K.R. MANGALAM UNIVERSITY
THE COMPLETE WORLD OF EDUCATION

SCHOOL OF ENGINEERING AND TECHNOLOGY

Bachelor of Computer Applications (AI & Data Science)

BCA (AI & DS)
PROGRAM CODE: 06

2020-23

Approved in the 23rd

Meeting of Academic

Council Held on 23

June 2020

Academic Council * K.R. Mangalam University * Member Secretary

Registrar
K.R. Mangalam University
Sohna Road, Gurugram, (Haryana)

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PREFACE

In consultation with Deans, Faculty Members, Industry Experts, and University Alumni, the Academic council constituted department-wise committees to draft the model curriculum of postgraduate computer application course. Increasing applications of computers in almost all areas of human endeavor has led to a vibrant industry with concurrent rapid change in technology. The primary emphasis in B.C.A is on designing computer applications for various organizations including business. finance, service and industry.

The BCA program is spread over three years in four semesters. The total number of credits in B.C.A is 141. The current programme focuses on programming language, JAVA. The first year of courses focuses on strengthening the fundamental of the students. Subjects like Programming for problem solving, Web Technologies and Basics of Mathematics. The second year lays the programming and mathematical foundation for mobile application development.. The third year is dedicated to Data Warehousing and Data Mining, Linux, Mobile Computing, Cloud Computing. The course includes ability enhancement courses like communication skills, presentation skills and aptitude reasoning to prepare the students for industry. A strong laboratory component is a part of the curriculum. The laboratories, besides supplementing the theory course should also expose the student to the use of the latest software tools.

About K.R Mangalam University

The K.R. Mangalam Group has made a name for itself in the field of education. The K.R. Mangalam story goes back to the chain of schools that offered an alternative option of world-class education, pitching itself against the established elite schools, which had enjoyed a position of monopoly till then. Having blazed a new trail in school education, the focus of the group was aimed at higher education.

K.R. Mangalam University is the fastest-growing higher education institute in Gurugram, India. K. R. Mangalam University was established under the Haryana Private University Act 2006, received the approval of Haryana Legislature vide Amendment Act # 36 of 2013 and consent of the Hon'ble Governor of Haryana on 11th April 2013, which was published in the Gazette notification vide Leg. No.10/2013, dated 3rd May 2013.

Since its inception in 2013, the University has been striving to fulfill its prime objective of transforming young lives through ground-breaking pedagogy, global collaborations, and world-class infrastructure. Resources at K.R Mangalam University have been continuously upgraded to optimize opportunities for the students. Our students are groomed in a truly interdisciplinary environment where they grow up with integrative skills through interaction with students from engineering, social sciences, management and other study streams.

K.R Mangalam University is unique because of its:

i. Enduring legacy of providing education to high achievers who demonstrate leadership in diverse fields.

ii. Protective and nurturing environment for teaching, research, creativity, scholarship, social and economic justice.

Objectives

i. To impart undergraduate, post graduate and doctoral education in identified areas of higher education.

ii. To undertake research programmes with industrial interface.

iii. To integrate its growth with the global needs and expectations of the major stake holders through teaching, research, exchange & collaborative programmes with foreign, Indian Universities/Institutions and MNCs.

iv. To act as a nodal center for transfer of technology to the industry.

v. To provide job oriented professional education to the Indian student community with particular focus on Haryana.

About School of Engineering & Technology (SOET)

School of Engineering and Technology (SOET), K.R. Mangalam University is dedicated to fostering innovation, excellence, and advancement in engineering and technology. Empowering the new generation of change-makers by imparting exceptional understanding and intellect to facilitate the creation of highly sophisticated futuristic solutions. Our well-qualified academicians, accomplished researchers and industry insiders are focused on imparting their extensive knowledge and expertise to students through various lectures, workshops, industrial visits, projects, and competitions throughout the year ensuring that students receive a comprehensive education that blends theory with practical application.

These programs offered at SOET have the distinct objective of equipping the students with knowledge, skills and attitudes in engineering and technology, to make them capable of successfully meeting the present requirements and future challenges in the engineering profession. SOET brings together outstanding academics, industry professionals, and experienced researchers to deliver a unique hands-on and multi-disciplinary learning experience.

The curriculum of programs has been designed to cater to the ever changing needs and demands of the industry. The curriculum is regularly updated. The school has best infrastructure including domain-specific labs. SOET aims to provide exposure to the principles and practices of Design / Developments and Projects in the area of engineering. SOET is offering Ph.D. programs also.

School Vision

To create, disseminate, and apply knowledge in science and technology to meet the higher education needs of India and the global society, To serve as an institutional model of excellence in scientific and technical education characterized by integration of teaching, research and innovation.

School Mission

M1: To create an environment where teaching and learning are prioritized, with all support activities being held accountable for their success.

M2: To strengthen the institution's position as the school of choice for students across the State & Nation.

M3: To promote creative, immersive, and lifelong learning skills while addressing societal concerns.

M4: To promote co- and extra-curricular activities for overall personality development of the students.

M5: To promote and undertake all-inclusive research and development activities.

M6: To instill in learners an entrepreneurial mindset and principles.

M7: Enhance industrial, institutional, national, and international partnerships for symbiotic relationships.

M8: To help students acquire and develop knowledge, skills and leadership qualities of the 21st Century and beyond.

Programs Offered by the School

School offers undergraduate B. Tech Program, B.Sc. (Hons) Program, postgraduate M. Tech Program, and Doctoral Program. All these programs are designed to impart scientific knowledge to the students and provide theoretical and practical training in their respective fields.

Bachelors of Computer Applications

Bachelor of Computer Applications (BCA) is a three-year undergraduate program which deals with information technology and computer applications. The students will be provided learning opportunities in real world work situations that will keep them abreast of the latest skills and knowledge. The program aims to prepare the students to analyze problems and generate solutions in the areas of data science. An initiative to make the teaching-learning framework better and enhance the student learning outcomes, the school has taken a thoughtful step by introducing the concept of Learning Outcome Based Curriculum Framework (LOCF) and Choice Based Credits System (CBCS) system.

Eligibility Criteria: The student should have passed the 10+2 examination conducted by the Central Board of Secondary Education or equivalent examination from a recognized Board with Mathematics / Computer Science / Information Practice as one of the subjects and with an overall aggregate of 50% or more.

Course Outline: Programming for Problem Solving, Web Technology, .Net Framework, Mobile Application Development

Career Options: Opportunities exist in the IT industry, freelancers, education and forensics.

Program Duration

The maximum completion period of the BCA Programme offered by the University shall be three years.

Class Timings

The classes will be held from Monday to Friday from 09:10 am to 04:00 pm.

Scheme of Studies and Syllabi

The schem of studies and syllabus of the BCA program for all semesters is given in the following pages. These are arranged semester-wise.

For each course, the first line contains; Course Code and Credits (C) of the course.

This is followed by the course objectives, course outcome and the syllabus (Unit I to IV), Text book and reference books and modes of evaluation/examination scheme.

Three Years Bachelor of Computer Applications (BCA) Program at a Glance

	Semester I	Semester II	Semester III	Semester IV	Semester V	Semester VI	Total
Course	8	6	8	9	9	8	**59**
Credit	25	24	20	24	23	25	**141**

Scheme of Studies as per Learning Outcome Based Curriculum Framework (LOCF) and Choice Based Credits System (CBCS)

SEMESTER I

SNo.		Course Code	Course Title	L	T	P	C
1	SE	ETEL155A	Communication Skills	4	0	0	4
2	SE	ETDM301A	Disaster Management	3	0	0	3
3	SE	ETCH125A	Environmental Studies	3	0	0	3
4	SE	ETMA163A	Basics of Mathematics	3	1	-	4
5	SE	ETMC121A	Management Thoughts and Applications	3	-	-	3
6	CC	ETCS103A	Programming for Problem Solving	3	1	0	4
7	SE	ETCS153A	Programming for Problem Solving Lab	-	-	4	2
8	SE	ETMA181A	Basics of Mathematics Lab	-	-	4	2
				19	**2**	**8**	**25**

SEMESTER II

SNo.		Course Code	Course Title	L	T	P	C
1	GE	ETPH112A	Electricity and Magnetism (GE-II)	4	2	-	6
2	CC	ETCS112A	Object Oriented Programming	3	1	-	4
3	CC	ETCS308A	Web Technologies	3	-	-	3
4	SE	ETMA144A	Differential Equations & Optimization Techniques	3	1	-	4
5	CC	ETCA 164A	Web Technologies Lab	-	-	2	1
6	OE		Open Elective	6	-	-	6
				19	**2**	**2**	**24**

SEMESTER III

SNo		Course Code	Course Title	L	T	P	C
1	CC	ETCS217A	Data Structures	4	-	-	4
2	CC	ETEC210A	Digital Electronics	4	-	-	4
3	CC	ETCS 211A	Operating Systems	4	-	-	4
4	CC	ETCS323A	Java Programming	4	-	-	4
5	SE	ETCS 257A	Data Structures Lab	-	-	2	1
6	SE	ETEC 256A	Digital Electronics Lab	-	-	2	1
7	SE	ETCS361A	Java Programming Lab	-	-	2	1
8	SE	ETCS255A	Operating System Lab	-	-	2	1
				16	**0**	**8**	**20**

SEMESTER IV

SNo		Course Code	Course Title	L	T	P	C
1	CC	ETCS222A	Computer Organization & Architecture	4	-	-	4
2	CC	ETCS307A	Database Management Systems	4	-	-	4
3	CC	ETCA326A	Enterprise Computing in JAVA	4	-	-	4
4	CC	ETCA324A	Net Framework	4	-	-	4
5	CC	ETCA228A	Mobile Application Development	4		-	4
6	SE	ETCA366A	Enterprise Computing in JAVA Lab	-	-	2	1
7	SE	ETCS 355A	Database Management Systems Lab	-	-	2	1
8	SE	ETCA264A	Mobile Application Development Lab	-	-	2	1
9	SE	ETCA364A	Net Framework Lab	-	-	2	1
				20	**0**	**8**	**24**

SEMESTER V

SNo.		Course Code	Course Title	L	T	P	C
1	CC	ETCS417A	Data Warehousing and Data Mining	3	-	-	3
2	CC	ETCA227A	Web Based Programming using PHP	3	1	-	4
3	CC	ETCA325A	Linux Environment	4	-	-	4
4	CC	ETCS304A	Computer Networks	4	-	-	4
5	CC	ETCS219A	Foundation of Computer Systems	3	1	-	4
6	SE	ETCA267A	Web Based Programming Using PHP Lab	-	-	2	1
7	SE	ETCS456A	Data Warehousing and Data Mining Lab	-	-	2	1
8	SE	ETCA365A	Linux Environment Lab	-	-	2	1
9	SE	ETCA367A	Practical Training	-	-	2	1
				20	**2**	**8**	**23**

SEMESTER VI

SNo		Course Code	Course Title	L	T	P	C
1	CC	ETCS314A	Mobile Computing	3	-	-	3
2	CC	ETCS416A	Cloud Computing	3	-	-	4
3	CC	ETCS 202A	Software Engineering	4	-	-	4
4	CC	ETCS401A	Artificial Intelligence	4	-	-	4
5	SE	ETCA362A	Cloud Computing Lab	-	-	2	1
6	CC	ETCS451A	Artificial Intelligence Lab	-	-	2	1
7	SE	ETCA368A	Major Project	-	-	6	3
8		**Elective (with Lab)**					
(i)	CC	ETCA328A	Multimedia Technologies	3	1	-	4
	SE	ETCA370A	Multimedia Technologies Lab	-	-	2	1
(ii)	CC	ETCA 330A	Network Security & Cryptography	3	1	-	4
	SE	ETCA372A	Network Security & Cryptography Lab	-	-	2	1
(iii)	CC	ETCA 332A	Software Testing	3	1	-	4
	SE	ETCA374A	Software Testing Lab	-	-	2	1
				15	**4**	**12**	**25**

OE	OPEN ELECTIVE
CC	CORE COURSE
SE	SKILL ENHANCEMENT

Semester I

ETEL155A	**Communication Skills**	L	T	P	C
Version 1.0		4	0	0	4
Pre-requisites/Exposure	--				
Co-requisites	--				

Course Objectives

1. Understand the basics of Grammar to improve written and oral communication skills.
2. Understand the correct form of English with proficiency
3. Improve student's personality and enhance their self-confidence.
4. Improve professional communication.
5. Enhance academic writing skills.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the basics of Grammar to improve written and oral communication skills

CO2. Understand the correct form of English with proficiency

CO3. Improve student's personality and enhance their self-confidence

CO4. Improve professional communication

CO5. Enhance academic writing skills

Catalog Description

This learning program with its practice-based learning tasks will facilitate the learners to enhance their communication skills in a modern and globalized context, enhance their linguistic and communicative competence and hone their interpersonal skills.

Course Content

UNIT I **10 lecture hours**

Introduction to Communication: Importance of Communication Skills, Meaning, Forms & Types of Communication; Process of Communication; Principles of Effective Communication/7Cs, Barriers in Communication (Interpersonal, Intrapersonal and Organizational).

UNIT II **10 lecture hours**

Academic Writing: Précis (Summary – Abstract – Synopsis – Paraphrase – Précis: Methods), Letter & Résumé (Letter Structure & Elements – Types of letter: Application & Cover - Acknowledgement – Recommendation – Appreciation – Acceptance – Apology – Complaint – Inquiry).Writing a proposal and synopsis. Structure of a research paper. Citations and plagiarism.

UNIT III **10 lecture hours**

Technology-Enabled Communication: Using technology in communication tasks, E-mails, tools for constructing messages, Computer tools for gathering and collecting information; Different virtual medium of communication.

UNIT IV **10 lecture hours**

Building Vocabulary: Word Formation (by adding suffixes and prefixes); Common Errors; Words Often Confused; One word substitution, Homonyms and Homophones; Antonyms &Synonyms, Phrasal Verbs, Idioms & Proverbs (25 each); Commonly used foreign words(15 in number);

UNIT V **10 lecture hours**

Personality Development: Etiquettes& Manners; Attitude, Self-esteem & Self-reliance; Public Speaking; Work habits (punctuality, prioritizing work, bringing solution to problems), Body Language: Posture, Gesture, Eye Contact, Facial Expressions; Presentation Skills/ Techniques.

Text book [TB]:

1. Kumar, Sanjay and Pushplata. Communication Skills. Oxford University Press, 2015.

Reference Books/Materials

1. Mitra, Barun K. Personality Development and Soft Skills. Oxford University Press, 2012.
2. Tickoo, M.L., A. E.Subramanian and P.R.Subramaniam. Intermediate Grammar, Usage and Composition. Orient Blackswan, 1976.
3. Bhaskar, W.W.S., AND Prabhu, NS., " English Through Reading", Publisher: MacMillan,1978
4. Business Correspondence and Report Writing" -Sharma, R.C. and Mohan K. Publisher: Tata McGraw Hill1994
5. Communications in Tourism & Hospitality- Lynn Van Der Wagen, Publisher: HospitalityPress
6. Business Communication-K.K.Sinha
7. Essentials of Business Communication By Marey Ellen Guffey, Publisher: ThompsonPress

8. How to win Friends and Influence People By Dale Carnegie, Publisher: Pocket Books
9. Basic Business Communication By Lesikar&Flatley, Publisher Tata McGraw Hills
10. Body Language By Allan Pease, Publisher SheldonPress

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand the basics of Grammar to improve written and oral communication skills	**PO10**
CO2	Understand the correct form of English with proficiency	**PO10**
CO3	Improve student's personality and enhance their self-confidence	**PO12**
CO4	Improve professional communication.	**PO10**
CO5	Enhance academic writing skills	**PO10**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Innovation and Industry Friendly	Ethics and Communication Skills

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETEL155A	Communication Skills										3		3			3

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETDM301A	**Disaster Management**	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure					
Co-requisites	--				

Course Objective:

1. To increase the knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts and public health consequences.
2. Understanding of the International Strategy for Disaster Reduction (UN-ISDR) and to increase skills and abilities for implementing the Disaster Risk Reduction (DRR) Strategy.
3. To ensure skills and abilities to analyze potential effects of disasters and of the strategies and methods to deliver public health response to avert these effects.
4. To ensure skills and ability to design, implement and evaluate research on disaster.

Course Outcomes:

After completing the program, the student will able to understand

CO1. Capacity to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
CO2. The course examines disaster profile of our country and illustrates the role played by various governmental and non- governmental organizations & its effective management.

CO3. It also acquaints learners with the existing legal framework for disaster management.

CO4. Capacity to analyze and evaluate research work on the field of emergencies and disaster while demonstrating insight into the potential and limitations of science, its role in society and people's responsibility for how it is used.

Catalog Description:

This course incorporates different types of disasters so that students are well aware of the circumstances around them. We have included one project in the syllabus so that they can thoroughly study the pre & post disastrous situations as well as the role of society in these difficult situations.

Course Content

Unit I: **8 lecture hours**

Introduction to Disasters: Concept and definitions- Disaster, Hazard, vulnerability, resilience, and risks.

Different Types of Disaster: Causes, effects and practical examples for all disasters.

- Natural Disaster: such as Flood, Cyclone, Earthquakes, Landslides etc
- Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Epidemic and Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures (Building and Bridge), War & Terrorism etc.

Unit II: **8 lecture hours**

Disaster Preparedness and Response Preparedness

- Disaster Preparedness: Concept and Nature
- Disaster Preparedness Plan
- Prediction, Early Warnings and Safety Measures of Disaster.
- Role of Information, Education, Communication, and Training, Role of Government, International and NGO Bodies.
- Role of IT in Disaster Preparedness
- Role of Engineers on Disaster Management.
- Relief and Recovery
- Medical Health Response to Different Disasters

Unit III: **6 lecture hours**

Rehabilitation, Reconstruction and Recovery

- Reconstruction and Rehabilitation as a Means of Development.
- Damage Assessment
- Post Disaster effects and Remedial Measures.
- Creation of Long-term Job Opportunities and Livelihood Options,
- Disaster Resistant House Construction
- Sanitation and Hygiene
- Education and Awareness,
- Dealing with Victims' Psychology,
- Long-term Counter Disaster Planning
- Role of Educational Institute.

Unit IV: **10 lecture hours**

Disaster Management in India

- **Disaster Management Act, 2005:**
  Disaster management framework in India before and after Disaster Management Act, 2005, National Level Nodal Agencies, National Disaster Management Authority

- **Liability for Mass Disaster**

  - Statutory liability
  - Contractual liability
  - Tortiousliability
  - Criminal liability
  - Measure of damages

- **Epidemics Diseases Act, 1897: Main provisions, loopholes.**

- **Project Work**: The project/ field work is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived based on the geographic location and hazard profile of the region where the institute is located.

Reference Books:

- Government of India, Department of Environment, Management of Hazardous Substances Control
- Act and Structure and Functions of Authority Created There under.

- Indian Chemical Manufacturers' Association & Loss Prevention Society of India, Proceedings of the National Seminar on Safety in Road Transportation of Hazardous Materials: (1986).
- Author Title Publication Dr.Mrinalini Pandey Disaster Management Wiley India Pvt. Ltd.
- Tushar Bhattacharya Disaster Science and Management McGraw Hill Education (India) Pvt. Ltd.
- Jagbir Singh Disaster Management: Future Challenges and Opportunities K W Publishers Pvt. Ltd.
- J. P. Singhal Disaster Management Laxmi Publications.
- Shailesh Shukla, ShamnaHussain Biodiversity, Environment and Disaster Management Unique Publications
- C. K. Rajan, NavalePandharinath Earth and Atmospheric Disaster Management: Nature and Manmade B S Publication
- IndianlawInstitute(UpendraBaxiandThomasPaul(ed.),MassDisastersandMultinationalLiability : The Bhopal Case(1986)
- IndianLawInstitute,UpendraBaxi(ed.),EnvironmentProtectionAct:AnAgendaforImplementation (1987)
- Asian Regional Exchange for Prof. Baxi.,Nothing to Lose But our Lives: Empowerment to Oppose
- Industrial Hazards in a Transnational world(1989)
- Guru dip Singh, Environmental Law: International and National Perspectives(1995), Lawman (India)Pvt.Ltd.
- Leela Krishnan, P, The Environmental Law in India, Chapters VIII,IX and X(1999),Butter worths, New Delhi

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination Examination Scheme:

Components	CAT	Mid Term Exam	Attendance/ Class performance	End Term Exam
Weightage (%)	20	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Capacity to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.	PSO3

CO2	The course examines disaster profile of our country and illustrates the role played by various governmental and non-governmental organizations & its effective management.	**PO3**
CO3	It also acquaints learners with the existing legal framework for disaster management.	**PO12**
CO4	Capacity to analyze and evaluate research work on the field of emergencies and disaster while demonstrating insight into the potential and limitations of science, its role in society and people's responsibility for how it is used.	**PO6**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Innovation and Industry Friendly	Ethics and Communication Skills
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETDM301A	Disaster Management			2			3						2			2

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCH125A	Environmental Studies	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Basics of Environment				
Co-requisites	--				

Course Objectives

1. To aware the students about the environment.
2. To learn the students concepts and methods from ecological and physical sciences and their application in environmental problem solving.
3. To think across and beyond existing disciplinary boundaries, mindful of the diverse forms of knowledge and experience that arises from human interactions with the world around them.
4. Communicate clearly and competently matters of environmental concern and understanding to a variety of audiences in appropriate forms.

Course Outcomes

On completion of this course, the students will be able to

CO1. To comprehend and become responsive regarding environmental issues.

CO2.Acquire the techniques to protect our mother earth, as without a clean, healthy, aesthetically beautiful, safe and secure environment no specie can survive and sustain.

CO3. Enable the students to discuss their concern at national and international level with respect to formulate protection acts and sustainable developments policies.

CO4.To know that the rapid industrialization, crazy consumerism and over-exploitation of natural resources have resulted in degradation of earth at all levels.

CO5. Become consciousness about healthy and safe environment.

Catalog Description

This course imparts the basic concepts of environment which enable them to solve basic problems related to their surroundings. This course helps them to get an idea adverse effect of industrialization, population and degradation of natural resources on the environment. The course introduces the concepts of renewable and non-renewable resources.

Course Content

UNIT I **10 Lectures**

Environment and Natural Resources:

Multidisciplinary nature of environmental sciences; Scope and importance; Need for public awareness.

Land resources; land use change; Land degradation, soil erosion and desertification.

Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.

Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
Energy resources: Renewable and non- renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

UNIT II **10 Lectures**

Ecosystems and Biodiversity:

Ecosystem: Definition and Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession.
Case studies of the following ecosystems:
a) Forest ecosystem
b) Grassland ecosystem
c) Desert ecosystem
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots ; India as a mega-biodiversity nation; Endangered and endemic species of India; Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity; Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

UNIT III **10 Lectures**

Environmental Pollution and Environmental Policies:
Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution Nuclear hazards and human health risks; Solid waste management: Control measures of urban and industrial waste; Pollution case studies.
Sustainability and sustainable development; Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture; Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act; Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

UNIT IV **10 Lectures**

Human Communities and the Environment and Field work:
Human population growth: Impacts on environment, human health and welfare; Resettlement and rehabilitation of project affected persons; case studies; Disaster management: floods, earthquake, cyclones and landslides; Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan; Environmental ethics: Role of Indian and other religions and cultures in environmental conservation; Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).
Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems-pond, river, Delhi Ridge, etc.

Text Books

1. Kaushik and Kaushik, Environmental Studies, New Age International Publishers (P) Ltd. New Delhi.

Reference Books/Materials

1. A.K. De, Environmental Chemistry, New Age International Publishers (P) Ltd. New Delhi.
2. S.E. Manahan, Environmental Chemistry, CRC Press.
3. S.S Dara and D.D. Mishra, Environmental Chemistry and Pollution Control, S.Chand& Company Ltd, New Delhi.
4. R. Gadi, S. Rattan, S. Mohapatra, Environmental Studies Kataria Publishers, New Delhi.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	The learners will be able to comprehend and become responsive regarding environmental issues.	**PO7**
CO2	Students will acquire the techniques to protect our mother earth, as without a clean, healthy, aesthetically beautiful, safe and secure environment no specie can survive and sustain.	**PO8**
CO3	It enables the students to discuss their concern at national and international level with respect to formulate protection acts and sustainable developments policies.	**PO10**
CO4	Students come to know that the rapid industrialization, crazy consumerism and over-exploitation of natural	**PO6**

	resources have resulted in degradation of earth at all levels.	
CO5	Students become consciousness about healthy and safe environment.	**PO7**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Innovation and Industry Friendly	Ethics and Communication Skills
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCH125A	Environmental Studies						2	3	3		3				1	2

1=weakly mapped

2= moderately mapped

3=strongly mapped.

ETMA 163A	**Basics of Mathematics**	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure	-				
Co-requisites	--				

Course Objectives

After completion of this course the students may capable to investigate the structure of real-world problems and plan solution strategies. They might be able to solve the problems using appropriate tools and develop a mathematical vocabulary by expressing mathematical ideas orally and in writing. Enhance and reinforce the student's understanding of concepts through the use of technology when appropriate.

Course Outcomes

On completion of this course, the students will be able to

CO1. Familiar with Determinant and Matrices
CO2. Identify an ordinary differential equation and classify it by order or linearity
CO3.To determine general term of series in AP and GP, Calculate sum of n terms of series
CO4.Demonstrate a working knowledge Definite and Indefinite Integrals.

Catalog Description

This course is to enable students to understand concepts of determinants and matrices such as addition, subtraction, multiplication, system of linear equation by Cramer's rule. This course is also designed to develop and solidify basic arithmetic series like Arithmetic Progression (A.P), Geometric Progression (G.P), and algebra skills that will be required in future math courses.

In this course also include differentiation topics: derivative of a function, polynomial, trigonometric, exponential, logarithmic, inverse trigonometric and implicit functions and Logarithmic Differentiation. Integration topics includes: Indefinite integrals, Methods of integration: by substitution, by parts, by partial fractions, Integration of algebraic and transcendental functions. Because of the basic concepts of differentiation and integration are very useful for solving simple application problems related to computer science based on these.

Course Content

Unit I: **8 lecture hours**

Determinants: Definition, Minors, Co-factors, Properties of Determinants, Applications of determinants in finding area of triangle.

Matrices: Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, Solution of system of linear equation by Cramer's Rule.

Unit II: **12 lecture hours**

Sequence and Series: Introduction, Sequences, Series, Arithmetic Progression (A.P), Geometric Progression(G.P), Relationship Between A. M. and G.M., Sum to N terms of Special Series, Principle of Mathematical Induction.

Unit III: **12 lecture hours**

Differentiation: Derivative of a function, Derivatives of sum, differences, product, and quotient of functions, Derivative of polynomial, trigonometric, exponential, logarithmic, inverse trigonometric and implicit functions, Logarithmic Differentiation, Derivatives of functions in parametric forms, Differentiation by substitution.

Unit IV: **8 lecture hours**

Integration: Indefinite integrals, Methods of integration: by substitution, by parts, by partial fractions, Integration of algebraic and transcendental functions.

Text Books

1. A Textbook of Mathematics for XI-XII Students, NCERT Publication Vol. I-II.
2. Shanti Narayan, Integral calculus, Sultan Chand & Co.
3. Shanti Narayan, Differential calculus, Sultan Chand & Company.
4. Babu Ram, Engineering Mathematics, Pearson Education.

Reference Books/Materials

1. B.S.Grewal, " Higher Engineering Mathematics", Khanna Publishers.

2. H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Company.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Familiar with Determinant and Matrices	PO5
CO2	Identify an ordinary differential equation and classify it by order or linearity	PO2
CO3	To determine general term of series in AP and GP, Calculate sum of n terms of series	PO4
CO4	Demonstrate a working knowledge Definite and Indefinite Integrals.	PO3

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETMA163A	Basic of Mathematics		3	3	2	1										

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETMC 121A	**Management Thoughts and Applications**	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Basics of Management				
Co-requisites	--				

Course Objectives

1. The course aims at providing fundamental knowledge and exposure to the concepts, theories and practices in the field of management.
2. Observe and evaluate the influence of historical forces on the current practice of management.
3. To understand the concept of Managerial function.

Course Outcomes

On completion of this course, the students will be able to

CO1. Practice the process of management's four functions: planning, organizing, leading, and controlling.

CO2. Identify and properly use vocabularies within the field of management to articulate one's own position on a specific management issue and communicate effectively with varied audiences.

CO3. Evaluate leadership styles and motivation theory to anticipate the consequences of each leadership style and motivation theory.

CO4. Apply course concepts and theory in a practical context.

Catalog Description

This course introduces the student to the management process. The course takes an integrated approach to management by examining the role of the manager from a traditional and contemporary perspective while applying decision-making and critical-thinking skills to the challenges facing managers in today's globally diverse environment. The course examines the techniques for controlling, planning, organizing resources and leading the workforce.

Course Content

Unit I: 10 lecture hours

Introduction: Concept, Nature, Process and Significance of Management; Managerial Levels, Skills, Functions and Roles; Management v/s Administration; Coordination as Essence of Management; Development of Management Thought: Classical, Neo-Classical, Behavioral, Systems and Contingency Approaches.

Unit II: 12 lecture hours

Planning: Nature, Scope and Objectives of Planning; Types of Plans; Planning Process; Business Forecasting; MBO; Concept, Types, Process and Techniques of Decision-Making; Bounded Rationality.

Organizing: Concept, Nature, Process and Significance; Principles of an Organization; Span of Control; Departmentation; Types of an Organization; Authority-Responsibility; Delegation and Decentralization; Formal and Informal Organization.

Unit III: 10 lecture hours

Staffing: Concept, Nature and Importance of Staffing; Motivating and Leading: Nature and Importance of Motivation; Types of Motivation; Theories of Motivation-Maslow, Herzberg, X, Y and Z; Leadership - Meaning and Importance; Traits of a Leader; Leadership Styles - Likert's Systems of Management; Tannenbaum & Schmidt Model and Managerial Grid.

Unit IV: 8 lecture hours

Controlling: Nature and Scope of Control; Types of Control; Control Process; Control Techniques - Traditional and Modern; Effective Control System.

TEXT BOOK:

1. Koontz, Cannice, and Weihrich (2014). Management- A Global, Innovative and Entrepreneurial Perspective (14th Edition). New Delhi: Tata McGraw Hill Publishing Company.

REFERENCE BOOKS:

1. Stoner, Freeman and Gilbert Jr. (2013). Management (6th Edition). New Delhi: Pearson Prentice Hall of India.
2. Chopra R. K., Mohan Puneet, & Sharma Vandana (2010). Principles & Practices of Management. New Delhi: Sun India Publication.
3. Tripathi P. C. & Reddy P. N. (2015). Principles & Practices of Management (5th Edition). New Delhi: Tata McGraw Hill Publishing House.
4. Gupta, C.B (2016). Management Concepts and Practices. New Delhi: Sultan Chand and Sons.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Practice the process of management's four functions: planning, organizing, leading, and controlling	**PO3**
CO2	Identify and properly use vocabularies within the field of management to articulate one's own position on a specific management issue and communicate effectively with varied audiences.	**PO10**
CO3	Evaluate leadership styles and motivation theory to anticipate the consequences of each leadership style and motivation theory.	**PO4**
CO4	Apply course concepts and theory in a practical context.	**PO11**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Ethics	Analysis
Course Code	Course Title	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
ETMC121A	MANAGEMENT THOUGHTS AND APPLICATIONS			2	1						2	1		3		3

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS103A	**Programming for Problem Solving**	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure	Advanced of Computer communication				
Co-requisites	--				

Course Objectives

1. Provide an understanding of the role computation can play in solving problems.

2. Master the fundamentals of writing codes.

3. Learn programming languageto solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

4. Discover how to work with arrays, functions, structures

5. Position students so that they can compete for projects and excel in subjects with programming components.

Course Outcomes

On completion of this course, the students will be able to
CO1.To formulate simple algorithms for arithmetic and logical problems.

CO2. To translate the algorithms to programs (in C language).

CO3.To test and execute the programs and correct syntax and logical errors.

CO4. To implement conditional branching, iteration and recursion.

CO5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

Catalog Description

Computer software plays an important role in our daily lives: Our mobile phones, laptop computers,online banking, Internet applications such as YouTube, video games and movies, cars, and almost all aspects of daily life are touched by software. In your personal and professional life, you will utilize computer software. It is also likely that you will select, or even influence the design of, software that is used in your professional or personal life. This thematic sequence will give you a deep understanding of how software works and is created, its limitations, and its potential. You will be able to read software and therefore be able to make informed decisions when selecting or participating in the design of business, scientific, or information systems that utilize computer software. This is a course in which you learn computer programming concepts that are fundamental in nearly any computer programming language. These concepts can then be used in other courses to help you create computer applications that can be used to solve real-world problems

Course Content

UNIT I **12 LECTURE HOURS**

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm:

Flowchart / Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

UNIT II **8 LECTURE HOURS**

Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops. Arrays: Arrays (1-D, 2-D), Character arrays and Strings

UNIT III **10 LECTURE HOURS**

Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required) Function: Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference. Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function, Quick sort or Merge sort.

UNIT IV **10 LECTURE HOURS**

Structure: Structures, Defining structures and Array of Structures Pointers: Idea of pointers, Definingpointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

TEXT BOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	To formulate simple algorithms for arithmetic and logical problems.	**PO1, PO2**
CO2	To translate the algorithms to programs (in C language).	**PO3, PO4**
CO3	To test and execute the programs and correct syntax and logical errors.	**PO10**
CO4	To implement conditional branching, iteration and recursion.	**PSO1**
CO5	To decompose a problem into functions and synthesize a complete program using divide and conquer approach	**PSO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Innovation and Industry Friendly	Ethics and Communication Skills
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCS103A	Programming for problem solving	2	2	2	2						2			3	3	

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS153A	**Programming for problem solving lab**	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Practical learning				
Co-requisites	--				

Course Objectives

Master the fundamentals of writing Python scripts.

Learn core Python scripting elements such as variables and flow control structures.

Discover how to work with lists and sequence data.

Position students so that they can compete for projects and excel in subjects with programming components.

Course Outcomes

On completion of this course, the students will be able to

CO 1 To learn the syntax and semantics of Python programming language

CO 2 To use the structural programming approach in solving the problem.

CO 3 To use the object oriented programming approach in solving problems

CO 4 To handle exceptions gracefully

CO 5 To develop searching and sorting algorithms

Course Content

List of Experiments

1	Develop programs to implement list	**2 lab hours**
2	Develop programs to implement Dictionary	**2 lab hours**
3	Develop programs to implement tuples	**2 lab hours**
4	Develop programs to understand the control structures of python	**2 lab hours**
5	Develop programs to implement function with stress on scoping	**2 lab hours**
6	Develop programs to implement classes and objects	**2 lab hours**
7	Develop programs to implement exception handling.	**2 lab hours**
8	Develop programs to implement linear search and binary search.	**2 lab hours**
9	Develop programs to implement insertion sort	**2 lab hours**
10	Develop programs to implement bubble sort.	**2 lab hours**
11	Develop programs to implement quick sort.	**2 Labs**
12	Develop programs to implement heap sort.	**2 Labs**

Modes of Evaluation: Quiz/Oral practical oral exam/presentation/projects/Practical Examination

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Examination Scheme:

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	To learn the syntax and semantics of Python programming language	**PO2**
CO2	To use the structural programming approach in solving the problem.	**PO3**
CO3	To use the object oriented programming approach in solving problems	**PO5**
CO 4	To handle exceptions gracefully	**PSO1**
	To develop searching and sorting algorithms	**PO9**

		Engineering Knowledge	Problem analysis	Design/ development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Innovation and Industry Friendly	Ethics and Communication Skills
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3

ETCS150A	Programming for problem solving Lab		2	3		3				3				3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

Semester II

ETPH112A	**Electricity and Magnetism(GE-II)**	L	T	P	C
Version 1.0		4	2	-	6
Pre-requisites/Exposure	Basics of Physics				
Co-requisites	--				

Course Objectives

1. The abstraction from forces to fields using the examples of the electric and magnetic fields, with some applications
2. To learn how charges behave through electric circuits.
3. Consolidate the understanding of fundamental concepts in Electricity and Magnetism more rigorously as needed for further studies in physics, engineering and technology.
4. Expand and exercise the students' physical intuition and thinking process through the understanding of the theory and application of this knowledge to the solution of practical problems

Course Outcomes

On completion of this course, the students will be able to

CO1. Acquire fundamental knowledge of electrostatic interaction using Gauss Law and able to apply on physical systems.
CO2. Better insight about magnetic and dielectric behaviour of materials.
CO3. Better understanding of electrical circuits/theorems which enhances problem solving approach.
CO4. Develop the ability to correlates the daily life phenomenon to physics using mathematical tools.

Catalog Description

This course imparts the basic concepts of Physics. The course is design to point to a plausible physical origin of simple electromagnetic phenomena in nature, based on what the candidate has learned in the course about fundamental laws and concepts in electricity and magnetism. The course of Electricity and Magnetism help organizing the data in variety of ways to solve the problem efficiently. The

course is focused on theoretical discussions of Electricity and Magnetism and applications of discussed phenomenon. It also discusses about daily life physics like magnetism, current etc.

Course Content

Unit I: **10 Lecture hours**

Electric field: Electric field lines. Electric flux. Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry.

Conservative nature of Electrostatic Field .Electrostatic Potential. Laplace's and Poisson equations. The Uniqueness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole.

Unit II: **10 Lecture hours**

Electrostatic energy of system of charges.Electrostatic energy of a charged sphere.Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors.Parallel-plate capacitor.Capacitance of an isolated conductor. Method of Images and its application to: (1) Plane Infinite Sheet and (2) Sphere.

Dielectric Properties of Matter: Electric Field in matter. Polarization, Polarization Charges.Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector D. Relations between E, P and D. Gauss' Law in dielectrics.

Unit III: **10 Lecture hours**

Magnetic Field: Magnetic force between current elements and definition of Magnetic Field B. Biot-Savart's Law and its simple applications: straight wire and circular loop. Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole). Ampere's Circuital Law and its application to (1) Solenoid and (2) Toroid. Properties of B: curl and divergence. Vector Potential. Magnetic Force on (1) point charge (2) current carrying wire (3) between current elements. Torque on a current loop in a uniform Magnetic Field.

Magnetic Properties of Matter: Magnetization vector (M). Magnetic Intensity (H). Magnetic Susceptibility and permeability. Relation between B, H, M. Ferromagnetism. B-H curve and hysteresis.

Unit IV: **10 Lecture hours**

Electromagnetic Induction: Faraday's Law. Lenz's Law. Self Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field. Introduction to Maxwell's Equations. Charge Conservation and Displacement current.

Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor, and (4) Band Width. Parallel LCR Circuit.

Network theorems: Ideal Constant-voltage and Constant-current Sources. Network Theorems: The venin theorem, Norton theorem, Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem. Applications to dc circuits.

Ballistic Galvanometer: Torque on a current Loop. Ballistic Galvanometer: Current and Charge Sensitivity. Electromagnetic damping. Logarithmic damping.CDR.

Text Books

1. Physics for Scientists and Engineers (6th Ed.), Raymond A. Serway and John W. Jewett, Thomson Brooks (2004).
2. Engineering Physics Theory and Practical, A. K. Katiyar and C. K. Pandey, Wiley (2015)

Reference Books/Materials

1. Introduction to Electrodynamics (3rd Indian reprint), D.J. Griffiths,., Pearson Education (2003).
2. Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Acquire fundamental knowledge of electrostatic interaction using Gauss Law and able to apply on physical systems.	PO1& PO2
CO2	Better insight about magnetic and dielectric behaviour of materials.	PO4
CO3	Better understanding of electrical circuits/theorems which enhancesproblem solving approach.	PO6
CO4	Develop the ability to correlates the daily life phenomenon to physics using mathematical tools.	PO7 & PO8

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Ethics	Analysis
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETPH112A	Electricity & Magnetism	2	2		2		2	2	3					3		2

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS112A	**Object Oriented Programming**	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure	Basics of Computer Programming				
Co-requisites	--				

Course Objectives

This course introduces the concepts of object-oriented programming to students with a background in the procedural paradigm. The course begins with a brief review of control structures and data types with emphasis on structured data types and array processing. It then moves on to introduce the object-oriented programming paradigm, focusing on the definition and use of classes along with the fundamentals of object-oriented design. Other topics include an overview of programming language principles, simple analysis of algorithms, basic searching and sorting techniques, event-driven programming, memory management and an introduction to software engineering issues.

Course Outcomes

On completion of this course, the students will be able to

CO1 Explain the steps in creating an executable program for a computer, including the intermediate representations and their purpose.
CO2. Manipulate binary patterns and understand the use of binary to represent numbers. CO 3. Apply good programming style and understand the impact of style on developing and maintaining programs.
CO4. Effectively use a version control system and the Linux command line tools for incremental development.
CO5. Explain the benefits of object-oriented design and understand when it is an appropriate methodology to use.
CO6. Design object-oriented solutions for small systems involving multiple objects.
CO7. Identify the relative merits of different algorithmic designs.

Catalog Description

This is a course in which you learn computer programming concepts that are fundamental in nearly any computer programming language. These concepts can then be used in other courses to help you create computer applications that can be used to solve real-world problems

Course Content

Unit I: **12 lecture hours**

Introduction: Introducing Object-Oriented Approach related to other paradigms (functional, data decomposition), Characteristics of Object-Oriented Languages.
Basic terms and ideas: Abstraction, Encapsulation, Information hiding, Inheritance, Polymorphism, Review of C, Difference between C and C++, Cin, Cout, new, delete operators.

Unit II: **8 lecture hours**

Classes and Objects: Abstract data types, Object & classes, attributes, methods, C++ class declaration, State identity and behavior of an object, Constructors and destructors, instantiation of objects, Default parameter value, Copy Constructor, Static Class Data, Constant Classes, C++ garbage collection, dynamic memory allocation.

Unit III: **12 lecture hours**

Inheritance and Polymorphism: Inheritance, Types of Inheritance, Class hierarchy, derivation – public, private & protected, Agrégations, composition vs classification hiérarchies, Polymorphism, Type of Polymorphism – Compile time and runtime, Method polymorphism, Polymorphism by parameter, Operator overloading, Parametric polymorphism, Generic function – template function, function name overloading, Overriding inheritance methods.

Unit IV: **8 lecture hours**

Files and Exception Handling: Persistent objects, Streams and files, Namespaces, Exception handling, Generic Classes Standard Template Library: Standard Template Library, Overview of Standard

Template Library, Containers, Algorithms, Iterates, Other STL Elements, The Container Classes, General Theory of Operation, Vectors.

Text Books

A.R. Venugopal, Rajjkumar, T. Ravishanker "Mastering C++", TMH

2. R. Lafore, "Object Oriented Programming using C++", BPB Publications

3. Schildt Herbert, "C++ Programming", 2nd Edition, Wiley DreamTech

Reference Books/Materials

1. D. Parasons, "Object Oriented Programming with C++", BPB Publication
2. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication
3. YashwantKanethkar, "Object Oriented Programming using C++", BPB

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	CO1 Explain the steps in creating an executable program for a computer, including the intermediate representations and their purpose.	**PO2**
CO2	CO2. Manipulate binary patterns and understand the use of binary to represent numbers. CO 3. Apply good programming style and understand the impact of style on developing and maintaining programs. CO4. Effectively use a version control system and the Linux command line tools for incremental development.	**PO3**
CO3	CO5. Explain the benefits of object-oriented design and understand when it is an appropriate methodology to use.	**PO4**
CO4	CO6. Design object-oriented solutions for small systems involving multiple objects.	**PO5**

CO5	CO7. Identify the relative merits of different algorithmic designs.	**PO4**
CO6	CO1 Explain the steps in creating an executable program for a computer, including the intermediate representations and their purpose.	**PO4**
CO7	CO2. Manipulate binary patterns and understand the use of binary to represent numbers. CO 3. Apply good programming style and understand the impact of style on developing and maintaining programs. CO4. Effectively use a version control system and the Linux command line tools for incremental development.	**PO9, PSO 1**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCS112A	Object oriented programming	1	2	3	3	3				3				3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS308A	Web Technologies	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Basics of HTML				
Co-requisites	--				

Course Objectives

1. Analyze a web page and identify its elements and attributes.
2. Create web pages using XHTML and Cascading Style Sheets.
3. Build dynamic web pages using JavaScript (Client side programming).
4. Create XML documents and Schemas.
5. Build interactive web applications using AJAX.

Course Outcomes

Upon completion of the course the students will be able to:
CO1. Create a well-designed and well-formed, professional Web site utilizing the most current standards and practices
CO2. Demonstrate knowledge in web technologies including HTML, XHTML, CSS, image editing software, web authoring software, and client-side scripting
CO3. Create client-side scripts to add interactivity to Web pages
CO4. Select appropriate Web tools for a Web development project
CO5. Identify Web authoring obstacles created by the availability of various web browsers and markup language versions

Catalog Description

This course is an introduction to Web site development and the technologies behind it. Students will learn how to design and develop Web pages using current technologies and tools. Topics covered will include the World Wide Web, HTML, Cascading Style Sheets (CSS) and XML. The focus of this course is on dynamic HTML, a collection of web technologies such as HTML and scripting languages used together to create interactive and animated Web pages. Students will learn to program client-side scripts using JavaScript and the Document Object Model to transform static Web pages created with HTML and CSS into dynamic Web pages.

Course Content

Unit I: **8 lecture hours**

Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers, Features of Web 2.0, Common terminology: IP Addressing, URLs, Domain names. Website Creation and maintenance, Web Hosting and Publishing Concepts, Search Engines and their working. HTML: Introduction to HTML, HTML Document structure tags, HTML comments, Text formatting, inserting special characters, anchor tag, adding images and sound, lists: types of lists, tables, frames and floating frames, Developing Forms, Image maps, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets,

Unit II: 12 lecture hours

Client-side scripting: JavaScript - Data Types, Control Statements, operators, Built-in and User Defined Functions, Objects in JavaScript, Handling Events. HTML Document Object Model. Page Styling: Separation of content and presentation in HTML, Cascading Style Sheets - Types of Style Sheets – Internal, inline and External style sheets, customizing common HTML elements, types of CSS selectors

Unit III: 12 lecture hours

Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation, Browser architecture and Web site structure

Unit IV: 8 lecture hours

XML: Introduction to XML-Mark up languages, Features of Mark-up languages, XML Naming rules, Building block of XML, Document, Difference between HTML & XML, Components of XML, XML Parser, DTD's Using XML with HTML and CSS.
Introduction to Web Services, UDDI, SOAP, WSDL, Web Service Architecture, Developing and deploying web services. AJAX –Introduction AJAX programming, Improving web page performance using AJAX.

Text Books

1. Internet and World Wide Web, Deitel H.M., P.J.Deitel , Pearson

Reference Books/Materials

1.Web Technologies, Uttam K. Roy, Oxford University Press

2. HTML Black Book, Stephen Holzner, Wiley Dreamtech.

3. Web Technology, Rajkamal, Tata McGraw-Hill.

4. Web Technologies: A Computer Science Perspective, Jeffrey C. Jackson, Pearson.

5. XML: How to Program, Deitel&Deitel Nieto

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Create a well-designed and well-formed, professional Web site utilizing the most current standards and practices	PO1
CO2	Demonstrate knowledge in web technologies including HTML, XHTML, CSS, image editing software, web authoring software, and client-side scripting	PO4
CO3	Create client-side scripts to add interactivity to Web pages	PO5
CO4	Select appropriate Web tools for a Web development project	PO2
CO5	Identify Web authoring obstacles created by the availability of various web browsers and markup language versions	PO3

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

ETCS308A	WEB TECHNOLOGIES	2		2	3	3								3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETMA144A	**Differential Equations & Optimization Techniques**	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure	Differentiation, Integration				
Co-requisites	--				

Course Objectives

1. identify, analyse and subsequently solve physical situations whose behaviour can be described by ordinary differential equations
2. enhance and develop the ability of using the language of mathematics in analyzing the real-world problems of sciences and engineering.
3. demonstrate the strength of mathematics in modelling and simulating real world problems of science and engineering.

Course Outcomes

On completion of this course, the students will be able to

CO1 Understand the genesis of ordinary differential equations.

CO2 Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order.

CO3 Know Picard's method of obtaining successive approximations of solutions of first order differential equations, passing through a given point in the plane and Power series method for higher order linear equations, especially in cases when there is nomethod available to solve such equations.

CO4 Grasp the concept of a general solution of a linear differential equation of an arbitrary order and also learn a few methods to obtain the general solution of such equations.

CO5 Analyse mathematical models using first order differential equations to solve application problems such as circuits, mixture problems, population modeling, orthogonal trajectories, and slope fields.

CO6 Formulate mathematical models in the form of ordinary differential equations to suggest possible solutions of the day-to-day problems arising in physical, chemical and biological disciplines.

Catalog Description

In this introductory course on Ordinary Differential Equations, we first provide basic terminologies on the theory of differential equations and then proceed to methods of solving various types of ordinary differential equations. We handle first and second order differential equations and then higher order linear differential equations. The course demonstrates the usefulness of ordinary differential equations for modelling physical, biological, financial or economic problems. The ability to predict the way in which these systems evolve or behave is determined by modelling these systems and find solutions of the equations explicitly or approximately. The course includes complementary mathematical approaches for their solution, including analytical methods, graphical analysis and numerical techniques. A significant part of the course is emphasis on solving linear systems with computer software as a mathematical tool.

Course Content

UNIT-I

First Order Differential Equations: Basic concepts and genesis of ordinary differential equations, Order and degree of a differential equation, Differential equations of first order and first degree, Equations in which variables are separable, Homogeneous equations, Linear differential equations and equations reducible to linear form, Exact differential equations, Integrating factor, First order higher degree equations solvable for x, y and p. Clairaut's form and singular solutions. Picard's method of successive approximations and the statement of Picard's theorem for the existence and uniqueness of the solutions of the first order differential equations.

UNIT-II

Second Order Linear Differential Equations: Statement of existence and uniqueness theorem for linear differential equations, General theory of linear differential equations of second order with variable coefficients, Solutions of homogeneous linear ordinary differential equations of second order with constant coefficients, Transformations of the equation by changing the dependent/independent variable, Method of variation of parameters and method of undetermined coefficients, Reduction of order, Coupled linear differential equations with constant coefficients.

UNIT-III

Higher Order Linear Differential Equations: Principle of superposition for a homogeneous linear differential equation, Linearly dependent and linearly independent solutions on an interval, Wronskian and its properties, Concept of a general solution of a linear differential equation, Linear homogeneous and non-homogeneous equations of higher order with constant coefficients, Euler-Cauchy equation, Method of variation of parameters and method of undetermined coefficients, Inverse operator method.

UNIT-IV

Series Solutions of Differential Equations: Power series method, Legendre's equation, Legendre polynomials, Rodrigue's formula, Orthogonality of Legendre polynomials, Frobenius method, Bessel's equation, Bessel functions and their properties, Recurrence relations.

Applications: Orthogonal trajectories, Acceleration-velocity model, Minimum velocity of escape from Earth's gravitational field, Growth and decay models, Malthusian and logistic population models, Radioactive decay, Drug assimilation into the blood of a single cold pill; Free and forced mechanical oscillations of a spring suspended vertically carrying a mass at its lowest tip, Phenomena of resonance, LCR circuits, Lotka-Volterra population model.

Reference Books/Materials

1. Belinda Barnes & Glenn Robert Fulford (2015). Mathematical Modelling with Case Studies**:** A Differential Equation Approach Using Maple and MATLAB (2nd edition). Chapman & Hall/CRC Press, Taylor & Francis.
2. H. I. Freedman (1980). Deterministic Mathematical Models in Population Ecology. Marcel Dekker Inc.
3. Erwin Kreyszig (2011). Advanced Engineering Mathematics (10th edition). Wiley.
4. Daniel A. Murray (2003). Introductory Course in Differential Equations, Orient.
5. B. Rai, D. P. Choudhury & H. I. Freedman (2013). A Course in Ordinary Differential Equations (2nd edition). Narosa.
6. Shepley L. Ross (2007). Differential Equations (3rd edition), Wiley India.
7. George F. Simmons (2017). Differential Equations with Applications and Historical Notes (3rd edition). CRC Press. Taylor & Francis.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand the genesis of ordinary differential equations.	**PO3**
CO2	Learn various techniques of getting exact solutions of solvable first order differential equations and linear differential equations of higher order.	**PO2**
CO3	Know Picard's method of obtaining successive approximations of solutions of first order differential equations, passing through a given point in the plane and Power series method for higher order linear equations, especially in cases when there is no method available to	**PO4**

	solve such equations.	
CO4	Grasp the concept of a general solution of a linear differential equation of an arbitrary order and also learn a few methods to obtain the general solution of such equations.	**PO5**
CO5	Analyze mathematical models using first order differential equations to solve application problems such as circuits, mixture problems, population modeling, orthogonal trajectories, and slope fields.	**PO1**
CO6	Formulate mathematical models in the form of ordinary differential equations to suggest possible solutions of the day-to-day problems arising in physical, chemical and biological disciplines.	**PO6**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Ethics	Analysis
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETMA144A	Differential Equations & Optimization Techniques	3	3	3	2	2	2							2		3

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA164A	Web Technologies Lab	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Basics of HTML				
Co-requisites	--				

Course Objectives

1. To understand best technologies for solving web client/server problems
2. analyze and design real time web applications
3. use Java script for dynamic effects and to validate form input entry
4. Analyze to Use appropriate client-side or Server-side applications

Course Outcomes

On completion of this course, the students will be able to

CO1. Analyze a web page and identify its elements and attributes. ·

CO2.Create web pages using XHTML and Cascading Style Sheets. ·

CO3.Build dynamic web pages using JavaScript (Client side programming). ·

CO4. Create XML documents and Schemas.

Catalog Description

This course is an introduction to Web site development and the technologies behind it. Students will learn how to design and develop Web pages using current technologies and tools. Topics covered will include the World Wide Web, HTML, Cascading Style Sheets (CSS) and XML.

List of Experiments (Indicative)

1	Write HTML/Java scripts to display your CV in Web Browser	**2 lab hours**
2	Creation and annotation of static web pages using any HTML editor.	**2 lab hours**
3	Write a program to use XML and JavaScript for creation of your homepage.	**2 lab hours**
4	Write a program in XML for creation of DTD which specifies a particular set of rules.	**4 lab hours**

5	Create a Stylesheet in CSS/XSL and display the document in Web Browser	**4 lab hours**
6	Create a Registration Form with Table	**3 lab hours**
7	CSS : Inline Style , Internal Style ,and External Style Sheets	**3 lab hours**
8	JavaScript & HTML: · Use user defined function to get array of values and sort them in ascending order · Demonstrate String and Math Object's predefined methods · Demonstrate Array Objects and Date Object's predefined methods · Exception Handling · Calendar Creation : Display all month · Event Handling · Validation of registration form · Open a Window from the current window · Change color of background at each click of button or refresh of a page · Display calendar for the month and year selected from combo box ·OnMouseover event	**10 lab hours**
9	XML · Create any catalog · Display the catalog created using CSS or XS	**4 lab hours**

Modes of Evaluation: Quiz/Oral practical oral exam/presentation/projects/Practical Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Projects/ etc.	End Term Exam
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Analyze a web page and identify its elements and attributes. ·	**PO1**
CO2	Create web pages using XHTML and Cascading Style Sheets. ·	**PO4**

CO3	Build dynamic web pages using JavaScript (Client side programming). ·	**PO5**
CO4	Create XML documents and Schemas	**PO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCA164A	WEB TECHNOLOGIES LAB	2			3	3								3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

Semester III

ETCS217A	**Data Structures**	L	T	P	C
Version 1.0		4	0	0	4
Pre-requisites/Exposure	Basics of Computer Programming				
Co-requisites	--				

Course Objectives

1. To be able to compute the efficiency of algorithms in terms of time and space complexities.

2. To understand concepts of searching and sorting algorithms.
3. Using various data structures viz. stacks, queues, linked list, trees and graphs to develop efficient algorithms through efficient representation of data and operations that can be applied.
4. To enable them to develop algorithms for solving problem by applying concepts of data structures.

Course Outcomes

On completion of this course, the students will be able to:
CO1. Analyze the algorithms to determine the time and computation complexity and justify the correctness.
C02. Implement a given Search problem (Linear Search and Binary Search).
CO3. Write algorithms concerning various data structures like Stack, Queue, Linked list,Graph search and traversal techniques and analyze the same to determine the time and computation complexity.
CO4. Write an algorithm for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap sort and compare their performance in term of Space and time complexity.

Catalog Description

This course imparts the basic concepts of data structures and algorithms. It enables them to write algorithms for solving problems with the help of fundamental data structures. The course of data structures help organizing the data in variety of ways to solve the problem efficiently. The course introduces the basic concepts about stacks, queues, lists, trees and graphs. It also discusses about daily problems like searching and sorting techniques

Course Content

Unit I: 8 lecture hours

Introduction to Data Structures: Definition of data structures and abstract data types, Static and Dynamic implementations, Examples and real life applications; Arrays**:** ordered lists, representation of arrays, sparse matrices, polynomial arithmetic

Running time: Analysis of Algorithms and their complexities: Time Complexities, Big – Oh - notation, Running Times, Best Case, Worst Case, Average Case, Factors depends on running time, Introduction to Recursion, Divide and Conquer Algorithm, Time & Space Tradeoff.

Unit II: 12 lecture hours

The Stacks: ADT Stack and its operation, Array based implementation of stacks, Linked List based implementation of stacks, Examples: Infix, postfix, prefix representation, Conversions, Applications, Algorithms and their complexities

Queues and Lists: ADT Queue and its operation, Array based implementation of linear Queues, Circular implementation of Queues, Linked Lists: Singly linked lists: Representation of linked lists in memory, Traversing, Searching, Insertion into, Deletion from linked list Linked List implementation

of Queues and Stacks Lists, Straight / circular implementation of doubly linked Queues / Lists, Priority Queues, Applications, Algorithms and their complexities

Unit III: 12 lecture hours

Trees: Basic Terminology, Binary Trees and their representation, expression evaluation, Complete Binary trees, Extended binary trees, traversing binary trees, Searching, Insertion and Deletion in binary search trees (with and without recursion), AVL trees, Threaded trees, B+ trees, algorithms and their analysis.

Graphs: Terminology and Representations, Graphs & Multigraphs, Directed Graphs, Sequential representation of graphs, Adjacency matrices, Transversal Connected Component and Spanning trees, Shortest path, algorithms and their analysis.

Unit IV: 8 lecture hours

Sorting Algorithms: Introduction, Sorting by exchange, selection sort, insertion sort, Bubble sort, Straight selection sort, Efficiency of above algorithms, Shell sort, Performance of shell sort, Merge sort, Merging of sorted arrays& Algorithms; Quick sort Algorithm analysis, heap sort: Heap Construction, Heap sort, bottom – up, Top – down Heap sort approach;

Searching Algorithms: Straight Sequential Search, Binary Search (recursive & non–recursive Algorithm

Text Books

1. E. Horowitz and S. Sahani, "Fundamentals of Data Structures", Galgotia Book source Pvt. Ltd.
2. R. L. Kruse, B. P. Leung, C. L. Tondo, "Data Structures and program design in C", PHI

Reference Books/Materials

1. Schaum's outline series, "Data Structure", McGraw Hills.
2. Y. Langsamet. al., "Data Structures using C and C++", PHI.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Analyze the algorithms to determine the time and computation complexity	**PO1**
CO2	Implement a given Search problem (Linear Search and Binary Search).	**PO4**
CO3	Write algorithms concerning various data structures	**PO5**
CO4	Write an algorithm for internal and external sorting	**PO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCS217A	Data Structures	2	2		3	3								3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETEC 210A	Digital Electronics	L	T	P	C
Version 1.0		4	0	0	4
Pre-requisites/Exposure					
Co-requisites	--				

Course Objectives

1. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
2. To understand number representation and conversion between different representation in digital electronic circuits.
3. To analyze logic processes and implement logical operations using combinational logic circuits.
4. To understand characteristics of memory and their classification.
5. To understand concepts of sequential circuits and to analyze sequential systems in terms of state machines.

Course Outcomes

On completion of this course, the students will be able to

CO1. Create the appropriate truth table from a description of a combinational logic function.
CO2. Create a gate-level implementation of a combinational logic function described by a truth table using and/or/not gates, multiplexers or ROMs, and analyse its timing behaviour.
CO3. Create a state transition diagram from a description of a sequential logic function and then convert the diagram into an implementation of a finite-state machine with the appropriate combinational and sequential components.
CO4. Describe the operation and timing constraints for latches and registers.
CO5. Draw a circuit diagram for a sequential logic circuit and analyse its timing properties (input setup and hold times, minimum clock period, output propagation delays).
CO6. Evaluate combinational and sequential logic designs using various metrics: switching speed, throughput/latency, gate count and area, energy dissipation and power.

Catalogue Description

This course helps the student to develop a digital logic and apply it to solve real life problems and will able to analyze, design and implement combinational logic circuits and sequential logic circuits.

Course Contents

Unit I: **10 lecture hours**

UNIT – I

Number Systems and Codes: Review of number systems, BCD codes and arithmetic, Gray code, self-complimenting codes, Error detection and correction principles.

Digital Circuits: Switching algebra & simplification of Boolean expressions. De Morgan's Theorem. Implementations of Boolean expressions using logic gates

Unit II: **10 lecture hours**

Combinational Logic Design: Combinational circuit analysis and synthesis, Techniques for minimization of Boolean functions such as Karnaugh map, VEM and Quine-Mc Cluskey methods. Design of arithmetic circuits, code convertors, multiplexers, demultiplexers, encoders, decoders & comparators. Parity generators and checker.

Introduction to Sequential Logic: Need for sequential circuits, Binary cell, Latches and flip-flops. RS, JK, Master-Slave JK, D & T flip flops.

Unit III: **10 lecture hours**

Synchronous Sequential Circuit Design: Fundamentals of Synchronous sequential circuits, Classification of synchronous machines, Analysis of Synchronous Sequential circuits, Design of Synchronous and Asynchronous Counters, Shift registers & Ring counters, Analysis and design of Finite State Machines. Timing issues in synchronous circuits.

Logic Families**:** Performance metrics of logic gates, Basic Transistor-Transistor Logic and CMOS logic.

Unit IV: **10 lecture hours**

Asynchronous Sequential Circuits: Fundamentals of Asynchronous Sequential circuits. Analysis and design of Asynchronous Sequential circuits. Pulse mode and Fundamental-mode Circuits. Cycles, Races and Hazards in asynchronous circuits.

Text Books

1. William I. Fletcher, ―An Engineering approach to Digital Design‖, Prentice Hall of India
2. C.H.Roth, ―Fundamentals of Logic Design, Thomson
3. Morris Mano, "Digital Design", PHI, 2nd Ed.

Reference Books/Materials

1. J. Nagrath, "Electronics, Analog & Digital", PHI.
2. B. S. Nai, "Digital Electronics and Logic Design", PHI.
3. Balabanian and Carlson, "Digital Logic Design Principles", Wiley Pub.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Create the appropriate truth table from a description of a combinational logic function.	**PO1**
CO2	Create a gate-level implementation of a combinational logic function described by a truth table using and/or/not gates, multiplexers or ROMs, and analyze its timing behavior.	**PO2**
CO3	Create a state transition diagram from a description of a sequential logic function and then convert the diagram into an implementation of a finite-state machine with the appropriate combinational and sequential components.	**PO3**
CO4	Describe the operation and timing constraints for latches and registers.	**PO4**
CO5	Draw a circuit diagram for a sequential logic circuit and analyze its timing properties (input setup and hold times, minimum clock period, output propagation delays).	**PO5**
CO6	Evaluate combinational and sequential logic designs using various metrics: switching speed, throughput/latency, gate count and area, energy dissipation and power.	**PO3**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Employability	Ethics and Behaviour	Knowledge
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

ETEC210A	Digital Electronics	2	2	3	3	3								2		3

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS211A	**Operating Systems**	L	T	P	C
Version 1.0		4	0	0	4
Pre-requisites/Exposure	Computer Organization & Architecture				
Co-requisites	--				

Course Objectives

1. To learn the mechanisms of OS to handle processes and threads and their communication.
2. To learn the mechanisms involved in memory management in contemporary OS
3. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
4. To know the components and management aspects of concurrency management
5. To learn to implement simple OS mechanisms

Course Outcomes

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

CO1. Create processes and threads.
CO2. Develop algorithms for process scheduling for a given specification of CPU utilization, throughput, Turnaround Time, Waiting Time, Response Time.
CO3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
CO4. Design and implement file management system.
CO5. For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

Catalog Description

This course will provide an introduction to the internal operation of modern operating systems. In particular, the course will cover processes and threads, mutual exclusion, CPU scheduling, deadlock, memory management, and file systems.

Course Content

Unit I: **6 lecture hours**

Introduction: Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, System Calls, Structure of an OS-Layered, Monolithic, Microkernel Operating Systems, Concept of Virtual Machine. Case study on UNIX and WINDOWS Operating System.

Unit II: **12 lecture hours**

Processes: Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching

Thread: Definition, Various states, Benefits of threads, Types of threads, Concept of multithreads,

Process Scheduling: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time;

Scheduling algorithms: Pre-emptive and Non-preemptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

Unit III: **12 lecture hours**

Memory Management: Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), Not recently used (NRU) and Least Recently used (LRU).

File Management: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free- space management (bit vector, linked list, grouping), directory implementation (linear list, hash table), efficiency and performance.

Unit IV: **10 lecture hours**

Process-Synchronization & Deadlocks: Inter-process Communication: Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson's Solution, The Producer\ Consumer Problem, Semaphores, Event Counters, Monitors, Message Passing, Classical IPC Problems: Reader's & Writer Problem, Dinning Philosopher Problem etc. Definition of

Deadlocks, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker's algorithm, Deadlock detection and Recovery.

I/O Systems: I/O devices, Device controllers, Direct memory access Principles of I/O Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software, Secondary-Storage Structure: Disk structure, Disk scheduling algorithms

Text Books

1. Silbersachatz and Galvin, "Operating System Concepts", Pearson

Reference Books/Materials

1. Tannenbaum, "Operating Systems", PHI, 4th Edition.
2. William Stallings, "Operating Systems Internals and Design Principles", PHI
3. HallMadnick, J. Donovan, "Operating Systems", Tata McGraw Hill.
4. W. Tomasi, "Electronic Communication Systems" Pearson Education, 5th Edition

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Create processes and threads	**PO1**
CO2	Develop algorithms for process scheduling for a given specification of CPU utilization, throughput, Turnaround Time, Waiting Time, Response Time.	**PO2**
CO3	For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.	**PO4**
CO4	Design and implement file management system.	**PO3**
CO5	For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device	**PO5**

	abstraction by performing operations for synchronization between CPU and I/O controllers.	

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCS211 A	Operating Systems	2	2	3	2	3								3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS 323A	**Java Programming**	L	T	P	C
Version 1.0		4	0	0	4
Pre-requisites/Exposure	NIL				
Co-requisites	--				

Course Objectives

1. Explain the concepts of object oriented paradigms to solve problems.
2. Appraise the concept of reusable software components using inheritance, packages and interfaces
3. Create scalable applications that can robustly handle errors and exceptions in runtime applications
4. Designing applications using pre-built frameworks.

Course Outcomes

On completion of this course, the students will be able to

CO1. Learn the syntax of Java Programming Language and implement applications using it.
CO2. Recognize features of object-oriented design such as encapsulation, polymorphism inheritance and composition of systems based on object identity.
CO3. Articulate re-usable programming components using Abstract Class, Interfaces and other permitted ways in packages.
CO4. Apply access control mechanism to safeguard the data and functions that can be applied by the object.
CO5. Understand multithreading and evaluate exception handing to create new applications.
CO6. Design GUI applications using pre-built frameworks available in Java.

Catalog Description

Java's unique architecture enables programmers to develop applications that can run across multiple platforms seamlessly and reliably. In this hands-on course, students gain extensive experience with Java and its object-oriented features. Students learn to create robust console and GUI applications and store and retrieve data from relational databases.

Course Content

Unit I: **12 lecture hours**

Introduction to Java: Introduction to Java: Importance and features of Java, Keywords, constants, variables and Data Types, Operators and Expressions, Decision Making, Branching and Looping: if..else, switch,?: operator, while, do, for statements, labeled loops, jump statements: break, continue return. Introducing classes, objects and methods: defining a class, adding variables and methods, creating objects, constructors, class inheritance.

Unit II: **9 lecture hours**

Arrays and Strings: Creating an array, one and two dimensional arrays, string array and methods, Classes: String and String Buffer classes, Wrapper classes: Basics types, using super, Multilevel hierarchy, abstract and final classes, Object class, Packages and interfaces, Access protection, Extending Interfaces, packages.

Unit III: **9 lecture hours**

Exceptional Handling: Fundamentals exception types, uncaught exceptions, throw, throw, final, built in exception, creating your own exceptions, Multithreaded Programming: Fundamentals, Java thread model: priorities, synchronization, messaging, thread classes, Run able interface, inter thread Communication, suspending, resuming and stopping threads.

Unit IV: **15 lecture hours**

Input/output Programming: Basics Streams, Byte and Character Stream, predefined streams, Reading and writing from console and files. Using Standard Java Packages (Lang, util, io, net).

Event Handling: Different Mechanism, the Delegation Event Model, Event Classes, Event Listener Interfaces, Adapter and Inner Classes.

Text Books

1. Cay S. Horstmann, "Core Java Volume – I Fundamentals", Pearson.

Reference Books/Materials

1. Herbert Schildt, "Java – The Complete Reference", Oracle Press.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Learn to the syntax of Java Programming Language and implement applications in it.	PO2
CO2	Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance and composition of systems based on object identity.	PO3
CO3	Articulate re-usable programming components using Abstract Class, Interfaces and other permitted ways in packages.	PO5
CO4	Apply access control mechanism to safeguard the data and functions that can be applied by the object	PO8
CO5	Understand multithreading and evaluate exception handing to create new applications.	PO1
CO6	Design GUI applications using pre-built frameworks available in Java.	PO9

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCS321A	Java Programming	2	3	3		2			2	3				3		

1=weakly mapped
2= moderately mapped;
3=strongly mapped

ETCS257A	**Data Structures Lab**	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Basics of Computer Programming				
Co-requisites	--				

Course Objectives

1. To be able to compute the efficiency of algorithms in terms of time and space complexities.
2. To understand concepts of searching and sorting algorithms.
3. Using various data structures viz. stacks, queues, linked list, trees and graphs to develop efficient algorithms through efficient representation of data and operations that can be applied.
4. To enable them to develop algorithms for solving problem by applying concepts of data structures.

Course Outcomes

On completion of this course, the students will be able to

CO1. Analyze the algorithms to determine the time and computation complexity and justify the correctness.
CO2. Implement a given Search problem (Linear Search and Binary Search).
CO3. Write algorithms concerning various data structures like Stack, Queue, Linked list, Graph search and traversal techniques and analyze the same to determine the time and computation complexity.
CO4. Write an algorithm for Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap sort and compare their performance in term of Space and time complexity.

Catalog Description

This course complements ETCS 217A. It enables them to write algorithms for solving problems with the help of fundamental data structures. The list of experiments helps organizing the data in variety of ways using data structures and to solve the given problem efficiently. It also discusses about daily problems like searching and sorting techniques.

List of Experiments (Indicative)

1	Write a program for multiplication and transpose of array.	2 lab hours
2	Write a program to compute the transpose of a sparse matrix	2 lab hours
3	Write a program to implement push and pop operation in Stack.	2 lab hours
4	Write a program to convert a Infix notation to post fix notation using stacks	2 lab hours
5	Write a program to evaluate postfix notation using stacks	2 lab hours
6	Write a program to implement a linear queue	2 lab hours
7	Write a program for swapping two numbers using call by value and call by reference strategies.	2 lab hours
8	Write a program to insert and delete a node in linked list. The number of nodes to inserted and deleted should be governed by user.	3 lab hours
9	Write a program to implement a linear search arrays and linked list.	2 lab hours
10	Using iteration and recursion concepts write programs for finding the element in the array using the Binary search method.	2 lab hours
11	Write the programs to implement bubble sort.	2 lab hours

12	Write a program using iteration and recursion concepts for quick sort.	2 lab hours
13	Write a program to implement merge sort.	2 lab hours
14	Write a program to simulate various tree traversal techniques.	3 lab hours
15	Write a program to simulate various BFS and DFS.	4 lab hours

Modes of Evaluation: Quiz/Oral practical oral exam/presentation/projects/Practical Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Analyze the algorithms to determine the time and computation complexity	**PO1**
CO2	Implement a given Search problem (Linear Search and Binary Search).	**PO4**
CO3	Write algorithms concerning various data structures	**PO5**
CO4	Write an algorithm for internal and external sorting	**PO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCS257A	Data Structures Lab	2	2		3	3								3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS361A	**Java Programming Lab**	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Basics of Computer Programming				
Co-requisites	--				

Course Objectives

1. Explain the concepts of object oriented paradigms to solve problems.
2. Appraise the concept of reusable software components using inheritance, packages and interfaces
3. Create scalable applications that can robustly handle errors and exceptions in runtime applications
4. Designing applications using pre-built frameworks.

Course Outcomes

On completion of this course, the students will be able to

CO1. Learn to the syntax of Java Programming Language and implement applications in it.

CO2. Recognize features of object-oriented design such as encapsulation, polymorphism inheritance and composition of systems based on object identity.
CO3. Articulate re-usable programming components using Abstract Class, Interfaces and other permitted ways in packages.
CO4. Apply access control mechanism to safeguard the data and functions that can be applied by the object.
CO5. Understand multithreading and evaluate exception handing to create new applications.
CO6. Design GUI applications using pre-built frameworks available in Java.

Catalog Description

This course complements ETCS 323A. It enables them to write algorithms for solving problems with the help of fundamental data structures. The list of experiments help organizing the data in variety of ways using data structures and to solve the given problem efficiently. It also discusses about daily problems like searching and sorting techniques

List of Experiments (Indicative)

1	Create a java program to implement stack and queue.	**2 lab hours**
2	Write a java program to demonstrate dynamic polymorphism.	**2 lab hours**
3	Write a java program to implement various shapes using Abstract class	**2 lab hours**
4	Write a java program to demonstrate interfaces.	**2 lab hours**
5	Write a java program to show multithreaded producer and consumer application.	**2 lab hours**
6	Create a java programs that make use of all the 5 exception keywords.	**4 lab hours**
7	Convert the content of a given file into the uppercase content of the same file.	**4 lab hours**
8	Develop a scientific calculator using swings.	**4 lab hours**
9	Create a servlet that uses Cookies to store the number of times a user has visited your servlet.	**4 lab hours**
10	Create a simple java bean having bound and constrained properties.	**4 lab hours**

Modes of Evaluation: Quiz/Oral practical oral exam/presentation/projects/Practical Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Learn to the syntax of Java Programming Language and implement applications in it.	**PO2**
CO2	Recognize features of object-oriented design such as encapsulation, polymorphism, inheritance and composition of systems based on object identity.	**PO3**
CO3	Articulate re-usable programming components using Abstract Class, Interfaces and other permitted ways in packages.	**PO5**
CO4	Apply access control mechanism to safeguard the data and functions that can be applied by the object	**PO8**
CO5	Understand multithreading and evaluate exception handing to create new applications.	**PO1**
CO6	Design GUI applications using pre-built frameworks available in Java.	**PO9**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCS361A	Java Programming Lab	2	3	3		2			2	3				3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS 255A	Operating Systems Lab	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Computer Organization & Architecture				
Co-requisites	--				

Course Objectives

1. To learn the mechanisms of OS to handle processes and threads and their communication.
2. To learn the mechanisms involved in memory management in contemporary OS
3. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
4. To know the components and management aspects of concurrency management
5. To learn to implement simple OS mechanisms

Course Outcomes

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

CO1. Create processes and threads.
CO2. Develop algorithms for process scheduling for a given specification of CPU utilization, throughput, Turnaround Time, Waiting Time, Response Time.
CO3. For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.
CO4. Design and implement file management system.
CO5. For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.

Catalog Description

Based on theory subject **ETCS 211A**, the following experiments are to be performed. It enables them to write algorithms for solving problems with the help of fundamental operating systems.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	**10**	**10**	**20**	**10**	**50**

List of Experiments (Indicative)

1	Write a C program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time. a) FCFS b) SJF c) Round Robin (pre-emptive) d) Priority	**4 lab hours**
2	Write a C program to simulate multi-level queue scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories – system processes and user processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue.	**2 lab hours**
3	Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time.	**4 lab hours**
4	Write a C program to simulate the following file allocation strategies. a) Sequential b) Indexed c) Linked	**4 lab hours**
5	Write a C program to simulate the MVT and MFT memory management techniques.	**4 lab hours**
6	Write a C program to simulate the following contiguous memory allocation techniques a) Worst-fit b) Best-fit c) First-fit	**2 lab hours**
7	Write a C program to simulate paging technique of memory management	**4 lab hours**
8	Write a C program to simulate the following file organization techniques a) Single level directory b) Two level directory c) Hierarchical	**4 lab hours**
9	Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance.	**4 lab hours**
10	Write a C program to simulate page replacement algorithms a) FIFO b) LRU c) LFU	**2 lab hours**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Create processes and threads	**PO1**
CO2	Develop algorithms for process scheduling for a given specification of CPU utilization, throughput, Turnaround Time, Waiting Time, Response Time.	**PO2**
CO3	For a given specification of memory organization develop the techniques for optimally allocating memory to processes by increasing memory utilization and for improving the access time.	**PO4**
CO4	Design and implement file management system.	**PO3**
CO5	For a given I/O devices and OS (specify) develop the I/O management functions in OS as part of a uniform device abstraction by performing operations for synchronization between CPU and I/O controllers.	**PO5**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3

ETCS255A	Operating Systems Lab	2	2	3	2	3								3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

Semester IV

ETCS222A	**Computer Organization and Architecture**	L	T	P	C
Version 1.0		3	1	-	4
Pre-requisites/Exposure	Basics of Microprocessor Systems				
Co-requisites	-				

Course Objectives

1. How Computer Systems work & the basic principles?
2. Instruction Level Architecture and Instruction Execution
3. The current state of art in memory system design
4. How I/O devices are accessed and its principles?
5. To provide the knowledge on Instruction Level Parallelism
6. To impart the knowledge on micro programming
7. Concepts of advanced pipelining techniques.

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the concepts of microprocessors, their principles and practices.

CO2. Write efficient programs in assembly language of the 8086 family of microprocessors.

CO3. Organize a modern computer system and be able to relate it to real examples.

CO4. Develop the programs in assembly language for 80286, 80386 and MIPS processors in real and protected modes.

CO5. Implement embedded applications using Emulator.

Catalog Description

Computer architecture is the science and art of selecting and interconnecting hardware components to create a computer that meets functional, performance, and cost goals. Computer organization defines the constituent parts of the system, how they are interconnected, and how they interoperate in order to implement the architectural specification. In this course, you will learn the basics of hardware components from basic gates to memory and I/O devices, instruction set architectures and assembly language, and designs to improve performance.

Course Content

Unit I: **12 lecture hours**

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU–registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs.

Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look- ahead adder, etc. multiplication – shift-andadd, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

Unit II: **10 lecture hours**

Introduction to x86 architecture.

CPU control unit design: hardwired and micro-programmed design approaches, Case study – design of a simple hypothetical CPU.

Memory system design: semiconductor memory technologies, memory organization.

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers–program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes–role of interrupts in process state transitions, I/O device interfaces – SCII, USB

Unit III: **8 lecture hours**

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards.

Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency.

Unit IV: **10 lecture hours**

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Text Books

1. “Computer Organization and Design: The Hardware/Software Interface”, 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

2. “Computer Organization and Embedded Systems”, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Reference Books/Materials

1. “Computer Organization and Design: The Hardware/Software Interface”, 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.

2. “Computer Organization and Embedded Systems”, 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Understand the concepts of microprocessors, their principles and practices.	PO2
CO2	Write efficient programs in assembly language of the 8086 family of microprocessors.	PO3
CO3	Organize a modern computer system and be able to relate it to real examples.	PO4
CO4	Develop the programs in assembly language for 80286, 80386 and MIPS processors in real and protected modes.	PO9
CO5	Implement embedded applications using Emulator.	PO5

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCS 222A	Computer Organization and Architecture		2	3	3	2				3				3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS307A	**Database Management Systems**	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure	Basics of Data Base				
Co-requisites	--				

Course Objectives

1. To understand the different issues involved in the design and implementation of a database system.
2. To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
3. To understand and use data manipulation language to query, update, and manage a database.
4. To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.
5. To design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS.

6. For a given query write relational algebra expressions for that query and optimize the developed expression.

Course Outcomes

On completion of this course, the students will be able to

CO1. Independently understand basic database technology.

CO2.Describe the fundamental elements of relational database management systems

CO3. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.

CO4.Design ER-models to represent simple database application scenarios

CO5. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.

CO6.Improve the database design by normalization.

CO7. Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.

CO8. Students will be able to work in a group on the design, and implementation of a database system project.

Catalog Description

Database Management Systems (DBMS) are vital components of modern information systems. Database applications are pervasive and range in size from small in-memory databases to terra bytes or even larger in various applications domains. The course focuses on the fundamentals of knowledge base and relational database management systems, and the current developments in database theory and their practice. The course reviews topics such as conceptual data modelling, relational data model, relational query languages, relational database design and transaction processing and current technologies.

Course Content

Unit I: **12 lecture hours**

Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML). Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

Unit II: **8 lecture hours**

Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server. Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design. Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

Unit III: **12 lecture hours**

Storage strategies: Indices, B-trees, hashing, Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery

Unit IV: **8 lecture hours**

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection. Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

Text Books

1."Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

2. "Principles of Database and Knowledge – Base Systems", Vol 1 by J.D. Ullman, Computer Science Press.

Reference Books/Materials

1. "Fundamentals of Database Systems", R. Elmasri and S. Navathe, Pearson Education

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Independently understand basic database technology.	PO2

CO2	Describe the fundamental elements of relational database management systems	**PO3**
CO3	Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.	**PO4**
CO4	Design ER-models to represent simple database application scenarios	**PO5**
CO5	Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.	**PO4**
CO6	Improve the database design by normalization.	**PO4**
CO7	Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.	**PO9**
CO8	Students will be able to work in a group on the design, and implementation of a database system project.	**PSO1**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCS307A	Database Management Systems		2	3	3	3				3				3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA 326A	Enterprise Computing in Java	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure	Java Programming				
Co-requisites	HTML				

Course Objectives

The objective of this course is to provide a foundation for the students to J2EE technology and advanced server-side programming with Servlet, Java Server Page, Socket Programming and Database Connectivity.

Course Outcomes

On completion of this course, the students will be able to

CO1. Design and Implement GUI based application using Swings

CO2. Implement basic networking based application using sockets

CO3. Able to apply database operations using J2EE .

CO4. Design web-based applications using Servlets and Java Server Page.

Catalog Description

It is imperious that programmers should be able to learn, practice and perfect the art and science of developing more advance and commercial software's. This course covers Java enabling technologies (based on Java Enterprise Edition) for developing and running portable, robust, scalable, reliable and secure server-side applications. Large organizations such as Multinational Corporation, educational institutes, hospitals, and government organizations have special requirements in terms of computing including operating systems, protocols, and network architecture.

Course Content

Unit I: **10 lecture hours**

Design of User Interfaces: Swing, Japplet, Icons and Labels, Text Fields, Buttons, Jbutton Class, CheckBox, Radio Buttons, The Container, Panel, Windows, and Frame Classes, Combo Box, Tabbed Panes, ScrollPanes, Trees, Tables, Custom Rendering of Jlist Cells

Unit II: **12 lecture hours**

Socket Programming: Connecting to a server, implementing a server, Sending E-mail, Making URL connections, Advance Socket Programming.

JDBC: JDBC Fundamentals, Establishing Connectivity and working with connection interface, working with statements, Creating and Executing SQL statements, working with Result Set Object & Result Set Meta Data.

Unit III: **10 lecture hours**

Servlets: Introduction to Servlets, Life cycle of Servlets, Creating, Compiling and running Servlets, Reading the Servlets Parameters, Reading Initialization parameter, Packages- javax.servlet Package, Handling HTTP Request and Response (GET / POST Request), Cookies and Session Tracking.

Unit IV: **9 lecture hours**

JSP: JSP Architecture, JSP Access Mode, JSP Syntax Basic (Directions, Declarations, Expression, Scriplets and Comments, JSP Implicit Object, Object Scope, Synchronization Issue, Session Management.

Text Book

1. Gary Cornell and Horstmann Cay S., "Core Java, Vol I and Vol II", Sun Microsystems Press.
2. Herbert Schildt, "Java: The Complete Reference", McGraw-Hill.

Reference Books/Materials

1. Philip Hanna, "JSP: The Complete Reference", McGraw-Hill.

2. Deital and Deital, "Java How to Program", Prentice Hall.

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Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Design and Implement GUI based application using Swings	PO5
CO2	Implement basic networking based application using sockets.	PO1, PO4
CO3	Able to apply database operations using J2EE	PO3, PO9
CO4	Design web-based applications using Servlets and JavaServer Page.	PO11, PO12

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCS326A	Enterprise Computing In Java	2		3	2	3				2		2	2	3	3	

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA324A	**.Net Framework**	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure	Knowledge of C and C++				
Co-requisites	--				

Course Objectives

1. To provide a consistent object-oriented programming environment whether object code is stored and executed locally, executed locally but Internet-distributed, or executed remotely.
2. To provide a code-execution environment that minimizes software deployment and versioning conflicts.
3. To provide a code-execution environment that guarantees safe execution of code, including code created by an unknown or semi-trusted third party.
4. To provide a code-execution environment that eliminates the performance problems of scripted or interpreted environments.

5. To make the developer experience consistent across widely varying types of applications, such as Windows-based applications and Web-based applications.

Course Outcomes

On completion of this course, the students will be able to

CO1. Introduction to the .NET framework.

CO2. Students will describe the basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE)

CO3. Learn about ASP. NET controls and create applications using Microsoft Windows Forms

CO4. Students will create applications that use ADO. NET

CO5. To understand and be able to explain Security in the .NET framework and Deployment in the .NET.

Catalog Description

In this course we will learn the fundamentals of the .Net framework, gaining a deeper understanding of web application standards, tools and techniques.

Course Content

Unit I: 10 lecture hours

Introduction to .NET technologies: Features of .NET, .NET Framework, CLR, MSIL, .NET class library, .NET Languages, CTS, assemblies, manifest, and metadata, what is ASP.NET? Difference between ASP and ASP.NET.

Unit II: 10 lecture hours

Controls in ASP.NET: Overview of Dynamic Web page, Understanding ASP.NET Controls, Applications, Web servers, Installation of IIS. Web forms, web form controls -server controls, client controls. Adding controls to a web form, Buttons, Text Box, Labels, Checkbox, Radio Buttons, List Box. Adding controls at runtime. Running a web Application, creating a multiform web project. Form Validation: Client-side validation, server-Side validation, validation Controls: Required Field Comparison Range. Calendar control, Ad rotator Control, Internet Explorer Control.

Unit III: 10 lecture hours

Overview of ADO.NET and XML: What is ADO.NET, from ADO to ADO. NET. ADO.NET architecture, Accessing Data using Data Adapters and Datasets, using Command & Data Reader, binding data to data bind Controls, displaying data in data grid, XML basics, attributes, fundamental XML classes: Document, text writer, text reader. XML validations, XML in ADO.NET, XML Data Document.

Unit IV: **10 lecture hours**

ASP.NET Applications: Creating, tracking, caching, error handling, Securing ASP.NET applications - form based applications, window-based application, State management- View state, Session state, Application state, Building ASP.NET web services, working with ASP.NET applications, creating custom controls.

Text Books

1. Stephen Walther, "ASP.NET Unleashed", SAMS publications

Reference Books/Materials

1. ASP.NET, WroxPublications
2. ASP.NET and VB.NET, Wrox Publication
3. ASP.NET and C#.NET, Wrox Publication.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Introduction to the .NET framework.	PO1, PO2

CO2	Students will describe the basic structure of a Visual Basic/C#.NET project and use main features of the integrated development environment (IDE)	**PO3**
CO3	Learn about ASP. NET controls and create applications using Microsoft Windows Forms	**PO5**
CO4	Students will create applications that use ADO. NET	**PO5**
CO5	To understand and be able to explain Security in the .NET framework and Deployment in the .NET	**PO4**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Employability	Ethics and Behavior	Knowledge
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCA324A	.Net Framework	2	2	3	2	3								3		2

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA228A	**Mobile Application Development**	L	T	P	C
Version 1.0		4	0	0	4
Pre-requisites/Exposure	Java Programming				
Co-requisites	--				

Course Objectives

This course facilitates classroom and laboratory learning, letting students develop competence and confidence in android programming and understand the entire Android Apps Development Cycle, as well as it would also enable the students to independently create new Android Applications.

Course Outcomes

On completion of this course, the students will be able to

CO1. Explain functioning of different mobile technology

CO2. Demonstrate Android activities life cycle

CO3. Execute operations on GUI objects

CO4. Perform Event driven programming

.CO5 Apply various techniques on working with menu

Catalog Description

The Android operating system (OS) has the highest market share worldwide on mobile devices. Android held 71.93 percent of the market.It is therefore necessary for students to know that how to build mobile apps for android operating system. This course covers the necessary concepts which are required to understand mobile communication and to develop Android Applications.

Course Content

Unit I: **12 lecture hours**

Introduction to Mobile Computing: Concept of Mobile Communication, Different generations of wireless technology, Basics of cell, cluster and frequency reuse concept, Noise and its effects on mobile, Understanding GSM and CDMA, Basics of GSM architecture and services like voice call, SMS, MMS, LBS, VAS, Different modes used for Mobile Communication, Architecture of Mobile Computing(3 tier), Design considerations for mobile computing, Characteristics of Mobile Communication, Application of Mobile Communication, Security Concern Related to Mobile Computing, Middleware and Gateway required for mobile Computing, Making Existing Application Mobile Enable, Mobile IP, Basic Mobile Computing Protocol

Unit II: **9 lecture hours**

Introduction to Android Programming: Overview of Android, Android Internals, Android for mobile apps development, Environment setup for Android apps Development, Framework -Android-SDK, Emulators - Android AVD, Android Emulation – Creation and set up, First Android Application

Unit III: **9 lecture hours**

Android Activities and GUI Design: Activity Lifecycle of Android, Design criteria for Android Application : Hardware Design Consideration, Design Demands For Android application, Intent, Activity, Activity Lifecycle and Manifest, Creating Application and new Activities, Simple UI - Layouts and Layout properties: Introduction to Android UI Design, Introducing Layouts, Fragments, Push Button , Text / Labels , Edit Text, Toggle Button , Padding

Unit IV: **10 lecture hours**

Background Tasks: Customizations: Floating hints and Auto Complete, Create Custom Layout, Create Custom Toast.

Save Data Locally on Phone: Save User Preferences, Save data using text files, Making use of Async Task class: Intro to Async Task Loader, load In Background() , Async Task Loader callbacks , Benefits of loaders . Connecting to data by SQL Lite Database: Overview of SQLite, Open Helper Android class, Querying (dev) Searching (user) databases, Best practices for using databases in Android, Best practices for testing your database

Permissions: The permissions model, Libraries: Using libraries, Widgets: What are widgets?, When to use them and how to implement them, Publishing your App: Different ways to monetize your app, Making and publishing APKs: Guidelines for publishing in Google Play , Make and sign the APK, Beta test your app , Publish your app to Google Play

Text Books

1. Reto Meier, "Professional Android Application Development", Wiley India Pvt Ltd
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
3. Sayed Y Hashimi and SatyaKomatineni, "Pro Android", Wiley India Pvt Ltd

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Explain functioning of different mobile technology	PO1
CO2	Demonstrate Android Activities Life Cycles	PO2
CO3	Execute Operations on GUI objects	PO3, PO5
CO4	Perform Event Driven Programming	PO5, PO9
CO5	Apply various techniques on working with menu	PO6, PO11, PO12

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCA228A	Mobile Application Development	1	2	3		3	2			2		2	2	3	2	

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS326A	**Enterprise Computing in Java**	L	T	P	C
Version 1.0		4	0	0	4
Pre-requisites/Exposure	Java Programming				
Co-requisites	HTML				

Course Objectives

The objective of this course is to provide a foundation forthe students to J2EE technology and advanced server-side programming withServlet, JavaServer Page, Socket Programming and Database Connectivity.

Course Outcomes

On completion of this course, the students will be able to

CO1. Design and implement programs in the Java programming language that make strong use of GUI components.

CO2. Communicate between two devices using Sockets.

CO3. Perform various database related information from the front end only.

CO4. Write server-side scripts using Java Servlets and Java Server Pages

Catalog Description

This course complements enables them to write algorithms for solving problems with the help of fundamental data structures. The list of experiments covers topics like Swings, Socket Programming, Database Connectivity, Java Servlets, and Java Server pages. The aim is to develop and run portable, robust, scalable, reliable and secure server-side applications.

List of Experiments (Indicative)

1	Create a java program to implement stack and queue.	**2 lab hours**
2	Write a java program to demonstrate dynamic polymorphism.	**2 lab hours**
3	Write a java program to implement various shapes using Abstract class	**2 lab hours**
4	Write a java program to demonstrate interfaces.	**2 lab hours**
5	Write a java program to show multithreaded producer and consumer application.	**2 lab hours**
6	Create a java programs that make use of all the 5 exception keywords.	**4 lab hours**
7	Convert the content of a given file into the uppercase content of the same file.	**4 lab hours**
8	Develop a scientific calculator using swings.	**4 lab hours**
9	Create a servlet that uses Cookies to store the number of times a user has visited your servlet.	**4 lab hours**
10	Create a simple java bean having bound and constrained properties.	**4 lab hours**

Modes of Evaluation: Quiz/Oral practical oral exam/presentation/projects/Practical Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Projects/ etc.	End Term Exam
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Design and implement programs in the Java programming language that make strong use of GUI components.	**PO5**
CO2	Communicate between two devices using Sockets .	**PO1, PO4**
CO3	Perform various database related information from the front end only.	**PO3, PO9**
CO4	Write server-side scripts using Java Servlets and Java Server Pages	**PO11, PO12**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCS366A	Enterprise Computing in Java Lab	2		3	2	3				2		2	2	3	3	

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS355A	Database Management Systems Lab	L	T	P	C
Version 1.0		-	-	2	1
Pre-requisites/Exposure	--				
Co-requisites	--				

Course Objectives

1. To explain basic database concepts, applications, data models, schemas and instances.
2. To demonstrate the use of constraints and relational algebra operations.
3. To facilitate students in Database design.
4. To familiarize issues of concurrency control and transaction management.

Course Outcomes

On completion of this course, the students will be able to:-
CO1. Apply the basic concepts of Database Systems and Applications.
CO2. Use the basics of SQL and construct queries using SQL in database creation and interaction.
CO3. Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.
CO4. Analyze and Select storage and recovery techniques of database system.

Catalog Description

This course introduces the core principles and techniques required in the design and implementation of database systems. This introductory application-oriented course covers the relational database systems RDBMS - the predominant system for business scientific and engineering applications at present. It includes Entity-Relational model, Normalization, Relational model, Relational algebra, and data access queries as well as an introduction to SQL. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery. It also provides students with theoretical knowledge and practical skills in the use of databases and database management systems in information technology applications.

Course Content

List of Experiments

S.No	Experiment	No of Hours
1	Design a Database and create required tables. For e.g. Bank, College Database	4
2	Apply the constraints like Primary Key, Foreign key, NOT NULL to the tables.	2
3	Write a SQL statement for implementing ALTER, UPDATE and DELETE.	2

4	Write the queries to implement the joins.	4
5	Write the queries for implementing the following functions: MAX (), MIN (), AVG (), COUNT ().	2
6	Write the queries to implement the concept of Integrity constrains	4
7	Write the queries to create the views.	2
8	Perform the queries for triggers.	4
9	Perform the following operation for demonstrating the insertion, updating and deletion using the referential integrity constraints.	2
10	Do some more practice based on your class work.	2

Text Books

1. "Database System Concepts", 6th Edition by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw-Hill.

Reference Books/Materials

1. "Principles of Database and Knowledge – Base Systems", Vol 1 by J.D. Ullman, Computer Science Press.
2. "Fundamentals of Database Systems", R. Elmasri and S. Navathe, Pearson Education.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Apply the basic concepts of Database Systems and Applications	PO5
CO2	Use the basics of SQL and construct queries using SQL in database creation and interaction	PO3
CO3	Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system	PO3
CO4	Analyze and Select storage and recovery techniques of database system.	PO2

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCS 355A	Database Management Systems Lab		3	3		2								3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS264A	**Mobile Application Development Lab**	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Java Programming				
Co-requisites	--				

Course Objectives

1. This course facilitates classroom and laboratory learning, letting students develop competence and confidence in android programming and understand the entire Android Apps Development Cycle, as well as it would also enable the students to independently create new Android Applications.

Course Outcomes

On completion of this course, the students will be able to

CO1. Design User Interface and develop activity for Android App.

CO2. Use Intent, Broadcast receivers and Internet services in Android App.

CO3. Design and implement Database Application and Content providers.

CO4. Use multimedia, camera and Location based services in Android App

Catalog Description

This course complements ETCA228A. The course acquaints the students with various features of Android programming. The aim of the course is to organizing the data in variety of ways using data structures and solve the given problem efficiently. Java is primary language for developing applications.

List of Experiments (Indicative)

1	Getting Started with Android Development.	**2 lab hours**
2	Activities and Views: Android Manifest.xml, Activity Class, Basic View Components: Layouts and Buttons	**2 lab hours**
3	Navigation with Data: Working with Intent, Sharing Data between Activities, Application Class.	**4 lab hours**
4	Android Resources: String Resources, Loading Strings in XML, Loading Strings in Code, the Resource Values Folder	**2 lab hours**
5	Drawables - Image Basics, Drawable Folders and Qualifiers, Dimensions, Image Padding, The ImageButton Widget	**2 lab hours**
6	Lists Implementing an Android List, ListView, ListActivity, Empty Lists, ListAdapter, Sorting the Adapter, Overriding ArrayAdapter, List Interaction	**4 lab hours**
7	Dialogs, New and Old: AlertDialog, Custom Dialog, Support Library, Fragments, DialogFragment.	**2 lab hours**
8	Menus: Options Menu, Modifying an Options Menu, Context Menu	**3 lab hours**
9	Saving Data with Shared Preferences: Shared Preferences, Getting	**4 lab hours**

	Started with Shared Preferences, Preference Activity	
10	Saving Data with a Database: Setting Up SQLite, Creating a Helper , using the Helper, Cursor and Cursor Adapater	**2 lab hours**
11	Threading with AsyncTasks: Threading in Android, AsyncTask, Tracking Progress	**2 lab hours**
12	Styles and Themes: Introduction to Styling: Defining Styles, Defining Themes, Style Inheritance, Direct Theme References	**2 lab hours**
13	Develop an Android based Project	**4 lab hours**

Modes of Evaluation: Quiz/Oral practical oral exam/presentation/projects/Practical Examination

Examination Scheme:

Components	**Quiz**	**Attendance**	**Mid Term Exam**	**Presentation/ Assignment/ etc.**	**End Term Exam**
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Design User Interface and develop activity for Android App.	**PO1; PO5**
CO2	Use Intent, Broadcast receivers and Internet services in Android App.	**PO2; PO3**
CO3	Design and implement Database Application and Content providers.	**PO3; PO9**
CO4	Use multimedia, camera and Location based services in Android App	**PO11; PO12**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCS264A	Mobile Application Development Lab	2	2	3		3				2		3	2	3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA364A	**Net Framework Lab**	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Knowledge of C and C++				
Co-requisites	--				

Course Objectives

1. To learn the basics of .net Frame work and C# language
2. To learn C# elements and OOPS concepts
3. To learn interface and inheritance concepts in C# language
4. To learn fundamentals of window application programming and create a window application
5. To develop web applications and learn advanced features of C#

Course Outcomes

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

CO1. Introduction to the .NET framework.

CO2. Students will describe the basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE)

CO3. Learn about ASP. NET controls and create applications using Microsoft Windows Forms

CO4. Students will create applications that use ADO. NET

CO5. To understand and be able to explain Security in the .NET framework and Deployment in the .NET.

Catalog Description

Based on theory subject **ETCS 324A**, the following experiments are to be performed. It enables students to understand the concept of .net Framework and create applications.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Introduction to the .NET framework.	**PO1, PO2**
CO2	Students will describe the basic structure of a Visual Basic.NET project and use main features of the integrated development environment (IDE)	**PO3**
CO3	Learn about ASP. NET controls and create applications using Microsoft Windows Forms	**PO5**
CO4	Students will create applications that use ADO. NET	**PO5**
CO5	To understand and be able to explain Security in the .NET framework and Deployment in the .NET.	**PO4**

List of Experiments (Indicative)

1	1. Write a program using web controls to a)Factorial of a number b) Money Conversion c) Quadratic Equation d) Temperature Conversion e) Login Control	**4 lab hours**
2	Write a program for Ad rotator Control	**4 lab hours**
3	2. Write a program for Calendar control a) Display a message in calendar b) Display vacations in calendar c) Select a day in calendar control using style	**4 lab hours**
4	Write a program for Tree view control and use various operation of Tree view control	**4 lab hours**
5	Write a program to design graphical user interface and display records stored in database	**4 lab hours**
6	Write a program to insert and delete the records in database	**4 lab hours**
7	Write a program of Data binding using drop down list control	**4 lab hours**
8	Design a interactive website for admissions in university.	**4 lab hours**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Employability	Ethics and Behavior	Knowledge
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

ETCA 364A	.Net Framework lab	2	2	3	2	3						3		3		2

1=weakly mapped
2= moderately mapped
3=strongly mapped

Semester V

ETCS 417A	**Data Warehouse And Data Mining**	L	T	P	C
Version 1.0		4	0	0	4
Pre-requisites/Exposure	Basic Database concepts, Query tools				
Co-requisites	--				

Course Objectives

1. Be familiar with mathematical foundations of data mining tools.

2. Understand and implement classical models and algorithms in data warehouses and data mining

3. Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.

4. Master data mining techniques in various applications like social, scientific and environmental context.

5. Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

Course Outcomes

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

CO1. Understand the functionality of the various data mining and data warehousing component

CO2. Appreciate the strengths and limitations of various data mining and data warehousing models

CO3. Explain the analyzing techniques of various data

CO4. Describe different methodologies used in data mining and data ware housing

CO5. Compare different approaches of data ware housing and data mining with various technologies

Catalog Description

This course will introduce the concepts of data ware house and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data ware housing concepts.

Course Content

Unit I: **10 lecture hours**

Introduction: Evolution Of Data Warehousing (Historical Context), The Data Warehouse - a Brief Overview, Characteristics, Operational Database Systems and Data Warehouse(OLTP & OLAP), Data Marts, Metadata.

Principles of Data Warehousing(Architecture and Design Techniques): System Processes, Data Warehousing Components, Architecture for a Warehouse, Three-tier Data Warehouse Architecture, Steps for the design and construction of Data Warehouses, Conceptual Data Architecture, Logical Architectures, Design Techniques.

Unit II: **12 lecture hours**

Multidimensional Data Models: Types of Data and Their Uses, From Tables and Spreadsheets to Data Cubes, Identifying Facts and Dimensions, Fact Tables, Designing Fact Tables, Designing Dimension Table, Data Warehouse Schemas- STAR Schema, Snowflake Schema, OLAP, OLAP Operations**,** Hypercube**,** ROLAP, MOLAP, From Data warehousing to Data Mining, Data warehouse Usage

Unit III: **12 lecture hours**

Data Mining: Motivation, Importance, Knowledge Discovery Process (KDD), KDD and Data Mining, Data Mining vs. Query Tools, Kind of Data, Data preprocessing, Functionalities, Interesting Patterns, Classification of data mining systems, Major issues.

Unit IV: **12 lecture hours**

Classification and Prediction: Classification & Prediction, Issues Regarding Classification & Prediction, Classification by Decision Tree Induction, Bayesian Classification, Classification by Back Propagation, Classification Parameters.

Cluster Analysis: Types of Data in Cluster Analysis, Partitioning Method, Hierarchical Method, Density Based Method, Grid Based Method, Model Based Clustering Method, Outlier Analysis.

Mining Association Rules: Association Rule Mining, Market Basket Analysis, Types of Association Rules, Methods for Mining Association

Text Books

Kamber and Han, "Data Mining Concepts and Techniques", Hartcourt India P. Ltd

Reference Books/Materials

1. W. H. Inmon, "Building the operational data store", 2nd Ed., John Wiley.
2. Paul Raj Poonia, "Fundamentals of Data Warehousing", John Wiley & Sons.
3. Sam Anahony, "Data Warehousing in the real world: A practical guide for building decision support systems", John Wiley.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand the functionality of the various data mining and data warehousing component	**PO1**
CO2	Appreciate the strengths and limitations of various data mining and data warehousing models	**PO1**
CO3	Explain the analyzing techniques of various data	**PO2**
CO4	Describe different methodologies used in data mining and data ware housing	**PO2**
CO5	Compare different approaches of data ware housing and data mining with various technologies	**PO4, PO5**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Innovation and Industry Friendly	Ethics and Communication Skills
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCS417A	Data warehouse and data mining	3	3	2	3	3	1							3	3	3

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA227A	**Web Based Programming using PHP**	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure					
Co-requisites	--				

Course Objectives

1. Learn about web-servers
2. Understanding the HTTP protocol
3. Understand scripting fundamentals
4. Introduction of PHP language and deployment
5. Understanding application architectures

Course Outcomes

On completion of this course, the students will be able to

CO1. Write simple applications in PHP

CO2. Learn and utilize databases with PHP

CO3. Learn PHP advanced features

CO4. Create full-fledged web-applications and deploy them

Course Overview:

This course aims at highlighting the features of different technologies involved in Web Development. It provides a ground-up look at web-servers, scripting languages (PHP), databases and a clear understanding on how to create web applications.

Course Content

Unit I: 8 lecture hours

Introduction to web applications: HTML, Client-Side Scripting Vs Server-Side Scripting, Web Servers: Local Servers and Remote Servers, Installing Web servers, Internet Information Server (IIS) and Personal Web Server (PWS). Static website vs Dynamic website development.

Unit II: 12 lecture hours

Introduction to PHP: Start and End Tags of PHP, Data types in PHP, Variables, Constants, operators and Expressions, printing data on PHP page, Control statements – if, switch case, for, while, do while.

Arrays: Initialization of an array, Iterating through an array, Sorting arrays, Array Functions

Functions: Defining and Calling Functions, Passing by Value and passing by references, Inbuilt Functions.

Unit III: 12 lecture hours

Working with Forms: Get and Post Methods, Query strings, HTML form controls and PHP

Maintaining User State: Cookies, Sessions and Application State.

Working with Files: Opening and Closing Files, Reading and Writing to Files, Getting Information on Files, OOP's – Instantiation, Modifiers, Inheritance, Interfaces, Exceptions, Static Methods and properties, Auto load, Reflection, Type Hinting and class constant.

Unit IV: 8 lecture hours

PHP Database Connectivity: Introduction to MYSQL, creating database and other operations on database, connecting to a database, use a particular database, sending query to database, Parsing of the query results, Checking data errors. MVC overview, security, Ajax basics, PHP with Ajax

Text Books

1. RasmusLerdorf and Kevin Tatroe, “Programming PHP”, O'Reilly.

Reference Books/Materials

1. Robin Nixon, “PHP, MySQL, and JavaScript: A Step-By-Step Guide to Creating Dynamic Websites”, O’Reilly Media

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Write simple applications in PHP	**PO1**
CO2	Learn and utilize databases with PHP	**PO4**
CO3	Learn PHP advanced features	**PO5**
CO4	Create full-fledged web-applications and deploy them	**PO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues

Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCA227A	Web Based Programming using PHP	2	3		3	3										

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA365A	**Linux Environment Lab**	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	-				
Co-requisites	-				

Course Objectives

The objective of this course is to impart necessary and practical knowledge concerning basic Linux usage.

1. To implement some standard Linux utilities such as ls.cpetc
2. To write shell script programs to solve problems.
3. To learn basics of system administration

Course Outcomes

On completion of this course, the students will be able to

CO1. Understanding the basic set of commands and utilities in Linux/UNIX systems
CO2. Able to create file handling utilities by using Linux shell environment
CO3. Evaluate the concept of shell scripting programs
CO4. Obtain a foundation for System Administration

Catalog Description

This course will provide you with a basic introduction to Linuxskills The student will learn how a Linux system is organized, and will demonstrate introductory system administration tasks. The student will be able to reasons why Linux and the open source development model are so important in today's computing environment.

List of Experiments (Indicative)

1	Installing Linux Operating System	**2 lab hours**
2	**Exploring the System:** Starting Up and changing run levels, Using the man utility, Using built-in help switches for commands, Using Auto completion	**2 lab hours**
3	Using cd**,** Using pwd**,** Using mkdir**,** Using rmdir,	
4	Using Touch, Using ls**,**Using mv**,** Using cp**,** Using cat, Using Redirection**,** rm**,** Using vi	**2 lab hours**
5	Searching for files: grep, frep and similar commands	**2 lab hours**
6	Preamble, Virtual terminals**,** Setting up a basic display**,**X clients**,** Window Managers**,** Display Manager**,** xinit and startx**,** system-config-display	**2 lab hours**
7	Manually creating a new user, Manually creating a new groups, automatically creating a new user, automatically creating new groups, using sticky bits, share the file between users and groups..	**2 lab hours**
8	Installing, Querying and Uninstalling Packages, Third party tools, Building Software from Source	**2 lab hours**
9	Determining device type, Creating devices, mounting and umounting devices	**2 lab hours**
10	Different kind of shells (c shell, bash shell, korn shell and others), A simple Script, Using variables in scripts	**2 lab hours**
11	Shell Script: Using Control Structures	**4 lab hours**

Modes of Evaluation: Quiz/Oral practical oral exam/presentation/projects/Practical Examination

Examination Scheme:

Components	**Quiz**	**Attendance**	**Mid Term Exam**	**Presentation/ Assignment/ etc.**	**End Term Exam**
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understanding the basic set of commands and utilities in Linux/UNIX systems	**PO5**
CO2	Able to create file handling utilities by using Linux shell environment.	**PO6**
CO3	Evaluate the concept of shell scripting programs	**PO3**
CO4	Obtain a foundation for System Administration	**PO12**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Employability	Ethics and Behavior
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
ETCA365A	Linux Environment Lab			2		3	2						3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS304A	Computer Networks	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure	Basics of Data Structure and Algorithms				
Co-requisites	Basic Mathematics				

Course Objectives

1. Help in understanding the concepts of communication and computer networks.

Course Outcomes

On completion of this course, the students will be able to

CO1. To develop an understanding of modern network architectures from a design and performance perspective.
C02. To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
CO3. To provide an opportunity to do network programming
CO4. Explain the functions of the different layer of the OSI Protocol.
CO5. For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component

Catalog Description

Through this subject, student will be able to understand the coarse grained aspects of Data Communication. Student will understand the applications of data structures and algorithms in networks. The internals of communications will be discussed throughout the course duration.

Course Content

Unit I: 8 lecture hours

Data communication Components: Representation of data and its flow Networks , Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum

Unit II: 12 lecture hours

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

Unit III: **12 lecture hours**

Network Layer: Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

Unit IV: **8 lecture hours**

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

Text Books

1. Data Communication and Networking, 4th Edition, Behrouz A. Forouzan, McGraw-Hill.
2. Data and Computer Communication, 8th Edition, William Stallings, Pearson Prentice Hall India.

Reference Books/Materials

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	To develop an understanding of modern network architectures from a design and performance perspective.	PO2, PO12
CO2	To introduce the student to the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).	PO12
CO3	To provide an opportunity to do network programming	PO2
CO4	Explain the functions of the different layer of the OSI Protocol.	PO4, PO5

CO5	For a given requirement (small scale) of wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs) design it based on the market available component	**PO11, PO12**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCS304 A	Computer Networks		3		3	3						3	3	2	2	

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS219A	**Foundation Of Computer Systems**	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure	Some concepts from basic math – algebra, geometry, pre-calculus				
Co-requisites	--				

Course Objectives

1. Use mathematically correct terminology and notation.
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.

4. Use counterexamples.
5. Apply logical reasoning to solve a variety of problems.

Course Outcomes

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

CO1. Acquire an understanding set theory, functions, and relations.

CO2. Develop the given problem as graph networks and solve with techniques of graph theory.

CO3. Understanding the language of mathematical logic and expressing statements in terms of logic.

CO4. Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.

CO5. Gaining insight into applications of discrete mathematics to various practical problems.

Catalog Description

The course is an introduction to discrete mathematics as a foundation to work within the fields of computer science, information technologies, and software development.

Course Content

Unit I: **10 lecture hours**

Set Theory: Introduction to set theory, Set operations, Algebra of sets, Duality, Finite and Infinite sets, Classes of sets, Power Sets, Multi sets, Cartesian Product, Representation of relations, Types of relation, Equivalence relations and partitions , Partial ordering relations and lattices Function and its types, Composition of function and relations, Cardinality and inverse relations

Unit II: **12 lecture hours**

Graphs And Trees: Introduction to graphs, Directed and Undirected graphs, Homomorphic and Isomorphic graphs, Subgraphs, Cut points and Bridges, Multigraph and Weighted graph, Paths and circuits, Shortest path in weighted graphs, Eurelian path and circuits, Hamilton paths and circuits, Planar graphs, Euler's formula, Trees, Spanning trees, Binary trees and its traversals.

Unit III: **12 lecture hours**

Propositional logic: Basic operations: AND(^), OR(v), NOT(~), Truth value of a compound statement, propositions, tautologies, contradictions, Validity of Arguments

Group theory: Definition and examples of a monoid, Semigroup, Groups and rings, Homomorphism, Isomorphism and Auto morphism, Subgroups and Normal subgroups, Cyclic groups, Co-Sets, Lagrange's theorem.

Unit IV: **10 lecture hours**

Recursion and Recurrence Relation: linear recurrence relation with constant coefficients, Homogeneous solutions, Solutions, Total solution of a recurrence relation using generating functions.

Techniques Of Counting: Permutations with and without repetition, Combination.

Text Books

1. Keneth H. Rosen, "Discrete Mathematics and Its Applications", TMH.
2. C.L. Liu, "Elements of Discrete Mathematics", TMH.

Reference Books/Materials

1. Kolman, Busby & Ross, "Discrete Mathematical Structures", PHI.
2. NarsinghDeo, "Graph Theory with Application to Engineering and Computer Science", PHI.
3. J. P. Trembly& P. Manohar, "Discrete Mathematical Structures with Applications to Computer Science", McGraw Hill.
4. Vinay Kumar, "Discrete Mathematics", BPB Publications.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Acquire an understanding set theory, functions, and relations.	PO1
CO2	Develop the given problem as graph networks and solve with techniques of graph theory.	PO2
CO3	Understanding the language of mathematical logic and expressing statements in terms of logic.	PO1
CO4	Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.	PO3

CO5	Gaining insight into applications of discrete mathematics to various practical problems.	**PO3**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Employability	Ethics and Behaviour	Knowledge
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO 2	PSO3
ETCS219 A	Foundation of Computer Systems	3	3	2										2		1

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA 267A	**WEB BASED PROGRAMMING USING PHP LAB**	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure					
Co-requisites	--				

Course Objectives

1. Understand the fundamentals of web.
2. Develop basic WebPages.
3. Use different styles to the webpage elements
4. Create, modify and format the contents of webpage with CSS

5. Create dynamic., Interactive WebPages using JavaScript
6. Apply basic controls of elements with JavaScript
7. Use JavaScript to validate form entries
8. Study the server-side scripting language, PHP
9. Understand the PHP Get and Post methods working difference
10. Develop knowledge of MySQL commands
11. Use PHP to access a MySQL database.

Course Outcomes

On completion of this course, the students will be able to

CO1.Describe fundamentals of web.
CO2. Introduce the creation of static webpage using HTML.
CO3. Describe the importance of CSS in web development.
CO4. Describe the function of JavaScript as a dynamic webpage creating tool.
CO5. Distinguish PHP as a server-side programming language.
CO6. Outline the principles behind using MySQL as a backend DBMS with PHP.

Catalog Description

This course aims at highlighting the features of different technologies involved in Web Development. It provides a ground-up look at web servers, scripting languages (PHP), databases and a clear understanding on how to create web applications.

List of Experiments (Indicative)

1	WAP using Client side scripting to perform arithmetical tasks and display results.	**2 lab hours**
2	WAP in PHP to accept values from user and check the eligibility to vote, and print result on screen.	**2 lab hours**
3	WAP in PHP to display table of a given no.	**2 lab hours**
4	WAP to transfer data from one page to another using PHP. Working in forms and using get and post method.	**2 lab hours**
5	WAP to manage data and information across the pages like in shopping carts etc.	**2 lab hours**
6	WAP a program to count total numbers of hit (visitor no) on the site and also total no of users online.	**4 lab hours**
7	Make a page to store the data in file and reading the data from file.	**4 lab hours**

8	Make an application to upload image file to website and display on site. Image to be uploaded dynamically using PHP controls etc.	**4 lab hours**
9	Write SQL Commands to create database, create a table in it and store data in this table. Also write commands to search and delete the record.	**4 lab hours**
10	Write PHP code to connect to database (MySQL) , and perform following operations	**4 lab hours**

Modes of Evaluation: Quiz/Oral practical oral exam/presentation/projects/Practical Examination

Examination Scheme:

Components	**Quiz**	**Attendance**	**Mid Term Exam**	**Presentation/ Assignment/ etc.**	**End Term Exam**
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Describe fundamentals of web.	**PO2**
CO2	Introduce the creation of static webpage using HTML.	**PO3**
CO3	Describe the importance of CSS in web development.	**PO5**
CO4	Describe the function of JavaScript as a dynamic webpage creating tool.	**PO8**
CO5	Distinguish PHP as a server-side programming language.	**PO1**
CO6	Outline the principles behind using MySQL as a backend DBMS with PHP.	**PO3**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCA267A	Web Based Programming Using Php Lab	2	3	3		2			2							

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS456A	**Data Warehousing And Data Mining Lab**	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Basic Database concepts, Query tools				
Co-requisites	--				

Course Objectives

1. Be familiar with mathematical foundations of data mining tools.

2. Understand and implement classical models and algorithms in data warehouses and data mining

3. Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.

4. Master data mining techniques in various applications like social, scientific and environmental context.

5. Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

Course Outcomes

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

CO1. Able to get the acquaintance to WEKA tool

CO2. Competent to preprocess the data for mining

CO3. Proficient in generating association rules

CO4. Able to build various classification models

CO5. Able to realize clusters from the available data

Catalog Description

The main objective of this lab is to impart the knowledge on how to implement classical models and algorithms in data warehousing and data mining and to characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering. At the end, the course provides a comparison of different conceptions of data mining.

List of Experiments (Indicative)

1	Demonstration of data pre-processing on datasets	**2 lab hours**
2	To list all the categorical (or nominal) attributes and the real valued attributes	**4 lab hours**
3	Create a data classification model using decision tree	**4 lab hours**
4	Create a data classification model using Naive Bayes	**2 lab hours**
5	Create a data classification model using rule based classifies	**2 lab hours**
6	Create a data classification model using statistical classifiers.	**4 lab hours**
7	Create a data classification model using neural networks.	**4 lab hours**
8	Create a data classification model	**4 lab hours**
9	Demonstrate the working of k-means algorithm for clustering the data.	**4 lab hours**
10	Create a clustering model using hierarchical clustering algorithm.	**2 lab hours**

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Able to get **the** acquaintance to WEKA tool	**PO5**
CO2	Competent to preprocess the data for mining	**PO2**
CO3	Proficient in generating association rules	**PO4**
CO4	Able to build various classification models	**PO3**
CO5	Able to realize clusters from the available data	**PO4**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Innovation and Industry Friendly	Ethics and Communication Skills
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCS 456A	Data warehouse and data mining Lab	2	2	3	3	3								3	3	3

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA367A	Practical Training	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Completion of fourth semester				
Co-requisites	--				

Course Objectives

The course is designed so as to expose the students to industry environment and to take up on-site assignment as trainees or interns.

Course Outcomes

On completion of this course, the students will be able to

CO1. Have an exposure to industrial practices and to work in teams.
CO2. Understand the impact of engineering solutions in a global, economic, environmental and societal context.
CO3. Develop the ability to engage in research and to involve in life-long learning.
CO4. Communicate effectively and learn to be a team player.

Catalog Description

This course enables students to face the real time problems which are usually faced by working professional while working in the industry. While on this training program, students come to know about technical as well individual skills required by a professional for survival in the market .In fact, this course is about industrial implementation of the technologies. This course enable students to learn technologies on industrial level. The student will be working closely with the technical team. This course enhances student's ability to think out of the box and suggest new ways of implementing ideas in a better manner and should be able to brainstorm and come up with innovative ideas.

Course Content

Six weeks of work at industry site. Supervised by an expert at the industry.

Modes of Evaluation: Internship Report, Presentation and Project Review**:**

Components	Internship Report	Presentation/ Project Review
Weightage (%)	**50**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Have an exposure to industrial practices and to work in teams.	**PO5**
CO2	Understand the impact of engineering solutions in a global, economic, environmental and societal context	**PO7**
CO3	Develop the ability to engage in research and to involve in life-long learning	**PO3**
CO4	Communicate effectively and learn to be a team player	**PO10**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Innovation and Industry Friendly	Ethics and Communication Skills
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCA367A	Practical Training			3		3		2			3					

1=weakly mapped
2= moderately mapped
3=strongly mapped

Semester VI

ETCS314A	MOBILE COMPUTING	L	T	P	C
Version 1.0		3	0	0	3
Pre-requisites/Exposure	Advanced of Computer communication				
Co-requisites	--				

Course Objectives

1. Define mobile technologies in terms of hardware, software, and communications.
2. Utilize mobile computing nomenclature to describe and analyze existing mobile computing frameworks and architectures.
3. Evaluate the effectiveness of different mobile computing frameworks.
4. Describe how mobile technology functions to enable other computing technologies.

Course Outcomes

On completion of this course, the students will be able to

CO1. Utilize mobile computing nomenclature to describe and analyze existing mobile computing frameworks and architectures.

CO2. Evaluate the effectiveness of different mobile computing frameworks.

CO3.Describe how mobile technology functions to enable other computing technologies.

Catalog Description

This course will cover the nomenclature and implementation of mobile computing and mobile communication. Coverage mobile systems will include 2G, 2.5G, 3G, 3G+, and 4G communication systems, mobile satellite communication networks, mobile IP, mobile TCP, digital audio-video broadcasting, and mobile TV. This course will also provide a systematic explanation of mobile computing as a discrete discipline and will provide an in-depth coverage of mobile systems and devices, mobile operating systems used for application development, mobile databases, client-server computing agents, application servers, security protocols, and mobile Internet, and ad-hoc and sensor networks.

Course Content

UNIT I 12 LECTURE HOURS

Introduction to Personal Communications Services (PCS): PCS Architecture, Mobility management, Networks signaling.

Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling.

General Packet Radio Services (GPRS): GPRS Architecture, GPRS Network Nodes.

UNIT II **8 LECTURE HOURS**

Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP.

Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless markup Languages (WML).

UNIT III **12 LECTURE HOURS**

Third Generation (3G) Mobile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G.

Wireless Local Loop(WLL): Introduction to WLL Architecture, wireless Local Loop Technologies.

UNIT IV **12 LECTURE HOURS**

Global Mobile Satellite Systems: case studies of the IRIDIUM and GLOBALSTAR systems.

Wireless Enterprise Networks: Introduction to Virtual Networks, Blue tooth technology, Blue tooth Protocols.

TEXT BOOKS:

1. Yi-Bing Lin &ImrichChlamtac, "Wireless and Mobile Networks Architectures", John Wiley & Sons.

REFERENCE BOOKS:

1. Mark Ciampa, "Guide to Designing and Implementing wireless LANs", Thomson learning, Vikas Publishing House.

2. Ray Rischpater, "Wireless Web Development", Springer Publishing.

3. P.Stavronlakis, "Third Generation Mobile Telecommunication systems", Springer Publishers.

4. Hansmann, "Principles of Mobile Computing", Wiley Dreamtech.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Utilize mobile computing nomenclature to describe and analyze existing mobile computing frameworks and architectures.	**PO1, PO2**
CO2	Evaluate the effectiveness of different mobile computing frameworks.	**PO3, PO4**
CO3	Describe how mobile technology functions to enable other computing technologies.	**PO10, PSO1, PSO2**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Innovation and Industry Friendly	Ethics and Communication Skills
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCS314A	MOBILE COMPUTING	2	2	2	2						2			3	3	

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS416A	Cloud Computing	L	T	P	C
Version 1.0		3	0	0	4
Pre-requisites/Exposure	--				
Co-requisites	--				

Course Objectives

1. To provide students with the fundamentals and essentials of Cloud Computing.
2. To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real-life scenarios.
3. To enable students exploring some important cloud computing driven commercial systems and applications.
4. To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.

Course Outcomes

On completion of this course, the students will be able to

CO1. Implement a public cloud instance using a public cloud service provider.

CO2. Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

CO3. Apply the fundamental concepts in data centres to understand the trade-offs in power, efficiency and cost.

CO4. Apply trust-based security model to different layers.

CO5. Develop a risk-management strategy for moving to the Cloud.

CO6. Describe big data and use cases from selected business domains.

CO7.Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.

CO8. Analyze various cloud programming models and apply them to solve problems on the cloud.

Catalog Description

The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure. Its focus is on parallel programming techniques for cloud computing and large-scale distributed systems which form the cloud infrastructure. The topics include overview of cloud computing, cloud systems, parallel processing in the cloud, distributed storage systems,

virtualization, security in the cloud, and multicore operating systems. Students will study state-of-the-art solutions for cloud computing developed by Google, Amazon, Microsoft, Yahoo, VMWare, etc. Students will also apply what they learn in one programming assignment and one project executed over Amazon Web Services.

Course Content

Unit I: **10 lecture hours**

Introduction: Cloud computing fundamentals, the role of networks in Cloud computing, Essential characteristics of Cloud computing, Cloud deployment model, Cloud service models, Multi-tenancy, Cloud cube model, Cloud economics and benefits, Cloud types and service scalability over the cloud, challenges in cloud NIST guidelines, Cloud economics and benefits, Cloud computing platforms - IaaS: Amazon EC2, PaaS: Google App Engine, Microsoft Azure, SaaS. Open Source platforms: OpenStack.

Unit II: **6 lecture hours**

Virtualization, Server, Storage and Networking: Virtualization concepts, types, Server virtualization, Storage virtualization, Storage services, Network virtualization, service virtualization, Virtualization management, Virtualization technologies and architectures, Internals of virtual machine, Measurement and profiling of virtualized applications. Hypervisors: KVM, Xen, Hyper V, VMware hypervisors and their features.

Unit III: **10 lecture hours**

Data in Cloud Computing: Relational databases, Cloud file systems: GFS and HDFS, BigTable, HBase and Dynamo. Map Reduce and extensions: Parallel computing, the map-Reduce model, Parallel efficiency of MapReduce, Relational operations using Map-Reduce, Enterprise batch processing using MapReduce.

Cloud Security: Cloud security fundamentals, Vulnerability assessment tool for cloud, Privacy and Security in cloud. Cloud computing security architecture: General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro - architectures; Identity Management and Access control, Autonomic security, Security challenges: Virtualization security management - virtual threats, VM Security Recommendations, VM - Specific Security techniques, Secure Execution Environments and Communications in cloud.

Unit IV: **8 lecture hours**

Issues in Cloud Computing: Implementing real time application over cloud platform, Issues in Inter -cloud environments, QOS Issues in Cloud, Dependability, data migration, streaming in Cloud. Quality of Service (QoS) monitoring in a Cloud computing environment. Cloud Middleware. Mobile Cloud Computing. Inter Cloud issues. A grid of clouds, Sky computing, load balancing, resource optimization, resource dynamic reconfiguration, Monitoring in Cloud

Text Books

1. Cloud Computing, Dr. Kumar Saurabh, Wiley Publication

Reference Books/Materials

1. Cloud computing – Automated virtualized data center, VenkataJosyula, CISCO Press

2. Cloud and virtual data storage networking, Greg Schulr CRC Press

3. Handbook of Cloud Computing, BorkoFurht, Springer

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Implement a public cloud instance using a public cloud service provider.	**PO5**
CO2	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.	**PO1**
CO3	Apply the fundamental concepts in data centres to understand the trade-offs in power, efficiency and cost.	**PO4**
CO4	Apply trust-based security model to different layers.	**PO5**
CO5	Develop a risk-management strategy for moving to the Cloud.	**PO2**
CO6	Describe big data and use cases from selected business domains.	**PO3**
CO7	Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in	**PO3**

	managing infrastructure in cloud computing.	
CO8	Analyze various cloud programming models and apply them to solve problems on the cloud.	**PO9**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCS416A	Cloud Computing	2	3	3	2	3				3				3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS 202A	**Software Engineering**	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure	None				
Co-requisites	--				

Course Objectives

1. The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.

2. Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Course Outcomes

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

CO1. To learn and understand the Concepts of Software Engineering
CO2. To Learn and understand Software Development Life Cycle
CO3. To apply the project management and analysis principles to software project development.
CO4. To apply the design & testing principles to software project development.
CO5. Ability to execute tests, design test cases, use test tools, etc.
CO6. To Study about Software maintenance tools

Catalog Description

This course covers the fundamentals of software engineering, including understanding system requirements, finding appropriate engineering compromises, effective methods of design, coding, and testing, team software development, and the application of engineering tools.

Course Content

Unit I: 8 lecture hours

Introduction: Software Crisis, Software Processes & Characteristics, Software life cycle models, Waterfall, Prototype, Evolutionary and Spiral Models

Software Requirements analysis & specifications: Requirement engineering, requirement elicitation techniques, requirements analysis using DFD, Data dictionaries & ER Diagrams, Requirement documentation, Nature of SRS, Characteristics & organization of SRS.

Unit II: 12 lecture hours

Software Metrics: Software measurements: What & Why, Token Count, Size Estimation like lines of Code & Function Count, Halstead Software Science Measures, Design Metrics, Data Structure Metrics, Information Flow Metrics, Cost Estimation Models: COCOMO,COCOMO-II.

System Design: Design Concepts, design models for architecture, component, data and user interfaces; Problem Partitioning, Abstraction, Cohesiveness, Coupling, Top Down and Bottom-Up design approaches; Functional Versus Object Oriented Approach, Design Specification.

Coding: TOP-DOWN and BOTTOM-UP structure programming, Information Hiding, Programming Style, and Internal Documentation, Verification.

Unit III: 8 lecture hours

Unified Approach and Unified Modeling Language: The Unified Approach: Layered Approach to OO Software Development, UML: UML Diagrams for Structure Modeling, UML Diagrams for Behavior Modeling, UML Diagram for Implementation and deployment modeling.

Software Reliability: Importance, Hardware Reliability & Software Reliability, Failure and Faults, Reliability Models, Basic Model, Logarithmic Poisson Model, Software Quality Models, CMM & ISO 9001.

Unit IV: **12 lecture hours**

Software Testing: Testing process, Design of test cases, functional testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing, Path Testing, Data flow and mutation testing, Unit Testing, Integration and System Testing, Debugging, Alpha & Beta Testing, Testing Tools & Standards.

Software Maintenance: Management of Maintenance, Maintenance Process, Maintenance Models, Regression Testing, Reverse Engineering, Software Re-engineering, Configuration Management, Documentation.

Text Books

1. K. K. Aggarwal & Yogesh Singh, "Software Engineering", New Age International.
2. R. S. Pressman, "Software Engineering – A practitioner's approach", McGraw Hill Int. Ed.
3. W.S. Jawadekar, "Software Engineering – Principles and Practices", McGraw Hill

Reference Books/Materials

1. Stephen R. Schach, "Classical &Object Oriented Software Engineering", IRWIN, TMH.
2. James Peter, W. Pedrycz, "Software Engineering: An Engineering Approach", John Wiley & Sons.
3. I. Sommerville, "Software Engineering", Addison Wesley.
4. K. Chandrasehakhar, "Software Engineering & Quality Assurance", BPB.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	To learn and understand the Concepts of Software Engineering	**PO1**
CO2	To Learn and understand Software Development Life Cycle	**PO1**
CO3	To apply the project management and analysis principles to software project development.	**PO3, PO11**
CO4	To apply the design & testing principles to software project development.	**PO3**
CO5	Ability to execute tests, design test cases, use test tools, etc.	**PO4**
CO6	To Study about Software maintenance tools	**PO2, PO5**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCS 202A	Software Engineering	3	3	3	3	3						2		3	3	2

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS401A	Artificial Intelligence	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure	Basics of Computer Programming				
Co-requisites	--				

Course Objectives

1. To have clear understanding of the problem-solving processes.
2. To explore Search strategies ranging from blind or uninformed search to heuristic or informed search are discussed.
3. To understand real world always entails uncertainty and the concept of uncertainty is introduced.
4. To know about Probabilistic reasoning, representing knowledge under uncertainty, Bayesian Networks, Exact and approximate inference in Bayesian Networks
5. To gain idea of supervised, unsupervised and reinforcement learning is covered.
6. To introduce the students to the challenges involved in designing intelligent

Course Outcomes

On completion of this course, the students will be able to

CO1. Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.
CO2. Apply these techniques in applications which involve perception, reasoning and learning.
CO3. Explain the role of agents and how it is related to environment and the way of evaluating it and how agents can act by establishing goals.
CO4. Acquire the knowledge of real world Knowledge representation.
CO5. Analyze and design a real world problem for implementation and understand the dynamic behavior of a system.
CO6. Use different machine learning techniques to design AI machine and enveloping applications for real world problems.
CO7.Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications.

Catalog Description

The course introduces the theoretical building blocks necessary to create intelligent machines. While we may struggle to define intelligence in an absolute sense, we can agree upon multiple approaches toward creating AI; from an initial attempt at acting humanly to a broader context of acting rationally. Solving problems which are seemingly simple for humans can seem like insurmountable hurdles for machines.

Course Content

Unit I: **8 lecture hours**

Scope of AI: Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems, AI techniques-search knowledge, abstraction. Problem Solving (Blind): State space search; production systems, search space control; depthfirst, breadth-first search. Heuristic Based Search: Heuristic search, Hill climbing, best-first search, A* Algorithm, Problem Reduction, Constraint Satisfaction

Unit II: **12 lecture hours**

Knowledge Representation: Predicate Logic: Unification, Modus Ponens, Modus Tokens, Resolution in Predicate Logic, Conflict Resolution Forward Chaining, Backward Chaining, Declarative and Procedural Representation, Rule based Systems. Structured Knowledge Representation: Semantic Nets: Slots, exceptions and default frames, conceptual dependency

Unit III: **12 lecture hours**

Handling Uncertainty: Non-Monotonic Reasoning, Probabilistic reasoning: Bayesian Inference, use of uncertainty factors. Natural Language Processing: Introduction, Syntactic Processing, Semantic Processing, Pragmatic Processing.

Unit IV: **8 lecture hours**

Learning: Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets. Expert Systems: Need and justification for expert systems, knowledge acquisition, Case Studies: MYCIN, RI.

Text Books

1. Artificial Intelligence, E. Rich and K. Knight, TMH.

Reference Books/Materials

1. Artificial Intelligence, P. H. Winston,Pearson Education.
2. Introduction to AI and Expert Systems, D. W. Patterson, PHI.
3. Principles of AI, N. J. Nilsson, Narosa Publishing House

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Quiz	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Understand the various searching techniques, constraint satisfaction problem and example problems- game playing techniques.	**PO1**
CO2	Apply these techniques in applications which involve perception, reasoning and learning.	**PO4**
CO3	Explain the role of agents and how it is related to environment and the way of evaluating it and how agents can act by establishing goals.	**PO5**
CO4	Acquire the knowledge of real world Knowledge representation.	**PO2**
CO5	Analyze and design a real world problem for implementation and understand the dynamic behavior of a system.	**PO3**
CO6	Use different machine learning techniques to design AI machine and enveloping applications for real world problems.	**PO3**
CO7	Demonstrate an ability to share in discussions of AI, its current scope and limitations, and societal implications.	**PSO1**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues

Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ETCS401A	ARTIFICAL INTELLIGENCE	2	3	2	3	3								3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA 362A	**Cloud Computing Lab**	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Practical learning				
Co-requisites	--				

Course Objectives

1. Define & implement Virtualization using different types of Hypervisors
2. Describe steps to perform on demand application delivery
3. Examine the installation and configuration of Open stack cloud
4. Analyze and understand the functioning of different components involved in Amazon web services cloud platform.
5. Describe the functioning of Platform as a Service
6. Design & Synthesize Storage as a service using own Cloud

Course Outcomes

On completion of this course, the students will be able to

CO1. Implement a public cloud instance using a public cloud service provider.

CO2. Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

CO3. Apply the fundamental concepts in data centres to understand the trade-offs in power, efficiency and cost.

CO4. Apply trust-based security model to different layers.

CO5. Develop a risk-management strategy for moving to the Cloud.

CO6. Describe big data and use cases from selected business domains.

CO7. Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.

CO8. Analyze various cloud programming models and apply them to solve problems on the cloud.

Catalog Description

This course is designed to introduce the concepts of Cloud Computing as a new computing paradigm. The students will have an opportunity to explore the Cloud Computing various terminology, concepts, principles and applications. This course provides a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). A variety of real case studies and existing in market cloud- based tools will be identified and studied in order to provide students with a close overview to Cloud Computing applications.

Course Content

1	Development of applications on Google app engine.	**4 lab hours**
2	Case study of private Cloud setup through OpenStack	**4 lab hours**
3	Case study of private Cloud setup through CloudStack	**4 lab hours**
4	Case study of XEN/VMware/KVM hypervisor	**4 lab hours**
5	Case study of Amazon ec2.	**4 lab hours**

Modes of Evaluation: Quiz/Oral practical oral exam/presentation/projects/Practical Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Implement a public cloud instance using a public cloud service provider.	**PO5**

CO2	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.	**PO1**
CO3	Apply the fundamental concepts in data centres to understand the trade-offs in power, efficiency and cost.	**PO4**
CO4	Apply trust-based security model to different layers.	**PO5**
CO5	Develop a risk-management strategy for moving to the Cloud.	**PO2**
CO6	Describe big data and use cases from selected business domains.	**PO3**
CO7	Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.	**PO3**
CO8	Analyze various cloud programming models and apply them to solve problems on the cloud.	**PO9**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
ETCA362A	Cloud Computing Lab	2	3	3	2	3				3				3	

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS451A	Artificial Intelligence Lab	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Basics of Prolog/ Python				
Co-requisites	--				

Course Objectives

1. To have clear understanding of the problem-solving processes.
2. To explore Search strategies ranging from blind or uninformed search to heuristic or informed search are discussed.
3. To understand real world always entails uncertainty and the concept of uncertainty is introduced.
4. To know about Probabilistic reasoning, representing knowledge under uncertainty, Bayesian Networks, Exact and approximate inference in Bayesian Networks
5. To gain idea of supervised, unsupervised and reinforcement learning is covered.
6. To introduce the students to the challenges involved in designing intelligent

Course Outcomes

On completion of this course, the students will be able to
CO1. Demonstrate working knowledge in Prolog in order to write simple Prolog programs
CO2. Understand different types of AI agents know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms)
CO3. Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving
CO4. Know how to build simple knowledge-based systems
CO5.Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information

Catalog Description

While AI applications can be developed in any number of different languages, certain language features make programming AI applications straightforward. Prolog is structured in such a way that AI program development is supported by Prolog language features. Other languages, such as Java, support AI programming through code libraries. This course will provide students with an introduction to AI via programming features that support basic AI applications. The main of this course is make students familiar with AI programming and be able to use it in future models to implement various AI applications.

List of Experiments (Indicative)

1	Write a program to solve 8-queens problem in Prolog.	**2 lab hours**
2	Solve any problem using depth first search in Prolog.	**2 lab hours**

3	Solve any problem using best first search in Prolog.	**2 lab hours**
4	Solve 8-puzzle problem using best first search in Prolog.	**2 lab hours**
5	Solve Robot (traversal) problem using means End Analysis.	**2 lab hours**
6	Solve traveling salesman problem in Prolog.	**2 lab hours**
7	Write a Program to Implement Tic-Tac-Toe game in Prolog/python.	**2 lab hours**
8	Write a Program to Implement Water-Jug problem.	**3 lab hours**
9	Write a Program to Implement Monkey Banana Problem using Python.	**2 lab hours**
10	Write a Program to Implement N-Queens Problem.	**4 lab hours**
11	Write a Program to Implement Missionaries-Cannibals Problems.	**4 lab hours**
14	Make a minor project using AI.	**3 lab hours**
15	Study about various applications of AI.	**4 lab hours**

Modes of Evaluation: Quiz/Oral practical oral exam/presentation/projects/Practical Examination

Examination Scheme:

Components	**Quiz**	**Attendance**	**Mid Term Exam**	**Presentation/ Assignment/ etc.**	**End Term Exam**
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Demonstrate working knowledge in Prolog in order to write simple Prolog programs	**PO1**

CO2	Understand different types of AI agents know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms)	**PO4**
CO3	Understand the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving	**PO5**
CO4	Know how to build simple knowledge-based systems	**PO2**
CO5	Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.	**PSO3**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCS451A	ARTIFICIAL INTELLIGENCE LAB	2	3		3	3										3

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCS368A	**Major Project**	L	T	P	C
Version 1.0		-	-	-	6
Pre-requisites/Exposure	--				
Co-requisites	--				

The course is designed to provide an opportunity to students to demonstrate the ability to devise, select and use a range of methodologies and tools to the Chosen/Given project, applying the theoretical knowledge to a real life situation. Experiential Learning outside classroom through self-exploration, practical experience, Industry, field experience, live experience, research, design projects etc.

The learning process in the Project seeks out and focuses attention on many latent attributes, which do not surface in the normal class room situations. These experiential learning attributes through project includes Intellectual ability, Professional judgment and decision making ability, Inter-disciplinary approach, Skills for data handling, Ability in written and oral presentation, Sense of responsibility Developing professional Skills Application of theory, concepts in given industry /practical / field scenario.

Course Outcomes

On completion of this course, the students will be able to

CO1. Use applied scientific knowledge to identify and implement relevant principles of mathematics and computer science.
C02. Use the relevant tools necessary for engineering practice.
CO3. Define overall needs and constraints to solve a problem and develop/ design a prescribed engineering sub-system.
CO4. Communicate effectively and learn to be a team player.

Catalog Description

Students are expected make a project based on the latest advancements related to the parent branch of Engineering. Students may opt for an in-disciplinary project (if feasible).
The project may be a complete hardware or a combination of hardware and software under the guidance of a Supervisor from the Department. This is expected to provide a good training for the student(s) in technical aspects

Student will be continuously evaluated during the semester in form of Project Progress Seminars. At the end of the semester, assessment of the research/project work of each student will be made by the board of examiners including supervisors on the basis of a viva-voce examination and the report submitted by the student.

Course Content

The assignment to normally include:

1. Review and finalization of the Approach to the Problem relating to the assigned topic.
2. Preparing an Action Plan for conducting the investigation, including team work.
3. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment as needed.
4. Final development of product/process, testing, results, conclusions and future directions.
5. Preparing a report in the standard format for being evaluated by the Department.
6. Final project presentation before a Departmental Committee.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Use applied scientific knowledge to identify and implement relevant principles of mathematics and computer science.	**PO3**
CO2	Use the relevant tools necessary for engineering practice.	**PO5**
CO3	Define overall needs and constraints to solve a problem and develop/ design a prescribed engineering sub-system.	**PO3**
CO4	Communicate effectively and learn to be a team player.	**PO10**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCS	Major			3		2					3			3		

462A	Project															

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA328A	**MULTIMEDIA TECHNOLOGIES**	L	T	P	C
Version 1.0		3	1	0	4
Pre-requisites/Exposure	Basics of Multimedia				
Co-requisites	--				

Course Objectives

The students will be able to get an idea on:

1. identify the essential features of graphics/image data types, file formats, and colour models in images and video.
2. explain the technical details of multimedia data representations.
3. perform a comparative analysis of the major methods and algorithms for multimedia data compression.
4. explain the technical details of popular multimedia compression standards.
5. write code and develop a multimedia application using JAI and JMF.
6. explain the principles and technical details of several wired and wireless networking protocols.
7. configure and manage multimedia content delivery platforms.

Course Outcomes

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

CO1. Discuss the technical details of common multimedia data formats, protocols, and compression techniques of digital images, video and audio content.

CO2. Describe and understand the technical details of JPEG and MPEG families of standards.

CO3. Describe the principles and technical details of several wired and wireless networking protocols.

CO4. Develop simple but demonstrative multimedia applications using JAI and JMF.

CO5. Understand and describe technical aspects of popular multimedia web applications including VoD and VoIP

CO6. identify the essential issues of quality of service in multimedia networking.

Catalog Description

Multimedia Technologies is an indispensable part of modern computing environments. This course will explain the technologies underlying digital images, videos and audio contents, including various compression techniques and standards, and the issues to deliver multimedia content over the Internet. This course is designed for Professional developers who want a technical foundation for developing applications with distributed multimedia components.

Course Content

Unit I: **8 lecture hours**

Introductory Concepts: Multimedia - Definitions, Basic properties and medium types. (Temporal and non-temporal). Multimedia applications, Uses of Multimedia, Introduction to making multimedia - The Stages of project, the requirements to make good multimedia, Multimedia skills and training . Multimedia-Hardware and Software: Multimedia Hardware - Macintosh and Windows production Platforms, Hardware peripherals - Connections, Memory and storage devices, Media software - Basic tools, making instant multimedia, Multimedia software and Authoring tools, Production Standards.

Unit II: **12 lecture hours**

Multimedia building blocks Creating & Editing Media elements: Text, image, Sound, animation Analog/ digital video Data Compression: Introduction, Need, Difference of lossless / lossy compression techniques. Brief overview to different compression algorithms concern to text, audio, video and images etc.

Unit III: **12 lecture hours**

Multimedia and the Internet: History, Internet working, Connections, Internet Services, The World Wide Web, Tools for the WWW - Web Servers, Web Browsers, Web page makers and editors, Plug-Ins and Delivery Vehicles, HTML, Designing for the WWW – Working on the Web, Multimedia Applications - Media Communication, Media Consumption, Media Entertainment, Media games

Unit IV: **8 lecture hours**

Multimedia-looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Virtual Reality, Digital Camera. Assembling and delivering a Multimedia project-planning and costing Designing and Producing, content and talent, Delivering, CD-ROM: The CD family, production process, CD-i – Overview – Media Types Technology

Text Books

1. Tay Vaughan, “Multimedia: Making it work”, TMH.

Reference Books/Materials

1. Ralf Steinmetz and KlaraNaharstedt, "Multimedia: Computing, Communications Applications", Pearson

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	Discuss the technical details of common multimedia data formats, protocols, and compression techniques of digital images, video and audio content.	PO1
CO2	Describe and understand the technical details of JPEG and MPEG families of standards.	PO3
CO3	Describe the principles and technical details of several wired and wireless networking protocols.	PO5
CO4	Develop simple but demonstrative multimedia applications using JAI and JMF.	PO2, PSO3
CO5	Understand and describe technical aspects of popular multimedia web applications including VoD and VoIP	PO4
CO6	identify the essential issues of quality of service in multimedia networking.	PO6

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCA328A	MULTIMEDIA TECHNOLOGIES	2		2	3	3	2							3		3

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA370A	**MULTIMEDIA TECHNOLOGIES LAB**	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Practical learning of Multimedia				
Co-requisites	--				

Course Objectives

The students will be able to get an idea on:

1. identify the essential features of graphics/image data types, file formats, and colour models in images and video.
2. explain the technical details of multimedia data representations.
3. perform a comparative analysis of the major methods and algorithms for multimedia data compression.
4. explain the technical details of popular multimedia compression standards.
5. write code and develop a multimedia application using JAI and JMF.

6. explain the principles and technical details of several wired and wireless networking protocols.
7. configure and manage multimedia content delivery platforms.

Course Outcomes

Upon completion of the course the students will be able to:
CO1.formulate a working definition of interactive multimedia
CO2.demonstrate competence in using the authoring program HyperStudio;
CO3. demonstrate the use of animation, digitized sound, video control, and scanned images;
CO4.use basic instructional design principles in the development of stacks;
CO5.will develop conceptual maps of content and process for interactive multimedia instructional programs

Catalog Description

Multimedia is the combined use of text, graphics, sound, animation, and video. A primary objective of this workshop is to teach participants how to develop multimedia programs. Another objective is to demonstrate how still images, sound, and video can be digitized on the computer. Participants in this workshop will create their own multimedia courses using HyperStudio on the Macintosh platform. Hyper Studio is an authoring tool that allows you to develop an electronic stack of cards that contain buttons, graphics, and text. Issues concerning multimedia design and its use in education will be the focus of reading and class discussions throughout the course of the workshop.

Course Content

1	Compare different Image Compression Techniques with regards to quality and compression ratios.	**2 lab hours**
2	Study how to create simple animations.	**2 lab hours**
3	Test different audio compression formats using an audio compression tool. Classify your results on the basis of fidelity, size and error tolerance.	**2 lab hours**
4	Learning video compression: Tools, codecs, quality vs. compression and the video quality requirements suitable for different medium.	**2 lab hours**
5	Create a website for a software company which contains all the details of that company and include links to other related web pages.	**2 lab hours**
6	Deploy the webpage to a hosting space. Identify the categories of web hosting services and their characteristics.	**4 lab hours**
7	Understanding principles in designing a simple game.	**4 lab hours**

8	Any other experiments using Flash or other suitable tools.	**4 lab hours**
9	To study about animation Tool.	**4 lab hours**
10	To study about tools for website designing.	**4 lab hours**
11	To explore about Adobe Photoshop.	

Modes of Evaluation: Quiz/Oral practical oral exam/presentation/projects/Practical Examination

Examination Scheme:

Components	**Quiz**	**Attendance**	**Mid Term Exam**	**Presentation/ Projects/ etc.**	**End Term Exam**
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	formulate a working definition of interactive multimedia	**PO2**
CO2	demonstrate competence in using the authoring program Hyper Studio;	**PO3**
CO3	demonstrate the use of animation, digitized sound, video control, and scanned images;	**PO5, PSO3, PO9**
CO4	use basic instructional design principles in the development of stacks;	**PO4**
CO5	will develop conceptual maps of content and process for interactive multimedia instructional programs	**PO5**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCA370A	MULTIMEDIA TECHNOLOGIES LAB		2	3	3	3				3						3

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA330A	**Network Security & Cryptography**	L	T	P	C
Version 1.0					
Pre-requisites/Exposure	Basics of Programming Skills				
Co-requisites	Basics of Mathematics				

Course Objectives

CO1. Build a solid mathematical basis to understand foundations of cryptography and Network Security.
CO2. To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
CO3. Formally understand the notions related to security authentication and privacy.
CO4. Provide a rigorous treatment of the emerging and key subject subarea of CSE - security.
CO5. To understand various protocols for network security to protect against the threats in the networks.

Course Outcomes

On completion of this course, the students will be able to understand cryptosystem to protect data security on the internet and generate ideas to solve real life problems.

Catalog Description

This course ETCA330A will teach students to provide security of the data over the network along with research in the emerging areas of cryptography and network security. During this course, student will learn to implement various networking protocols. The course outline will include understanding to protect any network from the threats in the world.

Course Content

Unit I: **8 lecture hours**

Introduction: Plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography.

Unit II: **12 lecture hours**

Symmetric key algorithms: introduction, algorithms types and modes, DES, AES.

Asymmetric key algorithms: introduction, history of asymmetric key cryptography, RSA symmetric and asymmetrickey cryptography together, Digital signature.

Unit III: **8 lecture hours**

Internet security protocols: basic concepts, Secure Socket Layer (SSL), Transport Layer Security (TLS), SecureHyper Text Transfer protocol (SHTTP), Time Stamping Protocol (TSP), Secure Electronic Transaction (SET), SSL versus SET, Electronic Money, Email Security

Unit IV: **8 lecture hours**

User Authentication and Kerberos: Introduction, Authentication basics, Passwords, authentication tokens, certificate based authentication, biometric based authentication, Kerberos, key distribution center (KDC), Security handshake pitfalls, single sign on(SSO) approach.

Text Books

1. AtulKahate, “Cryptography and Network Security”, TMH

2. Mani Subramaniam , “Network Management Principles & Practices” AWL

Reference Books/Materials

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination
Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Build a solid mathematical basis to understand foundations of cryptography and Network Security.	**PO1, PO2**
CO2	To learn about how to maintain the Confidentiality, Integrity and Availability of a data.	**PO4**
CO3	Formally understand the notions related to security authentication and privacy.	**PO2**
CO4	Provide a rigorous treatment of the emerging and key subject subarea of CSE - security.	**PO2, PO3**
CO5	To understand various protocols for network security to protect against the threats in the networks.	**PO2, PO4**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCA 330A	Network Security & Cryptography		2	1					2				2	3		2

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA372A	**Network Security and Cryptography Lab**	L	T	P	C
Version 1.0		0	0	2	1
Pre-requisites/Exposure	Basics of Computer Programming				
Co-requisites	Basics of Mathematics				

Course Objectives

1. Explain the concepts of Network Security and Cryptography.
2. Appraise the concept of confidentiality, Integrity and Availability.
3. Create scalable applications that can robustly handle security issues of the system

Course Outcomes

On completion of this course, the students will be able to

CO1. Apply the knowledge of symmetric cryptography to implement simple ciphers

CO2. Analyze and implement public key algorithms

CO3. Use tools like sniffers, port scanners and other related tools for analyzing packets in a network.

CO4. Explore the different network reconnaissance tools to gather information about networks

Catalog Description

This course complements ETCA330A. It enables them to understand working principle behind encryption techniques. The list of experiments help to provide security in variety of ways using encryption algorithms to solve the given problem efficiently.

List of Experiments (Indicative)

1	Understanding types of Network Attacks: Case study of different types of passive and active attacks (2 each).	**2 lab hours**
2	To study Symmetric key encryption principles.	**2 lab hours**
3	Write a program to implement DES algorithm or use existing library programs to test it.	**2 lab hours**
4	Examine different techniques for authentication. Study examples of each type.	**2 lab hours**
5	Examine how PGP works.Use the tools available at gnupg.org, study the commands and use it.	**2 lab hours**
6	To study MD5 algorithm. Use existing implementations in your own code to generate and verify MD5 hashes for files.	**2 lab hours**
7	To study RSA algorithm.	**2 lab hours**
8	Study of Secure Socket Layer (SSL).	**2 lab hours**
9	To study security requirements for websites	**2 lab hours**
10	To study Wireless Network security.	**2 lab hours**
11	Examine how firewalls work.	**2 lab hours**

Modes of Evaluation: Quiz/Oral practical oral exam/presentation/projects/Practical Examination

Examination Scheme:

Components	**Quiz**	**Attendance**	**Mid Term Exam**	**Presentation/ Projects/ etc.**	**End Term Exam**
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	Apply the knowledge of symmetric cryptography to implement simple ciphers	**PO2**
CO2	Analyze and implement public key algorithms	**PO3**

CO3	Use tools like sniffers, port scanners and other related tools for analyzing packets in a network.	**PO5**
CO4	Explore the different network reconnaissance tools to gather information about networks	**PO1, PO3**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethics and Professional Issues
Course Code	Course Title	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ETCA372A	Network Security & Cryptography Lab	2	3	3		2				3				3		2

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA 332A	**Software Testing**	L	T	P	C
Version 1.0		3	1	-	4
Pre-requisites/Exposure	-				
Co-requisites	-				

Course Objectives

1. Various test processes and continuous quality improvement
2. Types of errors and fault models

3. Methods of test generation from requirements
4. Behaviour modelling using UML: Finite state machines (FSM)
5. Test generation from FSM models
6. Input space modelling using combinatorial designs
7. Combinatorial test generation
8. Test adequacy assessment using: control flow, data flow, and program mutations
9. The use of various test tools
10. Application of software testing techniques in commercial environments

Course Outcomes

On completion of this course, the students will be able to

CO1. List a range of different software testing techniques and strategies and be able to apply specific(automated) unit testing method to the projects.

CO2. Distinguish characteristics of structural testing methods.

CO3. Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible.

CO4. Discuss about the functional and system testing methods.

CO5. Demonstrate various issues for object-oriented testing.

Catalog Description

This course will examine fundamental software testing and program analysis techniques. In particular, the important phases of testing will be reviewed, emphasizing the significance of each phase when testing different types of software. Students will learn the state of the art in testing technology for object-oriented, component-based, concurrent, distributed, graphical-user interface, and web software. In addition, closely related concepts such as mutation testing and program analysis (e.g., program-flow and data-flow analysis) will also be studied. Emerging concepts such as test-case prioritization and their impact on testing will be examined. Students will gain hands-on testing/analysis experience via a multi-phase course project. By the end of this course, students should be familiar with the state-of-the-art in software testing. Students should also be aware of the major open research problems in testing.

Course Content

Unit I: 12 lecture hours

Introduction: What is software testing and why it is so hard?, Error, Fault, Failure, Incident, Test Cases, Testing Process, Limitations of Testing, No absolute proof of correctness, Overview of Graph Theory.

Functional Testing: Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

Unit II: **10 lecture hours**

Structural Testing: Path testing, DD-Paths, Cyclomatic Complexity, Graph Metrics, Data Flow Testing, Mutation testing.

Testing Activities: Unit Testing, Levels of Testing, Integration Testing, System Testing, Debugging, Domain Testing.

Unit III: **8 lecture hours**

Reducing the number of test cases: Prioritization guidelines, Priority category, Scheme, Risk Analysis, Regression Testing, and Slice based testing

Object Oriented Testing: Issues in Object Oriented Testing, Class Testing, GUI Testing, Object Oriented Integration and System Testing.

Unit IV: **10 lecture hours**

Testing Tools: Static Testing Tools, Dynamic Testing Tools, and Characteristics of Modern Tools and Implementation with example, Advanced topics in software testing: web based testing, Client server testing, Automated test cases generation, Regular expression and FSM based testing.

Text Books:

1. William Perry, "Effective Methods for Software Testing", John Wiley & Sons.

2. CemKaner, Jack Falk, Nguyen Quoc, "Testing Computer Software", Van Nostrand Reinhold, NewYork.

Reference Books/Materials

1. Boris Beizer, "Software Testing Techniques, Second Volume", VanNostrand Reinhold, New York,.

2. Louise Tamres, "Software Testing", Pearson Education.

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz I	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	List a range of different software testing techniques and strategies and be able to apply specific(automated) unit testing method to the projects.	**PO3**
CO2	Distinguish characteristics of structural testing methods.	**PO2**
CO3	Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible.	**PO5**
CO4	Discuss about the functional and system testing methods.	**PO4**
CO5	Demonstrate various issues for object-oriented testing.	**PO4**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Project Management	Ethical and Professional Issues
Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ETCA 332A	SOFTWARE TESTING		2	3	3	3								3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA 374A	SOFTWARE TESTING LAB	L	T	P	C
Version 1.0		-	-	2	1
Pre-requisites/Exposure	-				
Co-requisites	-				

Course Objectives

1. Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.
2. Implement various test processes for quality improvement
3. Design test planning
4. Use practical knowledge of a variety of ways to test software and an understanding of some of the tradeoffs between testing techniques.

Course Outcomes

On completion of this course, the students will be able to

CO1. List a range of different software testing techniques and strategies and be able to apply specific(automated) unit testing method to the projects.

CO2. Distinguish characteristics of structural testing methods.

CO3. Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible.

CO4. Discuss about the functional and system testing methods.

CO5. Demonstrate various issues for object-oriented testing.

Catalog Description

Software Testing is an essential component of any organisation's ability to build software quality. Software Testers are, in general, not programmers. This course presents the Foundational software testing goals as laid out by the International Software Testing Qualifications Board (ISTQB) and approaches to testing software through all phases of the Software Testing Lifecycle. The course material includes – software testing standards and metrics, types of testing (black-box and white-box), test planning, analysis, test case generation, estimating test resources, test scheduling, test execution, assessing and managing risk, test prioritisation, automation strategy, defect management, test execution.

List of Experiments (Indicative)

1	Learn the procedure for Functional Testing using QTP.	2 lab hours

2	Learn to generate and run Test Scripts repeatedly for Regression Testing (Record and Play).	4 lab hours
3	Learn to check the behavior of Test Scripts for Multiple data (Parameterization).	4 lab hours
4	Learn how to do synchronization of Test Cases (Synchronization).	2 lab hours
5	Enables to add check points to Test Cases to know the current state of the object (Checkpoints).	4 lab hours
6	Learn to test the recovery mechanism for the specified scenario (Recovery Scenario Manager).	4 lab hours
7	Know to test Web application for no. of links, no. of images, load time, web buttons etc (Testing web application).	4 lab hours
8	Learn to do Manual Testing by writing own Test Cases (Identify Business Scenario's for Employee Login Form).	4 lab hours
9	Learn to write own Test cases and do Manual Testing (Independent Test cases for Students University Result System).	2 Lab hours

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	**Quiz**	**Attendance**	**Mid Term Exam**	**Presentation/ Assignment/ etc.**	**End Term Exam**
Weightage (%)	**10**	**10**	**20**	**10**	**50**

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	List a range of different software testing techniques and strategies and be able to apply specific(automated) unit testing method to the projects.	**PO3**
CO2	Distinguish characteristics of structural testing methods.	**PO2**
CO3	Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible.	**PO5**
CO4	Discuss about the functional and system testing methods.	**PO4**
CO5	Demonstrate various issues for object-oriented testing.	**PO4**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Ethics	Analysis
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCA 332A	SOFTWARE TESTING		2	3	3	3								3		

1=weakly mapped
2= moderately mapped
3=strongly mapped

ETCA 374A	**SOFTWARE TESTING LAB**	L	T	P	C
Version 1.0		-	-	2	1
Pre-requisites/Exposure	-				
Co-requisites	-				

Course Objectives

1. Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.
2. Implement various test processes for quality improvement
3. Design test planning
4. Use practical knowledge of a variety of ways to test software and an understanding of some of the tradeoffs between testing techniques.

Course Outcomes

On completion of this course, the students will be able to

CO1. List a range of different software testing techniques and strategies and be able to apply specific(automated) unit testing method to the projects.

CO2. Distinguish characteristics of structural testing methods.

CO3. Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible.

CO4. Discuss about the functional and system testing methods.

CO5. Demonstrate various issues for object-oriented testing.

Catalog Description

Software Testing is an essential component of any organisation's ability to build software quality. Software Testers are, in general, not programmers. This course presents the Foundational software testing goals as laid out by the International Software Testing Qualifications Board (ISTQB) and approaches to testing software through all phases of the Software Testing Lifecycle. The course material includes – software testing standards and metrics, types of testing (black-box and white-box), test planning, analysis, test case generation, estimating test resources, test scheduling, test execution, assessing and managing risk, test prioritisation, automation strategy, defect management, test execution.

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6	Learn to test the recovery mechanism for the specified scenario (Recovery Scenario Manager).	4 lab hours
7	Know to test Web application for no. of links, no. of images, load time, web buttons etc (Testing web application).	4 lab hours
8	Learn to do Manual Testing by writing own Test Cases (Identify Business Scenario's for Employee Login Form).	4 lab hours
9	Learn to write own Test cases and do Manual Testing (Independent Test cases for Students University Result System).	2 Lab hours

Modes of Evaluation: Quiz/Assignment/ presentation/ extempore/ Written Examination

Examination Scheme:

Components	Quiz	Attendance	Mid Term Exam	Presentation/ Assignment/ etc.	End Term Exam
Weightage (%)	10	10	20	10	50

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	List a range of different software testing techniques and strategies and be able to apply specific(automated) unit testing method to the projects.	**PO3**
CO2	Distinguish characteristics of structural testing methods.	**PO2**
CO3	Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible.	**PO5**
CO4	Discuss about the functional and system testing methods.	**PO4**
CO5	Demonstrate various issues for object-oriented testing.	**PO4**

		Engineering Knowledge	Problem analysis	Design/development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual or team work	Communication	Project management and finance	Life-long Learning	Application of Concepts	Ethics	Analysis
Course Code	Course Title	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ETCA 332A	SOFTWARE TESTING		2	3	3	3								3		

1=weakly mapped
2= moderately mapped
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