THEORY							
7th SEM							
SL. NO.	PAPER CODE	PAPER NAME	L	T	P	CONTACT HRS./WEEK	CREDIT
01	OEC(CS/IT)701	Open Elective I A. History of Science and Engineering B. Organizational Behavior	3	0	0	3	3
02	OEC(CS/IT)702	Open Elective II A. Economic Policies in India B. Soft Skills and Interpersonal Communication	3	0	0	3	3
03	OEC(CS/IT)703	Open Elective III A. Programming and Application of Advanced Microprocessors B. Control System C. Mobile Computing	3	0	0	3	3
04	PEC(CS)704	Elective-IV A. Web & Internet B. Artificial Intelligence C. Introduction to Deep Learning D. Digital Image processing E. Big Data Analytics	3	0	0	3	3
05	PEC(CS)705	Elective-V A. Internet of Things B. Distributed Database C. Computer Graphics D. Introduction to Quantum Computing E. Data Mining	3	0	0	3	3
PRACTICAL							
01	PROJ(CS)702	Project 2	0	0	15	15	7.5
		SESSIONAL					
01	INDTR(CS)1	Industrial Training Evaluation	0	0	0	0	1
		TOTAL	15	0	15	30	23.5

Name of the course	History of Science and Engineering		
Course Code: OEC(CS/IT)701A	Semester: 7th		
Duration: 6 months	Maximum Marks: 100		
Teaching Scheme	Examination Scheme		
Theory:3 hrs/week	Mid Semester 1 Exam:15 Marks		
Tutorial:0 hrs/week	Mid Semester 2 Exam:15 Marks		
Practical:0 hrs/week	Other Assessment tools (Assignment, Quiz etc.):20 Marks		
Credit Points: 3	End Semester Exam: 50 Marks (75 marks converted to 50)		
Objective:			
1.	To learn the development stages of ancient Science and Engineering		
2.	To explore the inventions of Agricultural, Technological and Medical Sciences		
3.	To judge the contributions of eminent Scientists of India		
Pre-Requisite:			
1.	NIL	Hrs	Marks
Unit	Content	Hrs	
1	Development of Ancient Science and Engineering : Stone Age (3.4 million BCE to 2000 BCE): Stone and bone tools, control of fire and cooking, boats, fishing tackle, stone and mud dwellings etc. Copper and Bronze Age (3300 BCE to 1200 BCE): Metal pots and pans, pottery wheel, pulley, metal tools and weapons etc. Iron Age (1500 BCE to 200 BCE): Block and tackle system, Pump, Lathe, Iron tools, Iron axe, development of weapons etc.	8	
2	Development of Medieval Science and Engineering : Middle Age (500 CE to 1500 CE): Waterwheel, windmill, cannon, mechanical clock, wheeled plow, compass, ships, optics, anatomy, Human dissection anatomy, books on optics, books on anatomy etc.	8	
3	Renaissance and Science and Engineering in Industrial Age Renaissance Period (c.1300 to c.1700): Mining, metallurgy, development of telescope, microscope, thermometer, barometer, printing press, firearms, nautical compass, sawmills etc. Industrial Age (c.1700 to c.1920): Steam engine, electricity, automobile, radio, airplane, mechanical television, telephone, rocket etc.	8	
4	Modern Science and Engineering: Information Age (c. 1920 to Present day): Vacuum tube, transistor, integrated circuits, microprocessor, computer, internet, mobile phones, wireless technology, Nuclear power and space technology, GPS etc.	6	
5	Eminent Ayurvedacharya& Scientist of India and their contributions: Sushruta (800 BCE- 700 BCE): Invention and Development of Surgical Procedures Charaka(Approx 200 BCE – 200CE): Contribution to Medicine Aryabhata (476 CE- 550 CE): Trigonometry, Algebra and Astronomy Brahmagupta (c.598 – 668 CE): Arithmetic Manipulation Rules for zero and Negative Numbers Bhaskara II (1114 - 1185): Some Principles of Differential Calculus and concept of Infinity Jagadish Chandra Bose (1858 – 1937): Investigation of Radio & Microwaves and Plant Science Prafulla Chandra Ray (1861- 1944): Eminent Chemist. Established Bengal Chemical & Pharmaceutical Ltd Srinivasa Ramanujan (1887-1920): Great Mathematician, Number Theory was among his specialities. C V Raman (1888 – 1970): Noble Prize in Physics in the field of Light Scattering Meghnad Saha (1893-1956): Astrophysicist and developed Saha Ionization Equation Satyendra Nath Bose (1894 – 1974): Best known for his work on Quantum Mechanics	6	

Course Outcomes:	
CO1	Identify the technological developments of the Stone Age, Bronze Age and Iron Age.
CO2	Interpret the advancement of Science and Medicine of the Medieval Age.
CO3	Differentiate the developments of Science and Engineering in the Renaissance and Industrial Age.
CO4	Estimate the progress of Modern Science and Engineering in the Information Age.
CO5	Review the activity of eminent Ayurvedacharya& Scientists.

Learning Resources:	
1.	A History of Science, Jackson Tom published by Worth Press Limited.
2.	An Introduction to the History of Science, Walter Libby published by Newman Press
3.	Science and Technology in World History: An Introduction, James E. McClellan, Harold Dorn published by JHU Press.
4.	The History of Science and Technology: A Browser Guide …… by B. H. Bunch, A. Hellemans, Published by Houghton Miffin (USA)
5.	History of Science and Technology in India by B. B. Satpathy [available at www.amazon.in]
6.	https://en.wikipedia.org/wiki/History_of_science
7.	https://en.wikipedia.org/wiki/History_of_technology
8.	https://en.wikipedia.org/wiki/Science
9.	https://en.wikipedia.org/wiki/Science_education
10.	https://en.wikipedia.org/wiki/Timeline_of_historic_inventions#Modern_era

Name of the Course	Organizational Behaviour
Course Code: OEC(CS/IT)701B	Semester: 7th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3 hrs/week	Mid Semester I Exam: 15 marks
Tutorial: 0 hrs/week	Mid Semester II Exam: 15 marks
Practical: 0 hrs/week	Assignment, Quiz, Attendance: 20 marks
Credit Points: 3	End Semester Exam: 50 marks (75 converted to 50)

Objectives:	
1.	To understand the human interactions of the organization.
2.	To find what is driving it and influence it for getting better result in attaining business goals.
Prerequisites:	
1.	Basic knowledge of motivation, learning, perception and personality.

Unit	Content	Hrs	Marks
1.	Behavioural concept: Nature & concept of O.B. – Relationship with other fields – learning – nature significance process of learning.	03	
2.	Individual Behaviour: Personality self-awareness – personality measurement.	03	
3.	Perception: perceptual process model – perceptual errors in organizational settings – improving perception – Attitude – job satisfaction – organisational commitment – Attribution theory – attribution errors – Ethics & Values.	08	
4.	Theory of motivation: Hierarchy of needs – goal setting theory – content and process theory of motivation – money as a motivator – team motivation.	08	
5.	Group Behaviour: stages of group formation – 5 stages model – group structure – task – decision making in group – team building and development – conflict and negotiation – leadership approach & development.	08	

6.	Organizing and Organization: Organization Structure & design – organizational culture – change – development – at the end students will be able to	06	

Course Outcomes:	
CO1	Identify different forms of organization and features and explain their relevance in a particular business context.
CO2	Define what an organization is, can define how organization evolve can act out what makes them effective.
CO3	To assess their behaviour with that others in organizational settings.
CO4	To appraise their ability to manage lead and work.
CO5	To detect, assess, analyse human behavioural problems.
CO6	To develop ethical thinking, they will be able to negotiate, lead, manage.

Learning Resources:	
1.	Organizational Behaviour by S. Shajahan
2.	New Age International Publishers
3.	Organizational Behaviour Publisher – University of Minnesota
4.	A Text book of O.B. by Dr. C. S.
5.	GuptaOB by Dr. Mittal & Agarwal

Name of the course	Economic policies in India
Course Code: OEC(CS/IT)702A	Semester: 7th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory Contact Hrs.: 3 hrs./week	Mid Semester-1 Exam: 15 Marks
Tutorial Contact Hrs.: 0 hrs./week	Mid Semester-2 Exam: 15 Marks
Practical Contact Hrs.: 0 hrs./week	Assignment & class attendance: 20 Marks
Credit Points: 3	End Semester Exam: 75 Marks (to be converted into 50 marks)

Objective:	
1.	To understand the changing nature of economic policy in India.
2.	To discuss the different sector-specific policies.
3.	To explain the implications of sectoral policies.

Pre-Requisite	
1.	NA

Unit	Content	Hrs	Marks
1	Changing nature of Economic Policy in India: Indian economy at independence. Economic Planning in India – Objectives, development strategy and assessment.	8	

	Economic reforms and liberalization.		
2	Policies in Agriculture: Importance of agriculture in Indian economy. An overview of policies for agriculture and rural development. Green Revolution – features, phases and impact. Land Reforms. Food security and food policy. Agricultural price policy.	8	
3	Policies in Industry: Industrial policy prior to 1991.Industrial Licensing Policy. New Industrial Policy 1991.Public sector in the Indian economy. Evolution of disinvestment programme and privatization policy. Small scale industries.	8	
4	Policies in Financial Sector: The banking sector in the pre-reform period. Banking sector reforms. Indian capital market – pre and post reform phase.	6	
5	India's Fiscal Policy: Objectives of fiscal policy in India. Fiscal imbalance and deficit financing. The fiscal imbalance and the new fiscal approach. The tax reforms since 1991.Federal finance in India.	6	

Course Outcome:	
After completion of this course the students will be able to :	
CO1	Explain the Changing nature of Economic Policy in India.
CO2	Analyze the different policies in Agriculture.
CO3	Examine the role of different industrial policies in India's industrial development.
CO4	Outline the policy reforms in the financial sector.
CO5	Discuss the different aspects of fiscal policy.
Learning Resources:	
1	Ruddar Dutt & KPM Sundaram: Indian Economy, S. Chand & Company Ltd.
2	Mishra and Puri: Indian Economy, Himalaya Publishing House.
3	Uma Kapila (ed.): Indian Economy since independence, Academic Foundation.
4	Uma Kapila: Understanding the problems of Indian economy, Academic Foundation.
5	Uma Kapila: Indian Economy issues in development & planning and sectoral aspects, Academic Foundation.
6	Economic Survey, Government of India- various issues.
7	Finance Commission Report, Ministry of Finance, various issues.

Name of the course		Soft Skill and interpersonal communication	
Course Code: OEC(CS/IT)702B		Semester: 7th	
Duration: 6 months		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs/week		Mid Semester 1 Exam: 15 Marks	
Tutorial: 0 hr/week		Mid Semester 2 Exam: 15 Marks	
Practical: 0 hrs/week		Assignment ,Quiz, Attendance: 20 Marks	
Credit Points: 3		End Semester Exam: 50 Marks (75 marks converted to 50)	
Objectives:			
1.	To handle interpersonal relations.		
2.	To communicate effectively.		
3.	To take appropriate decision.		
4.	To gain professional development		
Prerequisites:			
1.	To know at least basic grammar in English language		
Unit	Content	Hrs	Marks
1.	Introduction: Difference between soft and hard skill, communication the most important soft skill, types, process, barriers.	2	
2.	Verbal Communicationoral: listening, reading, speaking.	2	
3.	Verbal Communication Written: paragraph, letter, essay, precie, comprehension.	2	
4.	Communication As A Source Of Career Building: Job application letter with resume./cv, group discussion, presentation, mock interview.	10	
5.	Business Communication: Memo, agenda, minutes of meeting, notice, Email.	10	
6.	Soft Skill: Time management, goal setting, problem solving, decision making, leadership style, intra &interpersonal skill, swot analysis	10	
Course Outcomes:			
CO1	Define what communication is .		
CO2	Build strong professional vocabulary by reading writing listening and speaking.		
CO3	Express themselves properly to others.		
CO4	Organize Their thought processes,ideas, arguments through group discussion, presentation, interview.		
CO5	Negotiate with people.		
Learning Resources:			
1.	Organizational Behaviour by S. Shajahan		
2.	New Age International Publishers		
3.	Organizational Behaviour Publisher – University of Minnesota		
4.	A Text book of O.B. by Dr. C. S.		
5.	GuptaOB by Dr. Mittal & Agarwal		

Name of the course		Programming and Application of Advanced Microprocessors
Course Code: OEC(CS/IT)703A		Semester: 7th
Duration: 6 months		Maximum Marks: 100
Teaching Scheme		Examination Scheme
Theory: 3 hrs/week		Mid Term Exam I: 15 Marks
Tutorial: NIL		Mid Term Exam II: 15 Marks
Practical: NIL		Assignment & Quiz etc.: 20 Marks
Credit Points: 3		Semester End Exam: 75 Marks (to be mapped into 50 marks)
Objective:		
1.	To understand the features of 8086 and Pentium family of Microprocessors.	
2.	To learn Assembly Language Programming of advanced Microprocessors.	

3.	To design interface circuits and their connection with Microprocessors.		
4.	To implement Microprocessor based systems		
Pre-Requisite			
1.	Digital Electronics [ES(CS/IT) 307]		
Module	Content	Hrs	Marks
1	Introduction to 8086 Microprocessor: 8086 Microprocessor: Block diagram, Execution Unit, Bus Interface Unit, General Purpose Registers, Flag Registers, Memory Segmentation, Logical Memory and Physical Memory, Addressing Modes.	8	
2	x86 and Pentium family of Microprocessors: Simple Block Diagram, Address Bus, Data Bus, other Buses, Control Registers, General Purpose Registers, Cache Memory, Upward compatibility of features and privileges.	8	
3	Instruction Sets and Assembly Language Programming: Basic Instruction Sets, Assembler Directives and Assembly Language Programming, Machine Cycle and instruction Cycle, Minimum Mode and Maximum Mode.	8	
4	Controller and Peripheral Devices Working principles of DMA Controller, Interrupts and its application. Programmable Peripheral Interface, Working principles of LCD, Interface with LCD, Interface with Stepper Motors. Interface with Ports.	6	
5	BIOS and DEBUG: BIOS Function Calls, DEBUG in DOS and Windows Environment. Various DEBUG Commands, Memory access using DEBUG Command, Advanced Assembly Language Program with DEBUG. Disassemble and generation of HEX Codes using DEBUG.	6	
Course Outcomes			
After completion of the course, a student will be able to:			
CO 1	explain the characteristics of 16 bit Microprocessor.		
CO 2	determine the features of upward compatible Microprocessors.		
CO 3	execute Assembly Language Program.		
CO 4	simulate programs using DEBUG.		
CO 5	design circuits based on Microprocessors.		
Learning Resources:			
1.	Advanced Microprocessors and Peripherals by K.M. Bhurchandi and A. K. Ray, McGraw Hill Education (India) Private Limited.		
2.	An Introduction to the Intel Family of Microprocessors by James L. Antonakos, Pearson Education Asia.		
3.	The x86 PC: Assembly Language, Design and Interfacing by M.A. Mazidi, J. G. Mazidi and D. Causy, Pearson Publication.		
4.	The x86 Microprocessors: Architecture, Programming and Interfacing (8086 to Pentium) by Lyla B. Das, Pearson Publication.		
5.	Fundamentals of Microprocessors and Microcomputers by B. Ram, Dhanpat Rai Publications, New Delhi.		
6.	Microprocessors and Interfacing: Programming and Hardware by Douglas V. Hall, Tata McGraw-Hill Publishing Company Limited, New Delhi.		

Name of the course		Control System	
Course Code: OEC(CS/IT)703B		Semester: 7th	
Duration: 6 months		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs/week		Internal Assessment (50 Marks) a) Mid Semester Exam I: 15 Marks b) Mid Semester Exam II: 15 Marks c) Other Assessment tools (Assignment, Quiz etc.): 20 Marks	
Credit Points: 3		End Semester Exam: 75 Marks (to be mapped into 50 marks)	
Objective:			
1.	To classify different systems and the related parameters.		
2.	To apply different mathematical tools & techniques for analyzing different practical systems.		
3.	To develop the concept of stability of a system and compute stability parameters.		
4.	To design different controller parameters for stabilizing specific systems		
Pre-Requisite			
1.	Basic Electrical Engineering (ES (CS/IT) 101)		
2.	Mathematics (BS (CS/IT) 101, BS (CS/IT) 205, BS(CS/IT)307)		
Module	Content	Hrs	Marks
1	Introduction to Control System: Introduction to control system, objectives and areas of applications, Open loop system and closed loop system, Feedback control and Automatic control: concepts and examples, Concept and examples of linear and nonlinear systems, sensitivity, robustness, accuracy	03	
2	Concept of transfer function: mathematical modeling of physical systems: Transfer function of real life systems, properties and applications, Basic concepts of poles and zeroes of a transfer function, Mathematical modeling: electrical analogy of spring–mass-dashpot system, Block diagram representation of physical systems and analysis of block diagram, Different techniques for block diagram reduction, Development of signal flow graph, Mason's gain formula	07	
3	Control system components: Potentiometer, Synchros, Resolvers, Position encoders, Tacho-generators, Actuators, Basic concept of position control, speed control, temperature control, liquid level control, pressure control.	03	
4	Time domain analysis: Impulse, step and ramp function, Step response of first and second order system, Time domain analysis of a standard second order closed loop system, Understanding of Steady state error, undamped natural frequency, damping, overshoot, rise time and settling time and their applications, Stability assessment using locations of poles and zeroes, Stability analysis using Routh-Hurwitz criteria	07	
5	Stability Analysis and control: Stability analysis using Root locus techniques from transfer function, Idea of semi-log graph, Bode plots and stability analysis using Bode plots from transfer function, Measurement of phase margin and gain margin, Development of polar plots from transfer function, Measure of relative stability using Nyquist criteria, PI, PD and PID control	11	
6	Introduction to State variable Analysis: State variables and state space model, Diagonalization, Solution of state equations, Computation of stability, controllability and observability from state model	05	
Course Outcome: After completion of this course the students will be able to			
CO1	Develop transfer function of different systems using mathematical analysis, block diagram reduction, Mason's gain formula etc.		
CO2	Explain the operation of different components of control system and physical control systems		
CO3	Examine the system performance using different parameters of time domain response		
CO4	Determine stability of a system using Root locus techniques, Bode plots and Nyquist criteria using transfer function of		

	a system
CO5	Measure controllability and observability of a system from its state space model
Learning Resources:	
1.	Modern Control Engineering, K. Ogata, 5th Edition, Pearson Education India
2.	Control System Engineering, I. J. Nagrath & M. Gopal. 6th Edition, New Age International Publication
3.	Automatic Control Systems, B.C. Kuo & F. Golnaraghi, 10th Edition, McGraw Hill India
4.	Automatic Control Systems (with Matlab Programs), S. Hasan Saeed, Kataria, S. K., & Sons
5.	Modern Control Engineering, D. Roy Choudhury, PHI Learning
6.	Control Systems, A. Anand Kumar, 2nd Edition, PHI Learning
7.	Linear Control Systems with MATLAB Applications, B. S. Manke, Khanna Publishers

Name of the course:	Mobile Computing
Course Code: OEC(CS/IT)703C	Semester: 7th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory Contact Hrs.: 3 hrs/week	Mid Semester Exam 1: 15 Marks
Tutorial Contact Hrs.: NA	Mid Semester Exam 2: 15 Marks
Credit Point: 3	Assignment, Quiz, Attendance: 20 Marks
	End Semester Exam: 50 Marks (75 marks converted to 50)

Objective:

1.	To make the student understand the concept of mobile computing paradigm, its novel applications and limitations.
2.	To understand the typical mobile networking infrastructure through a popular GSM protocol.
3.	To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer.
4.	To understand the database issues in mobile environments & data delivery models.

Pre-Requisite

1.	Communication Engineering (ES-CS/IT-409)
2.	Computer Networks (PC(CS/IT) 617)

Module	Content	Hrs	Marks
1.	Fundamentals of Mobile Computing: - Introduction to Mobile Computing (MC), Current Wireless Systems, Cordless Phones, Cellular concept, Satellite Communication, Wireless LANs, GSM Systems Overview, Architecture, Location tracking and call setup, GPRS Network Nodes, Radio interface, Protocols, Localization and calling, Handover, channel structure, location management, HLR-VLR, Overview of Paging Systems.	07	
2.	Wireless communication and Mobile IP: Motivation for a specialized MAC, SDMA, FDMA, TDMA, CDMA. IEEE 802.11, TCP over wireless, data broadcasting, Mobile IP, protocol stack.	05	
3.	Mobile Network Layer: Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunnelling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).	07	
4.	Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP. Transport Layer Security. Session Protocol.	05	

5.	Data management Issues: Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware, context-aware computing, transactional models, query processing, recovery, quality of service issues. Data Dissemination, Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.	07	
6.	Application Issues of Dynamic DNS File System: Synchronization Protocol, Wireless Application Protocol-WAP. Mobile Agents computing, Mobile networking security, Mobile Operating Systems: Blue tooth, Overview of Mobile Ad hoc Networks (MANETs)	05	

Course Outcome:

After completion of this course the students will be able to -

CO1	Extrapolate the basic elements and applications of mobile computing.
CO2	Think and develop new mobile application.
CO3	Debate on any new technical issue related to this new paradigm and come up with a solution.
CO4	Develop new ad hoc network applications and/or algorithms/protocols.
CO5	Explain & develop any existing or new protocol related to mobile environment

Learning Resources:

1.	Jochen Schiller, “Mobile Communications”, Second Edition Pearson, 2003
2.	Raj Kamal, “Mobile Computing”, Second Edition Oxford ,2000
3.	Tomasz Imielinski , Henry F. Korth, “Mobile Computing”, 1996, Kluwer Academic Publication.
4.	Dharma PrakashAgarwal and Qing AnZeng, “Introduction to Wireless and Mobile Systems”, Third Edition Cengage Learning.

Name of the course		Web & Internet	
Course Code: PEC(CS)704A		Semester: 7th	
Duration: 6 months		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs/week		Mid Semester 1 Exam: 15 Marks	
Tutorial: 0hrs./week		Mid Semester 2 Exam: 15 Marks	
Practical: 0 hrs./week		Other Assessment tools (Assignment, Quiz etc.): 20 Marks	
Credit Points: 3		End Semester Exam: 75 Marks (Two third weightage for final reckoning i.e., 50 mark)	
Objective:			
1.	To explain web application development procedures		
2.	To understand the concept of JAVA SCRIPTS, HTML& XML.		
3.	To impart servlet technology for writing business logic		
4.	To familiarize various concepts of application development using JSP		
5	To facilitate students to connect to databases using JDBC		
Pre-Requisite			
1.	JAVA [PC(CS/IT)513]		
2.	Database Management System [PC(CS/IT)512]		
3	Computer Networks [PC(CS/IT)617]		
Unit	Content	Hrs	Marks
1	Introduction: Concept of client & server side web applications, Web Architectures, Enterprise architecture styles: Single 2-tier, 3-tier, n-tier, comparison of J2EE and .NET framework, concepts of URL, HTTP, Message format of HTTP-Request and response message, Persistent & Non Persistent connections in HTTP, Web Caching, HTTP Proxies.	5	
2	HTML Basics–HTML elements, attributes and tags, comments, title, paragraphs, line breaks, changing font size, style, making text bold, underlined , italicized, Table with Row and Column Header, CSS & its advantages, different style information-inline, internal/embedded and external,css cascading rules. Java Script - statements, comments, placing functions, variables, literals-String, Number, Boolean, looping- for, while, do-while, conditional statements, arrays, objects.	11	
3	Servlet- Introduction, servlet architecture, life cycle of servlet, Generic Servlet and HTTP servlet, parameter passing to servlets, retrieving parameters, session management-.cookies, hidden form field,URLrewriting,HttpSession Java Server Pages(Jsp)- Introduction, life cycle of JSP,comparision JSP & SERVLET, JSP components- directives, declarations, expressions, scriptlets, variables and methods, scope of JSP objects, concepts of beans-useBean, setProperty, getProperty. .	12	
4	Java Database Connectivity (Jdbc)-Introduction to data streams, JDBC architecture, JDBC Driver types- Type1, Type2, Type3 and Type4, making connections with the database for accessing records from JSP & servlet.	4	
5	Xtensible Mark Up Language –XML-Need for XML, HTML and XML, XML syntax and tags, elements and attributes, comments, Role of XML DTD and Schema, need for XML parser.	4	

Course outcomes			
After completion of the course, a student would be able to:			
CO 1	Explain web application & their types		
CO 2	Design web application using JavaScript and HTML		
CO 3	Create appropriate Server-side applications		
CO 4	Apply JDBC and ODBC technologies to create database connectivity.		
CO 5	Identify the engineering structural design of XML and parse tree.		
Learning Resources:			
1.	Web Design Technology (Theory And Technique On The Cutting Edge)-D.P. Nagpal, S.Chand Publication		
2.	Learn Object Orinted Programming Using Java: An Uml Based- Dr. N.B. Venkateswarlu&Dr. E.V. Prasad-S.Chand Publication.		
3.	Web Technologies-Uttam K. Roy, Oxford University Press, Higher Education.		
4.	Web Technologies: Tcp/Ip To Internet Application Architectures-Achyut S. Godbole, Achyut S Godbole, AtulKahate-Tata Macgraw-Hill Publication		
5.	Web Technology & Design - Xavier C., New Age Publication.		
6.	Java Server Programming, J2EE edition. (VOL I and VOL II); WROX publishers.		

Name of the course:	Artificial Intelligence
Course Code: PEC(CS)704B	Semester: 7th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory Contact Hrs.: 3 hrs/week	Mid Semester-1 Exam: 15 Marks
Tutorial Contact Hrs.: 1 hrs./week	Mid Semester-2 Exam: 15 Marks
Credit Point: 3	Assignment, Quiz & class attendance: 20 Marks
	End Semester Exam: 75 Marks (to be mapped into 50 marks)

Objective:	
1.	The main purpose of this course is to provide the most fundamental knowledge to the students so that they can understand what the AI is.
2.	Apply the basic principles, models, and algorithms of AI to recognize, model, and solve problems in the analysis and design of information systems.
3.	Analyze the structures and algorithms of a selection of techniques related to searching, reasoning, machine learning, and language processing.
Pre-Requisite	

1.	Strong knowledge of Mathematics. (BS (CS/IT) 101, BS (CS/IT) 205, BS(CS/IT)307).		
2.	Good command over programming languages. (PCL(CS/IT)305, PCL(CS/IT)516).		
3.	Design & Analysis of Algorithm PC(CS/IT)406.		
Module	Content	Hrs	Marks
1.	Introduction of AI and Agents : Overview of Artificial intelligence- Problems of AI, AI technique, Agents & environment, nature of environment, structure of agents, goal based agents, utility based agents, learning agents.	5	
2.	Problem Solving: Problems, Problem Space & search: Defining the problem as state space search, production system, problem characteristics, issues in the design of search programs.	3	
3.	Search techniques: Problem solving agents, searching for solutions; uniform search strategies: breadth first search, depth first search, depth limited search, bidirectional search, comparing uniform search strategies. Greedy best-first search, A* search, memory bounded heuristic search: local search algorithms & optimization problems: Hill climbing search, simulated annealing search, genetic algorithms; constraint satisfaction problems, Games, optimal decisions & strategies in games, the minimax search procedure, alpha-beta pruning.	11	
4.	Knowledge & reasoning and Representing knowledge using rules: Knowledge representation issues, representation & mapping, approaches to knowledge representation, issues in knowledge representation, The First Order Predicate Logic, Semantic Nets, Frames and Scripts Formalisms, Resolution in Predicate Logic, Unification, Strategies for Resolution by Refutation, Procedural verses declarative knowledge, logic programming, forward verses backward reasoning, matching, control knowledge.	6	
5.	Planning and Learning: Overview, components of a planning system, Goal stack planning, Hierarchical planning, other planning techniques, preliminary ideas of distributed and real time planning, Forms of learning, inductive learning, learning decision trees, explanation based learning, learning using relevance information, neural net learning & genetic learning.	5	
6.	Natural Language processing and Expert Systems: Introduction, Syntactic processing, semantic analysis, discourse & pragmatic processing, Representing and using domain knowledge, expert system shells, knowledge acquisition.	6	
Course Outcome: After completion of this course the students will be able to -			
CO1	To understand the basic issues of knowledge representation, blind and heuristic search as well as other topics such as minimax, resolution, etc. that play an important role in AI programs.		
CO2	To inspect of both the achievements of AI and the theory underlying those achievements.		
CO3	To apply the basic principles, models, and algorithms of AI to recognize, model, and solve problems in the analysis and		

	design of information systems.
CO4	To assess AI language including an ability to write simple to intermediate programs.
CO5	To develop the knowledge of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning.
Learning Resources:	
1.	E. Charniak, et.al., Introduction to Artificial Intelligence, PEARSON Education. P. H. Winston, Artificial Intelligence, PEARSON
2.	Education. E. Rich and K. Knight, Artificial Intelligence, PEARSON Education. R. Honavar and E. Uhr, Artificial Intelligence and
3.	The Handbook of Artificial Intelligence, Vol.1,2 and 3, Kaufman Inc.,1982. B. K. P. Horn, Robot Vision, MIT Press, 1985. J.
4.	Carbonell, Machine Learning paradigms and Methods, MIT Press, 1990. Journals- Artificial Intelligence, AI Magazine, IEEE 6. Expert, Machine Learning, Computer Vision Image Processing and Graphics, IEEE Transactions on Neural Networks.
5.	Logic & Prolog Programming, Saroj Kaushik, New Age International

Name of the course		Introduction to Deep Learning	
Course Code: PEC(CS)704C		Semester: 7th	
Duration: 6 months		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs./week		Mid Term Exam I: 15 Marks	
Tutorial: Nil		Mid Term Exam II: 15 Marks	
Practical: Nil		Assignment & Quiz etc.: 20 Marks	
Credit Points: 3		Semester End Exam: 75 Marks (Two third weightage for final reckoning i.e., 50 marks)	
Objective:			
1.	Understand the concepts of TensorFlow, Keras, its main functions, operations and execution.		
2.	Implement deep learning algorithms, understand neural networks and traverse the layers of data abstraction which will empower the student to understand data more precisely.		
3.	Build deep learning models in TensorFlow and interpret the results.		
4.	Learn topics such as convolutional neural networks, recurrent neural networks, LSTM, GRU, training deep networks and high-level interfaces.		
5.	Understand the Autoencoders, GAN and Reinforcement learning concepts.		
Pre-Requisite			
1.	Mathematics I BS(CS/IT) 101		
2.	Mathematics II BS(CS/IT) 205		
3.	Machine Learning PEC(CS)603A		
Module	Content	Hours	Marks.
1	Introduction to TensorFlowand Keras, Artificial Neural Networks (ANNs), Perceptron, Multi-Layer Perceptron (MLP), Back propagation, Training an MLP with TensorFlow/keras, Fine-Tuning Hyper-parameters, Hidden Layers, Neurons	10	

	per Hidden Layer, Activation Functions.		
2	Training Deep Neural Networks, Vanishing Gradients Problems, Batch Normalization, Reutilizing Pretrained Layers, Optimizers: AdaGrad, RMSProp, Adam Optimization, Escaping Over-fitting by means of Regularization.	6	
3	Convolutional Neural Networks (CNNs), Convolutional Layers, Filters, Pooling strategies, CNN Architectures.	6	
4	Recurrent Neural Networks (RNNs), Recurrent Neurons, Basic RNNs in TensorFlow, Training RNNs, Deep RNNs, LSTM, GRU.	5	
5	Autoencodersand Generative Adversarial Networks (GAN)	4	
6	Reinforcement Learning, Introduction to OpenAI Gym, Markov Decision Processes, Q-Learning, and Deep Q-Learning.	5	

Course Outcomes	
After completion of the course, a student would be able to:	
CO 1	describe the concepts of TensorFlow, Keras, its main functions, operations and execution.
CO 2	implement algorithms of deep learning algorithms, understand neural networks.
CO 3	developmodels of convolutional neural networks (CNN), recurrent neural networks (RNN), LSTM, GRU, training deep networks and high-level interfaces.
CO 4	applyDeep Learning Models to realise the conceptsof Autoencoders and GAN.
CO 5	designDeep Learning algorithms for Reinforcement learning.
Learning Resources:	
1.	Christopher Bishop. Pattern Recognition and Machine Learning. 2e
2.	Machine Learning by Tom Mitchell, McGraw Hill Education
3.	Devi V.S.; Murty, M.N. (2011) Pattern Recognition: An Introduction, Universities Press, Hyderabad.
4.	R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, Wiley, 2000.
5.	Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016

Name of the course:	Digital Image Processing
Course Code: PEC(CS)704D	Semester: 7th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory Contact Hrs.: 3 hrs/week	Mid Semester Exam 1: 15 Marks
Tutorial Contact Hrs.: NA	Mid Semester Exam 2: 15 Marks
Credit Point: 3	Assignment, Quiz, Attendance: 20 Marks
	End Semester Exam: 50 Marks (75 marks converted to 50)

Objective:

1.	To understand an Image fundamentals and basic analytical methods to be used in image processing.
2.	To build various Image enhancement and various restoration techniques
3.	To develop various Image segmentation methods, Wavelet basedandmorphological ImageProcessing
4.	To explain different colour image models and processingmethodology

Pre-Requisite

1.	Communication Engineering ES(CS/IT)409
2.	Mathematics (BS (CS/IT) 101, BS (CS/IT) 205, BS(CS/IT)307)

Module	Content	Hrs	Marks
1.	Fundamentals of Image processing and Image Transforms: - Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels Image Transforms: 2 – D Discrete Fourier Transform, Discrete Cosine Transform (DCT)	07	
2.	Image Enhancement: - Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.	10	
3.	Image Restoration: - Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering	05	
4.	Image Segmentation: - Segmentation concepts, point, line and Edge detection, Global Processing (Hough Transform), Thresholding Techniques, Region based segmentation, Morphological processing- erosion and dilation.	08	
5.	Colour Image Processing: - Colour Fundamentals, Colour Model, Conversion of one color model to another, Pseudo color image processing, Full colour image processing	06	

Course Outcome: After completion of this course the students will be able to -	
CO1	Extrapolate the basic elements and applications of image processing
CO2	Identify image sampling and quantization requirements and implications
CO3	Design and implement two-dimensional spatial and frequency filters for image enhancement
CO4	Model and Demonstrate the image restoration problem in both time and frequency domains
CO5	Develop & Illustrate the image segmentation and also the morphological image processing.
CO6	Identify, Manipulate and Apply their knowledge by analysing image processing problems including colour images while recognizing and employing (or proposing) effective solutions
Learning Resources:	
1.	Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.
2.	Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image ProcessingUsing MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
3.	Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
4.	S. Jayaraman, S. Esakkirajan And T.Veerakumar , “Digital Image Processing” 3Ed, TataMcGraw - Hill Education Pvt. Ltd, 2010.
5.	Willliam K Pratt, “Digital Image Processing”, John Willey, 2002.

Name of the course	Big Data Analytics
Course Code:PEC(CS)704E	Semester: 7th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3 hrs/week	Mid Semester 1 Exam: 15 Marks
Tutorial: 0hrs./week	Mid Semester 2 Exam: 15 Marks
Practical: 0 hrs./week	Assignment, quiz, Attendance: 10Marks
Credit Points: 3	End Semester Exam: 75 Marks

Objective:			
1.	To study the basic technologies that forms the foundations of Big Data		
2.	Provide an overview of Apache Hadoop, HDFS Concepts and Interfacing with HDFS		
3.	To understand the specialized aspects of big data including big data application, and big data analytics.		
4.	To study different types Case studies on the current research and applications of the Hadoop and big data in industry		
Pre-Requisite			
1.	DBMS and e knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment		
Unit	Content	Hrs	Marks

1	Introduction To Big Data And Hadoop Introduction to Big Data, why big data, convergence of key trends, unstructured data, Data Storage and Analysis, Characteristics of Big Data, Industry examples of big data Types of Digital Data, Introduction to Big Data,Challenges in Big Data Analytics, IBM Big Data Strategy, Introduction to InfosphereBigInsights and Big Sheets	7	
2	HDFS(Hadoop Distributed File System) Introduction to Hadoop, History of Hadoop, Apache Hadoop, Analyzing, Data with Unix tools, Analyzing Data with Hadoop, Hadoop Streaming, Hadoop Echo SystemThe Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.	9	
3	Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.	5	
4	Hadoop Eco System Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive: Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase:HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction	10	
5	Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.	5	

Course Outcome	
After the completion of the course, a student will be able to:	
CO1	Identify Big Data and its Business Implications.
CO2	List the components of Hadoop and Hadoop Eco-System
CO3	Manage Job Execution in Hadoop Environment
CO4	Develop Big Data Solutions using Hadoop Eco System
CO5	Analyze InfosphereBigInsights Big Data Recommendations.
CO6	Apply Machine Learning Techniques using R.

Learning Resources	
1	V.K. Jain, Big Data and Hadoop, Khanna Publishing House, New Delhi(2017).
2	V.K. Jain, Data Analysis, Khanna Publishing House, New Delhi(2019).
3	Tom White “Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012.
4	Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015.
5	Eric Sammer, "Hadoop Operations", O'Reilley,2012.
6	Michael Berthold, David J. Hand, "Intelligent Data Analysis”, Springer, 2007.
7	Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press (2013)
8	Tom Plunkett, Mark Hornick, “Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop”, McGraw-Hill/Osborne Media (2013), Oracle press.
9	Glen J. Myat, “Making Sense of Data”, John Wiley & Sons, 2007
10	Pete Warden, “Big Data Glossary”, O’Reily, 2011.
11	Michael Mineli, Michele Chambers, AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
12	ArvindSathi, “BigDataAnalytics: Disruptive Technologies for Changing the Game”, MC Press, 2012

Name of the course	Internet of Things
Course Code: PEC(CS)705A	Semester: 7th
Duration: 6 month	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3hrs/week	Mid Semester 1 Exam: 15 Marks
Tutorial: 0hrs/week	Mid Semester 2 Exam: 15 Marks
Practical: 0hrs/week	Other Assessment tools (Assignment, Quiz etc.): 20 Marks
Credit Points: 3	End Semester Exam: 75 Marks (Two third weightage for final reckoning i.e., 50 mark)

Objective:	
1.	To understand the application areas of IOT .
2.	To realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.
3.	To understand building blocks of Internet of Things and characteristics.

Pre-Requisite			
1.	Computer Networks [PC(CS/IT)617]		
Unit	Content	Hrs	Marks
1	Introduction: What is IoT,Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Physical design of IoT, Logical design of IoT, A simplified IoT Architecture.	7	
2	Major components of IoT: IoT enabling Technologies, Sources of IoT, M2M Communication, M2M Architecture, Difference between M2M and IoT,Data and Analytics for IoT,An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology.	8	
3	Smart Objects: The “Things” in IoT: Sensors,Actuators, and Smart Objects, Sensor Networks, Connecting Smart objects,Working Principles of sensors,Selection of Sensors for Practical Applications,Introduction of Different Types of Sensors such as Capacitive, Resistive, Surface Acoustic Wave for Temperature, Pressure, Humidity, Toxic Gas etc.	7	
4	IoT Physical Devices-Arduino Uno: Introduction to Arduino, Different versions of Arduino, Features and applications of Arduino, Basic concept of integration of Sensors and Actuators with Arduino.	8	
5	Recent trends in smart sensor for day to day life: Evolving sensors and their architecture. Real world applications for IoT: Industrial IoT, Connected Vehicles, Smart Grid, Agriculture,Healthcare, Smart Cities and Smart Homes.	6	

Course outcomes	
After completion of the course, a student would be able to:	
CO 1	Explain general concepts of Internet of Things (IoT).
CO 2	Construct various M2M and IoT architectures.
CO 3	Analyze the deployment of smart objects and the technologies to connect them to network..
CO 4	Evaluate design issues in IoT applications according the need for data analytics and security.
CO 5	Develop different sensor technologies for sensing real world entities.
Learning Resources:	
1.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome

	Henry,"IoTFundamentals:Networking Technologies, Protocols, and Use Cases for the Internet of Things".
2.	Srinivasa K G, "Internet of Things",CENGAGE Leaning India, 2017 .
3.	Yasuura, H., Kyung, C.-M., Liu, Y., Lin, Y.-L., Smart Sensors at the IoT Frontier, Springer International Publishing.
4.	Jeeva Jose, Internet of Things, Khanna Publishing House
5.	Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014. (ISBN: 978-8173719547)
6.	Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill

Name of the course		Distributed Database	
Course Code: PEC(CS)705B		Semester: 7th	
Duration: 6 months		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory Contact Hrs.: 3 hrs/week		Mid Semester 1 Exam: 15 Marks	
TutorialContact Hrs.: 0 hrs./week		Mid Semester 2 Exam: 15 Marks	
PracticalContact Hrs.: 0 hts./week		Other Assessment tools (Assignment, Quiz etc.): 20 Marks	
Credit Points: 3		End Semester Exam: 50 Marks (75 marks converted to 50)	
Objective:			
1.	To explain the basic principles of distributed database systems and its architectures		
2.	To evaluate the efficiency of distributed database design and the distributed query processing plans		
3.	To handle different concurrency control anomalies and maintain the reliability of distributed transactions		
Pre-Requisite			
1.	Database Management System [PC(CS/IT)512]		
2.	Computer Network [PC(CS/IT)617]		
Unit	Content	Hrs	Marks
1	Introduction: Concept of distributed data processing, basic idea of distributed database systems, homogenous, heterogenous and federated database, distributed database storge- fragmentation, replication and allocation, global schema and local schema, key advantages of distributed database- layers distribution transparency- fragmentation and replication transparency, reliability through distributed transactions, improved performance, complications of distributed database systems, reference architecture for distributed DBMS- client/server, peer-to-peer, and multidatabase systems, global directory issues in distributed DBMS.	8	
2	Distributed Database Design: Design issues for distributed database, design alternatives for distributed database- non replicated and non-fragmented, fully replicated, partially replicated, top down approach of distributed database design, reasons for data fragmentation, primary and derived horizontal fragmentation, vertical fragmentation mixed or hybrid fragmentation, correctness rules of fragmentation, data fragment allocation and its associated issues, bottom-up approach of distributed database design, view management-views in centralized and distributed database.	8	
3	Distributed Query Processing And Optimization: Basic concept, Query processing issues in distributed database, objectives of distributed query processing, different layers or phases of distributed query processing- query decomposition, data localization, global query optimization, distributed query execution, concept of distributed query optimization and its associated factors, distributed query optimization process and plans- operation, data and hybrid shipping, query trading, semi join based algorithms.	6	
4	Distributed Transaction Management And Concurrency Control : Concept of distributed transaction, goals of distributed transaction, distributed transaction processing issues, distributed concurrency control, concurrency control anomalies, distributed concurrency control algorithms- centralized 2PL, distributed 2PL, time stamp-based concurrency control algorithms- basic time stamp ordering, conservative time stamp ordering, mulit-version time stamp ordering.	6	
5	Reliability and Availability Aspects of Distributed Database Systems: Concept of reliability and its main problem areas for distributed database systems, types of failures- transaction failures, site Failure, media failure, communication failure, mean time between failures/mean time to repair, idea of local recovery manager, distributed reliability protocols- centralized 2PC, distributed 2PC, termination protocol for 2PC-coordinator and participant timeout, non-blocking commit protocol, network partitioning- checkpointing and cold restarts, voting based protocol.	8	
Course Outcome: After completion of this course the students will be able to -			
CO1: Explain the overall concept of distributed database systems and its different associated components			
CO2: Choose suitable design strategies for the distributed database systems in the aspects of data storage and views			
CO3: Analyze different query processing plans applicable for the distributed database systems			
CO4: Compare different types of concurrency control mechanisms related to distributed database transaction management systems			
CO5: Classify different types of failures as well as recovery techniques related to distributed database transaction systems			
Learning resources:			
1. Stefano Ceri, Guiseppe Pelagatti, “Distributed Databases: Principles and Systems”, McGraw Hill Education, Indian Edition, 2017.			

2. M. Tamer Ozsu, Patrick Valduriez, “Principles of Distributed Database Systems”, Springer, Third edition, 2011.
3. Saeed K. Rahimi, Frank S. Haug, “Distributed Database Management Systems: A Practical Approach”, Wiley-IEEE Computer Society, Aug, 2010, Print ISBN:9780470407455, Online ISBN:9780470602379, DOI:10.1002/9780470602379
4. Chhanda Ray, “Distributed Database Systems”, Pearson Education India, 1st Edition, Kindle Edition, 2009, ISBN-9788131727188, 8131727181.
5. Sachin Deshpande, “Distributed Databases”, Dreamtech Press, Kindle Edition, 2014, ISBN 13: 9789351197201

Name of the course		Computer Graphics	
Course Code: PEC(CS)705C		Semester: 7th	
Duration: 6 months		Maximum Marks: 100	
Teaching Scheme		Examination Scheme	
Theory: 3 hrs/week		Mid Semester 1 Exam: 15 Marks	
Tutorial: 0 hrs/week		Mid Semester 2 Exam: 15 Marks	
Practical: 0 hrs/week		Assignment, Quiz, Attendance: 20 Marks	
Credit Points: 3		End Semester Exam: 50 Marks (75 marks converted to 50)	
Objective:			
1.	To explain the need of computer graphics to prepare presentation and enhance information transfer.		
2.	To apply different techniques for preparing different picture.		
3.	To develop the concept of different shape drawing technique.		
Pre-Requisite			
1.	Mathematics I BS(CS/IT) 101		
2.	Mathematics II BS(CS/IT) 205		
Module	Content	Hours	Marks
1	Introduction to computer graphics & graphics systems : Overview of computer graphics, representing pictures, preparing, presenting & interacting with pictures for presentations; Visualization & image processing; RGB color model, direct coding, lookup table; storage tube graphics display, Raster scan display, 3D viewing devices, Plotters, printers, digitizers, Light pens etc.; Active & Passive graphics devices; Computer graphics software.	7	
2	Scan conversion: Points & lines, Line drawing algorithms; DDA algorithm, Bresenham’s line algorithm, Circle generation algorithm; Ellipse generating algorithm; scan line polygon, fill algorithm, boundary fill algorithm, flood fill algorithm.	7	

3	2D transformation & viewing: Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, transformations between coordinate systems; reflection shear; Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline, Window to view port co-ordinate transformation, clipping operations, point clipping, line clipping, clipping circles, polygons & ellipse.	10	
4.	3D transformation & viewing: 3D transformations: translation, rotation, scaling & other transformations. Rotation about an arbitrary axis in space, reflection through an arbitrary plane; general parallel projection transformation; clipping, view port clipping, 3D viewing.	8	
5	Curves: Curve representation, surfaces, designs, Bezier curves, B-spline curves, end conditions for periodic B-spline curves, rational B-spline curves.	4	
Course outcomes			
After completion of the course, a student would be able to:			
CO 1	Understand the technique to represent and prepared picture.		
CO 2	Explain translation and rotation technique of point and line.		
CO 3	Design line, circle and ellipse drawing technique.		
CO 4	Understand clipping technique.		
CO 5	Design carve drawing algorithm		
Learning Resources:			
1.	Hearn, Baker – "Computer Graphics (C version 2nd Ed.)" – Pearson education		
2.	Z. Xiang, R. Plastock – " Schaum's outlines Computer Graphics (2nd Ed.)" – TMH		
3.	D. F. Rogers, J. A. Adams – "Mathematical Elements for Computer Graphics (2nd Ed.)" – TMH		
4.	Sanyal, Prajapati – " Computer Graphics and Multimedia" Pragati Prakashan		

Name of the course	Introduction to quantum computing
Course Code: PEC(CS)705D	Semester: 7th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3 hrs/week	Mid Semester 1 Exam: 15 Marks
Tutorial: 0 hr/week	Mid Semester 2 Exam: 15 Marks
Practical: 0 hrs/week	Other Assessment tools (Assignment, Quiz etc.): 20 Marks
Credit Points: 3	End Semester Exam: 50 Marks (75 marks converted to 50)

Objectives:			
1.	To understand basic postulates of Quantum Mechanics & quantum state decomposition		
2.	To assess various quantum information processing techniques and concepts		
3.	To apply quantum algorithms to solve various simple problems.		
Prerequisites:			
1.	Design and Analysis of Algorithms PC(CS/IT)406		
Unit	Content	Hrs	Marks
1.	Introduction to Hilbert space: Linear space, Scalar product, Hilbert space, Self adjoint operator, Projection operator, Unitary operator.	2	
2.	Introduction to Quantum mechanics: Postulates of quantum mechanics, Uncertainty principle, Complementary principle, Unitary Dynamics, Detail study of two-level system. Multipartite quantum system, Quantum entanglement	2	
3.	Quantum state decomposition: Schmidt decomposition, Non-unique decomposition of mixed state, Hugston-Jozsa-Wooters theorem, No-Cloning Theorem, Distinguishing non-orthogonal quantum states, general quantum operations, Kraus representation theorem, various Quantum gates.	2	
4.	Quantum information processing: Quantum teleportation, Quantum dense coding, Remote state preparation, Quantum key distribution (Bennett-Brassard{1984} Protocol)	10	
5.	Quantum computing: Basic idea of quantum parallelism, Qubits, Some basic quantum algorithm, Deutschs algorithm, Deutsch-Jozsa algorithm, Simon's algorithm, Grover's search algorithm, Quantum Fourier Transform and Shor's factoring algorithm.	10	
Course Outcomes:			
CO1	Define Hilbert space and operators.		
CO2	Explain basic concepts of quantum mechanics		
CO3	Analyze Quantum state decomposition		
CO4	Assess fundamental quantum information processing concepts		
CO5	Design quantum algorithms to solve some simple problems		
Learning Resources:			
1.	Quantum Computation and Quantum Information, Michael A. Nielsen and Isaac L. Chuang,		
2.	Presskil Lecture notes http://www.theory.caltech.edu/~preskill/ph229/.Engineering Circuit Analysis, W.H. Hyat, J.E. Kemmerly& S.M. Durbin, The Mc Graw Hill		
3.	Organizational Behaviour Publisher – University of Minnesota		
4.	An Introduction to Quantum. Computing, Phillip Kaye,. Raymond La amme, and Michele Mosca. Oxford U. Press, New York, 2007.		
5.	Quantum Computer Science, N. David Mermin, Cambridge University Press 2007.		

Name of the course	Data Mining
Course Code:PEC(CS)705E	Semester: 7th
Duration: 6 months	Maximum Marks: 100
Teaching Scheme	Examination Scheme
Theory: 3 hrs/week	Mid Semester 1 Exam: 15 Marks
Tutorial: 0hrs./week	Mid Semester 2 Exam: 15 Marks
Practical: 0 hrs./week	Assignment, quiz, Attendance: 10Marks
Credit Points: 3	End Semester Exam: 75 Marks

Objective:			
1.	It focuses on fundamental data mining concepts and techniques for discovering interesting from data in various applications		
2.	To extract knowledge from data repository for data analysis, frequent pattern, classification and prediction		
3.	To emphasize the techniques for developing effective, efficient, and scalable data mining tools		
4.	To learn new, advanced techniques for emerging applications (e.g. social network analysis, stream data mining)		
Pre-Requisite			
1.	DBMS , algorithms and basic knowledge of statistics and probability theory		
Unit	Content	Hrs	Marks
1	Introduction Data Mining Concept, Origin, Process, Applications, Techniques, Challenges	3	
2	Data Preprocessing Data types, Quality, Descriptive data summarization – central tendency and dispersion measure, Data cleaning, Data integration & transform, Data reduction	6	
3	Association Rule Mining Market-basket analysis basics, Naïve algorithm, Apriority algorithm, Direct Hashing and Pruning (DHP), Software for Association Rule Mining, Classification and Prediction: Decision Tree, Classification by decision tree induction, Bayesian classification, Rule-based classification, Prediction – Linear and Nonlinear Regression, Classification software.	6	
4	Cluster Analysis Types of data in cluster analysis, Partitioning methods, Hierarchical methods, Density-based methods, Quality & Validity of clustering methods Cluster analysis software	7	
5	Web Data Mining Web content mining, Web usage mining, Web structure mining, Hubs and Authorities, HITS algorithm, Web mining software, Text Mining, Support Vector Machine	7	
6	Data Mining Application & Information Privacy Applications and trends in data mining such as Web, finance, telecommunication, biology and medicine, science and engineering retail industry etc. Social impacts of data mining, information privacy and data security, IT Act overview	7	
Course Outcome			
After the completion of the course, a student will be able to:			
CO1	Understand warehousing architectures and tools for systematically organizing large database and use their data to make strategic decisions.		
CO2	Understand KDD(knowledge discovery from data) process for finding interesting pattern from warehouse		
CO3	Characterize the kinds of patterns that can be discovered by association rule mining.		
CO4	Discover interesting patterns from large amounts of data to analyze for predictions and classification.		
CO5	Develop a data mining application for data analysis using various tools		
Learning Resources			
1	Data Mining: Introductory and Advanced Topics, 1e by DUNHAM		
2	Data Mining - Concepts and Techniques 3rd Edition (English, Paperback, Jiawei Han, MichelineKamber, Jain Pei)		
3	Introduction To Data Mining And Analytics by Kris Jamsa, Jones & Bartlett		
4	Introduction to Data Mining 2e by PANG-NING TAN MICHAEL STEINBACH ANUJ KARPATNE VIPIN KUMAR		
5	Data Warehousing in the Real World: A Practical Guide for Building Decision Support Systems, 1e by ANAHORY		
6	Data Mining For Dummies by Meta S. Brown		
7	Data Mining and Data Warehousing: Principles and Practical TechniquesbyParteek Bhatia		
8	Introduction to Data Mining Paperback by Pang-Ning Tan, Michael Steinbach, Vipin Kumar		
9	Data Warehousing: Fundamentals for IT Professionals, 2ed Paperback by PaulrajPonniah		