assess the performance of image processing algorithms and systems.

By the end of the course a student is expected to:

1. Possess a clear understanding of two-dimensional signal acquisition, sampling, and quantization.
2. Acquire a good understanding of the mathematical foundations for digital manipulation of images such as image acquisition, preprocessing, segmentation, compression and representation.
3. Learn and understand the image enhancement in the spatial domain and frequency domain.
4. Design and implement Matlab algorithms for digital image processing operations such as histogram equalization, filtering, enhancement, restoration, and denoising.
5. Analyze a wide range of problems and provide solutions related to the design of image processing systems and apply these techniques to real world problems.
6. Practice self-learning by using e-courses and web materials.

Syllabus

Unit I

Introduction and fundamental to digital image processing: What is digital image processing, Origin of digital image processing, Examples that use digital image processing, Fundamental steps in digital image processing, Components of digital image processing system, Image sensing and acquisition, Image sampling, Quantization and representation, Basic relationship between pixels.

Image enhancement in spatial domain: Background, Basic gray level transformation, Histogram processing, Basics of spatial filtering, Smoothing and sharpening spatial filters.

Unit II

Image enhancement in frequency domain: Introduction to Fourier transform, sampling, discrete Fourier transform, extension to functions of two variables, Basics of filtering in frequency domain, Smoothing and sharpening frequency domain filters.

Image Restoration: Image degradation/restoration Process, Noise models, Restoration in presence of noise, Inverse filtering, Minimum mean square filtering, Geometric mean filter, Geometric transformations.

Unit III

Color Image Processing: Color fundamentals, Color models, Basics of full color image processing, Color transformations, Smoothing and sharpening.

Image Compression: Fundamentals, Spatial and temporal redundancy, Measuring image information, Image compression methods, Loss less compression, Lossy compression, Digital image watermarking.

Unit IV

Image Segmentation: Fundamentals, Point, line and edge detection, Edge linking and boundary detection, Thresholding, Region based segmentation.

Representation, Description and Recognition: Representation-chain codes, polygonal approximation and skeletons, Boundary descriptors-simple descriptors, shape numbers, Regional descriptors- simple, topological descriptors, Pattern and Pattern classes-Recognition based on matching techniques and neural networks.

Software and Tools to be learnt: MATLAB tool box on image processing, SCILAB

Text and Reference Books:

1. Rafael C. Gonzalez and Richard E. Woods,“Digital Image Processing”**,** Pearson Education,Ed, 2001.
2. Anil K. Jain, “Fundamentals of Digital Image Processing”, Pearson Education, PHI, 2001.
3. Tinku Acharya and Ajoy K. Ray,“Image Processing-Principles and Applications”, John Wiley & Sons, Inc., 2005.
4. Chanda and D. Dutta Majumdar, “Digital Image Processing and Analysis”, PHI, 2003.
5. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing, Analysis, and Machine Vision”, Brookes/Cole, PWS Publishing Company, Thomson Learning, 2nd edition,1999.

High Speed Networks and Mobile Technologies

General Course Information:

Course Code: CSL723 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of computer networks, layers of OSI reference model, protocols at different layers of OSI reference model.

About the Course and its Objectives & Outcomes:

Today computers without effective and fast communication systems are practically of no use. We have seen sufficient growth in terms of computing power but a lot of work is required to be done to improve communication speed of computers.

The objective of the course is to:

make the students learn about different high speed communication technologies like 10 G Ethernet, WiFi, WiMAX, Fiber Channel, LTE, HSPA, GSM, CDMA, ATM, ISDN and Frame Relay.

By the end of the course a student is expected to:

1. have knowledge of different high speed communication LAN technologies like 10G Ethernet, Wi-Fi, Wi-MAX, WiMAX Fiber Channel.
2. have knowledge of different high speed WAN technologies like ATM, ISDN and Frame Relay.
3. Understand different mobile communication technologies and protocols.
4. be able to start research for improvement of performance of these technologies.

Syllabus

Unit I
HIGH SPEED LAN:
Gigabit Ethernet: Overview of fast Ethernet, Gigabit Ethernet – overview, specifications, layered protocol architecture, network design using Gigabit Ethernet, applications, 10GB Ethernet – overview, layered protocol architecture, applications.
Wireless Networks: Existing and emerging standards, Wireless LAN(802.11), Bluetooth(802.15) their layered protocol architecture and frame format.
Fiber Channel: Fibre channel physical characteristics – topologies & ports, layered protocol architecture, class of service, technology comparison.

Unit II
HIGH SPEED WAN:
Frame Relay: Protocol architecture, frame format.
ISDN: Channels, interfaces, addressing, protocol architecture, services.
ATM: Virtual circuits, cell switching, reference model.

Unit III
MOBILE COMMUNICATION TECHNOLOGIES:
Voice Communication Technologies: Overview, Multiple Access Techniques and architecture of Global System for

Mobile Communication, Code Division Multiple Access
Data Communication Technologies: Overview and Architecture of EDGE, HSPA, WiMAX (802.16) and Long Term Evolution

Unit IV
MOBILE COMMUNICATION PROTOCOLS:
Mobile network Layer Protocols: Mobile IP- goals, assumption, requirement, entities, terminology, IP packet delivery, Agent advertisement and discovery, registration, tunnelling, encapsulation, optimization , reverse tunnelling.
Mobile Transport Layer Protocols: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP fast retransmission/ recovery, transmission/time out freezing, selective retransmission, Transaction oriented TCP.

Software tools to be learnt: NS2, NS3, GLOMOSIM, Qualnet

Text and Reference Books:

1. Andrew S. Tanenbaum, Computer Networks, 5th Edition, Pearsons, 2010.
2. Jochen Schiller, Mobile Communication, 2nd Edition, Pearsons, 2003.
3. Lee, Mobile Cellular Telecommunications, 2nd Edition, McGraw- Hill, 2010.

Cloud Computing

General Course Information:

Course Code: CSL724 Course Credits: 4 Type: Compulsory Contact Hours: 4 hours/week Mode: Lectures	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of parallel and distributing computing.

About the Course and its Objectives & Outcomes:

Cloud Computing has recently emerged as one of the buzzwords in the field of ICT. This course covers theoretical concepts in cloud computing. Cloud Computing Platform and Technologies, Cloud Computing Architecture, Monitoring and Management, and finally Governance and Case Studies. The objective of this course is to educate students about the benefits of cloud computing and the best way to harness the full potential of the cloud. Students will apply the cloud Computing Techniques to homework assignments and mini-projects throughout the course. Both individual and group-oriented exercises will be assigned.

Expected outcomes of the course are as follows:

1. Able to understand about Cloud Computing Platforms and Technologies.
2. Students will be aware about Architecture and Open Challenges in Cloud Computing.
3. Students will be able to monitor and manage cloud computing applications.
4. Students will be able to describe the mechanisms needed to harness Cloud Computing in their own respective endeavors.
5. Students will be able to solve develop case studies related to Cloud Computing.

Syllabus

Unit I

Introduction to Cloud Computing, Migrating into a Cloud, Enriching the 'Integration as Service' Paradigm for the Cloud Era, Cloud Computing Platforms and Technologies: Amazon Web Services (AWS), Google AppEngine, Microsoft Azure, Hadoop, Force.com and Salesforce.com.

Unit II

Principles of Parallel and Distributing Computing: Parallel vs. Distributing Computing, Elements of Parallel Processing and Distributing Processing, Technologies of Distributed Computing.

Cloud Computing Architecture: Introduction, Cloud Reference Model, types of Cloud, Economics of the Cloud, and Open Challenges.

Unit III

Monitoring and Management: An Architecture for Federated Cloud Computing, SLA Management in Cloud Computing: A Service Provider's Perspective. Cloud Applications: Scientific Applications and Business Consumer Applications

Unit IV

Governance and Case Studies: Organizational Readiness and Change Management in the Cloud Age, Data Security in the Cloud, Legal Issues in Cloud Computing, Achieving Production Readiness for Cloud Services.

Text and Reference Books:

1. Rajkumar Buyya, James Broberg and Andrez Gosscinski, Cloud Computing: Principles and Paradigm, published by John Wiley and Sons, Inc. 2011 (ISBN 978-470-88799-8).
2. Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, Mastering Cloud Computing, published by McGraw Hill Publication (India) Private Limited, 2013 (ISBN 978-1-25-902995-0).
3. John W. Rittinghouse, James F. Ransome , Cloud Computing implementation, management and security , CRC Press, Taylor & Francis group, 2010.
4. Anthony T.velte, Toby J.velte Robert Elsenpeter , Cloud computing a practical approach , Tata Mc Graw Hill edition, 2010.

Research Methods

General Course Information:

Course Code: CSL725 Course Credits: 4 Type: Elective Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of set theory and calculus

About the Course and its Objectives & Outcomes:

With this course, students will learn the core concepts of probability theory and will be able to understand statistical inference principles. This course trains students to experiment with data, apply probability theory principles and various statistical tests. The course emphasizes on the scientific research concepts, statistical analysis, probability and distributions, random variables, sampling distributions and testing hypothesis.

The main objective of this course is to:

make the students familiar with basic concept of research and its methodologies so that in future, they are able to identify research problems and address them

By the end of the course a student is expected to be able to:

1. identify and define a research problem and its parameters.
2. organize and conduct research in an organized manner.
3. to understand and apply probability distributions.
4. use software tools to apply statistics.
5. To conduct experiments, interpret data and results.

Syllabus

Unit I

Scientific Research and Statistical analysis:

Introduction: Nature and objectives of research, types and methods of research; empirical and experimental research, study and formulation of a research problem.

Statistical analysis: Measures of central tendency and dispersion,-mean, median, mode, range, mean and standard deviations. computing correlation in variables, linear and non-linear regression.

Unit II

Probability and Probability distributions:

Probability: classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Bayes' Theorem and independence.

Probability distributions: binomial, poisson, geometric, negative binomial uniform exponential, normal and log normal distribution.

Unit III

Random Variables

Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, probability and moment generating function, median and quantiles, Markov inequality, correlation and regression, independence of random variables.

Unit IV
Sampling Distributions
The Central Limit Theorem, distributions of the sample mean and the sample variance for a normal population, Chi-Square, t and F distributions, problems.
Hypothesis Testing: Basic ideas of testing hypothesis, null and alternative hypotheses, the critical and acceptance regions, two types of error, tests for one sample and two sample problems for normal populations, tests for proportions, Chi-square goodness of fit test and its applications.

Software and Tools to be learnt: Statistical packages like SPSS and R.

T**ext and Reference Books:**

1. Hwei Hsu, Schaum's Outline of Probability, Random Variables, and Random Processes , 2nd Ed, McGraw-Hill, 2010.
2. Johnson, R.A. Probability and Statistics, PHI, New Delhi, 1994.
3. Kishore S. Trivedi, Probability & Statistics with Reliability, Queuing and Computer Sc. Applications, PHI, 2001.
4. S. Lipshutz, Schaums Outline series: Theory and Problems of Probability, McGraw-Hill Singapore, 1982.
5. V.K. Rohatgi, A.K. Md.E.Saleh, An Introduction to Probability and Statistics, Johm Willey, 2011.
6. S.M. Ross, A First Course in Probability, 8^{th} Edition, Printice Hall, 2009.

Security of Information Systems

General Course Information:

Course Code: CSL726 Course Credits: 4 Type: Elective Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of Number theory, Complexity Theory, Basic programming skills for security problems

About the Course and its Objectives & Outcomes:

The fast growth of interconnections of computer systems and electronic gadgets has increased the dependence of organizations on information storage and communication. This has resulted in the need to protect data and resources from network based attacks. This course is meant to provide a practical survey of principles and practices of cryptography and network security. Implementation projects are crucial for clear understanding of cryptography and network security. The projects are platform and language independent. This includes forming problems of number theory and probability theory, various forms of attack evaluation and vulnerabilities in various resources.

Objectives:

1. to understand several security issues.
2. to understand several cryptographic algorithms.
3. to understand the social legal and ethical implications of modern security systems.

By the end of the course a student is expected to:

1. be able to apply Symmetric and Asymmetric Cryptographic Algorithms, Hashing functions, Digital Signatures, Key Management.
2. have knowledge of the tools for Intrusion Detection Systems like nmap, Nessus, Tripwire etc.
3. have knowledge of cyber laws.
4. be aware of ethical aspects of security and privacy of information.

Syllabus

Unit 1

CRYPTOGRAPHY: Overview of Information Security,Basic Concepts, Cryptosystems, Cryptoanalysis, Ciphers & Cipher modes,Symmetric Key Cryptography- DES, AES.Asymmetric Key Cryptography- RSA algorithm, Key management protocols,Diffie Hellman Algorithm. Digital Signature-Digital Signatures, Public Key Infrastructure.

Unit II

SYSTEM SECURITY: Program Security-Security problems in Coding, Malicious Logic, Protection. Database Security-Access Controls, Security & Integrity Threats, Defence Mechanisms. OS Security-Protection of System Resources, Models for OS security. .Net Security-User based security, Code access security, form authentication.

Unit III

NETWORK & INTERNET SECURITY: LAN Security-Threats, Authentication & access control, Secured communication Mechanisms (IPSec, Kerberos, Biometric, PKI), Secured Design for LAN. Firewall & IDS Firewall

Techniques, Firewall Architecture, Types of IDS, IDS Tools. Email & Transaction Security Mechanisms Privacy Enhanced Mail (PEM), S/MIME, SET protocol, Client-Server Security on web. Cyber Laws- Objectives, cyber security & its policy. National and International IT Acts w. r. t. scheme, application, offences and penalties.

Unit IV

WIRELESS SECURITY: Wi-Fi & IEEE 802.11 Security -Protocol architecture, WEP, Access controls. Wireless Transport Layer- Security Transport Layer Security, SSL, IPSEC, WAP security. Bluetooth Security- Protocol architecture, Attacks, Security architecture.

Software and Tools to be learnt: nmap, nessus, tripwire, monitoring and analysis tools

T**ext and Reference Books:**

1. Charles P. Pfleeger, Security in Computing (Second Edition), Prentice-Hall International, Inc., 1996.
2. Bruce Schneier, Applied Cryptography Protocols, Algorithms, and Source Code in C (Second Edition), John Wiley & Sons, Inc., 1995.
3. Rolf Oppliger, Security Technologies for World Wide Web, Artech House:
4. Cryptography and Network security-Principles and Practices, Pearson Education, Ninth Indian Reprint 2005
5. Charlie Kaufman , Network Security : Private communication in Public World, Prentice-Hall International, Inc., Apr. 2008.
6. www.cyberlawsindia.net

Sensor Networks

General Course Information:

Course Code: CSL727 Course Credits: 4 Type: Elective Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of Computer Networks, Wireless Communication.

About the Course and its Objectives & Outcomes:

The objective of this course is to:

provide students with a broad knowledge of sensor networks, routing techniques used and the applications of sensor networks.

By the end of the course a student is expected to understand:

1. specific use of sensor networks and basic sensor network operations.
2. lower Layer Issues-Mac, Scheduling, And Transmission.
3. network layer protocols, energy efficient routing protocols.
4. the application and utility of sensor network.

Syllabus

Unit I: Sensor Network Operations
Overview of mission-oriented sensor networks, trends in sensor development, mission oriented sensor networks, dynamic systems perspective, Dense sensor networks, robust sensor positioning in wireless ad hoc sensor networks, trigonometric k clustering (TKC) for censored distance estimation, sensing coverage and breach paths in surveillance wireless sensor networks.

Unit II: Lower Layer Issues-Mac, Scheduling, And Transmission
Medium access control for sensor networks, comprehensive performance study of IEEE 802.15.4, providing energy efficiency for wireless sensor networks, link adaptation techniques.

Unit III: Network Routing
Load balanced query protocols for wireless sensor networks, energy efficient and MAC aware routing for data aggregation in sensor networks, ESS low energy security solution for large-scale sensor networks based on tree ripple zone routing scheme.

Unit IV: Sensor Network Applications
Evader centric program, Pursuer centric program, hybrid pursuer evader program, efficient version of hybrid program, Implementation and simulation results

Software and Tools to be learnt: Sensor Network Simulation Tool (e.g. Qualnet Wireless Sensor Network(WSN) tool).

Text and Reference Books:

1. Shashi Phoha, Thomas F. La Porta , Chrisher Griffin, Sensor Network Operations, Wiley-IEEE Press March 2006.
2. Jr. Edger H. Callaway, Wireless sensor networks, CRC Press, 2003.
3. F. Akyildiz and M. C. Vuran, Wireless Sensor Networks, John Wiley and Sons Publ. Company, 2010.
4. Feng Zho, Leonidas Guibas, Wireless Sensor Networks: An Information Processing Approach, Elsivier publication, 2004.

Computational Geometry

General Course Information:

Course Code: CSL 728 Course Credits: 4 Type: Elective Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods**: Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain five to seven short answers type questions each of two marks. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions by selecting one from each of the remaining four units. All the questions carry equal marks.

Pre-requisites: Basic knowledge of design algorithm, analysis techniques and data structures.

About the Course and its Objectives & Outcomes:
As we are living in a 3-dimensional world, so geometry plays a vital role in our daily life and computational geometry provides us solutions for geometrical problems. Due to encouragement in algorithm science and recognition of its wide applicability, this field has undergone tremendous growth and emerges out as an interesting and lime light field for researchers. This is an introductory course on computational geometry and its applications. At this level, the introduction of this course is very helpful for the students who are keen to go in the research field of geometry as this will serve as a basis for their research platform. This course also covers some problems that are culled from computer graphics.

Objective of this course is to:

cover design and analysis of algorithms, geometric data structures and applications and divide-conquer-algorithms.

By the end of the course a student is expected to be able to:

1. analyze the complexity of a given algorithm.
2. argue regarding the correctness and efficiency of an algorithm.
3. apply theoretical and practical aspects of a problem in the different application domains.
4. provide algorithmic solutions for different geometric problems.

Syllabus

Unit I
Introduction to algorithm analysis, Models of computation, Complexity measures: worst, average, amortized – case running time, asymptotic analysis: growth rate functions, asymptotic notation, Problem Complexity.

Unit II
Geometric Data Structures: Vectors, Points: point-line classification, polar co-ordinates, Polygons: convex polygons, point enclosure and least vertex in a convex polygon, Edges, Edge rotations, Geometric objects in space.

Unit III
Applications: Insertion and selection- star shaped polygons, convex hull: insertion hull, gift-wrapping, graham scan, point enclosure, line clipping, polygon clipping.

Unit IV
Divide and conquer: Voronoi diagram- definition and basic properties, computing the voronoi diagram, voronoi diagrams of line segments, farthest-point voronoi diagram, Delaunay Triangulation: definition, computing the delaunay triangulation and analysis, Merge hull.

Text and Reference Books:

1. Michael J ,Computational Geometry and Computer Graphics in C++, Prentice-Hall publication.
2. De Berg, van Kreveld, Overmars, and Schwarzkopf Computational Geometry Algorithms and Applications, 2nd ed., (Springer-Verlag, 2000).
3. F. P. Preparata and M. I. Shamos , Computational Geometry: An Introduction, Springer-Verlag, 1985.

Mathematical Concepts for Computer Science

General Course Information:

Course Code: CSL729 Course Credits: 4 Type: Elective Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of set theory, logic gates, probability theory, matrix and graph fundamentals

About the Course and its Objectives & Outcomes:

1. To enable students to think mathematically about data and how to apply discrete theory principles on random variables in real world scenarios.
2. To emphasizes on the algebraic structures, propositional calculus, graph theory, concept of random variables and stochastic processes.

By the end of the course a student is expected to:

1. understand and apply the knowledge of mathematics in the domain of computing problems.
2. create and comprehend mathematical arguments.
3. be able to formulate logical expressions, fuzzy logic to solve a variety of problems related to real scenarios.
4. be able to apply the mathematical constructs to solve problem that re modeled by graphs.
5. to be able to understand and apply mathematics related to random and stochastic processes.

Syllabus

Unit I

Groups: Subgroup, Normal group, Cyclic group, Rings, Characteristics of a ring, Fields, Vector spaces: Definition, Basis of a Vector space, Subspaces, Sum of subspaces, Dimensionality, Linear span, Linear dependence and independence, Norm of a vector, Orthogonality, Orthonormal set.

Unit II

Logic propositions and logical operations, Truth tables and proposition generated by a set equivalence and implication, Tautologies, Contradictions, Fuzzy sets, Operations on fuzzy sets, Fuzzy Relations, Properties and operations on fuzzy relations.

Unit III

Graphs: components of a graph, subgraphs, spanning graph, isomorphic and homo-morphic graphs, Planar graphs, Euler's and Hamiltonian graphs (along with based theorems), Graph colouring, Chromatic numbers , Trees: forests, spanning trees, rooted trees and binary trees(along with based theorems), Algorithms on graphs – BFS, DFS Dijkstra's algorithm for shortest path, Floyd's algorithm for all pairs of shortest paths.

Unit IV

Random variables, Functions of random variables, Sequences of random variables, Stochastic processes, Markov process, Transition probability, Transition probability matrix, First and higher order markov process, n-step transition probabilities, Markov chain, Queuing theory: Queueing system and problem, Transient and Steady states, Probability distributions in queuing systems.

Text and Reference Books:

1. Ernest Davis, Linear Algebra and Probability for Computer Science Applications (1st Ed): CRC Press, 2012.
2. Hwei Hsu, Schaum's Outline of Probability, Random Variables, and Random Processes (2nd Ed), McGraw-Hill, 2010.
3. Bernard Kolman and Robert Busby, Discrete Mathematical Structures for Computer Science (1st Ed), PHI (1984).
4. Kishore S. Trivedi, Probability & Statistics with reliability, queuing and computer Sc. Applications, PHI, 2001.
5. S. Lipshutz, Schaums Outline series: Theory and problems of Probability, McGraw-Hill Singapore, 1982.
6. Hamdy A. Taha, Operations Research, 9^{th} edition, Pearsons Printice Hall, 2010.
7. Hiller and Dieherman, Introduction to Operations Research, Stanford University, 2010.
8. C.Liu , Elements of Discrete Mathematics, Tata McGraw-Hill, 2000.

Analysis and Design of Computer Algorithms

General Course Information:

Course Code: CSL730 Course Credits: 4 Type: Elective Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of Data structures like arrays, stacks, queues and linked lists.

About the Course and its Objectives & Outcomes:

The objectives of this course are to

1. develop proficiency in problem solving and programming the different algorithmic techniques, and
2. to carry out the performance analysis of various algorithm.

By the end of the course a student is expected to:

1. understand the various algorithmic techniques.
2. analyze the time and space complexity of algorithms.
3. design algorithms for unforeseen problems.
4. compare and critically analyze the different algorithm design techniques for a given problem.
5. modify existing algorithms to improve efficiency.

Syllabus

Unit I

Trees: binary trees, Representation of trees and Binary trees, Binary tree Traversals, Binary Search trees, Red-black trees, AVL Trees and B Trees, Splay Trees. Graphs-basic concepts, representation and traversals and graph related algorithms.

Unit II

Introduction to Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving, Analysis of Algorithm Efficiency, Asymptotic Notations and its properties, Average, Best, and Worst Case Complexities, Analyzing Recursive Programs.

Divide and Conquer Technique: General Method, Binary Search, Finding Maximum and Minimum, Quick Sort, Merge sort, Quick sort, Strassen's Matrix Multiplication, Recurrence relations

Unit III

Greedy Method: General Method, Minimum Cost Spanning Trees, Single Source Shortest Path.

Dynamic Programming : General Method, All Pairs Shortest Path, Single Source Shortest Path, 0 / 1 Knapsack problem, Traveling Sales Person Problem.

Unit IV

Back Tracking and Branch – and – Bound: General Method, 8 – Queen's Problem, Graph Coloring. Branch – and – Bound: The Method, LC Search, Control Abstraction, Bounding, 0 / 1 Knapsack Problem.

Introduction to Probabilistic Analysis and Randomized Algorithms.

NP-completeness: Informal concepts of deterministic and nondeterministic algorithms, P and NP, NP-completeness, statement of Cook's theorem, some standard NP-complete problems

Text and Reference Books:

1. T. H. Cormen, Introduction to Algorithms, PHI, 1990.
2. Horowitz E, Sahni S and Rajasekharan S, Fundamentals of Computer Algorithms, University Press, Second Edition, 2007.
3. L. Banachowski , Analysis of Algorithms & Data Structures, Addison Wesley.
4. G.A.V. Pai , Data Structures and Algorithms, TMH, 2009.
5. Michael T. Goodrich, R Tamassia, Algorithm Design, Wiley, 2001.

Soft Computing Lab.

General Course Information:

Course Code: CSP721 *Course Credits: 2 Type: Compulsory Contact Hours: 4 hours/week Mode: Experimental Lab. *In lab. work one credit is equivalent to two hours	**Course Assessment Methods (internal: 30; external: 70)** An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Pre-requisites:

Programming in C/C++

The objectives of this lab. course are to:

1. give students a hands on training to implement soft computing techniques.
2. apply genetic algorithms to the unseen problems.
3. learn the tools to apply other soft computing techniques like neural net and fuzzy logic.

By the end of the course a student is expected to be able to:

1. practically apply Genetic Algorithms using C/C++ programming language to optimize some benchmark functions.
2. conduct experiments applying soft computing techniques and interpret the results.
3. design Genetic Algorithms for unforeseen problems.
4. use the tools like R and MATLAB proficiently to implement the Soft Computing techniques.

Students are required to implement GA by breaking the whole programme into eight to ten modules. The lab. assignments are evenly spread over the semester. Every students is required to prepare a file of lab. experiments done. At the end, they learn basics of MATLAB and do mini projects in groups.

Digital Image Processing Lab.

General Course Information:

Course Code: CSP722 *Course Credits: 2 Type: Compulsory Contact Hours: 4 hours/week Mode: Experimental Lab. *In lab. work one credit is equivalent to two hours	**Course Assessment Methods (internal: 30; external: 70)** An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Pre-requisites: Basic knowledge of linear algebra, probability and statistics, Programming knowledge of MATLAB

The objectives of this lab. course are to:

1. learn the creation and manipulation of digital images by computer.
2. learn the algorithms to solve the image processing problems.

By the end of the course a student is expected to:

1. describe and write the programs to represent 2-D data, time and frequency domain representations, filtering.
2. apply the enhancement, and segmentation algorithms for particular applications.
3. analyze the image processing problems.
4. design the image processing algorithms to be applied on real world data manipulation.

Students are given eight to ten lab. assignments with soft and hard deadlines. The lab. assignments are evenly spread over the semester. The assignments may include a mini/toy project. Every student is required to prepare a file of lab. experiments done.

Software and Tools to be learnt: MATLAB/SCILAB tool box on Image Processing

Text and Reference Books:

Online Manuals of various tools to be learnt.

Technical Writing and Effective Communication Skills

General Course Information:

Course Code: CSL731 Course Credits: Qualifying Type: Compulsory Contact Hours: 2 hours/week Mode: Lectures/Presentations/Group Discussions Examination Duration: 2 hours	**Course Assessment Methods (internal: 15; external: 35)** Two minor examinations each of 10 marks, Class Performance measured through percentage of lectures attended (2 marks) Assignment and quiz (3 marks), and end semester examination of 35 marks. For the end semester examination five questions are to be set by the examiner. A candidate is required to attempt any other three questions. All the questions carry equal marks.

Pre-requisites: Basic knowledge of English grammar and usage

About the Course and its Objectives & Outcomes:

All Scientist and Engineers need to convey their problem formulations and solutions verbally as well as in writing. This course is designed to serve as an introduction to the process of research and the nitty-gritty of technical writing. This course covers the research life cycle and its documentation in the form of research proposals, research synopses and research papers. In this course, students will practice critical reading, writing and reviewing research papers.

The objectives of this course are to:

1. develop scientific temper and critical thinking.
2. develop the ability to formulate a research questions and transforming the research question into a problem formulation.
3. understand the basic principles of technical writing.
4. understand the matters related to English styles and usage.
5. communicate the research ideas effectively in the form of presentations and research papers.

By the end of the course a student is expected to:

1. know the process of research and the ethical issues related to it.
2. be able to listen and contribute to the discussions.
3. be able to organize research ideas and present it to others through presentations
4. write a research/project proposal, synopsis, dissertation and research paper
5. be proficient with English usage and style for technical writing
6. be able proficiently to compile and format documents in MSWORD and Latex
7. references managing tools like Zotero and Endnote etc.

Syllabus

Scientific misconceptions, biases/prejudices, Discussion on the basis of a scientific method, research life cycle: formulating a research question, testable/realistic hypothesis, designing experiments, how to read a research article, structure of a scientific paper: Introduction, Review of literature, Problem definition and objective(s) of the study, The proposed system, Experimental Design/Methodology, depicting and discussing results, conclusions, References, Title, abstract and keywords, writing a review paper, writing research proposals, and synopses, research ethics, plagiarism
Elements of style: Elementary rules of English usage, Elementary principals of compositions, A few matters of form, commonly misused words and expression, An approach to style
Discussions and debates after suggested readings, listening to podcasts, webcasts, TED talks, etc.
A picture is worth a thousand words: bar graphs, histograms, pie charts, Line graphs, scatter plots.

Software/Tools to be learnt: MSWORD, PowerPoint, Latex, EXCEL; Reference management tools like Zotero and End Note.

Text and Reference Books:

1. Booth, W C, Colomb, G G, and Williams, J M The Craft of Research , Univ. of Chicago Press, 2008.
2. Strunk Jr., William; E. B. White, The Elements of Style, Fourth Edition, Longman; 4th edition, 1999.
3. Alley, Michael, The Craft of Scientific Writing, Springer, 2003.
4. Alley, Michael The Craft of Scientific Presentations, Springer, 2003
5. George M. Writing a Paper, Advanced Materials , 2004
6. Raimes, Ann. Grammar Troublespots: A Guide for Student Writers, Cambridge University Press, 2004.

Data Mining Concepts and Techniques

General Course Information:

Course Code: CSL732 Course Credits: 4 Type: Elective Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of databases, introductory statistics and programming

About the Course and its Objectives & Outcomes:

The computational capabilities as well as amount of data generated are growing exponentially. This presents an opportunity for automatically extracting hidden knowledge and interesting patterns from large databases. Data mining techniques like prediction, classification, summarization and clustering can be applied to scientific applications where data is generated from scientific experiments, medical applications where data is collected from patients, medical tests and images, and genetic data stores, financial applications where data is collected from stock markets and web applications where data is generated from user web access patterns. The knowledge extracted using data mining techniques can be utilised for decision making and planning in the concerned fields. The course will be taught with a database as well as machine learning perspectives. The objective of the course is to provide a comprehensive understanding of data prep-processing, data mining tasks and evaluation of results obtained out of data mining processes. The course will enable students to develop understanding of the strength and limitations of popular data mining techniques.

The objectives of this course are to:

1. provide in-depth knowledge and understanding of data mining process and tasks
2. develop the ability to design and compare data mining techniques.
3. understand different kind of data and its handling
4. implement the data mining techniques using appropriate tools and interpret results.

By the end of the course a student is expected to:

1. be able to appreciate the need for data mining.
2. be able to identify variable types and select the appropriate statistics.
3. be able to understand and pre-process data to make it suitable for mining
4. apply data mining techniques to discover interesting knowledge from various types of databases/datasets.
5. to be able to interpret and evaluate the outcomes of data mining process.
6. to use the tools available for data mining.
7. to choose a suitable data mining algorithm for addressing a given data mining task.

Syllabus:

Unit 1

Introduction: What and why of data mining, types of databases data mining functionalities, data mining, Types of data and sources of data, machine learning and statistics: measures of central tendency, dispersion of data, computing correlations, comparing machine learning algorithms.

Pre-processing of data: Descriptive data summarization, data cleaning, data integration and transformation, data reduction and discretization.

Unit II
Mining Frequent patterns, Associations and Correlations: Frequent item set, closed item sets and association rules, The Apriori Algorithm, Mining Association rules without candidate generation and mining frequent itemsets from frequent data, Association rule mining and correlation analysis

Unit III
Classification and Prediction: Decision tree induction, Bayesian classification, Rule based classification, classification by back propagation, K-nearest neighbour classifier, evolving classification rules using genetic algorithms, rule evaluation measures, Support Vector Machine (SVM), Rough set Approach

Unit IV
Linear and nonlinear regression, Classifier evaluation measures: Accuracy and error measures, holdout, cross validation methods, model selection and bias-variance trade off, estimating confidence intervals, ROC curves
Cluster Analysis: Types of data in cluster analysis, Partitioning Methods of clustering; K-means and K-medoids, Density based clustering method; DBScan, cluster quality evaluation measures. outlier and exception detection, Introduction to Big Data.

Software/Tools to be learnt: WEKA, RapidMiner, XMiner, R Programming, MATLAB

Text and Reference Books:

1. Han, J., Kamber, M, Pei, J., Data Mining Concepts and Techniques, Third edition, Morgan Kaufmann, 2012.
2. Witten, I. H. and Frank E., Data Mining, Practical Machine Learning Tools and Techniques, Third edition, Morgan Kaufmann, 2011.
3. Hand, D., Mannila, H. and Smyth, P., Principles of Data Mining. Cambridge, MA: MIT Press, 2001.
4. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, An Introduction to Statistical Learning with application in R, Springer, New York, 2013.

Performance Evaluation

General Course Information:

Course Code: CSL733 Course Credits: 4 Type: Elective Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Probability, Random Variables and their distributions, Laplace transform and generating function

About the Course and its Objectives & Outcomes:
Any system in which arrivals place demands upon a finite-capacity resourece may be termed a queueing system. If the arrival times of these demands are unpredictable, or if the size of these demands is unpredictable, then conflict for the use of the resource will arise and queues of waiting customers will form.

The objectives of this course are:

1. To provide in-depth knowledge and understanding of the queueing theory.
2. To develop the ability to apply the queueing theory to real world problems.

By the end of the course a student is expected to:

1. understand the stochastic processes both discrete and continuous.
2. to be able to apply of queuing theory for performance evaluation.
3. to be able to evaluate the performance for limited and infinite storage.
4. to be able analyze equilibrium and Erlangian distribution.

Syllabus

Unit-I
Notation and structure for basic queuing systems, definition and classification of stochastic processes, Discrete-Time Markov Chains, Continuous-Time Markov Chains, Birth-Death processes.

Unit-II
Queueingmodels : Little's Theorem, Probabilistic form of Little's Theorem, Applications of Little's Theorem. The M/M/1 queueing system, Markov Chain formulation, derivation of stationary distribution.

Unit-III
M/M/m : The m-server case, M/M/∞ : the infinite server case, M/M/1/K : finite storage
M/M/m/m : M-server loss system

Unit-IV
Markovian Queues in Equilibrium, The equilibrium equations, The method of stages Erlangian distribution, $M/E_r/1$ queue, Series-Parallel stages.

Text and Reference Books:

1. Leonard Kleinrock, Queueing Systems , Volume 1, John Wiley (New York) 1975
2. Feller W, Probability Theory and its applications, Wiley 1962

Machine Learning and Pattern Recognition

General Course Information:

Course Code: CSL734 Course Credits: 4 Type: Elective Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods**: Two minor examinations each of 20 marks, class performance measured through percentage of lectures attended (4 marks), assignment and quizzes (6 marks), and end semester examination of 70 marks. For the end semester examination nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions each of two marks. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt four questions by selecting one from each unit. All the questions carry equal marks.

Pre-requisites: Students are expected to have knowledge of Linear algebra, probability and Statistics

The objectives of this course are to:

1. study how to build computer systems that learn from experience.
2. study the representation of patterns and classes and the proximity measures.
3. study how to reduce the data and its use for pattern classification.
4. learn classification and clustering of patterns.

By the end of the course a student is expected to:

1. describe how to build systems that learn and adapt using real-world applications.
2. apply feature extraction and feature selection techniques.
3. develop pattern recognition techniques for practical problems such as document recognition.
4. compare and Contrast supervised learning and unsupervised learning.

Syllabus

Unit-I

Machine Learning, Introduction, Designing a Learning System, Issues in Machine Learning, Concept learning, Version Spaces and the Candidate Elimination algorithm, Inductive Bias. Pattern Recognition, Background, Introduction, Paradigms for Pattern recognition, Statistical Pattern Recognition.

Unit-II

Representation of Patterns and Classes, Different Representation Schemes, Tree-Based Representations, Metric and Non-Metric Proximity Measures, Dissimilarity Measures, Feature Extraction, Fisher's Discriminant, Principal Components as Features, Different Approaches to Feature Selection, Branch and Bound Schemes, Sequential Feature Selection.

Unit-III

Nearest Neighbour Classifier and its Variants, Nearest Neighbour Classifier, Soft Nearest Neighbour Classifiers, Efficient Algorithms for Nearest Neighbour Classification, Bayes Classifier, Naive Bayes Classifier, Bayesian Belief Networks, Decision Trees, Introduction to Decision Trees, Construction of Decision Trees, Support Vector Machines, Introduction to Support Vector Machines, Training Support Vector Machines.

Unit-IV

Clustering, What is Clustering, Representation of Patterns and Clusters, Clustering Process, Clustering Algorithms, Clustering Large Datasets, Incremental Clustering, Divide-and-Conquer Clustering, Document Recognition, Document Processing, Document Classification and Retrieval.

Text and Reference Books:

1. Tom Mitchell, Machine Learning, McGraw-Hill, 1997.
2. R. O. Duda, P.E. Hart and D. G.Stork, Pattern Classification, Wiley, 2000.
3. Devi V.S., Murty, M.N., Pattern Recognition: An Introduction, Universities Press, Hyderabad, 2011.
4. C. M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
5. R. Xu and D. C. Wunsch, II, Clustering, IEEE Press, 2009.

Software Project Management

General Course Information:

Course Code: CSL735 Course Credits: 4 Type: Elective Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisite: Basic Knowledge of software engineering principles, software development life cycles, software models, planning issues, and estimation process.

Course objectives:

1. To discuss the various aspects of project management.
2. To understand the tasks in software project management.
3. To describe the requirements of project plan.

Course Outcomes (COs)

1. Students will be able to understand and practice the process models, project life cycle models and the metrics road map along with typical metrics strategy used in software project management.
2. Understand risk management analysis techniques that identify the factors that put a project on risk and to quantify the likely effect of risk on project timescales.
3. Students will be able to understand and use process and activities related to configuration management, Software Quality Assurance, project initiation and completion criteria for the project intimation phase.
4. Students will be able to demonstrate use of tools and techniques for project planning and tracking, estimation along with the activities involved in testing phase and maintenance in software project management.

Syllabus

Unit I

Project Life Cycle Models: Project Life Cycle Model, A Framework for studying different life cycle models, The waterfall model, The prototyping model, The rapid Application Development (RAD) model, The spiral model and its variants. Process Models: Characteristics of a process, what constitutes an effective process, why are the processes important, process models, Common misconceptions about processes. Project evaluation and selection of an appropriate project approach.

Unit II

Software Configuration Management: The processes and activities of software configuration management, configuration status accounting, Configuration Audit, Software configuration management in geographically distributed teams, Metrics in software configuration management, **Software Quality Management:** introduction, importance of software quality in project planning, defining software quality, ISO 9126, practical software quality measures, product versus process quality management, external standard, techniques to help enhance software quality, Software Quality Assurance and Software Quality assurance tools, **Risk Management:** What is risk management and why it is important? Risk Management Cycle, Risk Identification: Common Tools and Techniques Risk quantification, Risk Monitoring, Risk mitigation, Risks and mitigation in the context of Global Project Teams. Some Practical Techniques in Risk Management, Metrics in risk management.

Unit III

Project Initiation: Activities during Project initiation, Outputs, quality records and completion criteria for the project intimation phase. Interfaces to the process database. **Project Planning and Tracking:** Components of project planning and tracking, the “What” part of a project plan, The “What Cost” part of a Project plan, The “When” part of project planning, The “How” part of project planning, The “By whom” part of project management plan, putting it all together: The software project management plan Activities specific to project tracking, Interfaces to the process database. **Project Closure:** When does project closure happen. Why should we explicitly do a Closure? An Effective Closure process, Issues that Get Discussed During Closure, metrics for project Closure, Interfaces to the process Database.

Unit IV

Software Project Estimation: software project size, estimation and decomposition approaches, empirical estimation models, algorithmic models for estimation, automated estimation tools. **Project Management in testing phase:** What is testing, what are the activities that make up Testing? Test scheduling and type of test, people issues in testing, Management structures for testing in global teams, metrics for Testing phase. **Project management in the maintenance phase**: Activities during the maintenance phase, management issues during the maintenance Phase, Configuration management during the maintenance phase, Skill sets for people in the maintenance phase, Estimating size, effort and people resources for the maintenance phase, Advantages of using geographically distributed teams for the maintenance phase , metrics for the maintenance phase.

Text and Reference Books:

1. Bob Hughes and Mike Cotterell, “Software Project Management”, Second Edition, Tata McGraw-Hill, 2001.
2. S. A. Kelkar, “Software Project Management: A Concise Study” Third Edition, PHI Learning Pvt. Ltd., January 2013.
3. Gopalaswamy Ramesh “Managing Global Software project” TMH Publishing Company, New Delhi, 2001.
4. Tom Demarco, Controlling Software Project Management, , Measurement, Prentice Hall , New jersey, 1982.
5. Tom Glib, Finzi Susannah, Principals of Software Engineering management, Addison Wesley, England, 2000.

Bio-informatics

General Course Information:

Course Code: CSL736 Course Credits: 4 Type: Elective Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Basic knowledge of databases, biology.

About the Course and its Objectives & Outcomes:
This course on Bio-informatics is going to cover topics DNA sequencing, sequence alignment, protein structure and the related databases. This course will deepen the student knowledge in both the biosciences and computational sciences.

By the end of the course a student is expected to:

1. be aware of basic terminologies used in the field of Bioinformatics.
2. be aware of databases related to Bioinformatics and able to comprehend data in these databases.
3. to be able to perform sequence alignment and analysis using software tools.
4. to be able to apply computational techniques and prediction algorithms to solve problems related to the domain of Bioinformatics.

Syllabus

Unit I
Introduction: Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition and prediction, Folding problem, Sequence Analysis, Homology and Analogy.
Protein Information Resources: Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.

Unit II
Genome Information Resources: DNA sequence databases, specialized genomic resources
DNA Sequence analysis: Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of \EST data on DNA databases.

Unit III
Pair wise alignment techniques: Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dotplot, Local and global similarity, different alignment techniques, Dynamic Programming, Pair wise database searching.
Multiple sequence alignment: Definition and Goal, The consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching

Unit IV
Secondary database searching: Importance and need of secondary database searches, secondary database structure and building a sequence search protocol .
Analysis packages: Analysis package structure, commercial databases, commercial software, comprehensive packages, packages specializing in DNA analysis, Intranet Packages, Internet Packages.

Text and Reference Books:

1. T K Attwood & D J Parry-Smith , Introduction to Bioinformatics, **A**ddison Wesley Longman
2. Jean-Michel Claveriw, Cerdric Notredame , Bioinformatics- A Beginner's Guide, WILEY dreamlech India Pvt. Ltd
3. M.Lesk , Introduction to Bioinformatics , OXFORD publishers (Indian Edition)

Introduction to Natural Language Processing

General Course Information:

Course Code: CSL737 Course Credits: 4 Type: Elective Contact Hours: 4 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Pre-requisites: Theory of Automata, Probability Theory

About the Course and its Objectives & Outcomes: The objectives of this course are to:

1. Understand approaches to syntax, semantics, dialogue and summarization in NLP, .
2. Understand current methods for statistical approaches to machine translation.
3. Understand machine learning techniques used in NLP, including hidden Markov models and probabilistic context-free grammars and clustering

By the end of the course a student is expected to:

1. Understand the mathematical and linguistic foundations in the area of NLP.
2. Design, implement and test algorithms for NLP problems.
3. Assess or evaluate NLP based systems.
4. Choose appropriate solutions for Natural Processing Language.

Syllabus

Unit 1

Introduction and Overview: What and why of Natural language Processing, Ambiguity and Uncertainty in language, The turing test.

Regular Expressions: Chomski Hierarchy, Regualr Languages and their limitations, Finite-state automata. Practical regular expressions for finding and counting language phenomena. A little morphology.

String Edit Distance and Alignment: Key algorithmic tool: dynamic programming, first a simple example, then its use in optimal alignment of sequences. String edit operations, edit distance, and examples of use in spelling correction

Unit II

Context Free Grammers: 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.

Non-probabilisitc 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.

Information Theory: What is information? Measuring it in bits. The "noisy channel model." The "Shannon game"-- motivated by language! Entropy, cross-entropy, information gain. Its application to some language phenomena.

Unit III

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.

Part of Speech Tagging and Hidden Markov Models: The concept of parts-of-speech, examples, usage. The Penn Treebank and Brown Corpus. Probabilistic (weighted) finite state automata. Hidden Markov models (HMMs), definition and use.

Viterbi Algorithm for Finding Most Likely HMM Path: Dynamic programming with Hidden Markov Models, and its use for part-of-speech tagging, Chinese word segmentation, prosody, information extraction, etc.

Unit IV

Probabilistic Context Free Grammars: Weighted context free grammars. Weighted CYK. Pruning and beam search.

Parsing with PCFGs: A treebank and what it takes to create one. The probabilistic version of CYK. Also: How do humans parse? Experiments with eye-tracking. Modern parsers.

Maximum Entropy Classifiers**:** The maximum entropy principle, and its relation to maximum likelihood. The need in NLP to integrate many pieces of weak evidence. Maximum entropy classifiers and their application to document classification, sentence segmentation, and other language tasks.

Text and Reference Books:

1. Daniel Jurafsky and James H. Martin, Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech recognition, Second Ed., 2009.
2. Chris Manning and Hinrich Schütze, Foundations of Statistical Natural Language Processing, MIT Press. Cambridge, MA, 1999.

Dissertation and Seminar-I

General Course Information:

Course Code: CSD-731 Course Credits: 4 Type: Compulsory Contact Hours: 2 hours/week with supervisor Mode: One- to- one discussions with the supervisor	**Course Assessment Methods (internal assessment: 100)** Every student is allotted a supervisor at the beginning of the third semester and is required to present his/her dissertation synopsis using power point presentation towards the end of third semester. The presentation is evaluated by a committee of senior teachers constituted by the Chairperson of the Department.

The objectives of Dissertation and Seminar-I are to train students to:

1. Do literature survey to identify a research problem of appropriate level and size.
2. Understand the process of research.
3. Plan and write dissertation synopsis.
4. Communicate and discuss research ideas.

Outcomes for Dissertation and Seminar-I: By the end of this phase every students is expected to display the evidence of having learnt:

1. Planning research including steps like indentifying research problem and selecting appropriate research methods and tools.
2. Organising ideas into the form of a research synopsis/proposal.
3. Organising and write references.
4. Communicating effectively verbally and in writing.
5. Discussing novel ideas critically and openly, and improving the research proposal in the light of the feedback given by others.
6. MS Office and other tools for writing and presenting the research proposals.

Bio-medical Instrumentation

General Course Information:

Course Code: BME 700 Course Credits: 3 Type: Open Elective Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objectives:

1. To learn about the basics, design and operation of biomedical instruments, and their role in medical science and health sector.
2. To encourage the students of various branches for their possible contribution in biomedical engineering.

Course Outcomes:

1. Learners are expected to get acquainted with the construction and operation of biomedical equipment and their significance in health care sector.
2. Stimulation among the students to start research and development in biomedical instrumentation and engineering.

Unit I

Biomedical Instrumentation- Man-Instrument System, Origin of Biosignals, Classification of Biomedical Instruments, Performance Parameters of Instruments, Physiological Systems

Bio-Potential Electrodes- Electrode-Electrolyte Interface, Half-cells and Their Potentials, Biomedical Recording Electrodes, Equivalent circuit model of Electrode, Bioelectric Amplifiers

Physiological Sensors and Transducers- Classification and Characteristics, Transducers for Displacement, Position and Motion, Pressure and Temperature, Photoelectric Transducers, Pulse Sensors, Biosensors

Unit II

Biomedical Equipment and Measurements

Cardiovascular Measurements- Blood Pressure Measurement, Blood Flowmeters, Electrocardiograph (ECG), Vectorcardiography (VCG), Phonocardiograph (PCG)

Neuromuscular and Nervous Measurements- Electroencephalograph (EEG), Electromyography (EMG)

Sensory and Behavioral Measurements- Audiometer, Skin Resistance Measurement, Biofeedback Instrumentation

Respiratory System Measurements- Spirometry, Measurement of Functional Residual Volume

Unit III

Analytical Instruments- Blood Gas Analyzers, Blood-Cell Counters, Auto-Analyzers, Colorimeter, Spectrophotometer, Flame Photometer, Electrophoresis

Medical Imaging System- X-ray Machine and Digital Radiography, Computed Tomography (CT) Scan, Magnetic Resonance Imaging System, Ultrasonic Imaging System, Thermal Imaging System

Unit IV

Therapeutic Equipment- Cardiac Pacemakers, Need and Types of Pacemakers, Defibrillation, Need and Types of Defibrillators, Need and Types of Diathermy, Hemodialysis, Dialyzer and Its Need, Ventilators and Their Types, Endoscopes

Patient Safety and Ethical Issues- Physiological Effects of Electricity, Shock Hazards, Safety Standards, Accident Prevention Methods, Biomedical Safety Standards and Ethical Issues

Text and Reference Books:

1. Khanpur R.S. Handbook of Biomedical Instrumentation, TMH
2. Cormwell L., Biomedical Instrumentation & Measurements, PHI
3. John G Webster, Bioinstrumentation, John Wiley and Sons, New York
4. Enderle John, Blanchard Susan and Bronzino Joseph, Introduction to Biomedical Engineering, Academic Press (Elsevier)

Advancements in Communication Systems

General Course Information:

Course Code: ECE 700 Course Credits: 3 Type: Open Elective Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objective:

1. The objective of this course is to study about the advancement in communication systems.
2. Study about the digital communication & basic concepts of mobile communication.
3. Study of optical communication & multiplexing techniques.
4. To understand basics of navigation devices like Radar, Sonar.

Course Outcomes:

1. Ability to understand about the advanced communication systems.
2. Students get introduction about navigational techniques.
3. Satellite is the core of modern communication. Students get the introduction about satellite by this subject.

Syllabus

Unit I
The essentials of a Communication system, Amplitude modulation, Phase modulation (PM) & frequency modulation (FM),Demodulation, ASK, FSK, BPSK, QPSK, Introduction to GSM, CDMA, Architecture of GSM,CDMA, Frequency Reuse concept, ISDN (Integrated Services digital Networks)

Unit II
Introduction to optical communication system: Electromagnetic spectrum used for optical communication, block diagram of optical communication system, Advantages of optical fiber communication, Optical fibers structures and their types, fiber characteristics, Basic principles of light propagation, Total internal reflection, Acceptance angle, Numerical aperture, Optical sources, Optical Detectors, Principles of optical detection, Optical Networks, why optical Networks? , SONET/SDH, WDM optical networks.

Unit III
Communication signal multiplexing, Time division multiplexing, Frequency division multiplexing, Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access

Unit IV
Block Diagram and operation of RADAR, SONAR, Simple form of Radar Equation, Pulse Repetition frequency, VSAT(data broadband satellite), MSAT(Mobile Satellite Communication technique), Sarsat(Search & Rescue satellite) & LEOs (Lower earth orbit satellite), Satellite communication with respect to Fiber Optic Communication, LANDSAT, Defense satellite Beam Acquisition, Tracking & Positioning.

Text and Reference Books:

1. Simon Haykins; John Wiley & Sons ,Communication systems (4th ed.).
2. Kennedy , Electronic Communication systems; TMH.
3. John M Senior , Optical Fiber Communications; PHI.
4. Theodore S. Rappaport , Wireless Communications; Pearsons.
5. Merrill I. Skolnik , Introduction to Radar Systems, MGH.
6. D.C. Aggarwal, Satellite Communication, Khanna Publications.

Computer Aided Design and Manufacturing

General Course Information:

Course Code: ME700 Course Credits: 3 Type: Open Elective Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course objectives:

1. To understand the basic parametric fundamentals that are used to create and manipulate geometric models.
2. To learn about the concepts of surface modeling and solid modeling.
3. To implement CNC programs for milling and Turning machining operations,
4. To create a computer aided manufacturing (CAM) model and generate the machining codes automatically using the CAM system

Course Outcomes:

1. Students would learn about the concepts of surface modeling, physically based modeling and surface visualization.
2. Students would be able Implement CNC programs for milling and turning machining operations

Syllabus

Unit I

Introduction: Introduction to CAD/CAM, Historical developments, Industrial look at CAD/CAM, Introduction to CIM; Basics of geometric and solid modeling, explicit, implicit, intrinsic and parametric equations, coordinate systems.
Transformations: Introduction, transformation of points and line, 2-D rotation, reflection, scaling and combined transformation, homogeneous coordinates, 3-D scaling, shearing, rotation, reflection and translation, combined transformations, orthographic and perspective projections, reconstruction of 3-D objects.

Unit II

Curves: Algebraic and geometric forms, tangents and normal, blending functions reparametrization, straight lines, conics, cubic splines, Bezier curves and B-spline curves.
Surfaces: Algebraic and geometric forms, tangents and normal, blending functions, reparametrization, sixteen point form, four curve form, plane surface, ruled surface, surface of revolution, tabulated cylinder, bi-cubic surface, Bezier surface, B-spline surface.
Solids: Solid models and representation scheme, boundary representation, constructive solid geometry, sweep representation, cell decomposition, spatial occupancy enumeration.

Unit III

Automation and Numerical Control: Introduction, fixed, programmable and flexible automation, types of NC systems, MCU and other components, NC manual part programming, coordinate systems, G & M codes, Part program for simple parts, computer assisted part programming.

Unit IV

Group Technology: Part families, part classification and coding, production flow analysis, Machine cell design, Advantages of GT
Flexible Manufacturing Systems & Computer aided process planning: Introduction, FMS components, types of FMS, FMS layouts, planning for FMS, advantages and applications Coventional process planning, types of CAPP, Steps in variant process planning, planning for CAPP.

Text and Reference Books:

1. Groover and Zimmer CAD/ CAM, Prantice Hall.
2. Zeid CAD/ CAM Theory and Practice , McGraw Hill
3. Chirs Mc Mohan & Jimmie Browne , CAD/CAM (Principles, Practice & Manufacturing Management) , Published by Addison- Wesley.
4. Kundra, Rao & Tiwari , Numerical Control and Computer Aided Manufacturing , TMH.
5. Groover M.P , Automation, Production Systems and Computer Integrated Manufacturing, Prentice Hall of India.

Advanced Printing Technologies

General Course Information:

Course Code: MTPT 700 Course Credits: 3 Type: Open Elective Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor examinations each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objectives
The objective of this course is to impart the basis knowledge of different printing processes along with their role, importance and applications.

Course Outcomes
The learning outcome of this course is expected that after completion of this course the students will be having the detail knowledge of various printing processes and the recent development in this industry and they will implement their knowledge for print production operations.

Syllabus

Unit I

Historical development in Printing Technology. Recent trends in the field of printing and allied technologies.
Pre-Press, Press and Post press operations

Unit II

Letterpress Printing Process; Characteristics, role, importance and applications.
Offset Printing Process; Characteristics, role, importance and applications.

Unit III

Flexography Printing Process; Characteristics, role, importance and applications.
Gravure Printing Process; Characteristics, role, importance and applications.

Unit IV

Screen Printing Process; Characteristics, role, importance and applications.
Digital Printing Process; Characteristics, role, importance and applications.

Text and Reference Books:

1. Anjan Kumar Baral Sheet-Fed Offset Technology.
2. C.S. Mishra, Letterpress Printing,
3. Havoed M Fenton, Frank J. Romao , On demand printing
4. Adams Fox, Printing Technology.

Research Tools for Computer Science and Engineering Lab.

General Course Information:

Course Code: CSP-731 *Course Credits: 2 Type: Compulsory Contact Hours: 4 hours/week Mode: Experimental Lab. *In lab. work one credit is equivalent to two hours	**Course Assessment Methods (internal: 30; external: 70)** An internal practical examination is conducted by the course coordinator. The end semester practical examination is conducted jointly by external and internal examiners. External examiner is appointed by the COE of the university from the panel of examiners approved by BOSR of the Department of Computer Science and Engineering, Hisar and the internal examiner is appointed by the Chairperson of the Department.

Pre-requisites: Programming experience and basic statistics

The objectives of this lab. course are to:

1. develop advanced skills in applying research methods.
2. train students in using appropriate research tools to address research problems.

By the end of the course a student is expected to:

1. be able to practically select and appropriate research tools to solve a real world research problem.
2. design experiments to test a research hypothesis.
3. be able to use the tools like MATLAB and R.
4. understand data and interpret results.

Students are required to solve small research problems in the lab. The lab. assignments are evenly spread over the semester. Every student is required to prepare a file of lab. experiments done. At the end, they achieve proficiency in using MATLAB, R and other related tools to solve research problems.

Dissertation and Seminar-II

General Course Information:

Course Code: CSD-741 *Course Credits: 9 Type: Compulsory Contact Hours: 2 hours/week with supervisor Mode: One- to- one discussions with the supervisor	**Course Assessment Methods (Joint evaluation: 100)** Fourth semester is dedicated to carry out the research proposal submitted at the end of third semester. It is to be jointly evaluated by internal and external examiners. The supervisor of a student acts as an internal examiner and the external examiner is appointed by COE from panel of experts approved by the BOS of the Department.

The objectives of Dissertation and Seminar-II are to train students to:

1. make students learn to conduct independent, original, and significant research.
2. try out novel and innovative research ideas
3. select suitable research methods and tools.
4. enhance the functionality of research tools
5. conducted suitable experiments and discuss the results in the light of similar works done by other.
6. understand the scope and relevance of their work.
7. write a dissertation.
8. publish research papers
9. know the ethics of research

Outcomes for Dissertation and Seminar-II: By the end of this phase every students is expected to be able to

1. handle research problems independently.
2. analyse and review the existing literature on a research question.
3. read research material/papers critically and make original comments on it.
4. design and conduct experiments.
5. interpret data and result, and critically evaluate empirical evidence.
6. use research methods efficiently.
7. use modern research tools.
8. write dissertation and technical reports.
9. publish research papers.
10. understand the social relevance of research.
11. communicate research ideas verbally and in writing.
12. to discuss ideas in a groups and accept critical comments.