



St. PETER'S
INSTITUTE OF
HIGHER EDUCATION
AND RESEARCH

IGNITE • INSPIRE • INNOVATE

(Deemed to be University U/S 3 of the UGC Act, 1956)

REGULATIONS 2020

CURRICULUM & SYLLABI

FOR

BACHELOR OF ENGINEERING PROGRAMME
(FOUR YEARS)

COMPUTER SCIENCE AND ENGINEERING

(With effective from the Academic Year 2020-21)

VISION & MISSION OF THE DEPARTMENT

Vision

To achieve technical excellence in Computer Science and Engineering education imbued with moral values that will enable the students to meet the societal needs scientifically and ethically.

Mission

1. To impart quality education in the domain of Computer Science & Engineering at Undergraduate and Postgraduate Level.
2. To make the students to gain exposure on Networking, Operating systems, Database administration, Computer Architecture organization in order to carve a niche in IT/ITES industries by organizing cutting edge technology courses.
3. To foster entrepreneurship and innovative skills integrated with moral values, among the students to make them successful engineers.
4. To encourage quality research and Development activities that would benefit the society.

Program Educational Objectives (PEOs)

PEO1: To enable the graduates to be successful in their career in industries, academia and other related sectors associated with Computer Science and Engineering, or as entrepreneurs.

PEO2: To educate the graduates with fundamental concepts, advanced techniques and modern tools that will enable them to design, develop and deploy solutions for real world problems and build systems of varying complexity.

PEO3: To prepare the students to review the existing literature in the area of specialization, provide innovative solutions scientifically and ethically by adapting to the new technology and communicate effectively in deliberating their duties as an individual or as a team.

PROGRAM OUTCOMES (POs):

Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO1: To effectively analyze, design and develop solutions by applying fundamental and advanced concepts in the domain of computer science and engineering.

PSO2: To adapt the emerging computer science and IT enabled technologies to develop novel ideas and solutions to existing or new problems.

Contribution 1: Reasonable

2: Significant

3: Strong

St. PETER'S INSTITUTE OF HIGHER EDUCATION AND RESEARCH

**B.E. (COMPUTER SCIENCE AND ENGINEERING) PROGRAMME
REGULATIONS AND SYLLABI UNDER CHOICE BASED CREDIT SYSTEM**

(Effective from the Academic Year 2020-2021)

B.E / B. Tech. REGULATIONS (2020)

Regulations – 2020 is applicable to the students admitted to the Degree of Bachelor of Engineering (B.E.), Bachelor of Technology (B.Tech.) (Eight Semesters) programme effective from the academic year 2020-2021

1. NOMENCLATURE

- **Programme** : Refers to the Bachelor of Engineering / Technology Stream that a student has chosen for study.
- **Course** : Refers to the course (Subject) that a student would have to undergo during the study in the Institution
- **Batch** : Refers to the Starting and Completion year of a Programme of study. Eg. Batch of 2020–2024 refers to students belonging to a 4 year Degree programme admitted in 2020 and completing in 2024.
- **Department** : Each Programme of the Institution is grouped under a Department. Eg. B.E Computer Science is grouped under Departments of Computer Science and Engineering. This Department offers various Undergraduate and Postgraduate Programmes in Engineering like B.E (Computer Science and Engineering), M.E (Computer Science and Engineering).
- **Dean** : Refers to the Head of Engineering Programmes.
- **HoD** : Refers to the Head of a Department (HoD) offering various UG and PG programmes.
He/She will be the Head of all staff members and Students belonging to the Department

2. QUALIFICATION FOR ADMISSION

Qualification for admission will be as per the criterion specified by the appropriate agencies of the Government of India.

- Candidates who passed the Higher Secondary Examination with Mathematics, Physics and Chemistry conducted by the Government of Tamil Nadu or its equivalent in the relevant subjects as recognized by the Institute or any other equivalent Examination thereto and who appeared for the entrance test conducted by the University or approved institutions wherever prescribed are eligible for admission to Four Year B.E. Programme.
- Candidates who passed Three Year Diploma in Technical Education in the concerned subject conducted by the Government of Tamil Nadu are eligible for admission to the Second Year of Four Year B.E. Programme in the relevant discipline.

3. STRUCTURE OF PROGRAMME

Every Programme will have a curriculum with syllabi consisting of theory and practical such as:

Credit Distribution:

| S.No | Category | No. of Courses | Credits |
|--------------|----------------------------|----------------|------------|
| 1. | Institute Core Courses | 22 | 56 |
| 2. | Program Core Courses | 34 | 91 |
| 3. | Institute Elective Courses | 02 | 06 |
| 4. | Program Elective Courses | 06 | 18 |
| Total | | 64 | 171 |

I Semester

| S.No | Code No. | Course Title | L | T | P | Total Credits | CA | EA | Total |
|--------------|----------|----------------------------------------------|-----------|----------|----------|---------------|------------|------------|------------|
| 1 | AELT1101 | English | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | AMAT1101 | Mathematics –I | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 3 | ACYT1101 | Chemistry | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | AEET1101 | Basic Electrical and Electronics Engineering | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | AMET1101 | Engineering Graphics & Design | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| 6 | ACYL1101 | Chemistry Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 7 | AMEL1101 | Engineering Practices Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| Total | | | 13 | 1 | 1 | 20 | 280 | 420 | 700 |

II Semester

| S.No | Code No. | Course Title | L | T | P | Total Credits | CA | EA | Total |
|--------------|----------|----------------------------------------------|-----------|----------|-----------|---------------|------------|------------|------------|
| 1 | AMAT1102 | Mathematics –II | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | APHT1101 | Physics | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | ACHT1101 | Environmental Science | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | ACST1101 | Computer Programming | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | ACST1100 | Fundamentals of Computing and Communications | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | ASSL1101 | Soft Skills-I | 0 | 0 | 2 | 1 | 100 | -- | 100 |
| 7 | APHL1101 | Physics Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 8 | ACSL1101 | Computer Programming Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| Total | | | 15 | 1 | 10 | 21 | 380 | 420 | 800 |

III Semester

| S.No | Code No. | Course Title | L | T | P | Total Credits | CA | EA | Total |
|--------------|----------|-----------------------------------------------|-----------|----------|-----------|---------------|------------|------------|------------|
| 1 | AMAT2103 | Transforms and Partial Differential Equations | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | ACST2102 | Design and Analysis of Algorithms | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | ACST2103 | Object Oriented Programming | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | ACST2104 | Programming and Data Structure | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | AECT2102 | Digital System Design | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | ACSL2101 | Object Oriented Programming Lab | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 7 | ACSL2102 | Programming and Data Structure Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 8 | AECL2102 | Digital System Design Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 9 | ASSL2102 | Soft Skills-II | 0 | 0 | 2 | 1 | 100 | -- | 100 |
| Total | | | 15 | 1 | 14 | 23 | 420 | 480 | 900 |

IV Semester

| S.No | Code No. | Course Title | L | T | P | Total Credits | CA | EA | Total |
|--------------|----------|-----------------------------------------------|-----------|----------|-----------|---------------|------------|------------|-------------|
| 1 | AMAT2104 | Discrete Mathematics | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | ACST2105 | Operating Systems | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | AECT2107 | Microprocessor and Microcontroller | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | ACST2106 | Object Oriented Software Design | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | ACST2107 | Computer Organization and Architecture | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | ACSL2103 | Operating Systems Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 7 | AECL2104 | Microprocessor and Microcontroller Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 8 | ACSL2104 | Object Oriented Software Design Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 9 | ACSI2101 | Internship-I | 0 | 0 | 0 | 2 | 100 | -- | 100 |
| 10 | ASSL2103 | Soft Skills-III | 0 | 0 | 2 | 1 | 100 | -- | 100 |
| Total | | | 15 | 1 | 14 | 25 | 520 | 480 | 1000 |

V Semester

| S.No | Code No. | Course Title | L | T | P | Total Credits | CA | EA | Total |
|--------------|----------|------------------------------------------------|-----------|----------|-----------|---------------|------------|------------|-------------|
| 1 | ACST3108 | Automata Theory and Compiler Design | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | ACST3109 | Artificial Intelligence | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | ACST3110 | Computer Networks | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | ACST3111 | Database Management Systems | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | AMBT1101 | Principles of Management & Professional Ethics | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | | Program Elective –1 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 7 | ACSL3105 | Database Management Systems Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 8 | ACSL3106 | Computer Networks Lab | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 9 | ACSL3107 | Compiler Design Lab | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 10 | ASSL3104 | Soft Skills-IV | 0 | 0 | 2 | 1 | 100 | -- | 100 |
| Total | | | 18 | 0 | 14 | 25 | 460 | 540 | 1000 |

VI Semester

| S.No | Code No. | Course Title | L | T | P | Total Credits | CA | EA | Total |
|--------------|----------|-------------------------------------------|-----------|----------|-----------|---------------|------------|------------|------------|
| 1 | ACST3117 | Computer Graphics | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | ACST3118 | Internet Programming | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | ACST3119 | Mobile Application Development | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | | Program Elective – 2 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | | Institute Elective-1 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | ACSL3108 | Internet Programming Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 7 | ACSL3109 | Mobile Application Development Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 8 | ACSI3102 | Internship-II | 0 | 0 | 0 | 2 | 100 | -- | 100 |
| 9 | ASSL3105 | Soft Skills–V | 0 | 0 | 2 | 1 | 100 | -- | 100 |
| Total | | | 15 | 0 | 10 | 22 | 480 | 420 | 900 |

VII Semester

| S.No | Code No. | Course Title | L | T | P | Total Credits | CA | EA | Total |
|--------------|----------|---------------------------------------------|-----------|----------|-----------|---------------|------------|------------|------------|
| 1 | ACST4122 | Network and Information Security | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | ACST4123 | Grid and Cloud Computing | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | | Program Elective – 3 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | | Program Elective – 4 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 5 | | Institute Elective-2 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 6 | ACSL4108 | Network and Information Security Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 7 | ACSL4109 | Grid and Cloud Computing Laboratory | 0 | 0 | 4 | 2 | 40 | 60 | 100 |
| 8 | ACSP4101 | Project Phase-1 | 0 | 0 | 6 | 3 | 40 | 60 | 100 |
| Total | | | 15 | 0 | 14 | 22 | 320 | 480 | 800 |

VIII Semester

| S.No | Code No. | Course Title | L | T | P | Total Credits | CA | EA | Total |
|--------------|----------|----------------------|----------|----------|-----------|---------------|------------|------------|------------|
| 1 | | Program Elective – 5 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 2 | | Program Elective – 6 | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | ACSP4102 | Project Phase-2 | 0 | 0 | 14 | 7 | 40 | 60 | 100 |
| Total | | | 6 | 0 | 14 | 13 | 120 | 180 | 300 |

TOTAL CREDITS: 171

- (i) **Institute Core Courses (IC)** which includes General Foundation courses comprising English, Mathematics, Basic Sciences and Engineering Sciences along with Laboratories.

| Institute Core Applicable to Department of CSE | | | | |
|-------------------------------------------------------|--------------------|--------------------------------------------------|-----------------------|-----------------------|
| Sl.No. | Course Code | Course Title | No. of Courses | No. of Credits |
| 1 | AMAT1101 | Mathematics I | 1 | 4 |
| 2 | AMAT1102 | Mathematics II | 1 | 4 |
| 3 | AMAT2103 | Transforms and Partial Differential Equations | 1 | 4 |
| 4 | APHT1101 | Physics | 1 | 3 |
| 5 | APHL1101 | Physics Laboratory | 1 | 2 |
| 6 | ACYT1101 | Chemistry | 1 | 3 |
| 7 | ACYL1101 | Chemistry Laboratory | 1 | 2 |
| 8 | AELT1101 | English | 1 | 3 |
| 9 | ACHT1101 | Environmental Science | 1 | 3 |
| 10 | AMBT1101 | Principles of management and Professional Ethics | 1 | 3 |
| 11 | AMET1101 | Engineering Graphics&Design | 1 | 3 |
| 12 | AMEL1101 | Engineering Practices Laboratory | 1 | 2 |
| 13 | AEET1101 | Basic Electrical and Electronics Engineering | 1 | 3 |
| 14 | ACST1101 | Computer Programming | 1 | 3 |
| 15 | ACSL1101 | Computer Programming Laboratory | 1 | 2 |
| 16 | ACST1100 | Fundamentals of Computing and Communication | 1 | 3 |
| 17 | AMAT2104 | Discrete Mathematics | 1 | 4 |
| 18 | ASSL1101 | Soft Skills-I | 1 | 1 |
| 19 | ASSL2102 | Soft Skills-II | 1 | 1 |
| 20 | ASSL2103 | Soft Skills-III | 1 | 1 |
| 21 | ASSL3104 | Soft Skills-IV | 1 | 1 |
| 22 | ASSL3105 | Soft Skills-V | 1 | 1 |
| TOTAL | | | | 56 |

(ii) Programme Core courses (PC) belonging to the Major Programme of study.

| Programme Core Courses | | | | |
|------------------------|-------------|-----------------------------------------------|--------------|---------|
| Sl.No. | Course Code | Course Title | Prerequisite | No. of |
| | | | Courses | Credits |
| 1 | ACST2102 | Design and Analysis of Algorithms | ACST1101 | 3 |
| 2 | ACST2103 | Object Oriented Programming | ACST1101 | 3 |
| 3 | ACST2104 | Programming and Data Structures | ACST1101 | 3 |
| 4 | AECT2102 | Digital System Design | None | 3 |
| 5 | ACSL2102 | Programming and Data Structures Laboratory | ACSL1101 | 2 |
| 6 | AECL2102 | Digital System Design Laboratory | None | 2 |
| 7 | ACSL2101 | Object Oriented Programming Laboratory | ACSL1101 | 2 |
| 8 | ACST2105 | Operating Systems | None | 3 |
| 9 | AECT2107 | Microprocessor and Microcontroller | AECT2102 | 3 |
| 10 | ACST2106 | Object Oriented Software Design | ACST2103 | 3 |
| 11 | ACST2107 | Computer Organization and Architecture | AECT2102 | 3 |
| 12 | ACSL2103 | Operating Systems Laboratory | ACSL1101 | 2 |
| 13 | AECL2104 | Microprocessor and Microcontroller Laboratory | AECL2102 | 2 |
| 14 | ACSL2104 | Object Oriented Software Design Laboratory | ACST2103 | 2 |
| 15 | ACSI2101 | Internship-I | None | 2 |
| 16 | ACST3108 | Automata Theory and Compiler Design | None | 3 |
| 17 | ACST3110 | Computer Networks | None | 3 |
| 18 | ACST3111 | Database Management Systems | None | 3 |
| 19 | ACSL3105 | Database Management Systems Laboratory | None | 2 |
| 20 | ACSL3106 | Computer Networks Laboratory | ACSL1101 | 2 |
| 21 | ACSL3107 | Compiler Design Laboratory | ACSL1101 | 2 |

| | | | | |
|--------------|----------|---------------------------------------------|---------------------------|-----------|
| 22 | ACST3109 | Artificial Intelligence | None | 3 |
| 23 | ACST3117 | Computer Graphics | None | 3 |
| 24 | ACST3118 | Internet Programming | None | 3 |
| 25 | ACST3119 | Mobile Application Development | ACST3110 | 3 |
| 26 | ACSL3108 | Internet Programming Laboratory | None | 2 |
| 27 | ACSL3109 | Mobile Application Development Laboratory | ACSL3108 | 2 |
| 28 | ACSI3102 | Internship-II | None | 2 |
| 29 | ACST4122 | Network and Information Security | ACST3110 | 3 |
| 30 | ACST4123 | Grid and Cloud Computing | ACST2105 & ACST2107 | 3 |
| 31 | ACSL4108 | Network and Information Security Laboratory | ACST3110 | 2 |
| 32 | ACSL4109 | Grid and Cloud Computing Laboratory | ACSL2103 | 2 |
| 33 | ACSP4101 | Project Work - Phase 1 | None | 3 |
| 34 | ACSP4102 | Project Work - Phase 2 | None | 7 |
| TOTAL | | | | 91 |

(iii) **Programme Electives (PE)** offered by the Department related to the Major programme of study. A student should choose at least 6 courses during the programme from any Group.

Program Electives Courses (PE)

| Programme Electives | | | | |
|--------------------------------------------|--------------------|-----------------------------------------------------|-----------------------------|----------------|
| Sl.No. | Course Code | Course Title | Prerequisite Courses | Credits |
| Program Elective-I(V Semester) | | | | |
| 1 | ACST3112 | Soft Computing and its applications | None | 3 |
| 2 | ACST3113 | Introduction to Cyber Security | None | 3 |
| 3 | ACST3114 | Multi-core Architectures and Programming | ACST2107 | 3 |
| 4 | ACST3115 | Distributed Computing | None | 3 |
| 5 | AECT3114 | Embedded Systems | AECT2107 | 3 |
| Program Elective-II(VI Semester) | | | | |
| 6 | ACST3120 | Artificial Intelligence for Real-World Applications | None | 3 |
| 7 | AITT3118 | Intellectual Property Rights | None | 3 |
| 8 | AITT3116 | Service Oriented Architecture | ACST2107 | 3 |
| 9 | AITT3120 | Practical Approach to Data Mining and Analytics | ACST3111 | 3 |
| 10 | AITT3121 | Internet of Things and its Applications | None | 3 |
| Program Elective-III (VII Semester) | | | | |
| 11 | ACST4124 | Machine Learning for Real-World Applications | ACST3109 | 3 |
| 12 | ACST4123 | Information Security-Practitioners Perspective | None | 3 |
| 13 | ACST4125 | Enterprise Software Architecture And Design | ACST2106 | 3 |
| 14 | ACST4126 | Introduction to Social Network Analysis | ACST3118 | 3 |
| 15 | ACST4127 | Foundations of Nano Science and Technology | None | 3 |
| Program Elective-IV (VII Semester) | | | | |
| 16 | ACST4128 | Applications of Deep Learning and Neural Networks | ACST3109 | 3 |
| 17 | ACST4129 | Introduction to Cyber Law and Ethical Hacking | None | 3 |

| | | | | |
|--------------------------------------------|----------|-------------------------------------------------|----------|---|
| 18 | ACST4130 | Cloud Computing and Virtualization | None | 3 |
| 19 | ACST4131 | Big Data Analytics | ACST3111 | 3 |
| 20 | AECT4133 | Wireless Communication | None | 3 |
| Program Elective-V (VIII semester) | | | | |
| 21 | ACST4132 | Intelligent Game Design and Its Applications | ACST3109 | 3 |
| 22 | ACST4133 | Block Chain Technology and Its Applications | ACST4122 | 3 |
| 23 | ACST4134 | Web Services | ACST3118 | 3 |
| 24 | ACST4135 | Introduction to Decision Support Systems | ACST3109 | 3 |
| 25 | AEET4140 | Robotics Technology | AECT2107 | 3 |
| 26 | ACST4140 | Software Project Management | ACST2106 | 3 |
| Program Elective-VI (VIII semester) | | | | |
| 27 | ACST4136 | Intelligent Systems and Its Applications | ACST3109 | 3 |
| 28 | ACST4137 | Introduction to Security Assessment and Testing | ACST4122 | 3 |
| 29 | ACST4139 | Applied Cloud Computing | ACT4123 | 3 |
| 30 | AITT4135 | Usability Design of Software Applications | None | 3 |
| 31 | ACST4138 | Foundations of Adhoc and Sensor Networks | ACST3110 | 3 |
| 32 | ACST4141 | Advanced Computer Networks | ACST3110 | 3 |

(iv) **Institute Electives (IE)** comprising of Professional elective courses from respective Departments and provides the opportunity to a students to choose any course of any stream. A student should choose atleast 2 courses during the programme.

| INSTITUTE ELECTIVES | | | | |
|----------------------------|----------------|--------------------|-----------------------------------------------------|----------------|
| Sl.No | Branch | Course Code | Course Name | Credits |
| 1 | CSE | ACST3112 | Soft Computing and its applications | 3 |
| 2 | CSE | ACST3120 | Artificial Intelligence For Real World Applications | 3 |
| 3 | CSE | ACST4124 | Machine Learning For Real World Applications | 3 |
| 4 | CSE | ACST4139 | Applied Cloud Computing | 3 |
| 5 | IT | AITT3111 | Cyber Security Fundamentals | 3 |
| 6 | IT | AITT3119 | Practical Approach To Data Mining And Analytics | 3 |
| 7 | IT | AITT4129 | Big Data Analytics Tools and Applications | 3 |
| 8 | IT | AITT4130 | Foundations of Block Chain Technologies | 3 |
| 9 | ECE | AECT3117 | Electromagnetic Interference and Compatibility | 3 |
| 10 | ECE | AECT3120 | PCB Design | 3 |
| 11 | ECE | AECT3121 | Digital Design using EDA tools | 3 |
| 12 | CSE, IT | AITT3120 | Internet of Things – Overview & its Application | 3 |
| 13 | EEE | AEET3112 | Industrial Automation | 3 |
| 14 | EEE | AEET3119 | Electric Vehicle Drive System | 3 |
| 15 | EEE | AEET4140 | Robotic Systems | 3 |
| 16 | Mech | AMET4163 | Waste Management | 3 |
| 17 | Mech | AMET4164 | Computer Workstation Ergonomics | 3 |
| 18 | Mech | AMET4165 | Structure and Properties of Materials | 3 |
| 19 | Mech | AMET4166 | Total Quality Management | 3 |
| 20 | Mech | AMET4167 | Supply chain Management | 3 |
| 21 | Mech | AMET4168 | Industrial Automation | 3 |

| | | | | |
|----|--------------|----------|-------------------------------------------------------------|---|
| 22 | Civil | ACIT4130 | Disaster Management | 3 |
| 23 | Civil | ACIT4131 | Safety Engineering | 3 |
| 24 | Civil | ACIT4132 | Climate Change | 3 |
| 25 | Civil | ACIT4125 | Environmental Impact Assessment | 3 |
| 26 | BME | ABMT4128 | Trouble shooting of Medical Instruments | 3 |
| 27 | BME | ABMT3117 | Biomedical Nanotechnology | 3 |
| 28 | BME | ABMT1101 | Biology for Engineers | 3 |
| 29 | BME | ABMT4136 | Bioinformatics | 3 |
| 30 | HUM | AHMT4101 | Gender, Culture and Development studies | 3 |
| 31 | HUM | AHMT4102 | State, Nation Building and Politics | 3 |
| 32 | HUM | AHMT4103 | Work Ethics, Corporate Social responsibility and Governance | 3 |
| 33 | HUM | AHMT4104 | Indian Constitution, Essence of Indian Knowledge Tradition | 3 |
| 34 | HUM | AMBT3102 | Cognitive Science | 3 |
| 35 | MBA | AMBT3103 | Stock Trading Fundamentals | 3 |
| 36 | MBA | AMBT3104 | Industrial Economics | 3 |
| 37 | MBA | AMBT3105 | Finance for Non Finance Professionals | 3 |
| 38 | Maths | AMAT2105 | Numerical Methods | 3 |
| 39 | Maths | AMAT2106 | Statistics and Numerical Methods | 3 |
| 40 | Maths | AMAT2107 | Probability and Random Processes | 3 |
| 41 | Maths | AMAT2108 | Probability and Statistics | 3 |
| 42 | Maths | AMAT2109 | Probability and Queuing Theory | 3 |
| 43 | Maths | AMAT2110 | Resource Management Techniques | 3 |

(v) **Online courses:** The Department Board of Studies (BoS) shall approve the list of online courses offered by approved external agencies. While listing the courses, the BoS shall consider the following points:

a. The course evaluation is carried out by the same external agency

b. Equivalent grading mechanism to be arrived at by the department

A student can register up to a maximum of 24 credits (total) as online courses during the entire programme of study. These shall be treated as Elective courses (program elective or open elective). Students may be allowed to register for one course per semester starting from 5th session onwards.

(vi) **Internship Training** during the course of study.

(vii) **Project Work**

Each semester curriculum shall normally have a blend of lecture courses and practical courses.

3.1 MEDIUM OF INSTRUCTION:

The medium of instruction, examinations and project report will be in English Language throughout the Programme.

3.2 CREDIT ALLOTMENT TO COURSES

Each course is normally assigned certain number of credits as follows:

- | | | | |
|--------------------------|-------------------------------|---|-----------------------------------------------------------------------------------|
| <input type="checkbox"/> | Lecture Hours (Theory) | : | 1 credit per lecture hour per week. |
| <input type="checkbox"/> | Laboratory Hours | : | 1 credit for 2 Practical hours, 2 credits for 3 or 4 hours of practical per week. |
| <input type="checkbox"/> | Project Work Phase I | : | 3 credits for 6 hours of project work (Phase - I) per week. |
| <input type="checkbox"/> | Project Work Phase II | : | 7 credits for 14 hours of project work (Phase - II) per week. |
| <input type="checkbox"/> | Internship Training | : | 2 credits for 2 weeks of Training |

*** All the engineering course having 3 credits may have 4 lecture hours of which one hour will be dedicated for tutorial which will not be accounted as a credit.**

(v) DURATION OF THE PROGRAMME

A student is normally expected to complete the B.E./B.Tech. Programme in 8 semesters but in any case not more than 12 consecutive semesters from the time of commencement of the course (not more than 10 semesters for those who join 3rd semester under the Lateral entry system).

(vi) REQUIREMENTS FOR COMPLETION OF SEMESTER

A candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirement for completion of a semester.

- He/She secures not less than 75% of overall attendance in that semester.
- Candidates who do not have the requisite attendance for the semester will not be permitted to write the semester examinations.

(vii) VARIOUS POSITIONS IN A DEPARTMENT

6.1 **DEAN** : All Engineering Departments are headed by a Dean. The dean is responsible for all activities taking place in coordination with all department heads and all staff members belonging to them. The Dean shall act as a linkage between the HoD's, faculty members and the students. The Dean makes a review of all the academic activities of staff, students and research on a regular time interval and takes steps to improve the morale of all staff and students.

6.2 HEAD OF THE DEPARTMENT

Each department offering various UG and PG programmes is headed by a Head (HoD). The head of the department (HoD) is responsible for allotting courses to each staff member uniformly in consultation with other HoD's and School Deans. The HoD is responsible for streamlined teaching of courses to students, improvement and assessment of teaching quality within the department on a continuous basis, assessment of staff members, transparent conduct of continuous assessment examinations, interacting with parents, ensuring that all academic and non-academic activities of staff and students are monitored and steps taken for their improvement.

6.3 FACULTY ADVISOR

To help the students in planning their courses of study and to render general advice regarding either the academic programme or any other activity, the Head of the Department concerned, will assign every year, a certain number of students from the first year to a faculty member who will be called as Faculty Advisor. The set of students thus assigned will continue to be under the guidance of this Faculty Advisor till they complete the programme or replaced by the HOD. The Faculty Advisor gets information about the syllabus coverage by the staff members, requirements of the students academically and otherwise, attendance and progress of the students from the respective class counselors. The Faculty Advisor also informs the students about the academic schedule including the dates of assessments and syllabus coverage for each assessment, weightage for each assessment, their continuous assessment marks and attendance % details before the commencement of end semester examinations.

6.4 CLASS COUNSELOR

There shall be a class counselor for each class/section. The class counselor will be one among the teachers of the department. He/She will be appointed by the Head of the respective department. The responsibilities for the class counselor shall be:

- To act as the channel of communication between the HoD, dean, year coordinator, course coordinator, staff and students of the respective class.
- To collect and maintain various statistical details of students.
- To help the year coordinator in planning and conduct of the classes.
- To monitor the academic performance of the students including attendance and to inform the year coordinator.
- To take care of the students' welfare activities like industrial visits, seminars, awards etc.

6.5 COURSE COORDINATOR FOR EACH COURSE

Each theory course offered to more than one class or branch or group of branches shall have a “course coordinator”. The course coordinator will be nominated by the school dean in consultation with the respective head of the department. The course coordinator will be normally a senior staff who is one among the teachers teaching the course.

The “Course Coordinator” shall meet the teachers handling the course, as often as possible and ensure

- A common teaching methodology is followed for the course.
- The study materials are prepared by the staff members and communicated to the students periodically.
- The involvement of students in course-based projects and assignments.
- To prepare common question papers for continuous assessment exams.
- For uniform evaluation of continuous assessments answer sheets by arriving at a common scheme of evaluation.

The course coordinator is responsible for evaluating the performance of the students in the continuous assessments and end semester examinations and analyse them to find suitable methodologies for improvement in the performance. The analysis should be submitted to the HoD and school dean for suitable action.

6.6 CLASS COMMITTEE

a) Constitution of the Class Committee

For every class, a class committee shall be constituted by the Heads of Department, as given below:

| | |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Chairman | A faculty member not teaching that particular class |
| Members | <ul style="list-style-type: none"> ● Faculty of all the courses of study ● Four student members from the class to be nominated by the Head of the Department |

b) Functions of the Class Committee

- (i) The class committee shall meet thrice during the session. The first meeting will be held within two weeks from the date of commencement of the session in which the nature of the broad assessment procedure for the different courses will be discussed. The second and third meetings will be held six weeks and ten weeks respectively from the commencement of a session to meaningfully interact and express opinions and suggestions to improve the effectiveness of the teaching-learning process and analyze the performance of the students in the assessments. The chairperson of the class committee should send the minutes of the class committee meetings to the Dean through the Head of the Department, immediately after the class committee meetings.
- (ii) During the first meeting of the class committee, all the faculty members shall give their course plan to the class committee chairperson for approval and uploading into the course plan website
- (iii) Any innovation in any course plan not agreed by the class committee or the HoD will be referred to the Chairman for approval.

7 COURSE PLAN AND DELIVERY

- a) The course plan (IC, PC, PE, IE) will have details of the overview of the course, course objectives, course outcome, course teaching and learning activities and course assessment methods and policy on compensation assessment.
- b) Each course will have tailor-made assessment models viz. group tasks, assignments, reports on field visit, quizzes, open book tests, laboratory exercises, mini-projects and end-of-session summative assessment etc. The course plan will also have details of information on study materials.
- c) The number of assessments for a course shall range from 4 to 6.
- d) Every course should have a final assessment (End Semester) on the entire syllabus with 60% weightage.
- e) The course plan shall be approved by the Class Committee (CC) chairperson and the HoD of the Department offering the course.
- f) The Course plans for all courses offered by the Institute will be available in the website for reference by the faculty and students.

8 ATTENDANCE

All courses should have a common attendance policy:

- a) At least 75% attendance in each course is mandatory.
- b) A maximum of 10% shall be allowed under On Duty (OD) category.
- c) Students with less than 65% of attendance shall be prevented from writing the End Semester Examination..

9 ASSESSMENT PROCEDURE

Each **COURSE** shall have assessments done according to the Course Plan drawn by the faculty who handle the course. The assessments of a course will depend on the needed course learning outcomes.

There will be a continuous assessment examination and end semester examination for both theory and practical courses of all programmes.

(i) Theory courses

| | |
|-----------------------------|-----------|
| Continuous Assessment (CAE) | : 40Marks |
| End Semester Exams (ESE) | : 60Marks |

(ii) Practical courses

| | |
|-----------------------------|-----------|
| Continuous Assessment (CAE) | : 40Marks |
| End Semester Exams (ESE) | : 60Marks |

9.1 CONTINUOUS ASSESSMENT EXAMS (CAE)

(a) Theory Courses

- There will be a minimum of Three continuous assessment exams (Assessment Test 1,2 and a Model Exam) , for each theory course.

DISTRIBUTION OF CONTINUOUS ASSESSMENT EXAM (CAE) MARKS FOR A THEORY COURSE

| Evaluation Component | Syllabus coverage | Duration of the Exam | Max. Weightage |
|--------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------|
| CAE-1 | First 1.5 Units of the syllabus | 2 Hours | 25 Marks (20% weightage for CAE 1 & CAE 2 and 60% for Model Exam) |
| CAE-2 | Next 1.5 Units of the syllabus | 2 Hours | |
| Model Exam | Full syllabus | 3 Hours | |
| Assignment | <ul style="list-style-type: none"> • 2 written assignments for each course / • Written quiz (or) Presentation of a written Report (or) Case study / • Multiple choice Objective Type Test | | 10 Marks |
| Mini Project (or) Group Presentation | <ul style="list-style-type: none"> • Technical Project involving not more than 3 students (or) any other Group Presentation related to the course. | | 5 Marks |

The total marks secured in the assessment exams out of 100, will be converted to 40 Marks.

- The continuous assessment marks obtained by the candidate in the first appearance shall be retained, considered and valid for all subsequent attempts, till the candidate secures a pass.

(b) Practical Courses

- For practical courses, the student will be evaluated on a continuous basis for 20 Marks (which will include performing all experiments, submitting observation and record notebook in scheduled format and time), 15 marks for model exam at the end of the semester and 5 marks for attendance in the course.
- For practical courses, if a student has been absent for some practical classes or has performed poorly, then the student will have to get permission from the lab incharge and year coordinator to do the experiments, so that he/she meets all the requirements for the course and thereby allowed to appear for model and end semester exams.
- If a student has not done all the experiments assigned for that lab, before the scheduled date or has attendance percentage less than 90%, the student will not be allowed to appear for the model and end semester practical exam. Such students will have to redo the course

again by doing all the experiments in the next semester when the course is offered.

9.2 END SEMESTER EXAMINATIONS (ESE)

- The end semester examinations shall normally be conducted between October and December during the odd semesters and between March and May during the even semesters for both theory and practical courses of all programmes.
- End semester examinations will be conducted for a maximum of 100 marks. The marks secured in end semester exams will be converted to 60 marks.
- End semester practical exams will be conducted for a maximum of 50 marks.

9.3 Internship / Industrial Training

- Every student is required to undergo Industrial Visits during every semester of the Programme. HoDs shall take efforts to send the students to industrial visits in every semester.
- Every student will have to undergo Internship / Industrial training for a Minimum period of 2-3 weeks during the semester Holidays at the end of second year and Third Year.
- This could be internship in an industry approved by the Dean or Professional Enrichment courses (like attending Summer Schools, Winter Schools, Workshops) offered on Campus or in Registered Off Campus recognised Training Centres approved by the Dean for a minimum period of 3 weeks.
- A report on Training undergone by the student, duly attested by the Coordinator concerned from the industry / Organisation, in which the student has undergone training and the Head of the Department concerned, shall be submitted after the completion of training. The evaluation of report and viva voce examination can be computed as per norms for the End Semester examination.
- The evaluation of training will be made by a three member committee constituted by Head of the Department in consultation with Faculty Advisor and respective Training Coordinator. A presentation should be made by the student before the Committee, based on the Industrial Training or Professional Enrichment undergone.

9.4 PURSUING COURSES IN OTHER INDIAN INSTITUTIONS AND ABROAD

- A student can be selected, to get Professional Exposure in his/her area of Expertise in any Reputed Research Organization or Educational Institution of repute or any Universities in India and abroad.
- This is possible only with the List of Research Organizations, Educational Institutions in India and abroad approved by the Academic Council.
- The student can have the option of spending not more than three to Six months in the Final year or Pre- final year of his/her Degree. During this period, the student can do his/her Project work

or register for courses which will be approved by the Class Committee and Dean, under the Guidance of a Project Supervisor who is employed in the Organization and Co-guided by a staff member from our Institution.

- Credit Transfer can be done by the CoE on submission of certificate through the HoD and Dean within 15 days of completion of the training.
- The students who undergo training outside the Institution (either in India or Abroad) is expected to abide by all Rules and Regulations to be followed as per Indian and the respective Country Laws, and also should take care of Financial, Travel and Accommodation expenses.

9.5 NSS/ NCC/ YRC/SPORTS Training

NSS/ NCC/ YRC training is compulsory for all the Undergraduate students:

- The activities will include Practical / Field activities / Extension lectures. The activities shall be beyond classhours.
- The student participation shall be for a minimum period of 45 hours per session during the first / Second year.
- The activities will be monitored by the respective faculty in charge and the Year Coordinator.
- Grades will be awarded on the basis of participation, attendance, performance and behavior. Grades shall be entered in the mark statement as given below:

Very Good, Good, Satisfactory and Unsatisfactory

- If a student gets an unsatisfactory Grade, he/she has to repeat the above activity in the subsequent years, along with the first year students.
- The Grades awarded by the Faculty in-charge shall be entered in the Third Year (Sixth Semester) Mark Statement.
- A student who has not completed the NSS / NCC / YRC requirements in first six semesters will not be permitted to continue the B.Tech. Programme.

9.6 PROJECTWORK

- Project work has to be done by each student in the final year. The project work has been divided in to two phases (Phase - I and II). Project work Phase - I has to be done in the pre-final semester and Phase - II during the final semester.
- Permission for project work in the second year of the programme in general will be given to innovative and industry related work. Such projects will be evaluated in every session until the VIII semester. If the evaluation committee is satisfied with the progress of the project work, continuation for the project work will be given until the final assessment is made in the VIII semester. In case, there is no tangible progress in a session, such project work will be terminated and the students will have to do their project in the final year in their respective departments.
- Project work may be allotted to a single or two students as a group. In special cases, the number of students in a project group cannot exceed three, if it can be justified by the project supervisor and HoD, that the project work content is large enough.

- For project work, assessment is done on a continuous basis by 3 reviews for 50 marks and final viva voce carries 50Marks.
- There shall be three project reviews (conducted during the pre-final semester and final semester) to be conducted by a review committee. The student shall make presentation on the progress made, before the committee. The head of the department shall constitute the review committee for each branch in consultation with school dean. The members of the review committee will evaluate the progress of the project and awardmarks.

| | PROJECT REVIEWS | | | FINAL PROJECT VIVA VOCE |
|-------------------|-----------------|----|----|-------------------------|
| | 1 | 2 | 3 | |
| Max. Marks | 5 | 15 | 30 | 50 |

- The total marks obtained in the three reviews, rounded to the nearest integer is the continuous assessment marks out of 50. There shall be a final viva-voce examination at the end of final semester conducted by one internal examiner, one external examiner and the supervisorconcerned.
- A student is expected to attend all the project reviews conducted by the institution on the scheduled dates. It is mandatory for every student to attend the reviews, even if they are working on a project in an industry based outside Chennai city. It is their duty to inform the organization about the project reviews and its importance, and get permission to attend the same. If a student does not attend any of the project reviews, he / she shall not be allowed for the successive reviews and thereby not allowed to appear for the final vivavoce.
- The final project viva-voce examination shall carry 50 marks. Marks are awarded to each student of the project group based on the individual performance in the viva-voce examination. The external examiner shall be appointed by the controller of examinations. The internal and external examiner will evaluate the project for 20 Marks each. The project report shall carry a maximum of 10marks.
- The candidate is expected to submit the project report as per the guidelines of the institution on or before the last day of submission. If a candidate fails to submit the project report on or before the specified deadline, he/she can be granted an extension of time up to a maximum limit of 5 days for the submission of project work, by the head of thedepartment.
- If he/she fails to submit the project report, even beyond the extended time, then he/she is deemed to have failed in the project work and shall register for the same in the subsequent semester and re-do the project after obtaining permission from the HoD and Dean.

9.7 REVALUATION OF ANSWER PAPERS;

A candidate can apply for revaluation of his/her End semester examination answer paper in a theory course, immediately after the declaration of results, on payment of a prescribed fee along with application to the Controller of Examinations through the Head of the Department. The Controller of

Examination will arrange for the revaluation and the result will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for practical courses and for project work.

10 PASSING REQUIREMENTS

- A candidate should secure not less than 50% of total marks (**Minimum 50%** of the grand total of CAE Marks and ESE marks put together) prescribed for the courses, subject to securing a minimum of 30% marks out of maximum mark in End Semester Exams (ESE). Then he/she shall be declared to have passed in the examination.
- If a candidate fails to secure a pass in a particular course, it is mandatory that he/she shall register and reappear for the examination in that course during the next semester when examination is conducted in that course. It is mandatory that he/she should continue to register and reappear for the examination till he/she secures a pass.

11 WITHDRAWAL FROM EXAMINATIONS

- A candidate may, for valid reasons, (medically unfit / unexpected family situations) be granted permission to withdraw from appearing for the examination in any course or courses in any one of the semester examination during the entire duration of the degree programme.
- Withdrawal application shall be valid only if the candidate is otherwise normally eligible (if he/she satisfies Attendance requirements and should not be involved in Disciplinary issues or Malpractice in Exams) to write the examination and if it is made within FIVE days before the commencement of the examination in that course or courses and also recommended by the Dean through HoD.
- Notwithstanding the requirement of mandatory FIVE days notice, applications for withdrawal for special cases under extraordinary conditions will be considered based on the merit of the case.
- Withdrawal shall not be considered as an appearance for deciding the eligibility of a candidate for First Class –, First Class with Distinction and First Class.
- Withdrawal is NOT permitted for arrears examinations of the previous semesters.

12 AUTHORIZED BREAK OF STUDY

- This shall be granted by the Institution, only once during the full duration of study, for valid reasons for a maximum of one year during the entire period of study of the degree programme.
- A candidate is normally not permitted to temporarily break the period of study. However, if a candidate would like to discontinue the programme temporarily in the middle of duration of study for valid reasons (such as accident or hospitalization due to prolonged ill health), he / she shall apply through the School Dean in advance (Not later than the Reopening day of that semester) through the Head of the Department stating the reasons. He /She should also mention clearly, the Joining date and Semester for Continuation of Studies after completion of break of Study. In such cases, he/she will attend classes along with the Junior Batches. A student who availed break of study has to rejoin only in the same semester from where he/she left.

- The authorized break of study will not be counted towards the duration specified for passing all the courses for the purpose of classification only for FirstClass.
- The total period for completion of the programme shall not exceed more than 12 consecutive semesters from the time of commencement of the course (not more than 10 semesters for those who join 3rd semester under Lateral entry system) irrespective of the period of break of study in order that he / she may be eligible for the award of the degree.
- If any student is not allowed to appear for End Semester Examinations for not satisfying Academic requirements and Disciplinary reasons, (Except due to Lack of Attendance), the period spent in that semester shall NOT be considered as permitted 'Break of Study' and is NOT applicable for Authorized Break of Study.
- In extraordinary situations, a candidate may apply for additional break of study not exceeding another one Semester by paying prescribed fee for break of study. Such extended break of study shall be counted for the purpose of classification of First Class Degree.
- If the candidate has not reported back to the department, even after the extended Break of Study, the name of the candidate shall be deleted permanently from the institution enrolment. Such candidates are not entitled to seek readmission under any circumstances.

13 AWARD OF DEGREE

All assessments of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain number of points, will be awarded as per the range of total marks (out of 100) obtained by the candidate in each course as detailed below:

RANGE OF MARKS FOR GRADES

| Range of Marks | Letter Grade | Grade Points (GP) |
|---------------------------|--------------|-------------------|
| 90 -100 | O | 10 |
| 80 – 89 | A | 9 |
| 70 – 79 | B | 8 |
| 60 – 69 | C | 7 |
| 50 – 59 | D | 6 |
| 00-49 (Reappear) | RA | 0 |
| ABSENT | AAA | 0 |
| Withdrawal | W | 0 |
| Authorised Break of Study | ABS | 0 |

13.1 CUMULATIVE GRADE POINT AVERAGE CALCULATION

The CGPA calculation on a 10 Point scale is used to describe the overall performance of a student in all courses from first semester to the last semester. RA, AAA and W grades will be excluded for

calculating GPA and CGPA.

$$GPA = \frac{\sum_{i=1}^N C_i GP_i}{\sum_i C_i}$$

$$CGPA = \frac{\sum_{i=1}^N C_i GP_i}{\sum_i C_i}$$

Where

C_i – Credits for the course

GP_i – Grade Point for the course

\sum_i – Sum of all courses successfully cleared during all the semesters

N – Number of all courses successfully cleared during the particular semester in the case of GPA and during all the semesters in the case of CGPA

14 GRADESHEET

After revaluation results are declared in each semester, Grade Sheets will be issued to each student. At the end of programme a consolidated grade sheet also will be issued to each student. The grade sheet and consolidated grade sheet will contain the following details:

- Name of the candidate with date of birth and photograph.
- The programme and degree in which the candidate has studied
- The list of courses enrolled during the semester and the grades secured
- The Grade Point Average (GPA) for the semester.

15 CLASSIFICATION OF DEGREE AWARDED

Final Degree is awarded based on the following:

| Range of CGPA | Classification of Degree |
|---------------|------------------------------|
| ≥ 7.50 | First Class with Distinction |
| ≥ 6.00 < 7.50 | First Class |
| ≥ 5.00 < 6.0 | Second Class |

Minimum requirements for award of Degree: A student should have obtained a minimum of 5.0 CGPA.

1. A candidate who qualifies for the award of the Degree having passed the examination in all the courses of all the 8 semesters in his/her first appearance within a maximum of 8 consecutive semesters (maximum of 6 semesters for Lateral entry students who join the course in the third semester) securing an overall CGPA of not less than 7.5 (Calculated from 1st semester) shall be declared to have passed the examination in **First Class with Distinction**. Authorized Break of Study vide Clause 12, will be considered as an Appearance for Examinations, for award of First Class with Distinction. Withdrawal shall not be considered as an appearance for deciding the eligibility of a candidate for First Class with Distinction.

2. A candidate who qualifies for the award of the Degree having passed the examination in all the courses of all the 8 semesters within a maximum period of 8 consecutive semesters (maximum of 6 semesters for Lateral entry students who join the course in the third semester) after his/her commencement of study securing a overall CGPA of not less than 6.0 (Calculated from 1st semester), shall be declared to have passed the examination in **First Class**. Authorized break of study vide Clause 12 (if availed of) or prevention from writing End semester examination due to lack of attendance will not be considered as Appearance in Examinations. For award of First class, the extra number of semesters than can be provided (in addition to four years for Normal B.E / B.Tech and 3 years for Lateral Entry) will be equal to the Number of semesters availed for Authorized Break of Study or Lack of Attendance. Withdrawal shall not be considered as an appearance for deciding the eligibility of a candidate for FirstClass.
3. All other candidates who qualify for the award of the Degree having passed the examination in all the courses of all the 8 semesters within a maximum period of 12 consecutive semesters (10 consecutive semesters for Lateral Entry students, who join the course in the third semester) after his/her commencement of study securing a overall CGPA of not less than 5.0, (Calculated from 1st semester) shall be declared to have passed the examination in **SecondClass**.
4. A candidate who is absent in semester examination in a course/project work after having registered _____ for the same, shall be considered to have appeared in that examination for the purpose of classification.

16 ELIGIBILITY FOR THE AWARD OF DEGREE

A student shall be declared to be eligible for the award of the B.E/B.Tech. degree, provided the student has successfully completed all the requirements of the programme, and has passed all the prescribed examinations in all the 8 semesters within the maximum period specified in clause 3.

- i) Successfully gained the required number of total credits as specified in the curriculum corresponding to his/her programme within the stipulated time.
- ii) Successfully completed the programme requirements and has passed all the courses prescribed in all the semesters within a maximum period of 6 years (5 Years for Lateral Entry Candidates) reckoned from the commencement of the first semester to which the candidate was admitted.
- iii) Successfully completed any additional courses prescribed by the Institution.
- iv) has earned a CGPA of not less than 5
- v) has no dues to the Institution, Library, Hostels, etc.,
- vi) has no disciplinary action pending against him / her.
- vii) No disciplinary action pending against the student.

The award of Degree must have been approved by the Board of Management of the Institution.

17 DISCIPLINE

Every student is required to observe disciplined and decorous behaviour both inside and outside the Institution and not to indulge in any activity which will tend to bring down the prestige of the Institution. If a student indulges in malpractice in any of the end semester theory / practical examination, continuous assessment examinations he/she shall will be liable for disciplinary action as prescribed by the Institution from time to time.

18 POWER TO MODIFY

From time to time, the Institution may revise, amend or change the regulations, scheme of examinations and syllabi if found necessary.

REGISTRAR

I Semester

| AELT1101 | ENGLISH | L | T | P | C | Total Marks |
|----------|---------|---|---|---|---|-------------|
| | | 3 | 0 | 0 | 3 | 100 |

| | |
|-------------------------------------------------------------------------------------------------------------------------------------|----------|
| PREREQUISITES: None | |
| COURSE OBJECTIVES | |
| ➤ The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills. | |
| 1. Vocabulary Building | 8 |
| 1.1 The concept of Word Formation | |
| 1.2 Root words from foreign languages and their use in English | |
| 1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. | |
| 1.4 Synonyms, antonyms, and standard abbreviations. | |
| 1.5 Parts of Speech | |
| 1.6 Wh -questions & Yes/No questions | |
| 1.7 Compound Words | |
| 2. Basic Writing Skills | 8 |
| 2.1 Sentence Structures | |
| 2.2 Writing Instruction | |
| 2.3 Importance of proper punctuation | |
| 2.4 Creating coherence | |
| 2.5 Writing purpose statement | |
| 2.6 Impersonal passive Voice | |
| 2.7 E-mail communication | |
| 2.8 Extended communication | |
| 3. Identifying Common Errors in Writing | 8 |
| 3.1 Subject-verb agreement | |
| 3.2 Adverb and Numerical adjective | |
| 3.3 Cause and effect relationship | |
| 3.4 Prepositions | |
| 3.5 IF Conditionals | |
| 3.6 Articles | |
| 3.7 Error deduction and proof reading | |
| 4. Nature and Style of sensible Writing | 8 |
| 4.1 Descriptive writing | |
| 4.2 Recommendation | |
| 4.3 Transcoding & Interpretation of Information | |
| 4.4 Process description | |
| 4.5 Checklist | |
| 4.6 Jumbled sentences | |
| 4.7 Dialogue writing | |
| 5. Writing Practices | 8 |
| 5.1 Reading Comprehension | |
| 5.2 Paragraph writing | |
| 5.3 Report writing | |
| 5.4 Letter writing (Formal & Informal letters) | |

6. Oral Communication5

(This unit involves interactive practice sessions in Language Lab)

- Listening Comprehension
- Pronunciation, Intonation, Stress and Rhythm
- Common Everyday Situations: Conversations and Dialogues
- Communication at Workplace
- Interviews
- Formal Presentations
- Group Discussion

TOTAL HOURS : 45

COURSE OUTCOMES

After completion of this course students will be able to:

CO1: Develop language skills both formally and informally in English.

CO2: Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

CO3: Understand the basic components of definitions, descriptions, process explanations, and other common forms of technical writing.

CO4: Familiarize with basic technical concepts and terms.

CO5: Develop professional work habits as instructor, representative and team player.

SUGGESTED READINGS

1. Central Institute of English And Foreign Languages. Exercises in Spoken English, Parts I-III. Orient BlackSwan :New Delhi, 2014.
2. Kumar, Sanjay and PushpLata. "Communication Skills", Oxford University Press: Oxford, 2015.
3. Lyons, Liz Hamp and Ben Heasley. "Study Writing", Cambridge University Press: Cambridge, 2006.
4. Swan, Michael. "Practical English Usage" .Oxford University Press: Oxford, 2016.
5. Wood, Frederick T. "Remedial English Grammar". Macmillan, 2014.
6. Zinsser William, "On Writing Well.", Harper Resource Book, 2013.

| | | | | | | |
|-----------------|------------------------|----------|----------|----------|----------|--------------------|
| AMAT1101 | MATHEMATICS – I | L | T | P | C | Total Marks |
| | | 3 | 1 | 0 | 4 | 100 |

| | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| PREREQUISITES: School Mathematics | |
| COURSE OBJECTIVES | |
| <ul style="list-style-type: none"> ➤ Application of Matrices in problems of Science and Engineering. ➤ Application of Sequences and Series. ➤ To apply the concepts of radius of curvature, evolute, envelope and asymptotes. ➤ To apply the concept of Taylor series, Maxima minima, composite function and Jacobians. ➤ To gain knowledge in evaluation of Double and triple Integrals and its applications. | |
| UNIT 1: MATRICES | 9+3 |
| Introduction – Symmetric-Skew Symmetric Matrices-Hermitian and Skew Hermitian Matrices- Characteristic equation-Eigen values of a real matrix-Eigen vectors of a real matrix-Properties of Eigen values-Cayley – Hamilton theorem- finding A inverse using Cayley Hamilton theorem- Finding higher powers of A using Cayley – Hamilton theorem-orthogonal reduction of a symmetric matrix to diagonal form-Reduction of Quadratic form to canonical by orthogonal transformations-Orthogonal matrices-Applications of Matrices in Engineering. | |
| UNIT 2: SEQUENCE AND SERIES | 9+3 |
| Sequences – Definition and Examples- Types of Convergence- Series of Five terms – Test of Convergence- Comparison test – Integral test- D’Alemberts Ratio test- Raabe’s root test- Convergent of Exponential Series- Cauchy’s Root test- Log test- Alternating Series: Leibnitz test- Series of positive and Negative terms- Absolute Convergence- Conditional Convergence- Simple Applications Convergence of series in engineering. | |
| UNIT 3: APPLICATIONS OF DIFFERENTIAL CALCULUS | 9+3 |
| Rolls and Mean Value Theorem-Maxima and Minima of one variable-Radius of Curvature – Cartesian and polar coordinates - Circle of curvature- Applications of Radius of curvature in engineering- Evolute – Involute -Asymptotes - Envelope of standard curves- - Beta Gamma Functions and their Properties. | |
| UNIT 4: DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES | 9+3 |
| Function of two variables – Partial derivatives-Eulers Theorems- Total differentials-Taylor’s expansion with two variables up to third order terms- Maxima and Minima-Constrained Maxima and Minima by Lagrangian Multiplier method- Jacobians - Properties of Jacobians. | |
| UNIT 5: INTEGRAL CALCULUS | 9+3 |
| Evaluation of double integration in Cartesian and polar coordinates-Evaluation of double integral by changing of order of integration-Area as a double integral using Cartesian and polar- -Conversion from Cartesian to polar in double integrals- Triple integration in Cartesian coordinates and its applications | |
| TOTAL HOURS :60 | |
| COURSE OUTCOMES | |
| After completion of this course students will be able to: | |
| CO1: Know how the Matrices, Eigen values and Eigen Vectors Reduce to Quadratics form. | |
| CO2: Attain the skills of convergence and divergence of series using different test and apply sequences and Series in the problems. | |

CO3: Understand the concepts of envelope and Circle of curvature and apply them in the problems.

CO4: Obtain the knowledge of Maxima and Minima, Jacobian, and Taylor series.

CO5: Understand the evaluation of multiple integrals using change of variables and its applications.

CO6: Develop the canonical form of a quadratic form. Construct evolutes and envelope of family of curves.

TEXT BOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2015.

2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2015

3. C. B. Gupta and S. R. Singh and Mukesh Kumar, Engineering Mathematics for first year, Tata McGraw-Hill, 1st edition, 2015.

4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 10th edition, 2015.

5. Dr. M.K. Venkatraman, Engineering Mathematics volume-1, The National Publishing company, 4th Edition, 2010.

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|-----------------|------------------|----------|----------|----------|----------|--------------------|
| ACYT1101 | CHEMISTRY | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

| |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PREREQUISITES: School Chemistry |
| <p>COURSE OBJECTIVES</p> <ul style="list-style-type: none"> ➤ To make the students conversant with atomic and molecular structure. ➤ To develop an understanding on the concepts of spectroscopic techniques and their applications. ➤ To understand the use of free energy in chemical equilibrium. ➤ To have thorough knowledge on phase rule and alloys. ➤ To understand the basic concepts of stereochemistry, organic reactions and synthesis of a drug molecule. |
| <p>UNIT 1 : ATOMIC AND MOLECULAR STRUCTURE 9</p> <p>Quantum mechanics -. Basics and significance-Schrodinger equation – Particle in one dimensional box-Molecular orbital theory- Molecular orbital diagrams of homonuclear and heteronuclear diatomic molecules. Energy level diagrams of diatomic pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.</p> |
| <p>UNIT 2 : SPECTROSCOPIC TECHNIQUES AND PHOTOCHEMISTRY 9</p> <p>Principles of spectroscopy-Electromagnetic spectrum- Electronic spectroscopy - Vibrational spectroscopy -Nuclear magnetic resonance spectroscopy - Principle, Instrumentation (Block diagram only) and applications –Photochemistry-Laws of photochemistry-Photo processes-Internal conversion, Intersystem crossing, Phosphorescence, Fluorescence and its applications.</p> |
| <p>UNIT 3 : USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA 9</p> <p>Thermodynamic functions: energy, entropy and free energy. Free energy and emf. Cell potentials, Nernst equation and applications. Corrosion-Types- -Control measures- Use of free energy considerations in metallurgy through Ellingham diagrams-Water Chemistry-Hardness-Types-Estimation of hardness by EDTA method-Desalination of brackish water-RO process.</p> |
| <p>UNIT 4 :PHASE RULE AND ALLOYS 9</p> <p>Phase rule: Introduction, definition of terms with examples, One Component System-water system - Reduced phase rule - Two Component Systems- classification – lead-silver system, zinc-magnesium system. Alloys: Introduction- Definition- Properties of alloys- Significance of alloying, Functions and effect of alloying elements- Ferrous alloys-Nichrome and Stainless steel – heat treatment of steel; Non-ferrous alloys – brass and bronze.</p> |
| <p>UNIT 5 :STEREOCHEMISTRY AND ORGANIC REACTIONS9</p> <p>Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transition metal compounds. Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings- Synthesis of paracetamol.</p> <p style="text-align: right;">TOTAL HOURS : 45</p> |
| <p>COURSE OUTCOMES</p> <p>Upon Completion of the course, the students will be able to:</p> <p>CO1: Analyze microscopic chemistry in terms of atomic and molecular orbitals.</p> |

CO2: Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

CO3: Rationalize bulk properties and processes using thermodynamic considerations.

CO4: Evaluate various metals and alloy combinations.

CO5: Design the steps for the manufacture of drug for medicinal applications.

TEXT BOOKS

1. K. P. C. Volhardt and N.E. Schore, "Organic Chemistry: Structure and Function", 6th Edition, W.H. Freeman Publisher, NHBS, 2015.
2. P. W. Atkins, Julio de Paula, "Physical Chemistry", 8th Edition, Oxford University press, Oxford, 2016.
3. Dr. Sayeeda Sultana, "Engineering Chemistry", R.K. Publishers, Coimbatore, 2016.
4. B. M. Mahan, R. J. Meyers, "University Chemistry", 4th Edition, Pearson Education, India, 2009.
5. Engineering Chemistry by Jain and Jain, 16th Edition, Dhanpat Rai Publishing Company, New Delhi, 2017.
6. C. N. Banwell, "Fundamentals of molecular spectroscopy", 5th Edition McGraw-Hill Education India Pvt Limited, India, 2013.

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|-----------------|-----------------------------------------------------|----------|----------|----------|----------|--------------------|
| AEET1101 | BASIC ELECTRICAL AND ELECTRONICS ENGINEERING | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

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| PREREQUISITES: None | |
| COURSE OBJECTIVES | |
| <ul style="list-style-type: none"> ➤ To provide comprehensive idea about DC circuit analysis, working principles and applications of basic machines in electrical engineering. ➤ To provide idea about AC circuit analysis, working principles and applications of basic machines in electrical engineering. ➤ To highlight the importance of transformers in transmission and distribution of electric power. ➤ To develop selection skill to identify the type of generators or motors required for particular application. ➤ To impart a basic knowledge of Power Converters | |
| UNIT 1: DC CIRCUITS | 9 |
| Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits. | |
| UNIT 2: AC CIRCUITS | 9 |
| Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections. | |
| UNIT 3: TRANSFORMERS | 9 |
| Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections. | |
| UNIT 4: ELECTRICAL MACHINES | 9 |
| Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators. | |
| UNIT 5 : POWER CONVERTERS | 9 |
| DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation. | |
| TOTAL HOURS :45 | |
| COURSE OUTCOMES | |
| At the end of this course, students will be able to: | |
| CO1 : Understand and analyze basic electric and magnetic circuits | |
| CO2 : Study the working principles of electrical machines and power converters. | |
| SUGGESTED TEXT / REFERENCE BOOKS | |
| <ol style="list-style-type: none"> 1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011. 2. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering" , Tata McGraw Hill, 2010. 3. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2019. | |

4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2011.
5. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India, 2015.

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|-----------------|----------------------------------------|----------|----------|----------|----------|--------------------|
| AMET1101 | ENGINEERING GRAPHICS AND DESIGN | L | T | P | C | Total Marks |
| | | 1 | 0 | 4 | 3 | 100 |

PREREQUISITES: School Mathematics

COURSE OBJECTIVES

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products
- To expose them to existing national standards related to technical drawings.

UNIT1: PLANE CURVES AND FREEHAND SKETCHING 9

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT2: PROJECTION OF POINTS, LINES AND PLANES SURFACES 9

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT3: PROJECTION OF SOLIDS 9

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT4: PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 9

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT5: ISOMETRIC AND PERSPECTIVE PROJECTIONS 9

Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

COMPUTER AIDED DRAFTING (demonstration only)

Introduction to drafting packages and demonstration of their use.

TOTAL HOURS :45

COURSE OUTCOMES

Upon the completion of this subject, the students will be able to know:

CO1: Specifications and standards of technical drawing and able to draw conic sections and special curves.

CO2: Orthographic projection and to draw the various views of orthographic projection of a point and various components.

CO3: Orthographic views of Straight Lines, Plane Figures and Simple Solids.

CO4: Sections of solids and Development of solid surfaces.

CO5: Drawing of isometric and perspective projection of simple solids and components.

SUGGESTED TEXTS / REFERENCE BOOKS

1. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi,2009.
2. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 53rd Edition,2014.
3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore,2017.
4. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition,2009.
5. Venugopal K. and Prabhu Raja V., "Engineering graphics", New Age International (P) Limited,2008.
- 6 NatrajanK.V., "A text book ofEngineering Graphics", DhanalakshmiPublishers, Chennai,2012.
- 7 Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi,2008..

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|-----------------|-----------------------------|----------|----------|----------|----------|--------------------|
| ACYL1101 | CHEMISTRY LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

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| PREREQUISITES: Handling of apparatus such as burettes and pipettes |
| COURSE OBJECTIVES <ul style="list-style-type: none"> ➤ To acquire the quantitative skills in volumetric analysis. ➤ To enable the students to plan and execute experimental projects. |
| LIST OF EXPERIMENTS <ol style="list-style-type: none"> 1. Determination of hardness of water by EDTA method. 2. Determination of chloride content of water sample by argentometric method. 3. Determination of strength of given hydrochloric acid using pH meter. 4. Determination of strength of acids in a mixture using conductivity meter. 5. Conductometric titration of strong acid Vs strong base. 6. Estimation of iron content by Potentiometry. 7. Determination of molecular weight of polymer using Ostwald viscometer. 8. Determination of alkali content of water sample. 9. Estimation of copper by EDTA method. 10. Adsorption of acetic acid by charcoal. <p style="text-align: right;">TOTAL HOURS :60</p> |
| COURSE OUTCOMES On completion of the course students will be able to: CO1: Carry out scientific experiments related to Viscosity, Conductivity, Potentiometry Hardness and Chloride content of water. |
| REFERENCES <ol style="list-style-type: none"> 1. Dr. Sayeeda Sultana, "Practical Engineering Chemistry laboratory manual", R.K. Publishers, Coimbatore, 2016. 2. Daniel R. Palleros, "Experimental organic chemistry" John Wiley & Sons, Inc. New York, 2011. 3. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel's Textbook of Practical organic chemistry", LBS, Singapore, 2010. |

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|-----------------|---------------------------------------------|----------|----------|----------|----------|------------------------|
| AMEL1101 | ENGINEERING PRACTICES LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE

Buildings: (a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

- (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- (b) Study of pipe connections requirements for pumps and turbines.
- (c) Preparation of plumbing line sketches for water supply and sewage works.
- (d) Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- (e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

- (a) Study of the joints in roofs, doors, windows and furniture.
- (b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting.

II MECHANICAL ENGINEERING PRACTICE

Welding:

- (a) Preparation of arc welding of butt joints, lap joints and teejoints.
- (b) Gas welding practice

Basic Machining:

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

Sheet Metal Work:

- (a) Forming & Bending:
- (b) Model making – Trays, funnels, etc.
- (c) Different type of joints.

Machine assembly practice:

- (a) Study of centrifugal pump
- (b) Study of air conditioner

Demonstration on:

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example –Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)**III ELECTRICAL ENGINEERING PRACTICE**

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

IV ELECTRONICS ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL HOURS :60**COURSE OUTCOMES**

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

CO1: Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.

CO2: Wire various electrical joints in common household electrical wire work.

CO3: Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.

CO4: Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

REFERENCES

1. Jeyachandran K., Natarajan S. & Balasubramanian S., "A Primer on Engineering Practices Laboratory", Anuradha Publications, 2007.
2. Jeyapoovan T., Saravanapandian M. & Pranitha S., "Engineering Practices Lab Manual" Vikas Publishing House Pvt. Ltd, 2006
3. Bawa H.S., "Workshop Practice", Tata McGraw – Hill Publishing Company Limited, 2007.
4. Rajendra Prasad A. & Sharma P.M.M.S., "Workshop Practice", Sree Sai Publication, 2004.

II Semester

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|-----------------|-------------------------|----------|----------|----------|----------|--------------------|
| AMAT1102 | MATHEMATICS – II | L | T | P | C | Total Marks |
| | | 3 | 1 | 0 | 4 | 100 |

PREREQUISITES: School Mathematics

COURSE OBJECTIVES

- To Apply the concept of Differential Equations in problems of Engineering
- To gain knowledge in evaluation of Line, Surface and Volume Integrals
- To know the techniques of Laplace Transforms and inverse transform and apply them in the problems of Science and Engineering.
- To know the properties of Analytic functions and its applications
- To gain knowledge of evaluation of improper integrals involving complex functions using Residue theorem and apply them in Engineering fields

UNIT 1: ORDINARY DIFFERENTIAL EQUATIONS 9+3

Introduction-Linear equations of second order with constant coefficients-Linear equations of second order variable coefficients- Homogeneous equation of Euler type- Homogeneous equation of Legendre's Type- Equations reducible to homogeneous form- Variation of parameters- Simultaneous first order with constant co-efficient.- Applications of Differential Equation in engineering

UNIT 2: VECTOR CALCULUS 9+3

Introduction to vectors - Gradient-divergence- curl – Solenoidal- Irrotational fields- Vector identities (without proof) –Directional derivatives- Line integrals- Surface integrals- Volume Integrals- Green's theorem (without proof)- Gauss divergence theorem (without proof),verification- Stoke's theorems (without proof) –Verification.

UNIT 3: LAPLACE TRANSFORMS 9+3

Laplace Transforms of standard functions- Transforms properties- Transforms of Derivatives and Integrals- Initial value and Final value theorems and verification of simple problems- periodic functions - Inverse Laplace transforms using partial fractions- shifting theorem- Convolution theorem- Applications of Laplace transforms for solving linear ordinary differential equations up to second order with constant coefficient - Solution of Integral equation and integral equation involving convolution type- Application of Laplace Transform in engineering.

UNIT 4: ANALYTIC FUNCTIONS 9+3

Definition of Analytic Function –Cauchy Riemann equations- Cauchy Riemann equations- Properties of analytic function- Determination of analytic function using – Milne-Thomson's method- Conformal mappings :magnification ,rotation, inversion, reflection-bilinear transformation- Cauchy's integral theorem (without proof)- Cauchy's integral theorem applications

UNIT 5: COMPLEX INTEGRATION 9+3

Cauchy's integral formulae- Taylor's expansions with simple problems- Laurent's expansions with simple problems- Singularities- Types of Poles and Residues- Cauchy's residue theorem - Contour integration :Unit circle.- Contour integration :semicircular.

TOTAL HOURS :60

COURSE OUTCOMES

At the end of this course students will be able to:

CO1: Solve the Differential Equations and its applications in engineering problems.

CO2: Apply the techniques of vector calculus.

CO3: Solve many Engineering problems that can be transformed in to problems involving ODE and integrals. Laplace transforms method and complex analytic methods can be used for solving theorem.

CO4: Know the fundamentals of complex analytic functions and its properties.

CO5: Gain knowledge in evaluating improper integrals using Residue theorem.

CO6: Understand Cauchy's integral formulae and Taylor's expansions with simple problems etc.

TEXT BOOKS

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2015

2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43rd Edition, 2015.

3. C B Gupta and S R Singh and Mukesh Kumar, Engineering Mathematics for first year, Tata McGraw-Hill, 1st edition, 2015.

4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 10th edition, 2015.

5. Dr. M.K. Venkatraman, Engineering Mathematics volume-1, The National Publishing company, 4th Edition, 2010.

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| APHT1101 | PHYSICS | L | T | P | C | TOTAL MARKS |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: School Physics

COURSE OBJECTIVES

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT 1: MECHANICS & PROPERTIES OF MATTER⁹

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Solving Newton's equations of motion in polar coordinates; Problems including constraints and friction; Extension to cylindrical and spherical coordinates Elasticity – Stress-strain diagram and its uses – twisting couple - torsion pendulum: theory and experiment

UNIT 2: WAVES AND FIBER OPTICS⁹

Oscillatory motion – forced and damped oscillations Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance. Lasers population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Solid state ,Gas laser, Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – Application in Communication

UNIT 3: ELECTRICAL PROPERTIES OF MATERIALS

9

Classical free electron theory-Expression for Electrical conductivity-thermal conductivity-expression- Wiedmann Franz law- success and failure-electrons in metals-Particle in three dimensional box- degenerate state- Fermi Dirac Statistics-Density of Energy states-Electron in periodic potential-Bloch Theorem- Metals and Insulators-Energy bands in solids-Effective mass of electron- Concept of holes

UNIT 4: THERMAL PHYSICS⁹

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conduction in solids – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT 5: QUANTUM PHYSICS⁹

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) - scanning tunnelling microscope.

TOTAL HOURS :45

COURSE OUTCOMES

Upon completion of this course the students will:

CO1: Gain knowledge on the basics of mechanics and properties of matter and its

applications,

CO2: Acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics

CO3: Have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion of joints and heat exchangers,

CO4: Get knowledge on advanced physics concepts of quantum theory and its applications in tunnelling microscopes

CO5: Understand the basics of electrical properties of materials and the classification of materials based on band theory.

TEXT BOOKS

1. Rajendran.V, "Engineering Physics", Tata McGraw-Hill, 2019.
2. Bhattacharya, D.K. & Poonam, T. "Engineering Physics", Oxford University Press, 2015.
3. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
4. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.
5. Brij Lal and N.Subramaniam,, "Properties of Matter ,S. Chand & Co., New Delhi. New Edition , 2017.

REFERENCES

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics". W.H. Freeman, 2007.

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| ACHT1101 | ENVIRONMENTAL SCIENCE | L | T | P | C | TOTAL MARKS |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- To study the nature and the facts about environment.
- To find and implement scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth's interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT 1: ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

9

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity- definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT 2: ENVIRONMENTAL POLLUTION

9

Definition – causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry- Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry;- Mitigation procedures- Control of particulate and gaseous emission, Control of SO₂, NO_x, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies – Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

Actual Activities:

- Plantation
- Shutting down the fans and ACs of the campus for an hour or so
- Drive for segregation of waste

UNIT 3: NATURAL RESOURCES**9**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants.
Field study of local area to document environmental assets – river/forest/grassland/hill/mountain.

UNIT 4: SOCIAL ISSUES AND THE ENVIRONMENT**9**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark). Enforcement machinery involved in environmental legislation- central and state pollution control boards- disaster management: floods, earthquake, cyclone and landslides. Public awareness.

Awareness Activities:

- (i) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste.
- (ii) Lectures from expert

UNIT 5: HUMAN POPULATION AND THE ENVIRONMENT**9**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology in environment and human health – Case studies.

TOTAL HOURS :45**COURSE OUTCOMES****Upon completion of the course, the students will be able to:**

- CO1: Create public awareness of environment at infant stage.
- CO2: Understand the importance of Environmental pollution and Natural resources.
- CO3: Solve social issues related to the sustainable Environment.
- CO4: Gain knowledge on human rights and women and child welfare programmes.

TEXT BOOKS

- 1.Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2nd Edition, Pearson Education, 2014.
- 2.Benny Joseph, "Environmental Science and Engineering", Tata Mc Graw-Hill, New Delhi, 2017.

REFERENCES

- 1.R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standard", Vol. I and II, Enviro Media,2011.
- 2.Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2007.
- 3.Dharmendra S. Sengar, "Environmental law", Prentice Hall of India PVT LTD, New Delhi, 2007.
- 4.Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press 2016.

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|-----------------|-----------------------------|----------|----------|----------|----------|--------------------|
| ACST1101 | COMPUTER PROGRAMMING | L | T | P | C | TOTAL MARKS |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- Introduction of Algorithms and Programming Concepts
- Writing Arithmetic Expressions and operator precedence in C and Python
- Understand array data structures and strings
- Sorting and Searching Algorithms and introduction to complexity
- Understand Functions and Recursion
- Understand Structures and Pointers

UNIT 1: INTRODUCTION TO PROGRAMMING 9

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 2: ARITHMETIC EXPRESSIONS, ARRAYS AND STRINGS 9

Conditional Branching and Loops (using C and Python). Writing and evaluation of conditionals and consequent branching Iteration and loops -Arrays (1-D, 2-D), Character arrays and Strings (using C) List, Tuple, Dictionary, Strings (using Python)

UNIT 3: BASIC ALGORITHMS 9

Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs.

UNIT 4: FUNCTION (USING C AND PYTHON) AND RECURSION 9

Functions (including using built in libraries), Parameter passing in functions, call by value Passing arrays to functions: idea of call by reference- Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

UNIT 5: STRUCTURE AND POINTERS 9

Structures, Defining structures and Array of Structures, Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list.

TOTAL HOURS :45

COURSE OUTCOMES

The course will enable the students to :

CO1: Formulate simple algorithms, write and debug programs in C and Python for arithmetic and logical problems.

CO2: Implement conditional branching, iteration and recursion.

CO3: Decompose a problem into functions and synthesize a complete program

using divide and conquer approach.

CO4: Use arrays, pointers and structures to formulate algorithms and programs.

CO5: Apply programming to solve matrix operations, searching and sorting problems

TEXT BOOKS

1. FlorianDedov, "Python Bible for Beginners", Kindle Edition, 2019
2. JamesTudor, "Python Programming for Beginners", Kindle Edition, 2019
3. JensGustedt, "ModernC", Manning Publications, 2019
4. KamranAmini, "Extreme C", Kindle Edition, 2019
5. Guido van Rossum and Fred L. Drake Jr, " An Introduction to Python"- Revised and updated for Python 3.2", Network Theory Ltd., 2011.

REFERENCE BOOKS

1. RobertSedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd., 2016.
2. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.
3. John V Guttag, "Introduction to Computation and Programming Using Python", MIT Press, 2013

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| ACST1100 | FUNDAMENTALS OF COMPUTING AND COMMUNICATIONS | L | T | P | C | TOTAL MARKS |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- Introduce the fundamentals of computing devices, peripheral devices and trouble shooting
- Understand the basics of Operating Systems
- Understand the basics of network communications
- Provide hands-on use of Microsoft Office applications Word, Excel, Access and PowerPoint and Data Publishing tools
- Gain familiarity to recent computing trends and technologies.

UNIT 1: BASICS OF COMPUTER

9

Five Component Model of a Computer, System and Application software (introduction) storage devices , primary (RAM, ROM, PROM, EPROM, cache) Memory and secondary (magnetic tape, hard disk, Compact disks) memory , peripheral devices, printers, Hardware Trouble Shooting.

UNIT 2: OPERATING SYSTEMS FUNDAMENTALS

9

Definition, Types of Operating Systems: Batch Operating System, Time Sharing OS, Distributed OS, Network OS, Real Time OS: Hard and Soft RTOS. Case Studies: Windows and Linux OS

UNIT 3 : NETWORKING BASICS

9

Networking Basics - Uses of a network and Common types of networks , Network topologies and protocols, TCP/IP protocol stack, Network media and hardware.

UNIT 4 : WORD PROCESSING AND DESKTOP PUBLISHING

9

Overview of Database Management System, Word Processing: Editing and Reviewing, Drawing, Tables, Graphs, Templates, Worksheet Management: Formulas, Functions, Charts, designing powerful power-point presentation. Adobe Photoshop: Using standard toolbox, creation and manipulation of images.

UNIT 5 : CURRENT COMPUTING TRENDS AND TECHNOLOGIES

9

Principles of Service Oriented Architecture, Basics of: Grid Computing, Cloud Computing, Internet of Things, Mobile Computing, Artificial Intelligence, Data Science and Quantum Computing.

TOTAL HOURS :45

COURSE OUTCOMES

Upon completion of the course, the students will be able to:

- CO1: Bridge the fundamental concepts of computers with the present level of knowledge of the students.
- CO2: Familiarize the basic concepts of operating systems
- CO3: Familiarize the basic concepts of network communications
- CO4: Understand the fundamentals of word processing and desktop publishing tools
- CO5: Gain exposure to the recent computing trends and technologies

TEXT BOOKS

1. August E. Grant, Jennifer H. Meadows, "Communication Technology Update and Fundamentals", Apress, 2018
2. Reema Thareja, "Fundamentals of Computers", Oxford University Press, 2015.
3. Andrews Jean, "A+ Guide to Managing & Maintaining Your PC", Cengage Publication 6/e, 2013

REFERENCE BOOKS

1. Anita Goel, "Computer Fundamentals", Pearson Education, 2010
2. Joiner Associates Staff, "Flowcharts: Plain & Simple: Learning & Application Guide" Oriel Inc, 2002.

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| APHL1101 | PHYSICS LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any Seven)

- 1(a) Determination of wavelength, and particle size using Laser
(b) Determination of acceptance angle in an optical fiber.
2. Determination of Young's modulus by non-uniform bending method
3. Determination of thermal conductivity of a bad conductor – Lee's Disc method
4. RC coupled Oscillator
5. Ultrasonic Interferometer-Determination of Velocity of Ultrasonic waves and compressibility of the given liquid
6. Determination of band gap of a semiconductor
7. LC circuit and LCR circuit
8. Measurement of speed of light on a table top using modulation
9. Experiments on electromagnetic induction and electromagnetic breaking.

TOTAL HOURS :60

COURSE OUTCOMES

Upon completion of the course, the students will be able to:

CO1:Apply the concepts and principles of elasticity, optics and Thermal properties for Engineering Applications.

TEXT BOOKS

1. Jacob Fraden, "Handbook of Modern Sensors Physics design and application", Springer, AIP press.2018.
2. Albert D. Helfrick & William D. Cooper, "Instrumentation & Measurement Techniques" (PHI) Edition, 2017.
3. C.V. Madhusudhana Rao, V. Vasanth Kumar, "Engineering Physics lab Manual", Scitech Publications (India) Pvt. Ltd, 4th Edition, 2019.
4. S. Stella Mary, 'Engineering Physics Lab Manual' RK Publisher, 2015.
5. Dr Ruby Das, C S Robinson, Rajesh Kumar, 'A Textbook of Engineering Physics Practical' Kindle Edition, 2018.

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| ACSL1101 | COMPUTER PROGRAMMING LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

COURSE OBJECTIVES

- To study the peripherals of a computer system and trouble shoot it.
- To understand the concepts of programming
- To apply programming techniques to solve numerical problems
- To understand the concept of recursion, sorting and searching techniques.
- To implement the concept of pointers and structures

Tutorial 1: Study of Peripheral of Computer System

Lab 1: Identify the peripherals of a computer, components in a CPU and its functions.

Tutorial 2: Hardware & Software Troubleshooting

Lab 2: To identify improper assembly or defective peripherals and system software problems.

Tutorial 3: Problem solving using computers:

Lab 3: Familiarization with programming environment

Tutorial 4: Variable types and type conversions:

Lab 4: Simple computational problems using arithmetic expressions

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures

Tutorial 6: Loops, while and for loops.

Lab 6: Iterative problems e.g., sum of series

Tutorial 7: 1D Arrays: searching, sorting:

Lab 7: 1D Array manipulation

Tutorial 8: 2D arrays and Strings

Lab 8: Matrix problems, String operations

Tutorial 9: Functions, call by value:

Lab 9: Simple functions

Tutorial 10 & 11: Numerical methods (Root finding, numerical differentiation, numerical integration):

Lab 10 and 11: Programming for solving Numerical methods problems

Tutorial 12: Recursion, structure of recursive calls

Lab 12: Recursive functions

Tutorial 13: Pointers, structures and dynamic memory allocation

Lab 13: Pointers and structures

TOTAL HOURS :60

COURSE OUTCOMES

The course will enable the students to:

CO1: Formulate the algorithms and translate it into Programs and debug it.

CO2: Write iterative as well as recursive programs

CO3: Represent data in arrays, strings and structures and manipulate them through a program

CO4: Declare pointers of different types and use them in defining self-referential structures.

CO5: Choose the appropriate searching and sorting technique depending on the problem given.

REFERENCE BOOKS

1. Fernandez, Irisini, "Python Programming Workbook: Practice in problem Solving (with solutions)", Kindle Edition, 2018
2. Yashavant Kanetkar, Aditya Kanetkar, "Let us Python", BPB Publications, 2019.

III Semester

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|----------|-----------------------------------------------|---|---|---|---|-------------|
| AMAT2103 | TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS | L | T | P | C | Total Marks |
| | | 3 | 1 | 0 | 4 | 100 |

COURSE OBJECTIVES:

- To apply the concept of Fourier series in the field of Engineering.
- To gain knowledge in evaluation of partial differential equations and its applications.
- To know the techniques of Fourier transforms and its inverse.
- To apply the concepts of probability in distributions.
- To gain knowledge in evaluation of two dimensional random variables.

UNIT1 FOURIER SERIES**12 Hrs.**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT2 PARTIAL DIFFERENTIAL EQUATION**12 Hrs.**

Formation of partial differential equations – Singular integrals -- Solutions of standard types of first order partial differential equations - Lagrange's linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT3 APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**12 Hrs**

Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation – One dimensionalequation of heat conduction - Steady state solution of two dimensionalequation of heat conduction (excluding insulated edges).

UNIT 4 FOURIER TRANSFORMS**12 Hrs.**

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity-Discrete Fourier Transforms

UNIT 5 Z - TRANSFORMS AND DIFFERENCE EQUATIONS**12 Hrs.**

Z- transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) – Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

Total Hours. 60**COURSE OUTCOMES:**

- CO1:Have good knowledge in Fourier series and apply in the field of Engineering.
 CO2:Know to formulate and solve partial differential equations.
 CO3:Gain good knowledge with applications of partial differential equations.
 CO4:Know the fundamentals of Fourier transforms and its properties.
 CO5:Gain good knowledge with Z transforms and its properties.

REFERENCES:

1. Kreyszig.E, "Advanced Engineering Mathematics", 10th edition, John Wiley & Sons. Singapore, 2012.
2. Grewal B.S, "Higher Engg Maths", Khanna Publications, 42nd Edition, 2012.
3. Sankara Rao, "Introduction to Partial Differential Equations", 2nd Edition, PHI Learning Pvt. Ltd., 2006.
4. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd, 2007.
5. Venkataraman, M,K., Engineering Mathematics - Vol.III - A & B (13th edition), National Publishing Co., Chennai, 1998

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| ACST2102 | DESIGN AND ANALYSIS OF ALGORITHMS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST1101-Computer Programming

COURSE OBJECTIVES

- To understand and apply the algorithm analysis techniques.
- To critically analyze the efficiency of alternative algorithmic solutions
- To understand different algorithm design techniques.
- To gain knowledge on iterative improvement techniques
- To understand the limitations of Algorithmic power.

UNIT 1 INTRODUCTION

9Hrs.

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types Fundamentals of the Analysis of Algorithmic Efficiency –Asymptotic Notations and their properties. Analysis Framework – Empirical analysis - Mathematical analysis for Recursive and Non-recursive algorithms –Visualization

UNIT 2 BRUTE FORCE AND DIVIDE-AND-CONQUER

9Hrs.

Brute Force – Computing a^n – String Matching - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers – Closest-Pair and Convex - Hull Problems.

UNIT 3 DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE

9Hrs.

Dynamic programming – Principle of optimality - Coin changing problem, Computing a Binomial Coefficient – Floyd's algorithm – Multi stage graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique – Container loading problem - Prim's algorithm and Kruskal's Algorithm – 0/1 Knapsack problem, Optimal Merge pattern - Huffman Trees.

UNIT 4 ITERATIVE IMPROVEMENT

9Hrs.

The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs, Stable marriage Problem.

UNIT 5 COPING WITH THE LIMITATIONS OF ALGORITHM POWER

9Hrs.

Lower - Bound Arguments - P, NP NP- Complete and NP Hard Problems. Backtracking – n-Queen problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO search - Assignment problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Travelling Salesman problem – Knapsack problem.

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of the course, the students should be able to:

- CO1:Design algorithms for various computing problems.
- CO2:Analyze the time and space complexity of algorithms.
- CO3:Critically analyze the different algorithm design techniques for a given problem.
- CO4:Modify existing algorithms to improve efficiency.
- CO5:Understand P, NP, NP-Complete and NP Hard problems

TEXT BOOKS

1. Anany Levitin,“ Introduction to the Design and Analysis of Algorithms”, Pearson Education,2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Computer Algorithms C++”, Universities Press,2007.

REFERENCES

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and CliffordStein, ““Introduction to Algorithms”, PHI Learning Private Limited,2012.
2. Alfred V.Aho, JohnE. Hopcroft and JeffreyD. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint2006.
3. HarshBhasin,“Algorithms Design and Analysis”, Oxford university press,2016.
4. S.Sridhar,“Design and Analysis of Algorithms”, Oxford university press,2014.
5. <http://nptel.ac.in/>

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|----------|-----------------------------|---|---|---|---|-------------|
| ACST2103 | OBJECT ORIENTED PROGRAMMING | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST1101-Computer Programming

COURSE OBJECTIVES

The course will discuss about

- Object Oriented Programming Concepts
- Inheritance, Virtual Functions and File handling in C++
- Understand about function and class templates
- Understand inheritance- base class and derived class concepts
- Exception handling and files

UNIT1 INTRODUCTION TO FUNDAMENTAL CONCEPTS OF OOP

9 Hrs.

Survey of programming paradigms – Object-Oriented Paradigm: Elements of Object Oriented Programming –Merits and demerits of object oriented methodology. benefits of object oriented programming - structure ofC++ program– Static members, Working with classes, Classes and Objects- Class specification- class objects accessing class members- defining member functions - Passing and returning objects – Array of objects- inline functions - accessing member functions within class.

UNIT2 UNIT OBJECT INITIALIZATION AND CLEANUP

9 Hrs.

Constructors - Parameterized constructors - Constructor overloading. Copy constructor, Destructors, Default arguments - new, delete operators - “this” pointer, friend classes and friend functions.

UNIT3 OVERLOADING AND GENERIC PROGRAMMING

9 Hrs.

Function overloading – Operator overloading- Non-over loadable operators- unary operator overloading- operator keyword- limitations of increment/decrement operators- binary operator overloading- Generic programming with templates-Function templates- class templates

UNIT4 INHERITANCE

9Hrs.

Inheritance-Base class and derived class relationship-derived class declaration-Forms of inheritance- inheritance and member accessibility- constructors in derived class, abstract class, virtual functions, pure virtual function

UNIT5 EXCEPTION HANDLING AND STREAMS

9Hrs.

Files and Streams-Opening and Closing a file- file modes- file pointers and their manipulation, sequential access to a file-random access to a file-Reading and Writing – Exception handling.

TOTAL HOURS : 45

COURSE OUTCOMES

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

- CO1. Acquire a full Object Oriented perspective for analyzing real world problems.
- CO2. Apply and use the object oriented concepts/ techniques in modeling computer
- CO3. Understand about overloading and function templates
- CO4. Implement base and derived class concepts
- CO5. Handle File operations and exception handling

TEXT BOOKS

1. Herbert Schildt, "The Complete Reference C++", Tata McGraw Hill,2017
2. James R. Rumbaugh, "Object Oriented Design", Pearson publication, 1991

REFERENCES

- 1.Robert Lafore, "Object-oriented programming in Turbo C++", Galgotia Publication, 2001
- 2.E.Balagurusamy,"Object-oriented programming with C++", Tata McGraw Hill,2017

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|----------|---------------------------------|---|---|---|---|-------------|
| ACST2104 | PROGRAMMING AND DATA STRUCTURES | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST1101-Computer Programming

COURSE OBJECTIVES

- To impart the basic concepts of data structures and algorithms.
- To understand basic concepts about abstract data types
- To gain knowledge on stacks, queues and lists.
- To understand trees and graph data structures
- To understand about sorting and hashing techniques

UNIT 1 INTRODUCTION

9Hrs.

Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

UNIT 2 ABSTRACT DATA TYPES

9Hrs.

ADT's Abstract Data Types, Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

UNIT 3 LINKED LISTS, STACKS AND QUEUES

9Hrs.

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

UNIT 4 TREES AND GRAPHS

9Hrs.

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, General Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. Red Black tree, B Tree, B+ Tree: definitions, algorithms and analysis.

Graph: Basic Terminologies and Representations, Graph search and Traversal algorithms: BFS, DFS, Minimum Spanning Tree: Prim's and Kruskal's Algorithm, Shortest Path Algorithm: Dijkstra's, Bellman Ford, Floyd-Warshall Algorithm and complexity analysis.

UNIT 5 SORTING AND HASHING

9Hrs.

Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance And Comparison among all the methods, Hashing: Static Hashing Techniques, Collision resolution techniques, Dynamic Hashing techniques.

TOTAL HOURS : 45

COURSE OUTCOMES

Upon completion of the Course the students will be able to

- CO1: Analyze the algorithms to determine the time and computation complexity
- CO2: Implement Search problem (Linear Search and Binary Search)
- CO3: Analyze the complexity of Stacks, Queues and linked list
- CO4: Able to write sorting algorithms
- CO5: Implement Graph search and traversal algorithms

TEXT BOOKS

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Pearson Education, 2014.
2. Reema Thareja, "Data Structures Using C", Oxford University Press, 2011

REFERENCES

1. Thomas H.Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Tata McGraw Hill, 2002.
2. Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
3. Stephen G. Kochan, "Programming in C", Pearson Education, 2015
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", University Press, 2008

| AECT2102 | DIGITAL SYSTEM DESIGN | L | T | P | C | Total Marks |
|----------|-----------------------|---|---|---|---|-------------|
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- To impart the knowledge of combinational circuit design.
- To impart the knowledge of decoders and encoders
- To gain knowledge on flip-flops and its applications
- To understand Sequential circuit design.
- To provide the basic knowledge about VHDL & its use.

UNIT 1: PRINCIPLES OF COMBINATIONAL LOGIC 9 Hrs

Review of Boolean Algebra. Definition of combinational, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3, 4 and 5 variables. Incompletely specified functions (Don't care terms). Simplifying max – term equations. Quine -McClusky minimization technique, Quine – McClusky using don't care terms, Reduced Prime Implicant tables, Map entered variables

UNIT 2: ANALYSIS AND DESIGN OF COMBINATIONAL LOGIC 9 Hrs

Decoders, Encoders, Digital multiplexers, Adders and subtractors, Look ahead carry, Binary comparators, Programmable Logic Devices, Complex PLD, FPGA.

UNIT3:FLIP-FLOPS AND ITS APPLICATIONS 9 Hrs

Basic Bistable elements, Latches, The master-slave flipflops (pulse-triggered flip-flops): SR flip-flops, JK flip-flops, Characteristic equations, Registers, binary ripple counters, and synchronous binary counters.

UNIT 4: SEQUENTIAL CIRCUIT DESIGN 9 Hrs

Design of a synchronous counter, Design of a synchronous mod-n counter using clocked JK, D, T and SR flip-flops. Mealy and Moore models, State machine notation, Construction of state diagrams.

UNIT 5: APPLICATIONS OF DIGITAL CIRCUITS 9 Hrs

Design of a Sequence Detector, Guidelines for construction of state graphs, Design Example – Code Converter, Design of Iterative Circuits (Comparator), Design of Sequential Circuits using ROMs and PLAs, CPLDs and FPGAs, Serial Adder with Accumulator, Design of Binary Multiplier, Design of Binary Divider

TOTAL HOURS : 45

COURSE OUTCOMES

Upon completion of the course, students will be able to:

CO1: Explain the concept of combinational and sequential logic circuits.

CO2: Design the combinational logic circuits.

CO3: Design the sequential circuits using SR, JK, D, T flip-flops and Mealy & Moore machines

CO4: Design applications of Combinational & Sequential Circuits.

CO5: Design sequential circuits using ROMs and PLAs

TEXT / REFERENCE BOOKS

1. John M Yarbrough, -Digital Logic Applications and Design, Thomson Learning, 2001.
2. Donald D. Givone, —Digital Principles and Design, McGraw Hill, 2002.
3. Charles H Roth Jr., Larry L. Kinney —Fundamentals of Logic Design, Cengage Learning, 7th Edition.
4. D. P. Kothari and J. S Dhillon, —Digital Circuits and Design, Pearson, 2016,
5. Morris Mano, —Digital Design, Prentice Hall of India, Third Edition.
6. K. A.Navas, —Electronics Lab Manual, Volume I, PHI, 5th Edition, 2015.

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| ACSL2102 | PROGRAMMING AND DATA STRUCTURES LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: ACSL1101-Computer Programming Laboratory

COURSE OBJECTIVES

- To impart the basic concepts of data structures and algorithms.
- To understand basic concepts about stacks, queues, lists, trees and graphs.
- To understand about sorting and hashing techniques
- To implement shortest path algorithms
- To perform string operations

Suggested Lab Experiments

The concepts should be practiced using C++.

- 1.Virtual lab Study experiments.
- 2.Operations on Stacks and Queues- infix to postfix- simple expression evaluation using stacks-linked stack implementation-linked queue implementation
- 3.Implementation of sorting algorithms
- 4.Implementation of linear search and binary search
- 5.Applications of Stacks and Queues
- 6.Binary search tree
- 7.Tree traversal techniques
- 8.Minimum Spanning tree
- 9.Shortest Path Algorithms
- 10.Design a C++ interface for ADT Stack. Implement this interface using array. Provide necessary exception handling in both the implementations.
- 11.Write a C++ program to perform string operations. Write functions for the

following

- Append – add at end
- Insert – add at particular index Search
- List all string starts with given letter

TOTAL HOURS :30

COURSE OUTCOMES

Upon completion of the course the students will be able to do the following programs in C++

- CO1:To implement various operations on stacks and queues.
- CO2:To implement search and sorting algorithms
- CO3:To construct minimum spanning tree
- CO4:To write program using arrays
- CO5:To implement exception handling programs

REFERENCES

1. Stephen Prata, “C++ Primer Plus”, Pearson Education,2015.
2. Gary Litvin, Maria Litvin, “Programming with C++ and Data Structures”, Vikas Publications, 2013.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education, 2008

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|-----------------|---------------------------------------------|----------|----------|----------|----------|------------------------|
| AECL2102 | DIGITAL SYSTEM DESIGN LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- To verify the working principles of gates
- To design half, full adder and Subtractor
- To realize multiplexer and demultiplexer
- To design and realize encoders, decoders and flip flops.
- To understand counters and shift registers

LIST OF EXPERIMENTS

1. Verification of gates
2. Half/Full Adder/Subtractor
3. Parallel adder/Subtractor
4. Excess-3 to BCD & Vice versa
5. Binary-Grey & Grey-Binary Converter
6. MUX/DEMUX
7. MUX/DEMUX using only NAND gates
8. Comparators
9. Encoder/Decoder
10. Flipflops
11. Counters and shift registers

TOTAL HOURS :30

COURSE OUTCOMES

Upon Completion of the course, the students will be able to:

- CO1: Study the working principle of logic gates
 CO2: Realize half adder and full adder circuits.
 CO3: Design and realize multiplexers and demultiplexers.
 CO4: Design and realize encoders/decoders
 CO5: Implement counters and shift registers using logic gates

REFERENCES

1. D. P. Kothari and J. S Dhillon, "Digital Circuits and Design", Pearson, 2016,
2. Morris Mano, "Digital Design", Prentice Hall of India, Third Edition.
3. K. A. Navas, "Electronics Lab Manual", Volume I, PHI, 5th Edition, 2015.

| | | | | | | |
|-----------------|---------------------------------------------------|----------|----------|----------|----------|------------------------|
| ACSL2101 | OBJECT ORIENTED PROGRAMMING LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: ACSL1101-Computer Programming Laboratory

Course Objectives:

The student will be able to learn:

- To implement the object oriented programming concepts.
- To create class templates and function templates
- To understand and implement exception handling mechanism
- To create file stream classes
- To develop simple real time applications in C++ and Java

Suggested List of Experiments

The concepts should be practiced using C++. Pearl may also be introduced wherever possible.

1. Constructors & Destructors, Copy Constructor.
2. Friend Function & Friend Class.
3. Inheritance.
4. Polymorphism & Function Overloading.
5. Virtual Functions.
6. Overload Unary & Binary Operators Both as Member Function & Non Member Function.
7. Class Templates & Function Templates.
8. Exception Handling Mechanism.
9. Standard Template Library concept.
10. File Stream classes.
11. Develop a C++ application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff.

If the type of the EB connection is domestic, calculate the amount to be paid as follows:

First 100 units – Rs. 1 per unit
 101-200 units – Rs. 2.50 per unit
 201 -500 units – Rs. 4 per unit
 > 501 units – Rs. 6 per unit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:

First 100 units – Rs. 2 per unit
101-200 units – Rs. 4.50 per unit
201 -500 units – Rs. 6 per unit
> 501 units – Rs. 7 per unit

12. Write a C++ Program to create an abstract class named Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.
13. Write a C++ program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

TOTAL HOURS :30

COURSE OUTCOMES

Upon completion of the course, the students will be able to

CO1:Apply good programming design methods for program development.

CO2:Develop and implement C++ programs for simple applications that make use of classes, packages and interfaces.

CO3:Develop and implement C++ programs with array list, exception handling and multithreading.

CO4:Design applications using file processing, generic programming and event handling.

CO5:Develop C++ applications to implement multi-threaded application

REFERENCES

1. Barbara Liskov, Program Development in Java, Addison-Wesley,2001
2. Any book on CoreJava
3. Any book on C++

IV Semester

| | | | | | | |
|-----------------|-----------------------------|----------|----------|----------|----------|--------------------|
| AMAT2104 | DISCRETE MATHEMATICS | L | T | P | C | Total Marks |
| | | 3 | 1 | 0 | 4 | 100 |

PREREQUISITES: None**COURSE OBJECTIVES:**

- To acquire knowledge in discrete mathematical structures as applied to Computer science and Information Technology students.
- Apply the concepts of mathematical logics, mathematical Induction, permutations and combinations, Recurrence relations and its applications.
- To gain knowledge on graph data structure
- Apply graph theory to solve real world problems.
- Understand the concepts of algebraic structure, lattices and Boolean algebra.

UNIT1 SETS AND LOGIC**12 Hrs.**

Basic notations – Sets- Propositional Logic – Propositional equivalences - Predicates and Quantifiers – Nested Quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.

UNIT2 COMBINATORICS**12 Hrs.**

Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT3 GRAPHS**12 Hrs.**

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT 4 ALGEBRAIC STRUCTURES**12 Hrs.**

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Definitions and examples of Rings and Fields.

UNIT 5 LATTICES AND BOOLEAN ALGEBRA**12 Hrs.**

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.

Total Hours: 60**COURSE OUTCOMES:**

- CO1: Understand mathematical logic and reasoning to count or enumerate objects in systematic way
- CO2: Understand mathematical induction, permutation combination, Recurrence relation and generating functions.
- CO3: Understand how to apply graph theory to solve real world problems.
- CO4: Understand the concepts of algebraic system and its applications.
- CO5: Have a good knowledge in lattices and Boolean algebra.

TEXT BOOKS:

1. J.P. Tremblay, R.Manohar, "Discrete Mathematical Structures with applications to Computer Science" Tata McGraw-Hill Publishing company pvt.Ltd.,New Delhi,35th edition,2008.
2. Veerajan T., Discrete Mathematics with Graph Theory and Combinatorics", 10th edition,Tata McGraw HillCompanies,2010.
3. Kenneth H.Rosen, "Discrete Mathematics and its Application", Fifth edition, Tata McGraw-Hill Publishing company pvt. Ltd., New Delhi,2003.
4. Narsing Deo, "Graph Theory with applications to Engineering and Computer science", Prentice-Hall of India pvt.Ltd.,New Delhi, 2004.
5. Dr.M.K.Venkataraman, Dr.N.SridharanN.Chandrasekaran, "Discrete Mathematics", The National Publishingcompany,2003.

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|-----------------|--------------------------|----------|----------|----------|----------|--------------------|
| ACST2105 | OPERATING SYSTEMS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- To learn the fundamentals of Operating Systems.
- To learn the mechanisms of OS to handle processes and threads and their communication
- To learn the mechanisms involved in memory management in contemporary OS
- To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
- To know the components and management aspects of concurrency management

UNIT 1 INTRODUCTION

9 Hrs

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 2 PROCESS MANAGEMENT

9 Hrs

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 pre-emptive, FCFS, SJF, RR; Multiprocessor scheduling: Real Time scheduling: RM and EDF.

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

UNIT 3 INTER-PROCESS COMMUNICATION

9 Hrs

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, Dining Philosopher Problem etc.

UNIT 4 MEMORY MANAGEMENT**9 Hrs**

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).

UNIT 5 MEMORY MANAGEMENT**9 Hrs**

I/O Hardware: 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

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, Distributed File System.

Disk Management: Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

TOTAL HOURS : 45**COURSE OUTCOMES**

At the end of the course 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

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

TEXT BOOKS

1.AviSilberschatz, Peter Galvin, Greg Gagne ,”Operating System Concepts Essentials”, Wiley Asia Student Edition, 2017.

2.William Stallings, ”Operating Systems: Internals and Design Principles”, Prentice Hall of India, 2013

REFERENCES

1.Charles Crowley ,”Operating System: A Design-oriented Approach”, Irwin Publishing,2005

2. Nutt Gary, ”Operating Systems: A Modern Perspective”, Addison-Wesley,2001

3.Maurice Bach, “Design of the Unix Operating Systems”, Prentice-Hall of India, 1986

4.Daniel P. Bovet, Marco Cesati, ”Understanding the Linux Kernel”, O'Reilly Publications,2000

| AECT2107 | MICROPROCESSOR AND MICROCONTROLLER | L | T | P | C | Total Marks |
|----------|------------------------------------|---|---|---|---|-------------|
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: AECT2102-Digital System Design

COURSE OBJECTIVES

The student should be made to:

- Study the Architecture of 8086 microprocessor.
- Learn the design aspects of I/O and Memory Interfacing circuits.
- Study about communication and bus interfacing.
- Study the Architecture of 8051 microcontroller.
- Study the interfacing of microcontroller
-

UNIT 1 THE 8086 MICROPROCESSOR

9 Hrs

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT 2 8086 SYSTEM BUS STRUCTURE

9 Hrs

8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure –Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT 3 I/O INTERFACING

9 Hrs

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller Programming and applications Case studies: Traffic Light control, LED display ,LCD display, Keyboard display interface and Alarm Controller.

UNIT 4 MICROCONTROLLER

9 Hrs

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT 5 INTERFACING MICROCONTROLLER

9 Hrs

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD &Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of the course, the student should be able to:

- CO1:Design and implement programs on 8086 microprocessor.
- CO2:Design I/O circuits.
- CO3:Design Memory Interfacing circuits.
- CO4:Design and implement 8051 microcontroller based systems.
- CO5:Design ADC, DAC and Sensor Interfacing

TEXT BOOKS

1. Yu-Cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088 Family -Architecture, Programming and Design”, Second Edition, Prentice Hall of India, 2011.
2. Mohamed Ali Mazidi, Janice GillispieMazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson Education, 2011

REFERENCE

- 1.Douglas V.Hall, “Microprocessors and Interfacing, Programming and Hardware:;TMH, 2012

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|-----------------|----------------------------------------|----------|----------|----------|----------|--------------------|
| ACST2106 | OBJECT ORIENTED SOFTWARE DESIGN | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST2103-Object Oriented Programming

COURSE OBJECTIVES

The student should be made to:

- Understand the phases in a software project
- Understand fundamental concepts of requirements engineering, testing and implementation of software
- Learn the basics of OO analysis and design skills, UML design diagrams.
- Analyze the case study NextgenPos System with UML diagram
- Applying Design Patterns

UNIT 1 SOFTWARE PROJECT MANAGEMENT AND DESIGN

9 Hrs

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Software Project Management: Estimation – LOC and FP Based Estimation, COCOMO Model. Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design –Architectural styles, Architectural Design, User Interface Design

UNIT 2 SOFTWARE DEVELOPMENT, TESTING AND IMPLEMENTATION

9 Hrs

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document - Software testing fundamentals-white box testing- basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging – Issues in OO Testing – Class Testing – OO Integration Testing – GUI Testing – OO System Testing. Software Implementation, Techniques: Coding practices-Refactoring.

UNIT 3 UML DIAGRAMS AND DESIGN PATTERNS

9 Hrs

Introduction to OOAD – Unified Process - UML diagrams – Use Case – Class Diagrams– Interaction, Diagrams – State Diagrams – Activity Diagrams – Package, component and Deployment Diagrams, GRASP: Designing objects with responsibilities – Creator – Information expert – Low Coupling – High, Cohesion – Controller - Design Patterns – creational - factory method - structural – Bridge – Adapter - behavioral – Strategy – observer.

UNIT 4 CASE STUDY

9 Hrs

Case study – the Next Gen POS system, Inception -Use case Modeling - Relating Use cases –include, extend and generalization - Elaboration - Domain Models - Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies - Aggregation and Composition.

UNIT 5 APPLYING DESIGN PATTERNS

9 Hrs

System sequence diagrams - Relationship between sequence diagrams and use cases Logical architecture and UML package diagram – Logical architecture refinement - UML class diagrams – UML interaction diagrams - Applying GoF design patterns- Mapping design to code

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of the course, the student should be able to:

- CO1: Identify the key activities in managing a software project.
- CO2: Apply systematic procedure for software design and deployment.
- CO3: Compare and contrast the various testing and maintenance.
- CO4: Design and implement projects using OO concepts.
- CO5: Use the UML analysis and apply appropriate design diagrams.

TEXT BOOKS

1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Seventh Edition, Mc Graw-Hill International Edition, 2010.
2. Craig Larman, "Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development”, Third Edition, Pearson Education, 2005.

REFERENCES

1. Ian Sommerville, “Software Engineering”, 9th Edition, Pearson Education Asia, 2011.
2. Rajib Mall, “Fundamentals of Software Engineering”, Third Edition, PHI Learning Private Limited ,2009.
3. Simon Bennett, Steve Mc Robb and Ray Farmer, “Object Oriented Systems Analysis and Design Using UML”, Fourth Edition, Mc-Graw Hill Education, 2010.
4. Erich Gamma, a n d Richard Helm, Ralph Johnson, John Vlissides, “Design patterns: Elements of Reusable Object-Oriented Software”, Addison-Wesley, 1995.
5. Martin Fowler, “UML Distilled: A Brief Guide to the Standard Object Modeling Language”, Third edition, Addison Wesley, 2003.
6. <http://nptel.ac.in/>.

| ACST2107 | COMPUTER ORGANIZATION AND ARCHITECTURE | L | T | P | C | Total Marks |
|----------|----------------------------------------|---|---|---|---|-------------|
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: AECT2102-Digital System Design

COURSE OBJECTIVES

To expose the students to the following

- Functional Blocks of computer and data representation.
- Design of CPU control unit, Memory system and Peripheral devices
- Pipelining and basic MIPS implementation
- Parallel processing architecture
- Memory organization and replacement algorithms

UNIT 1 BASICS OF A COMPUTER SYSTEM

9 Hrs

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-and add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

UNIT 2 INSTRUCTION SET, MEMORY AND I/O SYSTEMS

9 Hrs

Introduction to x86 architecture-instruction set. 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, RAID architecture. 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 – PCI, SCSI, USB

UNIT 3 PIPELINING

9 Hrs

A Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined datapath and control – Handling Data Hazards & Control Hazards – Exceptions.

UNIT 4 PARALLELISM

9 Hrs

Parallel processing challenges – Flynn's classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors - Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

UNIT 5 MEMORY ORGANIZATION

9 Hrs

Memory organization: Memory interleaving, concept of hierarchical memory organization- Types and characteristics of memories – Cache memories – cache size vs. block size, mapping functions, replacement algorithms, write policies-Improving cache performance – Virtual memory – Memory management techniques – Associative memories.

TOTAL HOURS : 45

COURSE OUTCOMES

- CO1: Describe the function of the instruction execution cycle, addressing modes, instruction set.
- CO2: Write assembly language program for specified microprocessor
- CO3: Draw a flowchart for Concurrent access to memory and cache coherency in Parallel processors
- CO4: Design a memory module and analyze its operation by interfacing with the CPU.
- CO5: Given a CPU organization, assess and enhance its performance

TEXT BOOKS

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Elsevier, 2012.
2. Carl Hamacher, "Computer Organization and Embedded Systems", Tata McGraw Hill, 2012

REFERENCES

1. John P. Hayes, "Computer Architecture and Organization", Tata McGraw-Hill, 2012.
2. William Stallings, "Computer Organization and Architecture: Designing for Performance", Pearson Education, 2013
3. Vincent P. Heuring and Harry F. Jordan "Computer System Design and Architecture", Pearson Education, 2004.

| ACSL2103 | OPERATING SYSTEMS LABORATORY | | | | Total Marks |
|----------|------------------------------|---|---|---|-------------|
| | L | T | P | C | |
| | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: ACSL1101-Computer Programming Laboratory

COURSE OBJECTIVES

The students will learn about:

- Basic Unix Commands
- Write shell programs
- CPU scheduling algorithms
- Banker's and deadlock avoidance and detection algorithms
- Page Replacement and Memory management algorithms

List of Suggested Experiments

1. Basics of UNIX commands.
2. Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir
3. Write C programs to simulate UNIX commands like cp, ls, grep, etc.
4. Shell Programming
5. Implement the following CPU scheduling algorithms
 - a) Round Robin b) SJF c) FCFS d) Priority
6. Implement all file allocation strategies
 - a) Sequential b) Indexed c) Linked
7. Implement Semaphores
8. Implement all File Organization Techniques
 - a) Single level directory b) Two level c) Hierarchical d) DAG
9. Implement Bankers Algorithm for Dead Lock Avoidance
10. Implement an Algorithm for Dead Lock Detection
11. Implement all page replacement algorithms
 - a) FIFO b) LRU c) LFU
12. Implement Shared memory and IPC
13. Implement Paging Technique of memory management
14. Implement Threading & Synchronization Applications

TOTAL HOURS :30

COURSE OUTCOMES

Upon completion of the course the students will be able to:

- CO1: Use linux commands to create operating system functions like fork,exec etc.,
 CO2: Write shell program and implements CPU scheduling algorithms
 CO3: Implement file organization techniques
 CO4: Implement shared memory and memory management techniques
 CO5: Implement threading and synchronization applications

REFERENCES

1. Inderjeet Kaur, Sonam Gupta, "Operating System- A Concept based Approach", Wiley Publications, 2020.
2. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall of India, 2013

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|----------|------------------------------------------------------|---|---|---|---|-------------|
| AECL2104 | MICROPROCESSOR AND MICROCONTROLLER LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: AECL2102-Digital System Design Laboratory

COURSE OBJECTIVES:

- Introduce ALP concepts and features
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

LIST OF EXPERIMENTS:

8086 Programs using kits and MASM

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

Peripherals and Interfacing Experiments

7. Traffic light control
8. Stepper motor control
9. Digital clock
10. Key board and Display
11. Printer status
12. Serial interface and Parallel interface
13. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM

14. Basic arithmetic and Logical operations
15. Square and Cube program, Find 2's complement of a number
16. Unpacked BCD to ASCII

TOTAL HOURS :30

COURSE OUTCOMES:

- CO1:Write ALP Programmes for fixed and Floating Point and Arithmetic
 CO2:Interface different I/Os with processor
 CO3:Generate waveforms using Microprocessors
 CO4:Execute Programs in 8051
 CO5:Explain the difference between simulator and Emulator

LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS: HARDWARE:

- 8086 development kits -
- 30 nos Interfacing Units -
- Each 10 nos
- Microcontroller - 30 nos

SOFTWARE:

- Intel Desktop Systems with MASM - 30nos
- 8086 Assembler, 8051 Cross Assembler

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| ACSL2104 | OBJECT ORIENTED SOFTWARE DESIGN LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: ACSL2101-Object Oriented Programming Laboratory

COURSE OBJECTIVES:

The student should be made to:

- Learn the basics of OO analysis and design skills.
- Be exposed to the UML design diagrams.
- Learn to map design to code.
- Be familiar with the various testing techniques
- To implement mini projects

LIST OF EXPERIMENTS

To develop a mini-project by following the 9 exercises listed below.

1. To develop a problem statement.
2. Identify Use Cases and develop the Use Case model.
3. Identify the conceptual classes and develop a domain model with UML Class diagram.
4. Using the identified scenarios, find the interaction between objects and represent them Using UML Sequence diagrams.
5. Draw relevant state charts and activity diagrams.
6. Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
7. Develop and test the Technical services layer.
8. Develop and test the Domain objects layer.
9. Develop and test the User interface layer.

SUGGESTED DOMAINS FOR MINI-PROJECT:

1. Passport automation system.
2. Book bank
3. Exam Registration
4. Stock maintenance system.
5. Online course reservation system
6. E-ticketing
7. Software personnel management system
8. Credit card processing
9. e-book management system
10. Recruitment system
11. Foreign trading system
12. Conference Management System
13. BPO Management System
14. Library Management System
15. Student Information System

TOTAL HOURS :30

COURSE OUTCOMES

At the end of the course, the student should be able to

CO1: Design and implement projects using OO concepts.

CO2: Use the UML analysis and design diagrams.

CO3: Apply appropriate design patterns.

CO4: Create code from design.

CO5: Compare and contrast various testing techniques

Suggested Software Tools:

Rational Suite (or) Argo UML (or) equivalent, Eclipse IDE and Junit

REFERENCES

1. Simon Bennett, Steve Mc Robb and Ray Farmer, "Object Oriented Systems Analysis and Design Using UML", Fourth Edition, Mc-Graw Hill Education, 2010.
2. Erich Gamma, and Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley, 1995.
3. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third edition, Addison Wesley, 2003.

V Semester

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|-----------------|--------------------------------------------|----------|----------|----------|----------|--------------------|
| ACST3108 | AUTOMATA THEORY AND COMPILER DESIGN | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- To understand and list the different stages in the process of compilation.
- Identify different methods of lexical analysis and design top-down and bottom-up parsers
- Identify synthesized and inherited attributes
- Develop syntax directed translation schemes
- Develop algorithms to generate code for a target machine

UNIT 1 FORMAL LANGUAGES AND REGULAR EXPRESSION**9 Hrs**

Introduction: Phases of compilation and overview. Lexical Analysis (scanner): Regular languages, finite automata-DFA,NFA. Conversion of regular expression to NFA,NFA to DFA. Applications of finite automata to lexical analysis, scanner generator (lex, flex).

UNIT 2 SYNTAX ANALYSIS (PARSER)**9 Hrs**

Context-free languages and grammars, push-down automata, LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), LR(1), LALR(1) grammars and bottom-up parsing, ambiguity and LR parsing, LALR(1) parser generator (yacc, bison)Context-sensitive features-Chomsky hierarchy of languages and recognizers, type checking, type conversions, equivalence of type expressions.

UNIT 3 SEMANTICS AND RUNTIME ENVIRONMENTS**9 Hrs**

Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree. Symbol Table: its structure, symbol attributes and management. Runtime environment: Procedure activation, parameter passing, value return, memory allocation, and scope

UNIT 4 INTERMEDIATE CODE GENERATION & OPTIMIZATION**9 Hrs**

Intermediate Code Generation: Translation of different language features, different types of intermediate forms. Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc. Architecture dependent code improvement: instruction scheduling (for pipeline), loop optimization (for cache memory) etc.

UNIT 5 CODE GENERATION & TURNING MACHINE**9 Hrs**

Register allocation and target code generation Advanced topics: Type systems, data abstraction, compilation of Object Oriented features and non-imperative programming languages.Turing machine: Basic Turing Machine Model, Representation of TMs. Representation of TMs, Language acceptability of TMs, Techniques for TM construction. TM as computer of integer functions, Universal TM, Linear bounded automata, Church Thesis, Halting problem, post

correspondence problem.

TOTAL HOURS : 45

COURSE OUTCOMES

Upon Completion of the course the students will be able to perform:

CO1:For a given grammar specification develop the lexical analyser

CO2:Understand the automata and its conversion

CO3:For a given parser specification design top-down and bottom-up parsers

CO4:Develop syntax directed translation schemes

CO5:Develop algorithms to generate code for a target machine and construct Turing machine

Model

TEXT BOOK

- 1.Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman,"Compilers: Principles, Techniques and Tools", Pearson Education, 2009.

REFERENCES

1. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence based Approach", Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers,2003.
3. Keith D Cooper and Linda Torczon, Engineering a Compilerl, Morgan Kaufmann Publishers Elsevier Science, 2004.
4. V. Raghavan, "Principles of Compiler Design", Tata McGraw Hill Education,2010.
5. Allen I. Holub,"Compiler Design in C", Prentice-Hall Software Series, 1993.

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|-----------------|--------------------------------|----------|----------|----------|----------|--------------------|
| ACST3109 | ARTIFICIAL INTELLIGENCE | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES:

The student should be made to:

- Study the concepts of Artificial Intelligence.
- Learn the methods of solving problems using Artificial Intelligence.
- Introduce the concepts of Expert Systems and machine learning.
- Understand planning and machine learning
- Gain knowledge on expert systems

UNIT 1 INTRODUCTION TO AI AND PRODUCTION SYSTEMS 9 Hrs

Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions –Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.

UNIT 2 REPRESENTATION OF KNOWLEDGE 9 Hrs

Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

UNIT 3 KNOWLEDGE INFERENCE 9 Hrs

Knowledge representation -Production based system, Frame based system. Inference – Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.

UNIT 4 PLANNING AND MACHINE LEARNING 9 Hrs

Basic plan generation systems - Strips -Advanced plan generation systems – K strips –Strategic explanations -Why, Why not and how explanations. Learning- Machine learning, adaptive Learning.

UNIT 5 EXPERT SYSTEMS 9Hrs

Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition – Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.

TOTAL HOURS :45

COURSE OUTCOMES:

At the end of the course, the student should be able to:

CO1: Identify problems that are amenable to solution by AI methods.

CO2: Identify appropriate AI methods to solve a given problem.

CO3: Formalise a given problem in the language/framework of different AI methods.

CO4: Implement basic AI algorithms.

CO5: Design and carry out an empirical evaluation of different algorithms

TEXT BOOKS:

1. Kevin Night and Elaine Rich, Nair B., “Artificial Intelligence (SIE)”, Mc Graw Hill- 2008. (Units-I,II,VI & V)
2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007. (Unit-III).

REFERENCES:

1. Peter Jackson, “Introduction to Expert Systems”, 3rd Edition, Pearson Education, 2007.
2. Stuart Russel and Peter Norvig “AI – A Modern Approach”, 2nd Edition, Pearson Education 2007.
3. Deepak Khemani “Artificial Intelligence”, Tata Mc Graw Hill Education 2013.
4. <http://nptel.ac.in>

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|-----------------|--------------------------|----------|----------|----------|----------|--------------------|
| ACST3110 | COMPUTER NETWORKS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- To understand data communication components
- To understand data link layer and medium access sub layer
- To gain knowledge on Network Layer Concepts
- To understand Transport Layer Concepts and Protocols
- To understand Application Layer Concepts and Protocols

UNIT 1 DATA COMMUNICATION COMPONENTS

9 Hrs

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 spreadspectrum.

UNIT 2 DATA LINK LAYER AND MEDIUM ACCESS SUB LAYER

9 Hrs

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 3 NETWORKLAYER

9 Hrs

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

UNIT 4 TRANSPORTLAYER

9 Hrs

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 5APPLICATION LAYER

9 Hrs

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

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of the course, the student should be able to:

- CO1. Identify the components required to build different types of networks
- CO2. Choose the required functionality at each layer for given application
- CO3. Identify solution for functionalities at each layer
- CO4. Trace the flow of information from one node to another node in the network
- CO5. Understand basic concepts of cryptography

TEXT BOOK

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011.

REFERENCES

1. James F. Kurose, Keith W. Ross, "Computer Networking – A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
2. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.
3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", Mc Graw Hill Publisher, 2011.
4. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw – Hill, 2011.

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|-----------------|------------------------------------|----------|----------|----------|----------|--------------------|
| ACST3111 | DATABASE MANAGEMENT SYSTEMS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs and database modeling
- To understand and use data manipulation language to query, update, and manage a database
- To develop an understanding on database security, distributed database and intelligent database
- To design and build a simple database system

UNIT 1 DATABASE SYSTEM ARCHITECTURE

9 Hrs

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 2 QUERY PROCESSING

9 Hrs

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. Storage strategies: Indices, B-trees, hashing.

UNIT 3 TRANSACTION PROCESSING

9 Hrs

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

UNIT 4 DATABASE SECURITY

9 Hrs

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

UNIT 5 ADVANCED TOPICS

9 Hrs

Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

TOTAL HOURS : 45

COURSE OUTCOMES

CO1: For a given query write relational algebra expressions for that query and optimize

CO2: For a given specification of the requirement design the databases using E-R method

CO3: Construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2.

CO4: For a given query optimize its execution using Query optimization algorithms

CO5: For a given transaction-processing system, determine the transaction properties

TEXT BOOKS

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 6th Edition, TataMcGraw-Hill, 2011.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education, 2011.

REFERENCES

1. J. D. Ullman, "Principles of Database and Knowledge – Base Systems", Computer Science Press, 1999.
2. Serge Abiteboul, Richard Hull, Victor Vianu, "Foundations of Databases", Addison-Wesley, 1995
3. C.J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
4. Raghuram Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill College Publications, 2015.

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|-----------------|---------------------------------------------------------|----------|----------|----------|----------|--------------------|
| AMBT1101 | PRINCIPLES OF MANAGEMENT AND PROFESSIONAL ETHICS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES:

- To enable the students to study the evolution of Management
- To provide an overall holistic approach to management principles
- To provide a sound knowledge on leadership skills.

UNIT 1 MANAGEMENT FUNCTIONS AND STRUCTURE 9 Hrs

Management – Definition – Basic Functions – Contributions of Taylor and Fayol. Types of structure – Line, Staff, Line and Staff, Functional, Committee, Project and Matrix Structures. Departmentalization – Centralisation – Decentralization – Span of Control – Management by Objectives – Management by Exception.

UNIT 2 MANAGEMENT OF ORGANISATION 9 Hrs

Forms of Business – Industrial Ownership, Sole Trade, Partnership, Company. Performance Appraisal – Basic principles – Pitfalls – Methods to overcome. Industrial Safety – Causes of accidents – How to minimize accidents. Plant Layout and Maintenance – Need, Types and Managerial Aspects

UNIT 3 ORGANISATIONAL BEHAVIOR 9 Hrs

Organisational Behavior – Definition, Nature and Scope, Contributing Disciplines, Importance of OB to Managers. Personality – Definition – Theories – Factors Influencing Personality. Motivation – Definition – Theories – Theory X and Theory Y. Transaction Analysis – Morale and Job Satisfaction – Factors influencing job satisfaction.

UNIT 4 GROUP DYNAMICS 9 Hrs

Group – Definition – Types – Determinants of Group Cohesiveness – Communication – Process – Barriers – Effective Communication. Leadership Theories – Factors Contributing to Effective Leadership – Role of Trade Union in Organizations – Functions of Trade Union – Why Trade Union is required? – Types of Trade Union.

UNIT 5 PROFESSIONAL ETHICS 9 Hrs

Ethics in Workplace – Formulation of Ethics – Managerial Ethics – Managing Ethical Behaviour – Codes of Ethics – Encouraging Ethical Behaviour – Social Responsibility – Spirituality

Total Hours:45

COURSE OUTCOMES:

CO1: Realize the responsibilities and rights in the society.

CO2: Understand planning and Organization

CO3: Develop a deep understanding of Human values

CO4: Apply ethics in society & discuss the ethical issues related to engineering

Text Books / Reference Books:

1. Gupta C.B., Management Theory and Practice, 14th Edition, Sultan Chand & Sons, 2009.
2. Dr. Prasad L.M., Principle & Practice of Management, 7th Edition, Sultan Chand & Sons, 2008.
3. Aswathappa, Organisational Behaviour, 8th Edition, Himalaya Publishing House, 2010.
4. Harold Koontz, Principles of Management, 1st Edition, Tata McGraw Hill, 2004

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|-----------------|---------------------------------------------------|----------|----------|----------|----------|------------------------|
| ACSL3105 | DATABASE MANAGEMENT SYSTEMS LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES:None

COURSE OBJECTIVES

- To design simple information systems using proper data modelling techniques.
- To understand the method of implementing simple information systems.
- To provide the knowledge of various database tools and techniques.
- To implement PL/SQL programs
- To develop mini-projects

Suggested List of Experiments

1. a) Create a table EMP with the following fields.
ENAME, ENO, SALARY, DEPTNO, ADDRESS, DNAME
 - b) Insert 5 records into EMP
 - c) ALTER EMP table i) varying size of ENO field
ii) adding a new field JOB
 - d) Delete the table EMP
2. Create a table EMP with the above mentioned fields.
 - i) Insert 5 records into EMP
 - ii) Update the salary of the Employees by 10% hike
 - iii) Delete the employees whose name is 'AAA'
3. Create a table ORDER with the following fields and constraints.

| | | | |
|------------------|-----------------|-----------------|--|
| ORDER | | | |
| Column Name | Constraint Name | Constraint Type | |
| Order-no | pk-order-no | PRIMARY KEY | |
| Item-name | it | UNIQUE | |
| Qtyck-aty | CHECK | | |
| (25<QTY<50) | | | |
| rate-unitNn-rate | NOT NULL | | |
4. Using Ex 3.
 - a. Drop unique constraint for item-name
 - b. Disable the constraint Nn-rate
 - c. Insert a record with NULL values for rate unit
 - d. Enable the constraint with NULL value existing on rate-unit
5. Create a table EMP mentioned above and test all the arithmetic functions and character functions
6. Add a field date-of-birth to EMP table and test all the date functions.
7. i) Modify EMP table adding a new field BONUS, update it using NVL
ii) Retrieve the employees whose name starts with S.
iii) Select all the employees who are working in IT department.
8. i) Using EMP table find the employee getting maximum salary
ii) Find the employee whose salary is minimum
iii) Find the sum of salaries of all the employees working in 'ACCOUNTS' department.

9. Create a table DEPT with the following fields
DNo. Primary Key
DName
Modify EMP table adding a foreign key constraint on DeptNo.
 - i) Insert 6 records into Dept.
 - ii) Implement the following Join operations
 - a) Self Join
 - b) Equi Join
 - c) Non EquiJoin
 - d) OuterJoin
 - e) Natural Join
10. Using EMP and DEPT, implement all type of view techniques.
 - a) Row subset view
 - b) Column subset view
 - c) Row column subset view
 - d) Grouped view
 - e) Joined view
 - f) With check option
11. Using EMP and DEPT
 - a) Create a sequence to insert the empno in EMP table
 - b) Create a synonym for the above two tables
12. Create a cursor to update the salary of employees in EMP table
13. a) Write a PL/SQL program to raise an Exception When the bonus exceeds salary
b) Write a PL/SQL program to test the built-in Exceptions
14. Write a procedure to insert a record into ORDER table by validating qty limit of the item and also check whether that item exists.
15. Write a function to find substring.
16. Create a trigger which checks whether employee with Emp_no is present in the Employee table before inserting into EMP.
17. Development of mini-projects with VB as front-end.

TOTAL HOURS :30

Course Outcomes

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

CO1: Demonstrate the project management activities.

CO2: Develop any real time information system with all realistic constraints.

CO3: Solve basic issues of information systems

CO4: Construct real time database application using current techniques.

CO5: Develop mini-projects with front end tools

REFERENCES

1. J. D. Ullman, "Principles of Database and Knowledge – Base Systems", Computer Science Press, 1999.
2. Serge Abiteboul, Richard Hull, Victor Vianu, "Foundations of Databases", Addison-Wesley, 1995
3. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

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| CSL3106 | COMPUTER NETWORKS LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: ACSL1101-Computer Programming Laboratory

COURSE OBJECTIVES:

- Learn socket programming.
- Be familiar with simulation tools.
- Have hands on experience on various networking protocols.
- Application using TCP and UDP sockets
- Understand routing algorithms

LIST OF EXPERIMENTS:

1. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
2. Study of Socket Programming and Client – Server model
3. Write a code simulating ARP /RARP protocols.
4. Write a code simulating PING and TRACEROUTE commands
5. Create a socket for HTTP for web page upload and download.
6. Write a program to implement RPC (Remote Procedure Call)
7. Implementation of Subnetting .
8. Applications using TCP Sockets like
 - a. Echo client and echo server
 - b. Chat
 - c. File Transfer
- 9.Applications using TCP and UDP Sockets like
 - d. DNS
 - e. SNMP
 - f. File Transfer
9. Study of Network simulator (NS).
10. Perform a case study about the different routing algorithms:
 - i. Link State Routing
 - ii. Flooding
 - iii. Distance vector

TOTAL HOURS :30

COURSE OUTCOMES:

- CO1:Use simulation tools
 CO2:Implement the various protocols.
 CO3:Analyse the performance of the protocols in different layers.
 CO4:Demonstrate web page upload and download
 CO5:Analyze various routing algorithms

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

SOFTWARE

- C / C++ / Java / Equivalent Compiler 30
- Network simulator like NS2/Glomosim/OPNET/ Equivalent

HARDWARE

Standalone desktops 30 Nos

REFERENCES

- 1.James F. Kurose, Keith W. Ross, “Computer Networking – A Top-Down Approach Featuring the Internet”, Fifth Edition, Pearson Education, 2009
- 2.Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, 2010.
3. spoken-tutorial.org

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|-----------------|-----------------------------------|----------|----------|----------|----------|--------------------|
| ACSL3107 | COMPILER DESIGN LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: ACSL1101-Computer Programming Laboratory

COURSE OBJECTIVES

The student should be made to:

- Be exposed to compiler writing tools.
- Learn to implement the different Phases of compiler
- Be familiar with control flow and data flow analysis
- Construction of DAG
- Learn simple optimization techniques

LIST OF EXPERIMENTS:

1. Implementation of Symbol Table
2. Develop a lexical analyzer to recognize a few patterns in C.
(Ex. identifiers, constants, comments, operators etc.)
3. Implementation of Lexical Analyzer using Lex Tool
4. Generate YACC specification for a few syntactic categories.
 - a) Program to recognize a valid arithmetic expression that uses operator +, -, *, and /.
 - b) Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.
 - c) Implementation of Calculator using LEX and YACC
5. Convert the BNF rules into Yacc form and write code to generate Abstract Syntax Tree.
6. Implement type checking
7. Implement control flow analysis and Data flow Analysis
8. Implement any one storage allocation strategies(Heap,Stack,Static)
9. Construction of DAG
10. Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions that can be assembled and run using an 8086 assembler. The target assembly instructions can be simple move, add, sub, jump. Also simple addressing modes are used.
11. Implementation of Simple Code Optimization Techniques (Constant Folding., etc.)

TOTAL HOURS :30

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Standalone desktops with C / C++ compiler and Compiler writing tools 30 Nos.

(or)

Server with C / C++ compiler and Compiler writing tools supporting 30 terminals or more.

LEX and YACC

COURSE OUTCOMES:

Upon Completion of the course, the students should be able to:

CO1: Implement the different Phases of compiler using tools

CO2: Analyze the control flow and data flow of a typical program

CO3: Optimize a given program

CO4: Generate an assembly language program equivalent to a source language program

CO5: Implement simple code optimization techniques

REFERENCES

1. Randy Allen, Ken Kennedy, "Optimizing Compilers for Modern Architectures: A Dependence based Approach", Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, "Advanced Compiler Design and Implementation", Morgan Kaufmann Publishers, 2003.

VI SEMESTER

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|-----------------|--------------------------|----------|----------|----------|----------|--------------------|
| ACST3117 | COMPUTER GRAPHICS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

The student should be made to:

- Gain knowledge about graphics hardware devices and software used.
- Understand the two-dimensional graphics and their transformations.
- Understand the three-dimensional graphics and their transformations.
- Appreciate illumination and color models.
- Be familiar with and understand clipping techniques.

UNIT 1 INTRODUCTION**9 Hrs**

Survey of computer graphics, Overview of graphics systems – Video display devices, Raster scan systems, Random scan systems, Graphics monitors and Workstations, Input devices, Hard copy Devices, Graphics Software; Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

UNIT 2 TWO DIMENSIONAL GRAPHICS**9 Hrs**

Two-dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two-dimensional viewing – viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two-dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

UNIT 3 THREE DIMENSIONAL GRAPHICS**9 Hrs**

Three-dimensional concepts; Three-dimensional object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces.

TRANSFORMATION AND VIEWING: Three-dimensional geometric and modeling transformations – Translation, Rotation, Scaling, composite transformations; Three-dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNIT 4 ILLUMINATION AND COLOUR MODELS**9 Hrs**

Light sources - basic illumination models – halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model - YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection.

UNIT 5 ANIMATIONS & REALISM**9 Hrs**

Animation Graphics: Design of Animation sequences – animation function – raster animation – key frame systems – motion specification –morphing – tweening. Computer Graphics Realism: Tiling the plane – Recursively defined curves – Koch curves – C curves – Dragons –space-filling curves – fractals – Grammar-based models – fractals – turtle graphics – ray tracing.

TOTAL HOURS : 45**COURSE OUTCOMES**

At the end of the course, the student should be able to:

CO1: Design two-dimensional graphics.

CO2: Apply two dimensional transformations.

CO3: Design three-dimensional graphics.

CO4: Apply three-dimensional transformations.

CO5: Apply Illumination and color models and apply clipping techniques to graphics.

TEXT BOOKS

1. John F. Hughes, Andries Van Dam, Morgan Mc Guire, David F. Sklar, James D. Foley, Steven K. Feiner and Kurt Akeley, "Computer Graphics: Principles and Practice", 3rd Edition, Addison-Wesley Professional, 2013. (UNIT I, II, III, IV).
2. Donald Hearn and Pauline Baker M, "Computer Graphics", Prentice Hall, New Delhi, 2007 (UNIT V).

REFERENCES

1. Donald Hearn and M. Pauline Baker, Warren Carithers, "Computer Graphics With Open GL", 4th Edition, Pearson Education, 2010.
2. Jeffrey McConnell, "Computer Graphics: Theory into Practice", Jones and Bartlett Publishers, 2006.
3. Hill F S Jr., "Computer Graphics", Maxwell Macmillan", 1990.
4. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, Kelvin Sung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.
5. William M. Newman and Robert F. Sproull, "Principles of Interactive Computer Graphics", Mc Graw Hill 1978.
6. <http://nptel.ac.in/>

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|-----------------|-----------------------------|----------|----------|----------|----------|--------------------|
| ACST3118 | INTERNET PROGRAMMING | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

The student should be made to:

- Learn Java Programming.
- Understand different Internet Technologies.
- Understand client side and server side programming
- Understand PHP and XML programming
- Be exposed to java specific web services architecture.

UNIT 1 JAVA PROGRAMMING

9 Hrs

An overview of Java – Data Types – Variables and Arrays – Operators – Control Statements – Classes – Objects – Methods – Inheritance - Packages – Abstract classes – Interfaces and Inner classes – Exception handling - Introduction to Threads – Multithreading – String handling – Streams and I/O – Applets.

UNIT 2 WEBSITES BASICS, HTML 5, CSS 3, WEB 2.0

9 Hrs

Web 2.0: Basics-RIA Rich Internet Applications - Collaborations tools - Understanding websites and web servers: Understanding Internet – Difference between websites and web server- Internet technologies Overview –Understanding the difference between internet and intranet; HTML and CSS: HTML 5.0 , XHTML, CSS 3.

UNIT 3 CLIENT SIDE AND SERVER SIDE PROGRAMMING

9 Hrs

Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling- DHTML with JavaScript.

Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions- Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server;- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - JSP: Understanding Java Server Pages- JSP Standard Tag Library(JSTL)-Creating HTML forms by embedding JSP code.

UNIT 4 PHP and XML

9 Hrs

An introduction to PHP: PHP- Using PHP- Variables- Program control- Built-in functions to Database – Using Cookies-Regular Expressions; XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

UNIT 5 INTRODUCTION TO AJAX and WEB SERVICES

9 Hrs

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing ,Testing and Describing a Webservices (WSDL)-Consuming a web service, Database Driven web service from an application – SOAP.

TOTAL HOURS :45

COURSE OUTCOMES

At the end of the course, the student should be able to:

- CO1: Implement Java programs.
- CO2: Create a basic website using HTML and Cascading Style Sheets.
- CO3: Design and implement dynamic web page with validation using JavaScript objects
- CO4: Design rich client presentations using AJAX.
- CO5: Design and implement a simple web page in PHP, and to present data in XML format.

TEXT BOOKS

1. Deitel and Deitel and Nieto, “Internet and World Wide Web - How to Program”, Prentice Hall, 5th Edition, 2011.
2. Herbert Schildt, “Java-The Complete Reference”, Eighth Edition, Mc Graw Hill Professional, 2011.

REFERENCES

1. Stephen Wynkoop and John Burke “Running a Perfect Website”, QUE, 2nd Edition,1999.
2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J., “Web Technology”, Prentice Hall of India, 2011.
5. Paul Dietel and Harvey Deitel, “Java How to Program”, , 8th Edition Prentice Hall of India.
6. Mahesh P. Matha, “Core Java A Comprehensive Study”, Prentice Hall of India, 2011.
7. UttamK.Roy, “Web Technologies”, Oxford University Press, 2011.

| ACST3119 | MOBILE APPLICATION DEVELOPMENT | L | T | P | C | Total Marks |
|----------|--------------------------------|---|---|---|---|-------------|
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST3110-Computer Networks

COURSE OBJECTIVES:

- To facilitate students to understand android SDK
- To help students to gain a basic understanding of Android application development
- To inculcate working knowledge of Android Studio development tool
- To gain knowledge on files, database and location based services
- To understand audio, video and SMS messaging services

UNIT 1 INTRODUCTION TO ANDROID

9 Hrs

What is Android, Android versions and its feature set, Android Development Environment - Android SDK, Installing Java, and ADT bundle - Eclipse Integrated Development Environment (IDE), Creating Android Virtual Devices (AVDs), Creating a New Android Project ,Defining the Project Name and SDK Settings, Project Configuration Settings, Configuring the Launcher Icon, Creating an Activity.

UNIT 2 ARCHITECTURE OVERVIEW

9 Hrs

The Android Software Stack, The Linux Kernel, Android Runtime - Dalvik Virtual Machine, Android Runtime – Core Libraries, Dalvik VM Specific Libraries, Java Interoperability Libraries, Android Libraries, Application Framework, Running the Application in the AVD, Stopping a Running Application, Modifying the Example Application, Reviewing the Layout and Resource Files,

UNIT 3 ANDROID SOFTWARE DEVELOPMENT PLATFORM AND FRAMEWORK OVERVIEW

9 Hrs

Understanding Java SE and the Dalvik Virtual Machine , The Directory Structure of an Android Project , Common Default Resources Folders , The Values Folder , Leveraging Android XML, Screen Sizes , Launching Your Application: The AndroidManifest.xml File, Creating Your First Android Application; Android Application Components, Android Activities: Defining the UI, Android Services: Processing in the Background, Broadcast Receivers: Announcements and Notifications Content Providers: Data Management, Android Intent Objects: Messaging for Components Android Manifest XML: Declaring Your Components.

UNIT 4 ANDROID AND GUI

9 Hrs

Designing for Different Android Devices, Views and View Groups, Android Layout Managers, The View Hierarchy, Designing an Android User Interface using the Graphical Layout Tool, Displaying Text with TextView, Retrieving Data from Users, Using Buttons, Check Boxes and Radio Groups, Getting Dates and Times from Users, Using Indicators to Display Data to Users, Adjusting Progress with SeekBar, Working with Menus using views, Displaying Pictures, Gallery, ImageSwitcher, GridView, and ImageView views to display images, Creating Animation, Intent Overview, Implicit Intents, Creating the Implicit Intent Example Project, Explicit Intents, Creating the Explicit Intent Example Application, Intents with Activities, Intents with Broadcast Receivers.

UNIT 5 FILES, DATABASES, MESSAGING, LOCATION-BASED SERVICES AND MULTIMEDIA

9 Hrs

Saving and Loading Files, SQLite Databases, Android Database Design, Exposing Access to a Data Source through a Content Provider, Content Provider Registration, Native Content Providers. Sending SMS

Messages Programmatically, Getting Feedback after Sending the Message Sending SMS Messages Using Intent Receiving, sending email, Introduction to location-based service, configuring the Android Emulator for Location-Based Services, Geocoding and Map-Based Activities, Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures.

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of this course, students will be able to:

- CO1. Identify various concepts of mobile programming that make it unique from programming for other platforms
- CO2. Critique mobile applications on their design pros and cons
- CO3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces
- CO4. Program mobile applications for the Android operating system that use basic and advanced phone features, and
- CO5. Deploy applications to the Android marketplace for distribution.

TEXT BOOK

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)

REFERENCES

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd, 2011
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd, 2010
3. Barry Burd, "Android Application Development All in one for Dummies", John Wiley & Sons, 2011

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|-----------------|----------------------------------------|----------|----------|----------|----------|--------------------|
| ACSL3108 | INTERNET PROGRAMMING LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

The student should be made to:

- Be familiar with Web page design using HTML/XML and style sheets
- Be exposed to creation of user interfaces using Java frames and applets.
- Learn to create dynamic web pages using server side scripting.
- Learn to write Client Server applications and familiar with the frameworks JSP Strut, Hibernate, Spring
- Be exposed to creating applications with AJAX

LIST OF EXPERIMENTS:

IMPLEMENT THE FOLLOWING:

WEBPAGE CONCEPTS

1) Create a web page with the following using HTML

- a. To embed a map in a web page
- b. To fix the hot spots in that map
- c. Show all the related information when the hot spots are clicked.

2) Create a web page with the following.

- a. Cascading style sheets.
- b. Embedded style sheets.
- c. Inline style sheets. Use our college information for the web pages.

3) Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document.

SOCKETS & SERVLETS

1) Write programs in Java using sockets to implement the following:

i. HTTP request

- ii. FTP
- iii. SMTP
- iv. POP3

2) Write a program in Java for creating simple chat application with datagram sockets
And datagram packets.

3) Write programs in Java using Servlets:

- i. To invoke servlets from HTML forms
- ii. To invoke servlets from Applets

4) Write programs in Java to create three-tier applications using servlets for conducting online examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.

5) Write a program to lock servlet itself to a particular server IP address and port number.

It requires an init parameter key that is appropriate for its servlet IP address and port before it unlocks itself and handles a request

6) Session tracking using hidden form fields and Session tracking for a hit count

7) Install TOMCAT web server. Convert the static webpages of programs 1&2 into dynamic

Web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.

ADVANCE CONCEPTS:

- 1) Implement a simple program using following frameworks
 - a. JSP Struts Framework
 - b. Hibernate
 - c. Spring
- 2) Explore the following application in AJAX: Searching in real time with live searches, Getting the answer with auto complete, Chatting with friends, Dragging and dropping with Ajax, Getting instant login feedback, Ajax-enabled popup menus, Modifying Web pages on the fly.
- 3) Write a web services for finding what people think by asking 500 people's opinion for any consumer product
- 4) Write a web services for predicting for any product sales

TOTAL HOURS :30

COURSE OUTCOMES

At the end of the course, the student should be able to

- CO1: Design Web pages using HTML/XML and style sheets
- CO2: Create user interfaces using Java frames and applets.
- CO3: Create dynamic web pages using server side scripting.
- CO4: Write Client Server applications.
- CO5: Use the frameworks JSP Strut, Hibernate, Spring and create applications with AJAX

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

SOFTWARE:

Java, Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server

HARDWARE:

Standalone desktops 30 Nos

REFERENCES

1. Stephen Wynkoop and John Burke "Running a Perfect Website", QUE, 2nd Edition, 1999.
2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2011.
4. spoken-tutorial.org

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|-----------------|------------------------------------------------------|----------|----------|----------|----------|------------------------|
| ACSL3109 | MOBILE APPLICATION DEVELOPMENT LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: ACSL3106-Computer Networks Laboratory

COURSE OBJECTIVES

The student should be made to:

- Know the components and structure of mobile application development frameworks
- Understand how to work with various mobile application development frameworks.
- Learn the basic and important design concepts of development of mobile applications.
- Creates GPS location information
- Understand the capabilities and limitations of mobile devices.

LIST OF EXPERIMENTS:

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop an application that makes use of RSS Feed.
7. Implement an application that implements Multi threading
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Implement an application that creates an alert upon receiving a message.
11. Write a mobile application that creates alarm clock

TOTAL HOURS :30

COURSE OUTCOMES

At the end of the course, the student should be able to:

- CO1: Design and Implement various mobile applications using emulators.
 CO2: Deploy applications to hand-held devices
 CO3: Develop application that use RSS feed
 CO4: Design native application that uses GPS location information
 CO5: Develop applications to create alarm clock

LIST OF EQUIPMENT

Standalone desktops with Windows or Android or iOS or Equivalent Mobile Application Development

Tools with appropriate emulators and debuggers

REFERENCES

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd, 2011
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd, 2010
3. Barry Burd, "Android Application Development All in one for Dummies", John Wiley & Sons, 2011

VII SEMESTER

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|-----------------|-----------------------------------------|----------|----------|----------|----------|--------------------|
| ACST4122 | NETWORK AND INFORMATION SECURITY | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST3110-Computer Networks

COURSE OBJECTIVES

The student should be made to:

- To understand the fundamentals of Cryptography
- To acquire knowledge on standard security algorithms
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data
- To design security applications in the field of Information technology

UNIT 1 INTRODUCTION**9 Hrs**

An Overview of Computer Security-Security Services-Security Mechanisms-Security Attacks-Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies.

UNIT 2 CRYPTOSYSTEMS & AUTHENTICATION**9 Hrs**

Classical Cryptography-Substitution Ciphers-permutation Ciphers-Block Ciphers-DESModes of Operation- AES-Linear Cryptanalysis, Differential Cryptanalysis- Hash Function - SHA 512-Message Authentication Codes-HMAC - Authentication Protocols -

UNIT 3 PUBLIC KEY CRYPTOSYSTEMS**9 Hrs**

Introduction to Public key Cryptography- Number theory- The RSA Cryptosystem and Factoring Integer- Attacks on RSA-The ELGamal Cryptosystem- Digital Signature Algorithm-Finite Fields-Elliptic Curves Cryptography- Key management – Session and Interchange keys, Key exchange and generation-PKI

UNIT 4 SYSTEM IMPLEMENTATION**9 Hrs**

Design Principles, Representing Identity, Access Control Mechanisms, Information Flow and Confinement Problem Secure Software Development: Secured Coding - OWASP/SANS Top Vulnerabilities - Buffer Overflows - Incomplete mediation - XSS - Anti Cross Site Scripting Libraries - Canonical Data Format - Command Injection - Redirection - Inference – Application Controls

UNIT 5 NETWORK SECURITY**9 Hrs**

Secret Sharing Schemes-Kerberos- Pretty Good Privacy (PGP)-Secure Socket Layer (SSL)- Intruders – HIDS- NIDS - Firewalls - Viruses

TOTAL HOURS : 45**COURSE OUTCOMES**

Upon Completion of the course, the students will be able to

CO1: Implement basic security algorithms required by any computing system.

- CO2: Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
CO3: Analyze the possible security attacks in complex real time systems and their effective countermeasures
CO4: Identify the security issues in the network and resolve it.
CO5: Evaluate security mechanisms using rigorous approaches, including theoretical derivation, modeling, and simulations

TEXT BOOK

1. William Stallings, "Cryptography and Network Security: Principles and Practices", Third Edition, Pearson Education, 2006.

REFERENCES

1. Matt Bishop, "Computer Security art and science ", Second Edition, Pearson Education, 2002
2. Wade Trappe and Lawrence C. Washington, "Introduction to Cryptography with Coding Theory" Second Edition, Pearson Education, 2007
3. Jonathan Katz, and Yehuda Lindell, Introduction to Modern Cryptography, CRC Press, 2007
4. Douglas R. Stinson, "Cryptography Theory and Practice", Third Edition, Chapman & Hall/CRC, 2006
5. Wenbo Mao, "Modern Cryptography – Theory and Practice", Pearson Education, First Edition, 2006.
6. Network Security and Cryptography, Menezes Bernard, Cengage Learning, New Delhi, 2011
7. Man Young Rhee, Internet Security, Wiley, 2003
8. OWASP top ten security vulnerabilities: <http://xml.coverpages.org/OWASPTopTen.pdf>

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| ACST4123 | GRID AND CLOUD COMPUTING | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST2105-Operating Systems & ACST2107-Computer Organization and Architecture

COURSE OBJECTIVES

The student should be made to:

- Understand how Grid computing helps in solving large scale scientific problems.
- Understand Open Grid Services Architecture
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
- Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

UNIT1 INTRODUCTION

9 Hrs

Evolution of Distributed computing: Scalable computing over the Internet – Technologies for network based systems – clusters of cooperative computers - Grid computing Infrastructures – cloud computing - service oriented architecture – Introduction to Grid Architecture and standards – Elements of Grid – Overview of Grid Architecture.

UNIT2 GRID SERVICES

9 Hrs

Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services.

UNIT3 VIRTUALIZATION

9 Hrs

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software - Pros and Cons of cloud computing – Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

UNIT4 PROGRAMMING MODEL

9 Hrs

Open source grid middleware packages – Globus Toolkit (GT4) Architecture , Configuration – Usage of Globus – Main components and Programming model - Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system, HDFS concepts, command line and java interface, dataflow of File read & File write.

UNIT5 SECURITY

9 Hrs

Trust models for Grid security environment – Authentication and Authorization methods – Grid security infrastructure – Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud, Key privacy issues in the cloud.

TOTAL HOURS : 45

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- CO1: Apply grid computing techniques to solve large scale scientific problems.
CO2: Understand Open Grid Services Architecture

CO3:Apply the concept of virtualization.

CO4:Use the grid and cloud toolkits.

CO5:Apply the security models in the grid and the cloud environment.

TEXT BOOKS:

1. Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.
2. Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management and Security", CRC Press, 2017.

REFERENCES:

1. Jason Venner, "Pro Hadoop- Build Scalable, Distributed Applications in the Cloud", APress, 2009
2. Tom White, "Hadoop The Definitive Guide", First Edition. O'Reilly, 2009.
3. Bart Jacob (Editor), "Introduction to Grid Computing", IBM Red Books, Vervante, 2005
4. Ian Foster, Carl Kesselman, "The Grid: Blueprint for a New Computing Infrastructure", 2nd Edition, Morgan Kaufmann, 2004
5. Frederic Magoules and Jie Pan, "Introduction to Grid Computing" CRC Press, 2009.
6. Daniel Minoli, "A Networking Approach to Grid Computing", John Wiley Publication, 2005.
7. Barry Wilkinson, "Grid Computing: Techniques and Applications", Taylor and Francis Group, 2010.

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|-----------------|--------------------------------------------------------|----------|----------|----------|----------|------------------------|
| ACSL4108 | NETWORK AND INFORMATION SECURITY LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: ACSL3106-Computer Networks Laboratory

COURSE OBJECTIVES

The student should be made to:

- Be exposed to the different cipher techniques
- Learn to implement the algorithms DES,RSA,MD5,SHA-1
- Create Honeypots and install root kits
- Learn to use network security tools like GnuPG, KF sensor, NetStrumbler
- Demonstrate intrusion detection system

LIST OF EXPERIMENTS:

1. Implement the following SUBSTITUTION & TRANSPOSITION TECHNIQUES concepts:
 - a) Caesar Cipher
 - b) Play fair Cipher
 - c) Hill Cipher
 - d) Vigenere Cipher
 - e) Rail fence – row &Column Transformation
2. Implement the following algorithms
 - a) DES
 - b) RSA Algorithm
 - c) Difie-Hellman
 - d) MD5
 - e) SHA-1
3. Implement the SIGNATURE SCHEME - Digital Signature Standard
- 4.Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures(GnuPG).
- 5.Setup a honey pot and monitor the honeypot on network (KFSensor)
6. Installation of rootkits and study about the variety ofoptions
7. Perform wireless audit on an access point or a router and decrypt WEP and WPA.(Net Stumbler)
8. Demonstrate intrusion detection system (ids) using any tool (snort or any others/w)

TOTAL HOURS :30

COURSE OUTCOMES

At the end of the course, the student should be able to

- CO1: Implement the ciphertechniques
- CO2: Develop the various securityalgorithms
- CO3: Use different open source tools for network security andanalysis
- CO4: Create Digital Signatures and honeypots
- CO5: Install rootkits and demonstrate IDS

LIST OF SOFTWARE REQUIRED:

C / C++ / Java or equivalent compiler
GnuPG, KF Sensor or Equivalent, Snort, Net Stumbler or Equivalent

REFERENCES

1. Matt Bishop ,“Computer Security art and science ”, Second Edition, Pearson Education, 2002
2. Wade Trappe and Lawrence C. Washington, “Introduction to Cryptography with Coding Theory” Second Edition, Pearson Education, 2007
3. Jonathan Katz, and Yehuda Lindell, Introduction to Modern Cryptography, CRC Press, 2007

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| ACSL4109 | GRID AND CLOUD COMPUTING LABORATORY | L | T | P | C | Total Marks |
| | | 0 | 0 | 4 | 2 | 100 |

PREREQUISITES: ACSL2103-Operating Systems Lab

COURSE OBJECTIVES

The student should be made to:

- Be exposed to tool kits for grid and cloud environment.
- Be familiar with developing web services/Applications in grid framework
- Learn to run virtual machines of different configuration.
- Learn to use Hadoop
- Implement map and reduce program

LIST OF EXPERIMENTS:

GRID COMPUTING LAB

Use Globus Toolkit or equivalent and do the following:

1. Develop a new Web Service for Calculator.
2. Develop new OGSA-compliant Web Service.
3. Using Apache Axis develop a Grid Service.
4. Develop applications using Java or C/C++ Grid APIs
5. Develop secured applications using basic security mechanisms available in Globus Toolkit.
6. Develop a Grid portal, where user can submit a job and get the result. Implement it with and without GRAM concept.

CLOUD COMPUTING LAB

Use Eucalyptus or Open Nebula or equivalent to set up the cloud and demonstrate.

1. Find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time.
2. Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
3. Install a C compiler in the virtual machine and execute a sample program.
4. Show the virtual machine migration based on the certain condition from one node to the other.
5. Find procedure to install storage controller and interact with it.
6. Find procedure to set up the one node Hadoop cluster.
7. Mount the one node Hadoop cluster using FUSE.
8. Write a program to use the API's of Hadoop to interact with it.
9. Write a wordcount program to demonstrate the use of Map and Reduce tasks

TOTAL HOURS :30

COURSE OUTCOMES

At the end of the course, the student should be able to

- CO1: Use the grid and cloud toolkits.
- CO2: Design and implement applications on theGrid.
- CO3: Design and Implement applications on theCloud.
- CO4: Create virtual machine and perform virtualization
- CO5: Implement Map and Reduce Program

LIST OF SOFTWARE

Globus Toolkit or equivalent

Eucalyptus or Open Nebula or equivalent

REFERENCES:

1. Jason Venner, "Pro Hadoop- Build Scalable, Distributed Applications in the Cloud", APress, 2009
2. Tom White, "Hadoop The Definitive Guide", First Edition. O'Reilly, 2009.
3. Bart Jacob (Editor), "Introduction to Grid Computing", IBM Red Books, Vervante, 2005

PROGRAMME ELECTIVE-I (V SEMESTER)

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|----------|-------------------------------------|---|---|---|---|-------------|
| ACST3112 | SOFT COMPUTING AND ITS APPLICATIONS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

The objective of this course is to

- Provide students with the knowledge in Neural networks and fuzzy logic
- Demonstrate an understanding of statistics and machine learning concepts
- Produce Python code to statistically analyse and test
- Critically evaluate data visualisations based on their design
- Learn about MATLAB and Python libraries to implement data science operations

UNIT 1 INTRODUCTION**9 Hrs**

Introduction to Soft Computing and Neural Networks, Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics

UNIT 2 FUZZY LOGIC**9 Hrs**

Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

UNIT 3 NEURAL NETWORKS**9 Hrs**

Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks

UNIT 4 GENETIC ALGORITHMS**9 Hrs**

Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition, Recent Trends in deep learning

UNIT 5 MATLAB/PYTHON LIB**9 Hrs**

Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic

TOTAL HOURS : 45**COURSE OUTCOMES**

On completion of the course the student should be able to

CO1:Understand the key concepts in Soft Computing and fuzzy logic

CO2:Gain understanding in Fuzzy logic

CO3:Gain understanding in Neural Networks

CO4:Gain understanding in Genetic Algorithms

CO5:UseMatlab/Python Lib to study Neural Networks toolbox andfuzzy logic toolbox

TEXT BOOKS

1. J.S.R.Jang, C.T. Sun and E.Mizutani, ‘Neuro-Fuzzy and Soft Computing’, PHI / Pearson Education 2004.
2. S.N.Sivanandam and S.N.Deepa, ‘Principles of Soft Computing’, Wiley India Pvt Ltd, 2011.

REFERENCES

1. S.Rajasekaran and G.A.Vijayalakshmi Pai, ‘Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications’, Prentice-Hall of India Pvt. Ltd., 2006.
2. George J. Klir, Ute St. Clair, Bo Yuan, ‘Fuzzy Set Theory: Foundations and Applications’ Prentice Hall, 1997.
3. David E. Goldberg, ‘Genetic Algorithm in Search Optimization and Machine Learning’ Pearson Education India, 2013.
4. James A. Freeman, David M. Skapura, ‘Neural Networks Algorithms, Applications, and Programming Techniques’, Pearson Education India, 1991.
5. Simon Haykin, ‘Neural Networks Comprehensive Foundation’ , Pearson Education, 2005.

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|----------|--------------------------------|---|---|---|---|-------------|
| ACST3113 | INTRODUCTION TO CYBER SECURITY | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

The students should be made familiar:

- Overview of Cyber Security
- Understand Cyber Security Vulnerabilities
- Understand Intrusion Detection and Prevention
- Cyberspace and the law
- Understand cyber forensics

UNIT 1 INTRODUCTION TO CYBER SECURITY

9Hrs

Overview of Cyber Security, Internet Governance – Challenges and Constraints, Cyber Threats:- Cyber Warfare-Cyber Crime-Cyber terrorism-Cyber Espionage, Need for a Comprehensive Cyber Security Policy, Need for a Nodal Authority, Need for an International convention on Cyberspace.

UNIT 2 CYBER SECURITY VULNERABILITIES AND CYBER SECURITY

SAFEGUARDS

9Hrs

Cyber Security Vulnerabilities-Overview, vulnerabilities in software, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness. Cyber Security Safeguards- Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, Security policy, Threat Management.

UNIT 3 INTRUSION DETECTION AND PREVENTION

9Hrs

Intrusion, Physical Theft, Abuse of Privileges, Unauthorized Access by Outsider, Malware infection, Intrusion detection and Prevention Techniques, Anti-Malware software, Network based Intrusion detection Systems, Network based Intrusion Prevention Systems, Host based Intrusion prevention Systems, Security Information Management, Network Session Analysis, System Integrity Validation.

UNIT 4 CYBERSPACE AND THE LAW

9Hrs

Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013.

UNIT 5 CYBER FORENSICS

9Hrs

Introduction to Cyber Forensics, Handling Preliminary Investigations, Controlling an Investigation, Conducting disk-based analysis, Investigating Information-hiding, Scrutinizing E-mail, Validating E-mail header information, Tracing Internet access, Tracing memory in real-time.

TOTAL HOURS : 45

COURSE OUTCOMES

Upon completion of the course the students should be able to

- CO1: Challenges and Constraints of Internet Governance
- CO2: Understand about Cyber Security Safeguards
- CO3: Intrusion prevention Systems and Security Information Management
- CO4: Have awareness on cyber space and the law
- CO5: Investigate Information-hiding, Scrutinize and validate E-mail

TEXT BOOKS

- 1 Introduction to Cyber Security available at <http://uou.ac.in/foundation-course>
2. Fundamentals of Information Security <http://uou.ac.in/progdetail?pid=CEGCS-17>

REFERENCES

1. Cyber Security Techniques <http://uou.ac.in/progdetail?pid=CEGCS-17>
2. Cyber Attacks and Counter Measures: UserPerspective <http://uou.ac.in/progdetail?pid=CEGCS-17>
3. Information System <http://uou.ac.in/progdetail?pid=CEGCS-17>

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| ACST3114 | MULTI-CORE ARCHITECTURES AND PROGRAMMING | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST2107-Computer Organization and Architecture

COURSE OBJECTIVES

The student should be made to:

- Understand multi core processors
- Understand the challenges in parallel and multi-threaded programming.
- Learn about the various parallel programming paradigms, and solutions.
- Learn about distributed memory programming
- Learn about parallel program case studies

UNIT1 MULTI-CORE PROCESSORS

9 Hrs

Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks - Symmetric and Distributed Shared Memory Architectures – Cache coherence - Performance Issues – Parallel program design.

UNIT 2 PARALLEL PROGRAM CHALLENGES

9 Hrs

Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communication between threads (condition variables, signals, message queues and pipes).

UNIT3 SHARED MEMORY PROGRAMMING WITH OpenMP

9 Hrs

OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs - Library functions – Handling Data and Functional Parallelism – Handling Loops - Performance Considerations.

UNIT4 DISTRIBUTED MEMORY PROGRAMMING WITH MPI

9 Hrs

MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived datatypes – Performance evaluation

UNIT5 PARALLEL PROGRAM DEVELOPMENT

9 Hrs

Case studies - n-Body solvers – Tree Search – OpenMP and MPI implementations and comparison.

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of the course, the student should be able to:

CO1: Program Parallel Processors.

CO2: Compare and contrast programming for serial processors and programming for parallel processors.

CO3: Develop shared memory programs using OpenMP

CO4: Develop distributed memory program with MPI.

CO5: Learn about case studies in parallel program development

TEXT BOOKS

1. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan Kauffman/Elsevier, 2011.
2. Darryl Gove, "Multicore Application Programming for Windows, Linux, and OracleSolaris", Pearson, 2011 (unit2)

REFERENCES

1. Michael J Quinn, "Parallel programming in C with MPI and OpenMP", Tata McGraw Hill,2003.
Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press,2006.

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|-----------------|------------------------------|----------|----------|----------|----------|--------------------|
| ACST3115 | DISTRIBUTED COMPUTING | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST2105-Operating Systems

COURSE OBJECTIVES

The student should be made to:

- Understand foundations of Distributed Systems.
- Understand Communication in distributed system
- Introduce the idea of peer to peer services and files system.
- Understand in detail the system level and support required for distributed system.
- Understand the issues involved in studying process and resource management.

UNIT 1 INTRODUCTION

9 Hrs

Examples of Distributed Systems–Trends in Distributed Systems – Focus on resource sharing – Challenges. Case study: World Wide Web.

UNIT 2 COMMUNICATION IN DISTRIBUTED SYSTEM

9 Hrs

System Model – Inter process Communication - the API for internet protocols – External data representation and Multicast communication. Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation And Objects: Remote Invocation – Introduction - Request-reply protocols - Remote procedure call - Remote method invocation. Case study: Java RMI-Group communication - Publish-subscribe systems - Message queues - Shared memory approaches-Distributed objects - Case study: Enterprise Java Beans -from objects to components.

UNIT 3 PEER TO PEER SERVICES AND FILE SYSTEM

9 Hrs

Peer-to-peer Systems – Introduction - Napster and its legacy - Peer-to-peer – Middleware - Routing overlays. Overlay case studies: Pastry, Tapestry- Distributed File Systems –Introduction - File service architecture – Andrew File system. File System: Features-File model -File accessing models-File sharing semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP.

UNIT 4 SYNCHRONIZATION AND REPLICATION

9 Hrs

Introduction - Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks - Global states – Coordination and Agreement – Introduction - Distributed mutual exclusion – Elections – Transactions and Concurrency Control– Transactions -Nested transactions – Locks – Optimistic concurrency control - Timestamp ordering – Atomic Commit protocols -Distributed deadlocks – Replication – Case study – Coda.

UNIT 5 PROCESS & RESOURCE MANAGEMENT

9 Hrs

Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of the course, the student should be able to:

CO1:Discuss trends in Distributed Systems.

- CO2:Apply network virtualization
- CO3:Understand peer to peer systems
- CO4:Apply remote method invocation and objects.
- CO5.Design process and resource management systems.

TEXT BOOK

- 1.George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.

REFERENCES

1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India,2007.
2. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”,Pearson Education,2007.
3. Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education,2004.
4. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA,2003.

| AECT3114 | EMBEDDED SYSTEMS | L | T | P | C | Total Marks |
|----------|------------------|---|---|---|---|-------------|
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: AECT2107-Microprocessor and Microcontroller

COURSE OBJECTIVES:

- Learn the architecture and programming of ARM processor.
- Be familiar with the embedded computing platform design and analysis.
- Be exposed to the basic concepts of real time Operating system.
- Learn the system design techniques and networks for embedded systems
- Learn the case studies of embedded systems

UNIT 1 INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS 9Hrs

Complex systems and micro processors– Embedded system design process –Design example: Modeltrain controller- Instruction sets preliminaries - ARM Processor – CPU: programming input and outputsupervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.

UNIT 2 EMBEDDED COMPUTING PLATFORM DESIGN 9Hrs

The CPU Bus-Memory devices and systems–Designing with computing platforms – consumerelectronics architecture – platform-level performance analysis - Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and poweranalysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT 3 PROCESSES AND OPERATING SYSTEMS 9Hrs

Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real-timeoperating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluatingoperating system performance- power optimization strategies for processes – Example Real timeoperating systems-POSIX-Windows CE.

UNIT 4 SYSTEM DESIGN TECHNIQUES AND NETWORKS 9Hrs

Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis andarchitecture design – Quality Assurance techniques- Distributed embedded systems – MPSoCsandshared memory multiprocessors.

UNIT 5 CASE STUDY 9Hrs

Data compressor - Alarm Clock - Audio player - Software modem-Digital still camera - Telephoneanswering machine- Engine control unit – Video accelerator.

TOTAL HOURS : 45

COURSE OUTCOMES:

- CO1:Upon completion of the course, students will be able to:
 CO2:Describe the architecture and programming of ARM processor.
 CO3:Outline the concepts of embedded systems
 CO4:Explain the basic concepts of real time Operating system design.
 CO5:Use the system design techniques to develop software for embedded systems

TEXT BOOK:

- Marilyn Wolf, “Computers as Components - Principles of Embedded Computing System Design”, Third Edition “Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.

REFERENCES:

1. Jonathan W.Valvano, “Embedded Microcomputer Systems Real Time Interfacing”, Third Edition Cengage Learning, 2012.
1. David. E. Simon, “An Embedded Software Primer”, 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.
2. Raymond J.A. Buhr, Donald L.Bailey, “An Introduction to Real-Time Systems- From Design to Networking with C/C++”, Prentice Hall,1999.
3. C.M. Krishna, Kang G. Shin, “Real-Time Systems”, International Editions, Mc Graw Hill 1997
4. K.V.K.K.Prasad, “Embedded Real-Time Systems: Concepts, Design & Programming”, Dream Tech Press, 2005.

PROGRAM ELECTIVE-II (VI SEMESTER)

| ACST3120 | ARTIFICIAL INTELLIGENCE FOR REAL WORLD APPLICATIONS | L | T | P | C | Total Marks |
|----------|-----------------------------------------------------|---|---|---|---|-------------|
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None**COURSE OBJECTIVES**

- To understand the basics of artificial intelligence
- To know the searching and reasoning techniques
- To know the aspects of machine learning
- To become aware of time series analysis
- To know the technological aspects of Information Security

UNIT 1 INTRODUCTION TO AI**9 Hrs**

History of AI- Tools to be used for AI Programming and its Overview- Explaining What is Cognitive Science and Perception Problem- Applications of AI

UNIT 2 SEARCH**9 Hrs**

Intelligent Agents, Uninformed Search- Search Techniques 1 - Search Space, State Space Search- Search Techniques 2 - Heuristic Search, and Pattern Directed Search- Planning, Control Strategies and Implementation, Constraint Satisfaction- Problem Solving by Heuristic Search, A* algorithm, AO* Algorithm- Adversarial Search, Game Playing

UNIT 3 REASONING**9 Hrs**

Proposition and First Order Logic- Rule-base, Semantic Net, Conceptual Graph, Inference and Deduction- Resolution Refutation, Answer Extraction- Reasoning under Uncertainty - Probabilistic Reasoning, Belief Networks

UNIT 4 MACHINE LEARNING**9 Hrs**

Basic Concepts- Linear Models, Perceptrons- Introduction to Supervised Learning and K Nearest Neighbors, Decision Trees- Advanced Models – SVM, Ensemble Classifiers- Introduction to Neural Networks- Backpropagation- Training Neural Nets using Keras- Regularization, Batch Normalization, Dropout- Introduction to Convolutional Neural Networks- Introduction to Natural Language Processing and Toolkits

UNIT 5 TIME-SERIES ANALYSIS**9 Hrs**

Introduction to Time Series- Stationary Time Series- Smoothing Time Series- Autocorrelation Functions- ARIMA Models- Signal Transformations- Introduction to TensorFlow- Convolutional Neural Networks with TensorFlow- Using TensorFlow for implementing Regression and Clustering methods

TOTAL HOURS : 45**COURSE OUTCOMES**

At the end of this course, the students should be able to:

- CO1: Discuss the basics of artificial intelligence
- CO2: Illustrate the search concepts
- CO3: Illustrate the reasoning concepts
- CO4: Demonstrate reasoning concepts and machine learning techniques
- CO5: Become aware of time series analysis

TEXT BOOKS

- 1 S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
- 2 I. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

REFERENCES

1. M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Publishers, Inc.; First Edition, 2008
2. Nils J. Nilsson, "The Quest for Artificial Intelligence", Cambridge University Press, 2009.
3. William F. Clocksin and Christopher S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.
4. Gerhard Weiss, "Multi Agent Systems", Second Edition, MIT Press, 2013.
5. David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.

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|----------|------------------------------|---|---|---|---|-------------|
| AITT3118 | INTELLECTUAL PROPERTY RIGHTS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

The aim of this course is to:

- Introduce the basic concepts of Intellectual property laws
- Understand the concepts of copyright
- Create an awareness on patents
- Familiarize them with the kind of rights, remedies and licensing
- Create a basic understanding of GI.

UNIT 1 INTRODUCTION

9 Hrs

Basic concept of Intellectual Property-Characteristics and Nature of Intellectual Property right-Justifications for protection of IP-IPR and Economic Development- Major International Instruments relating to the protection of IP-Berne Convention-Paris Convention-TRIPS

UNIT 2 COPYRIGHT

9 Hrs

Meaning-Subject matter-Original literary, dramatic, musical, artistic works-Cinematograph film-Sound recordings-Ownership of copyright-Term of copyright-Rights of owner-Economic Rights-Moral Rights-Assignment and license (including basic concept of statutory and compulsory license) of rights-Performers rights and Broadcasters rights-Infringement of copyright-Fair use and Fair Dealing concepts

UNIT 3 PATENTS

9 Hrs

Meaning-Criteria for obtaining patents: Novelty, Inventive step,Utility-Non patentable inventions-Procedure for registration-Term of patent-Rights of patentee-Basic concept of Compulsory license and Government use of patent-Infringement of patents and remedies in case of infringement

UNIT 4 TRADE MARKS

9 Hrs

Meaning of mark, trademark-Categories of Trademark: Certification Mark, Collective Mark and Well known Mark and Non-conventional Marks-Concept of distinctiveness,Absolute and relative grounds of refusal, Doctrine of honest concurrent user, Procedure for registration and Term of protection,Assignment and licensing of marks, Infringement and Passing Off

UNIT 5 DESIGNS, GI AND OTHER FORMS OF IP

9 Hrs

Designs-Meaning design protection-Concept of original design-Term of protection-Geographical Indication-Meaning of GI-Difference between GI and Trade Marks-Concept of Authorized user-Homonymous GI-Trade-secret-Meaning, Criteria of Protection, Plant Variety Protection and Farmer's Right-Meaning, Criteria of protection

TOTAL HOURS : 45

COURSE OUTCOMES

Upon completion of the course the student will be able to:

- CO1: Understand Characteristics and Nature of Intellectual Property right
- CO2: Know about Infringement of copyright
- CO3: Understand Term of patent-Rights of patentee
- CO4: Meaning of mark, trademark-Categories of Trademark
- CO5: Meaning of GI-Difference between GI and Trade Marks

TEXT BOOKS

- 1.Lionel Bently& Brad Sherman, Intellectual Property Law, Oxford.
- 2.P. Narayanan, Intellectual Property Law, Eastern Law House TEXT BOOKS & REFERENCES:
- 3.E. Bouchoux Intellectual property right, Deborah., Cengage learning.
- 4.Prabuddha ganguli, Intellectual property right – Unleashing the knowledge economy, , Tate McGraw Hill Publishing company ltd.,

REFERENCES

Statutes

The Copyright Act, 1957

The Patent Act, 1970

The Trade Marks Act, 1999

The Designs Act, 2000

The Geographical Indication of Goods Act, 1999

The Protection of Plant Varieties and Farmers' Rights Act, 2001

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|----------|-------------------------------|---|---|---|---|-------------|
| AITT3116 | SERVICE ORIENTED ARCHITECTURE | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST2107-Computer Organization and Architecture

COURSE OBJECTIVES

The student should be made to:

- Learn XML fundamentals.
- Be exposed to build applications based on XML.
- Understand the key principles behind SOA.
- Be familiar with the web services technology elements for realizing SOA.
- Learn the various web service standards.

UNIT 1 INTRODUCTION TO XML

9 Hrs

XML document structure – Well formed and valid documents – Namespaces – DTD – XML Schema – X-Files.

UNIT 2 BUILDING XML- BASED APPLICATIONS

9 Hrs

Parsing XML – using DOM, SAX – XML Transformation and XSL – XSL Formatting – Modeling Databases in XML.

UNIT 3 SERVICE ORIENTED ARCHITECTURE

9 Hrs

Characteristics of SOA, Comparing SOA with Client-Server and Distributed architectures – Benefits of SOA -Principles of Service orientation – Service layers.

UNIT 4 WEB SERVICES

9 Hrs

Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Message Exchange Patterns – Orchestration – Choreography – WS Transactions.

UNIT 5 BUILDING SOA-BASED APPLICATIONS

9 Hrs

Service Oriented Analysis and Design – Service Modeling – Design standards and guidelines -- Composition – WS-BPEL – WS-Coordination – WS-Policy – WS-Security – SOA support in J2EE

TOTAL HOURS : 45

COURSE OUTCOMES:

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

CO1: Build applications based on XML.

CO2: Develop web services using technology elements.

CO3: Understand service oriented architecture

CO4: Understand web services

CO5:Build SOA-based applications for intra-enterprise and inter-enterprise applications.

TEXTBOOKS

1. Ron Schmelzer et al. “XML and Web Services”, Pearson Education, 2002.
2. Thomas Erl, “Service Oriented Architecture: Concepts, Technology, and Design”, Pearson Education, 2005.

REFERENCES

1. Frank P.Coyle, "XML, Web Services and the Data Revolution", Pearson Education, 2002
2. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", Pearson Education, 2005
3. Sandeep Chatterjee and James Webber, "Developing Enterprise Web Services: An Architect's Guide", Prentice Hall, 2004.
4. James McGovern, Sameer Tyagi, Michael E.Stevens, Sunil Mathew, "Java Web Services Architecture", Morgan Kaufmann Publishers, 2003.

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|-----------------|--------------------------------------------------------|----------|----------|----------|----------|--------------------|
| AITT3120 | PRACTICAL APPROACH TO DATA MINING AND ANALYTICS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST3111-Database Management Systems

COURSE OBJECTIVES

The objective of this course is to

- Introduce the basic concepts of data mining
- Familiarize students with the basics of data processing algorithms
- Familiarize students with the basics of data mining algorithms
- Provide exposure to data analytics using programming tools
- Understand the topic in analytics

UNIT1 INTRODUCTION TO DATA MINING

9 Hrs

Basic concepts of data mining- Importance and Goals of Data Mining- Data Mining Techniques- Related technologies - Machine Learning, DBMS (Data management and indexing, Data representation and characterization), OLAP, Basic statistical analysis tools and models

UNIT2 DATA PROCESSING

9 Hrs

Data cleaning- Data transformation- Data reduction- Discretization and generating; concept hierarchies

UNIT3 DATA MINING ALGORITHMS

9 Hrs

Association Rules - Frequent Patterns, Association Rules, Correlation Analysis-Classification - Decision trees, Rule-based, k-Nearest Neighbour, Bayesian, SVM- Prediction - Regression, Training and testing Accuracy and Error measure, Ensembles Methods – bagging, Boosting-Clustering - Basic issues, Types, Partitioning, Hierarchical, Density Based, Grid Based, Model Based, Constraint Based. Outlier analysis. Clustering High Dimensional Data

UNIT4 DATA ANALYTICS USING PROGRAMMING TOOLS

9 Hrs

R, SPSS, Matlab, Python and their associated packages as per the tools chosen, Data Source, Data structure and data handling, Required Packages and installation, Visualising Tool

UNIT5 TOPICS IN ANALYTICS

9 Hrs

Association and correlation analysis- regression models-Predictive analytics - Exploratory analysis- Sensors for Engine feedback control – EGO sensor, EGO characteristics, Magneto-strictive principle and Knock sensor, accelerometers-Image analytics - Text analytics

TOTAL HOURS : 45

COURSE OUTCOMES

Upon Completion of the course the students will be able to:

- Understand the basic concepts of data mining
- Familiar with the basics of data processing algorithms
- Familiar students with the basics of data mining algorithms
- Gain exposure to data analytics using programming tools
- Understand the topic in analytics

TEXT BOOKS

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

REFERENCES

1. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analytics, John Wiley & sons, 2012.
2. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O'Reilly, 2011.
3. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

| AITT3121 | INTERNET OF THINGS AND ITS APPLICATIONS | L | T | P | C | Total Marks |
|----------|-----------------------------------------|---|---|---|---|-------------|
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES:

- To understand the fundamentals of Internet of Things
- To learn about the basics of IOT protocols
- To build a small low cost embedded system using Raspberry Pi.
- To apply the concept of Internet of Things in the real world scenario.
- Implement IOT projects

UNIT I IOT OVERVIEW

9Hrs

Introduction to IoT- Kit Description, Installation, Program Structure- Data types, Control statements, Arrays, Strings

UNIT II IOT FUNCTIONALITY

9Hrs

Digital Input / Output, Analog Input / Output- Time, Characters- Bit & Bytes, Math support

UNIT III IOT ADVANCED FUNCTIONALITY

9Hrs

PWM (Pulse width Modulation)- Communication, Wire communication- I2C (Inter Integrated Circuit), SPI (Serial peripheral interface)

UNIT IV IOT WIRELESS MODULE AND IOT SENSORS / DEVICES

9Hrs

Wireless module basics, Wireless connectivity configuration- Acting as TCP client for IoT, Acting as TCP server for IoT- Acting as Wifi access point for IoT-LDR, Potentiometer, LED strip, switches- Temperature Sensor, Ultrasonic sensor- Piezo buzzer, LCD display- Motor, Accelerometer, Gyroscope, SD card, IR sensor

UNIT V IOT PROJECTS

9Hrs

Standalone interfacing of Sensors, Internet controlled LEDs- Temperature Logger, Home Automation / Home security system- Internet controlled motor, Connectivity with WAMP server Interaction with Google Cloud Interaction with Amazon Web Services (AWS)

Total Hours:45

COURSE OUTCOMES:

- CO1:Analyze various protocols for IoT.
- CO2:Develop web services to access/control IoT devices.
- CO3:Design a portable IoT using Raspberry Pi
- CO4:Deploy an IoT application and connect to the cloud.
- CO5:Analyze applications of IoT in real time scenario

REFERENCES:

1. ArshdeepBahga, Vijay Madiseti, —Internet of Things – A hands-on approachll, Universities Press, 2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Thingsll, Springer, 2011.
3. Honbo Zhou, —The Internet of Things in the Cloud: A Middleware Perspectivel, CRCPress, 2012.
4. Jan Ho`ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.

PROGRAM ELECTIVE – III (VII SEMESTER)

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|-----------------|-----------------------------------------------------|----------|----------|----------|----------|--------------------|
| ACST4124 | MACHINE LEARNING FOR REAL WORLD APPLICATIONS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST3109-Artificial Intelligence**COURSE OBJECTIVES**

- Gain knowledge on the basics of statistical concepts used in machine learning
- To understand the basics of machine learning
- To understand the concepts of machine learning methodology
- To gain knowledge on imbalanced datasets and regression techniques
- Gain knowledge on the applications of machine learning in real life use cases

UNIT 1 BASICS OF STATISTICS**9****Hrs**

Matrices and vectors, matrix addition, scalar multiplication, matrix-vector multiplication, matrix-matrix multiplication, matrix inverse and transpose, distance measures (Euclidean, Manhattan, Mahalanobis, Minkowsky's)- Descriptive Statistics, Basic Probability & Distributions, Hypothesis testing, correlation, co-variance, normal distribution, Basics of Inferential Statistics, Sample, Population, regression

UNIT 2 BASICS OF MACHINE LEARNING**9 Hrs**

Data Analytics, Machine learning, Business Applications- Definitions of Supervised learning, Linear Regression, Logistic Regression- Definition of Un-supervised learning, K-Means clustering, Agglomerative Clustering- Definition, Basics of Reinforcement Learning with Examples

UNIT 3 MACHINE LEARNING METHODOLOGY (CRISP DM)**9 Hrs**

Steps in CRISP-DM methodology, Introduction Data Types- Handling missing data (imputation), ordering data, normalization, data merging, data manipulation, data transformation- Dimensionality reduction, Multicollinearity, Factor Analysis, PCA (Principle component Analysis)

UNIT 4 KEY CONCEPTS IN MACHINE LEARNING**9 Hrs**

Sample selection, Training data, Test data & Validation- modeling assumptions, assessment of modeling algorithms, parameter setting, model description- Linear Regression, Multiple Linear Regression (stepwise All), Binary Logistic Regression (Stepwise All), Multi Logistic Regression, GBM (Gradient Boosting Algorithm)- Model Validation, Confusion Matrix, ROC curve, cross Validation, AIC, R2 Value, Lift, Gain, K-fold Validation, Bootstrapping & Bagging, overfitting vs under-fitting diagnosis- Frequency of model execution, frequency of model update, monitoring- sampling algorithms (over sampling and under sampling), random over sampling, SMOTE, Random under-sampling,

UNIT 5 MACHINE LEARNING ALGORITHMS WITH REAL LIFE USE CASES**9 Hrs**

K-Means clustering and Hierarchical clustering- KNN classification, Decision trees (ID3, CHAID), Naïve-Bayes, Random Forests, Support Vector Machines

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of the course, the students will be able

CO1: Understand the statistical concepts used in machine learning

CO2: Understand the basic concepts used in machine learning

CO3: Familiarize with the dimension reduction methods in ML

CO4: Understand the key concepts in machine learning

CO5: Gain knowledge on machine learning algorithms with real life use cases

TEXT BOOK

1.Ethem Alpaydin, “Introduction to Machine Learning”, Second Edition,MIT Press

REFERENCES

- 1.Stephen Marsland,” Machine Learning: An Algorithmic Perspective”,
<http://www.amazon.com/Machine-Learning-Algorithmic-PerspectiveRecognition/dp/1420067184> .
2. Christopher M. Bishop, “Pattern Recognition and Machine Learning”.
<http://research.microsoft.com/en-us/um/people/cmbishop/prml/>.
3. Tom Mitchell, “Machine Learning”, <http://www.cs.cmu.edu/~tom/mlbook.html>.

| AITT4123 | INFORMATION SECURITY-PRACTITIONERS PERSPECTIVE | L | T | P | C | Total Marks |
|----------|---------------------------------------------------|---|---|---|---|----------------|
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES:

- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To know the aspects of risk management
- To become aware of various standards in this area
- To know the technological aspects of Information Security

UNIT 1 INTRODUCTION TO BASIC SECURITY SERVICES 9 Hrs

Computer Security Concepts- Confidentiality, Integrity- Security Architecture for Open Systems- Computer Security Trends

UNIT 2 ANATOMY OF AN ATTACK 9 Hrs

Network Mapping using ICMP Queries- TCP Pings- TCP and UDP Port Scanning- FTP Bounce Scanning- Vulnerability Scanning- System and Network Penetration, Denial of Service - Defense and Response

UNIT 3 PROTOCOLS ATTACKS AND DEFENSE MECHANISMS 9 Hrs

Network Layer- Transport Layer- Application Layer

UNIT 4 MALICIOUS SOFTWARE 9 Hrs

Types of Malicious Software (Malware)- Propagation: Infected Content, Viruses, Vulnerability Exploit, Worms. Propagation Social Engineering : SPAM E-mail, Trojans- Payload–System Corruption, Attack Agent–Zombie, Bots, Information Theft–Keyloggers, Phishing, Spyware, Stealthing–Backdoors, Rootkits

UNIT 5 TOPICS IN SECURITY 9 Hrs

Cryptographic Tools- Security Auditing - Security Auditing Architecture, The Security Audit Trail, Implementing- Legal and Ethical Aspects – Cyber-Crime and Computer Crime, Intellectual Property, Privacy, Ethical Issues

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of this course, the students should be able to:

- CO1: Discuss the basics of information security
- CO2: Illustrate the legal, ethical and professional issues in information security
- CO3: Demonstrate the aspects of risk management.
- CO4: Become aware of various standards in the Information Security System
- CO5: Design and implementation of Security Techniques.

TEXT BOOK

1. Michael E Whitman and Herbert J Mattord, “Principles of Information Security”, Vikas Publishing House, New Delhi, 2003

REFERENCES

1. Micki Krause, Harold F. Tipton, ”Handbook of Information Security Management”, Vol 1-3 CRCPress LLC, 2004.
2. Stuart McClure, Joel Scrambray, George Kurtz, ”Hacking Exposed”, Tata McGraw- Hill, 2003
3. Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2002.

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|----------|---------------------------------------------|---|---|---|---|-------------|
| ACST4125 | ENTERPRISE SOFTWARE ARCHITECTURE AND DESIGN | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST2106-Object Oriented Software Design

COURSE OBJECTIVES

- Gain knowledge on the enterprise information systems
- To understand data processing and data modeling concepts
- To understand the concepts of domain driven architecture
- To understand the concepts in resource driven architecture
- To understand the concepts in event driven architecture

UNIT 1 ENTERPRISE INFORMATION SYSTEMS

9 Hrs

Enterprise information systems-Software architecture-Middleware, Web services and Cloud computing.

UNIT 2 DATA MODELING & DATA PROCESSING

9 Hrs

Data Modeling- UML and E-R models. XML Schemas. Data Processing-Strategies for data processing. Introduction to XQuery. JSON.

UNIT 3 DOMAIN-DRIVEN ARCHITECTURE

9 Hrs

Domain-driven design (DDD), Object-relational mapping (ORM), Service-oriented Architecture (SOA), Standardized service contract. Loose coupling. Service abstraction. Reusability and autonomy. Statelessness. Service discoverability.

UNIT 4 RESOURCE-DRIVEN ARCHITECTURE

9 Hrs

Resource-Oriented Architecture (ROA). Plain Old XML (POX) and REST. Hypermedia networks. Message-Oriented Middleware (MOM). Asynchronous enterprise integration patterns.

UNIT 5 EVENT -DRIVEN ARCHITECTURE

9 Hrs

Event-Driven Architecture (EDA)-Complex event processing, Semantic Data Modeling. Introduction to RDF and RDFS. Semantic data modeling, RDFS and OWL, Business Processing Modeling, Descriptive and analytics BPMN, Petri Nets and Workflow, Place-transition and workflow nets. Cloud Data Stores. Relational vs. object data models. Algebras and co-algebras, Contexts and dependency injection (CDI). Transactional APIs.

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of the course, the students will be able

- CO1: Understand the data modeling and data processing concepts
- CO2: Understand data processing and data modeling concepts
- CO3: Understand the concepts of domain driven architecture
- CO4: Understand the concepts in resource driven architecture
- CO5: Understand the concepts in event driven architecture

TEXT BOOKS

- 1.Dominic Duggan , “ Enterprise Software Architecture and Design: Entities, Services, and Resources”, Wiley, 2012
- 2.Taylor et al.,’Software Architecture: Foundations, Theory, and Practice”, John Wiley, 2010.

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|-----------------|------------------------------------------------|----------|----------|----------|----------|--------------------|
| ACST4126 | INTRODUCTION TO SOCIAL NETWORK ANALYSIS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST3118-Internet Programming

COURSE OBJECTIVES

- To understand the components of the social network
- To model and visualize the social network
- To mine the users in the social network
- To understand the evolution of the social network
- To mine the interest of the user

UNIT 1 INTRODUCTION

9 Hrs

Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Discussion networks - Blogs and online communities - Web-based networks

UNIT 2 MODELING AND VISUALIZATION

9 Hrs

Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation - Centrality-Clustering - Node-Edge Diagrams - Visualizing Social Networks with MatrixBased Representations- Node-Link Diagrams - Hybrid Representations - Modelling and aggregating social network data – Random Walks and their Applications –Use of Hadoop and Map Reduce - Ontological representation of social individuals and relationships.

UNIT 3 MINING COMMUNITIES

9 Hrs

Aggregating and reasoning with social network data, Advanced Representations - Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Evaluating Communities – Core Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Node Classification in Social Networks.

UNIT 4 EVOLUTION

9 Hrs

Evolution in Social Networks – Framework - Tracing Smoothly Evolving Communities - Models and Algorithms for Social Influence Analysis - Influence Related Statistics - Social Similarity and Influence - Influence Maximization in Viral Marketing - Algorithms and Systems for Expert Location in Social Networks - Expert Location without Graph Constraints - with Score Propagation – Expert Team Formation - Link Prediction in Social Networks - Feature based Link Prediction - Bayesian Probabilistic Models - Probabilistic Relational Models

UNIT 5 TEXT AND OPINION MINING

9 Hrs

Text Mining in Social Networks -Opinion extraction – Sentiment classification and clustering - Temporal sentiment analysis - Irony detection in opinion mining - Wish analysis - Product review mining – Review Classification – Tracking sentiments towards topics over time

TOTAL HOURS : 45

COURSE OUTCOMES

Upon Completion of the course, Students will be able to:

CO1: Work on the internal components of the social network

- CO2: Model and visualize the social network
- CO3: Mine the behaviour of the users in the social network
- CO4: Predict the possible next outcome of the social network
- CO5: Mine the opinion of the user

TEXT BOOKS

1. Charu C. Aggarwal, "Social Network Data Analytics", Springer; 2011
2. Peter Mika, "Social Networks and the Semantic Web", Springer, 1st edition, 2007.

REFERENCES

1. BorkoFurht, "Handbook of Social Network Technologies and Applications", Springer, 1st edition, 2010.
2. GuandongXu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", Springer, 1st edition, 2011.
3. Giles, Mark Smith, John Yen, "Advances in Social Network Mining and Analysis", Springer, 2010.
4. Ajith Abraham, Aboul Ella Hassanien, Václav Snášel, "Computational Social Network Analysis: Trends, Tools and Research Advances", Springer, 2009.
5. Toby Segaran, "Programming Collective Intelligence", O'Reilly, 2012

| | | | | | | |
|----------|--------------------------------------------|---|---|---|---|-------------|
| ACST4127 | FOUNDATIONS OF NANO SCIENCE AND TECHNOLOGY | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- To understand the background of nano science
- To understand the types of nanostructure
- To understand the application of nano material
- To understand the application of nanotechnology
- To gain knowledge on Nano Sensors

UNIT 1 BACKGROUND TO NANOSCIENCE

9Hrs

Definition of Nano, Scientific revolution-Atomic Structure and atomic size, emergence and challenges of nanoscience and nanotechnology, carbon age-new form of carbon (CNT to Graphene), influence of nano over micro/macro, size effects and crystals, large surface to volume ratio, surface effects on the properties.

UNIT 2 TYPES OF NANOSTRUCTURE AND PROPERTIES OF NANOMATERIALS

9Hrs

One dimensional, Two dimensional and Three dimensional nano structured materials, Quantum Dots shell structures, metal oxides, semiconductors, composites, mechanical-physical-chemical properties.

UNIT 3 APPLICATION OF NANOMATERIAL

9Hrs

Ferroelectric materials, coating, molecular electronics and nano electronics, biological and environmental, membrane based application, polymer based application.

UNIT 4 APPLICATION OF NANOTECHNOLOGY

9Hrs

Nanotechnology for waste reduction and improved energy efficiency, nanotechnology based water treatment strategies.

UNIT 5 NANOSENSORS

9Hrs

Introduction to sensors. Characteristics and terminology - static and dynamic characteristics. Micro and nano-sensors, Fundamentals of sensors, biosensor, micro fluids, Packaging and characterization of sensors, Sensors for aerospace and defense. Organic and inorganic nano sensors.

TOTAL HOURS : 45

COURSE OUTCOMES:

Upon Completion of the course, Students will be able to:

- CO1: Emergence and challenges of nanoscience and nanotechnology
 CO2: Understand One dimensional, Two dimensional and Three dimensional nanostructured materials
 CO3: Understand molecular electronics and nanoelectronics
 CO4: Gain knowledge on the applications of nanotechnology
 CO5: Understand nanosensors

TEXT BOOKS

1. Chemistry of nanomaterials: Synthesis, properties and applications by CNR Rao et.al.
2. Nanoparticles: From theory to applications – G. Schmidt, Wiley Weinheim 2004.

REFERENCES

1. Instrument E L Principe, P Gnauck and P Hoffrogge, "Microscopy and Microanalysis (2005)", 11: 830-831, Cambridge University Press.
2. Leon L. Shaw, "Processing & properties of structural nanomaterials, Nanochemistry: A Chemical Approach to Nanomaterials", Royal Society of Chemistry, Cambridge UK 2005.

PROGRAM ELECTIVE –IV (VII SEMESTER)

| | | | | | | |
|-----------------|----------------------------------------------------------|----------|----------|----------|----------|--------------------|
| ACST4128 | APPLICATIONS OF DEEP LEARNING AND NEURAL NETWORKS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST3109-Artificial Intelligence

COURSE OBJECTIVES

- Gain knowledge on the basics of machine learning and deep learning
- To understand the basics of neural networks
- To understand the deep learning concepts
- To understand the recursive neural network concepts
- Gain knowledge on the emerging trends in machine learning

UNIT 1 BASICS OF MACHINE LEARNING AND DEEP LEARNING**9 Hrs**

AI Introduction-Machine learning and Deep learning evolution- Supervised, Unsupervised, Semi-supervised, Reinforcement. Some Prominent Tasks e.g., Classification, Regression, Clustering.

UNIT 2 BASICS OF NEURAL NETWORKS**9 Hrs**

Neural Networks- Architectures: Single Layer Perceptron-Feedforward and Feedback (Recurrent)-activation function-different types of activation functions-Back Propagation Learning-Batch Learning-Mini-Batch Learning- gradient descent- regularization- Multi-Layer Perceptron Recurrent Neural Network-Convolutional Neural Network-Long- Short Term Memory (LSTM) networks- Industry Applications of CNN, RNN, LSTM TensorFlow, Keras, PyTorch, CNTK, NLTK-predicting diabetes or predicting taxi fares in Mumbai, how deep learning is used in healthcare or transportation, in-depth analysis of diabetes dataset or taxi fare dataset including visualization (case studies of clustering, classification) using the above tools- The Human Brain, Biological Neurons, An inspiration for Neural Networks

UNIT 3 DEEP NEURAL NETWORKS – 1**9 Hrs**

Relevance and applicability of CNN, convolution structure, convolution layers, stride and padding in convolution layers- LeNet, AlexNet, VGG16, Inception, ResNet, etc.,- Face Recognition, Cat Vs Dog classification, Object detection using Tensorflow, Keras

UNIT 4 DEEP NEURAL NETWORKS – 2**9 Hrs**

RNN, Long Short-Term Memory (LSTM) Networks, Gated Recurrent Units- BOW, CBOW, GloVe, Word2Vec, BERT- Parsing and Sentiment Analysis using Recursive Neural Networks- Sentence classification using CNN- RNN and LSTM in Sentence Similarity, Topic Discovery, FAQ Bots, Question Answering, similar question detection, NeuralSummarization

UNIT 5 EMERGING TRENDS**9 Hrs**

Attention and memory models- Dynamic memory networks-Applications of Dynamic Memory Networks in NLP-Siamese- Contextual word Embeddings from LASER

TOTAL HOURS : 45**COURSE OUTCOMES**

At the end of the course, students will be able to:

CO1: Gain knowledge on the basics of machine learning and deep learning

CO2: Understand the basics of neural networks

CO3: Understand the deep learning concepts

CO4: Illustrate recursive neural network concepts

CO5: Gain knowledge on the emerging trends in machine learning

TEXT BOOK

1. Ian Goodfellow and YoshuaBengio and Aaron Courville, “Deep Learning”, MIT Press, 2016

REFERENCES

1. Raul Rojas, Neural Networks,”A systematic introduction”, 1996
2. Christopher Bishop, “Pattern Recognition and Machine Learning”, 2007

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|----------|-----------------------------------------------|---|---|---|---|-------------|
| ACST4129 | INTRODUCTION TO CYBER LAW AND ETHICAL HACKING | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- To learn foundations of Cyber Security and Ethical Hacking analysis .
- To learn various types of algorithms and its applications of Cyber Security .
- To learn python toolkit for required for programming Cyber Security, Ethical Hacking concepts.
- To understand the concepts of Cyber Security, Ethical Hacking, Forensic detection.
- To apply Cyber Security, Ethical Hacking to solve interdisciplinary problems.

UNIT 1 CYBER LAWS AND FORENSICS

9 Hrs

Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy 2013. Introduction to Cyber Forensics, Need of Cyber Forensics, Cyber Evidence, Documentation and Management of Crime Scene, Image Capturing and its importance, Partial Volume Image, Web Attack Investigations, Denial of Service Investigations, Internet Crime Investigations, Internet Forensics, Steps for Investigating Internet Crime, Email Crime Investigations

UNIT 2 INTRODUCTION TO ETHICAL HACKING

9 Hrs

LINUX and Networking, Doxing, Website/ IP information Gathering, Network Mapping o Google Hacking, d Discovering IP Range and Open Port, , Identifying Target Operating System and Services, Secure Bypassing Firewalls while Scanning, Understanding Wireless Networks,, Deauthentication attack, Fragmentation Attacks, , Chop Chop attack, Fake authentication , Evil Twin Attack, Cafe-latte attack, Reveal Hidden SSID's, WPA and WPA2 wireless password,hacking techniques, Cracking Wireless Passwords using Rainbow tables, Brute force techniques. Wordpress-scan , Drupal scan, Joomscan, cms-explorer for CMS Hacking and Pentesting, Websploit, SET, Fast-Track SQL Pwnage, Winautopwn for various System

UNIT 3 SERVER HACKING AND SECURITY TECHNIQUES

9 Hrs

Learning Various Methods to Use Proxies, Hiding yourself behind VPN, Using Proxies and VPN for Hacking Tools i.e Scanning, Configuring TOR with Backtrack and Nmap for Invisible Scanning, Using Tunneling methods for IP hide, Types of Email Addresses, Security measures for Phishing, Security measures for Password Guessing,

UNIT 4 SECURITY TECHNIQUES

9 Hrs

Security measures for Mobile Phone., Hacking Windows Passwords using various methods & Security, Cracking SAM file, Protecting SAM file from hack, Privilege Escalation in windows and Linux., Using Stealers, Key loggers and Remote Administrations Tools (RATs), Creating Undetectable Viruses using Crypters, Binders and Assembly Codes.,, Protection against Trojans , Worms and Malwares, Advance SQL Injection, Cross Site Scripting, Router Hacking, Sniffing Data and Passwords, ARP , DNS, DHCP Spoofing attacks. DNS poisoning , DOS attack against an IP address Flood the LAN with random MAC addresses Packet Injection

UNIT 5 COMPUTER FORENSIC DETECTION AND INCIDENT MANAGEMENT 9 Hrs

Computer Investigation Process and Collecting Digital Evidences. Cyber Crime Investigation and Understanding various trace back Techniques. Acquiring data, duplicating data and Recovering deleted

Files. Understanding Boot Process and Important System Files Investigating Network Traffic, Cyber Crimes and Laws Understanding Various Corporate Threats .Case Studies.

TOTAL HOURS : 45

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1: Understand, appreciate, employ, design and implement appropriate security technologies
- CO2: Identify & Evaluate Information Security threats and vulnerabilities
- CO3: Identify common trade-offs and compromises that are made in the Information Systems
- CO4: Demonstrate the use of standards and cyber laws to enhance information security
- CO5: Understand about computer forensics and incident management

TEXTBOOKS

1. William Stallings, "Cryptography and Network Security", Pearson Education/PHI, 2006.
2. Gupta Sarika, "Information and Cyber Security", Khanna Publishing House, Delhi.
3. Patric Engebretson, "The basic of Hacking and Penetration testing", PHI, 2009

REFERENCES

1. <http://www.ignou.ac.in/upload/Announcement/programmedetails.pdf>
2. V.K. Jain, "Cryptography and Network Security", Khanna Publishing House
3. Atul Kahate, "Cryptography and Network Security", McGraw Hill.
4. V.K. Pachghare, "Cryptography and Information Security", PHI Learning
5. Nina Godbole, "Information System Security", Wiley
6. Bothra Harsh, "Hacking", Khanna Publishing House, Delhi
7. The web application hackers handbook and LAB manual by Wiley

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|-----------------|-------------------------------------------|----------|----------|----------|----------|--------------------|
| ACST4130 | CLOUD COMPUTING AND VIRTUALIZATION | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

- To understand the concepts of virtualization and virtual machines
- To gain expertise in server, network and storage virtualization.
- To understand and deploy practical virtualization solutions and enterprise solutions
- To gain knowledge on the concept of virtualization that is fundamental to cloud computing
- To understand the various issues in cloud computing

UNIT 1 VIRTUALIZATION

9 Hrs

Basics of Virtual Machines - Process Virtual Machines – System Virtual Machines –Emulation – Interpretation – Binary Translation - Taxonomy of Virtual Machines. Virtualization –Management Virtualization — Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization

UNIT 2 VIRTUALIZATION INFRASTRUCTURE

9 Hrs

Comprehensive Analysis – Resource Pool – Testing Environment –Server Virtualization –Virtual Workloads – Provision Virtual Machines – Desktop Virtualization – Application Virtualization – Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

UNIT 3 CLOUD PLATFORM ARCHITECTURE

9 Hrs

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software- A Generic Cloud Architecture Design Layered Cloud Architectural Development– Virtualization Support and Disaster Recovery – Architectural Design Challenges - Public Cloud Platforms : GAE,AWS – Inter-cloud Resource Management

UNIT 4 PROGRAMMING MODEL

9 Hrs

Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack, Nimbus

UNIT 5 CLOUD SECURITY

9 Hrs

Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud - Key privacy issues in the cloud –Cloud Security and Trust Management

TOTAL HOURS : 45

COURSE OUTCOMES

Upon completion of this course, the students should be able to:

- CO1: Employ the concepts of storage virtualization, network virtualization and its management
- CO2: Apply the concept of virtualization in the cloud computing
- CO3: Identify the architecture, infrastructure and delivery models of cloud computing
- CO4: Develop services using Cloud computing
- CO5: Apply the security models in the cloud environment

TEXT BOOKS

- 1.Danielle Ruest, Nelson Ruest,"Virtualization: A Beginner's Guide', McGraw-Hill Osborne Media, 2009.
- 2.Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005
- 3.John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.

REFERENCES

- 1.Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
- 2.Tim Mather, SubraKumaraswamy, and ShahedLatif ,"Cloud Security and Privacy", O'Reilly Media, Inc.,2009.
- 3.Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, 2009.
- 4.Tom White, "Hadoop: The Definitive Guide", Yahoo Press, 2012.

| ACST4131 | BIG DATA ANALYTICS | | | | Total Marks |
|----------|--------------------|---|---|---|-------------|
| | L | T | P | C | |
| | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST3111-Database Management Systems

COURSE OBJECTIVES

The objective of this course is to

- Understand big data for business intelligence.
- Learn business case studies for bigdata analytics.
- Understand nos
-
- qlbigdata management.
- Perform map-reduceanalytics using Hadoop and related tools
- Gain knowledge on Hadoop Tools

UNIT1 INTRODUCTION TO BIG DATA

9Hrs

What is big data, why big data, convergence of key trends, unstructured data, industry examples of big Data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

UNIT2 DATA MODELS

9Hrs

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer- peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.

UNIT3 HADOOP

9Hrs

Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures

UNIT4 MAP REDUCE

9Hrs

MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduceandYARN, jobscheduling,shuffle andsort,taskexecution, MapReduce types, input formats, output formats

UNIT5 HADOOP TOOLS

9Hrs

Hbase, data model and implementations, Hbase clients, Hbase examples, praxis.Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration. Pig, Grunt, pig data model, Pig

Latin, developing and testing Pig Latin scripts. Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries

TOTAL HOURS : 45

COURSE OUTCOMES

After completion of course, students would be:

- CO1: Describe big data and use cases from selected businessdomains
- CO2: Explain NoSQL big datamanagement
- CO3: Install, configure, and run Hadoop andHDFS
- CO4: Perform map-reduce analytics usingHadoop
- CO5: Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big dataanalytics

TEXT BOOKS

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics:Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley,2013.

REFERENCES

1. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional,2012.
2. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley,2012.
3. Eric Sammer, "Hadoop Operations", O'Reilley,2012.
4. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley,2012.
5. Lars George, "HBase: The Definitive Guide", O'Reilley,2011.
6. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley,2010.
7. Alan Gates, "Programming Pig", O'Reilley,2011.

| AECT4133 | WIRELESS COMMUNICATION | L | T | P | C | Total Marks |
|----------|------------------------|---|---|---|---|-------------|
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES:

- Know the characteristic of wireless channel
- Learn the various cellular architectures
- Understand the concepts behind various digital signaling schemes for fading channels
- Be familiar the various multipath mitigation techniques
- Understand the various multiple antenna systems

UNIT 1 WIRELESS CHANNELS

9Hrs

Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design – Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters-Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.

UNIT 2 CELLULAR ARCHITECTURE

9Hrs

Multiple Access techniques – FDMA, TDMA, CDMA – Capacity calculations – Cellular concept- Frequency reuse – channel assignment- hand off- interference & system capacity- trunking & grade of service – Coverage and capacity improvement.

UNIT 3 DIGITAL SIGNALING FOR FADING CHANNELS

9Hrs

Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.

UNIT 4 MULTIPATH MITIGATION TECHNIQUES

9Hrs

Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macro diversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver.

UNIT 5 MULTIPLE ANTENNA TECHNIQUES

9Hrs

MIMO systems – spatial multiplexing – system model – Pre-coding – Beam forming – transmitter diversity, receiver diversity-channel state information-capacity in fading and non-fading channels

TOTAL HOURS : 45

COURSE OUTCOMES:

CO1: Characterize wireless channels

CO2: Design and implement various signaling schemes for fading channels

CO3: Design a cellular system

CO4: Compare multipath mitigation techniques and analyze their performance

CO5: Design and implement systems with transmit/receive diversity and MIMO systems and analyze their performance

TEXTBOOKS:

- Rappaport, T.S., “Wireless communications”, Second Edition, Pearson Education, 2010.
- Andreas.F. Molisch, “Wireless Communications”, John Wiley – India, 2006.

REFERENCES:

- David Tse and Pramod Viswanath, “Fundamentals of Wireless Communication”, Cambridge University Press, 2005.
- Upena Dalal, “Wireless Communication”, Oxford University Press, 2009.
- Van Nee, R. and Ramji Prasad, “OFDM for wireless multimedia communications”, Artech House, 2000.

PROGRAM ELECTIVE –V (VIII SEMESTER)

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|----------|----------------------------------------------|---|---|---|---|-------------|
| ACST4132 | INTELLIGENT GAME DESIGN AND ITS APPLICATIONS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST3109-Artificial Intelligence

COURSE OBJECTIVES

Upon learning the course the students will be able to:

- Gain knowledge on the basics of game design
- Understand the principles of game design
- Understand game design and development process
- Understand Game Technology
- Gain knowledge on the applications of games and roles of gaming professionals

UNIT 1 DEFINITION OF A GAME AND HISTORY OF GAME DESIGN 9Hrs

What is a game and where is it used?- The game creator and the gamer. Stakeholders and skillsets required in game design and development- Different Formats for games and the history of games over the years

UNIT 2 PRINCIPLES OF INTELLIGENT GAME DESIGN (GOALS, CHALLENGES, REWARDS) 9Hrs

Needs - Needs, Social Interaction, Recognition, Success- Creating Conflicts - Risks, Challenges and Obstacles- Feedback - Rewards, Punishments

UNIT 3 GAME DESIGN AND DEVELOPMENT PROCESS 9Hrs

Process overview from Goal Setting to Testing- User Study and Research- The Big Idea- Game Mechanics- Storytelling and Storyboarding- Character Design and Development - Heros, Enemies,NPCs- Environment Design and Level Design- Game Prototyping and Testing

UNIT 4 GAME TECHNOLOGY (GAME ENGINES, AR, VR, AI) 9Hrs

Game Engines - a contrast between Unity, Unreal, Cry- Application of AI and new technologies in Gaming-Project Work: Rapid Prototyping of a Game Concept

UNIT 5 APPLICATIONS OF GAMES AND ROLES FOR GAMING PROFESSIONALS 9Hrs

Gaming Industry overview - role of games in entertainment, Advertising Healthcare, Education, Social Impact- Skills sets and roles for Game Designers, Developers and producers in the industry.

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of the course, the students will be able

- CO1: Understand the basics of game design
 CO2: Understand the principles of game design
 CO3: Gain knowledge on game design and development process
 CO4: Know about the applications of games and roles of gaming professionals

TEXT BOOKS:

1. Mike Mc Shaffrly and David Graham, "Game Coding Complete", Fourth Edition, Cengage Learning, PTR, 2012.
2. Jason Gregory, "Game Engine Architecture", CRC Press / A K Peters, 2009.
3. David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics" 2nd Editions, Morgan Kaufmann, 2006.

REFERENCES

1. Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", 2nd Edition Prentice Hall /New Riders, 2009.
2. Eric Lengyel, "Mathematics for 3D Game Programming and Computer Graphics", 3rd Edition, Course Technology PTR, 2011.
3. Jesse Schell, 'The Art of Game Design: A book of lenses', 1st Edition, CRC Press, 2008.

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|----------|---------------------------------------------|---|---|---|---|-------------|
| ACST4133 | BLOCK CHAIN TECHNOLOGY AND ITS APPLICATIONS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST4122-Network and Information Security

COURSE OBJECTIVES

Upon learning the course the students will be able to:

- Understand block chain models
- Familiarize the functional/operational aspects of cryptocurrency
- Understand emerging abstract models for Blockchain Technology.
- Understand Ethereum block chain technology
- Identify technical gaps existing between theory and practice in cryptocurrency

UNIT 1 INTRODUCTION OF BLOCK CHAIN MODELS

9 Hrs

The consensus problem - Asynchronous Byzantine Agreement - AAP protocol and its analysis - Nakamoto Consensus on permission-less, nameless, peer-to-peer network - Abstract Models for BLOCKCHAIN - GARAY model - RLA Model - Proof of Work (PoW) as random oracle - formal treatment of consistency, liveness and fairness - Proof of Stake (PoS) based Chains - Hybrid models (PoW + PoS).

UNIT 2 BASICS FOR CRYPTOCURRENCY

9 Hrs

Cryptographic basics for cryptocurrency - a short overview of Hashing, signature schemes, encryption schemes and elliptic curve cryptography

UNIT 3 BITCOIN

9 Hrs

Bitcoin - Wallet - Blocks - Merkle Tree - hardness of mining - transaction verifiability - anonymity - forks - double spending - mathematical analysis of properties of Bitcoin.

UNIT 4 ETHEREUM

9 Hrs

Ethereum - Ethereum Virtual Machine (EVM) - Wallets for Ethereum - Solidity - Smart Contracts - some attacks on smart contracts

UNIT 5 TRENDS AND TOPICS

9 Hrs

Zero Knowledge proofs and protocols in Blockchain - Succinct non interactive argument for Knowledge (SNARK) - pairing on Elliptic curves - Zcash.

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of the course, the students will be able

- CO1.Understand the Abstract Models for BLOCKCHAIN
- CO2.Understand the Cryptographic basics for cryptocurrency
- CO3.Gain knowledge on Bitcoin, Wallet, Blocks
- CO4.Gain knowledge on the trends in block chain technology

TEXT BOOK

1.Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder,” Bitcoin and cryptocurrency technologies: a comprehensive introduction”,Princeton University Press, 2016. (Free download available)

REFERENCES

1. Joseph Bonneau et al, "SoK: Research perspectives and challenges for Bitcoin and cryptocurrency", IEEE Symposium on security and Privacy, 2015 (article available for free download).
2. J.A.Garay et al, "The bitcoin backbone protocol - analysis and applications", EUROCRYPT 2015 LNCS VOL 9057, (VOLII), pp 281-310. (Also available at eprint.iacr.org/2016/1048)
3. R.Pass et al, "Analysis of Blockchain protocol in Asynchronous networks", EUROCRYPT 2017, (eprint.iacr.org/2016/454)
4. R.Pass et al, "Fruitchain, a fair blockchain", PODC 2017 (eprint.iacr.org/2016/916).

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|----------|--------------|---|---|---|---|-------------|
| ACST4134 | WEB SERVICES | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST3118-Internet Programming

COURSE OBJECTIVES

- To understand the details of web services technologies like WSDL,UDDI, SOAP
- To gain distributed computing technologies
- To learn how to implement and deploy web service client and server
- To explore interoperability between different frameworks
- To understand web services life cycle

UNIT 1 INTRODUCTION TO WEB SERVICES

9 Hrs

Introduction to Web Services — The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services.

UNIT 2 DISTRIBUTED COMPUTING TECHNOLOGIES

9 Hrs

Evolution and Emergence of Web Services – Evolution of distributed computing, Core distributed computing technologies — client/server, CORBA, JAVA RMI, Microsoft DCOM, MOM, Challenges in Distributed Computing, role of J2EE and XML in distributed computing, emergence of Web Services and Service Oriented Architecture (SOA).

UNIT 3 WEB SERVICES ARCHITECTURE

9 Hrs

Web Services Architecture — Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication models, basic steps of implementing web services.

UNIT 4 FUNDAMENTALS OF SOAP

9 Hrs

Fundamentals of SOAP — SOAP Message Structure, SOAP encoding, Encoding of different data types, SOAP message exchange models, SOAP communication and messaging, Java and Axis, limitations of SOAP.

UNIT 5 WSDL

9 Hrs

Describing Web Services — WSDL — WSDL in the world of Web Services, Web Services life cycle, anatomy of WSDL definition document, WSDL bindings, WSDL Tools, limitations of WSDL.

TOTAL HOURS : 45

COURSE OUTCOMES

At the end of the course, the students will be able

- CO1:Basic details of WSDL, UDDI, SOAP
- CO2:Implement WS client and server with interoperable systems
- CO3:Implement and deploy web service client and server
- CO4:Explore interoperability between different frameworks
- CO5: Understand web services life cycle

TEXT BOOK

1. R. Nagappan, R. Skoczylas, R.P. Sriganesh,"Developing Java Web Services", Wiley India,2008

REFERENCES

1. James McGovern, Sameer Tyagi etal.,"Java Web Service Architecture", Elsevier, 2003
2. S. Graham ,"Building Web Services with Java", 2 Edition, Pearson Edn,2002.
- 3.D.A. Chappell & T. Jewell,"Java Web Services" , O'Reilly,SPD, 2002.
4. G. Alonso, F. Casati,"Web Services", Springer, 2004.

| | | | | | | |
|-----------------|-------------------------------------------------|----------|----------|----------|----------|--------------------|
| ACST4135 | INTRODUCTION TO DECISION SUPPORT SYSTEMS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES:Artificial Intelligence

COURSE OBJECTIVES

The objectives of this course is to:

- Understand decision making and problem solving
- Introduce decision support systems
- Provide knowledge of knowledge acquisition and meta-knowledge
- Familiarize with decision making procedure
- Built management models

UNIT 1 METHODS OF DECISION MAKING AND PROBLEM SOLVING 9 Hrs

Characteristics and elements of systems thought-The general systems model-Explore communication systems-Differentiate between data processing systems, management information systems and decision support systems- Elements of problem solving process- Problems versus systems-Structured, unstructured, and semi-structured problems-The systems approach and its relationship to the scientific approach

UNIT 2 DECISION SUPPORT SYSTEMS (DSS) 9 Hrs

Development of DSS-Relationship to data processing and database systems-DSS development and implementation-DSS features and capabilities-DSS in the information center-Expert Systems Overview-Expert behavior in decision-making situations-Knowledge capture-Expert systems development process

UNIT 3 KNOWLEDGE ACQUISITION AND META-KNOWLEDGE 9 Hrs

Editing (supplementing, correcting, deleting) knowledge -Multiple levels of knowledge representation-Multiple levels of control and search procedures-Spreadsheet Facilities-Modeling with a spreadsheet-Hands-on use of a spreadsheet for business decision-making-Spreadsheet in the information center

UNIT 4 MANIPULATION OF MODELS AS A DECISION-MAKING PROCEDURE 9 Hrs

Effects of data manipulation to support decisions in pricing, production, cash flow and new product evaluation models-Proficiency in utilizing expert system, spreadsheet, database, graphic and statistical software for "what if" analyses

UNIT 5 BUILDING MANAGEMENT MODELS 9 Hrs

Picking a model type-Validation of models-Management models and expert systems in the information Center

TOTAL HOURS : 45

COURSE OUTCOMES

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

- CO1: Distinguish among data processing systems and management information systems
- CO2: Integrate the major components of decision support systems (DSS) and expert systems (ES)
- CO3: Capture decision rules based on knowledge provided by an acknowledged expert
- CO4: Analyze how information is used to solve problems.
- CO5: Utilize commercial spreadsheet and database integrated packages

TEXT BOOKS:

1. Bennett, John L, "Building Decision Support Systems". Addison Wesley, 1983.
2. Leigh, William E. & Michael E. Doherty, " Decision Support and Expert Systems", Cincinnati: South-Western Publishing, 1986.

REFERENCES

1. Sprague, Ralph H., Jr., & Hugh J. Watson, eds., "Decision Support Systems", Englewood Cliffs, NJ Prentice-Hall, 1986.
2. Turban, Efraim, "Decision Support and Expert System: Managerial Perspectives", New York: Macmillan, 1988.
3. Young, Lawrence F, "Decision Support and Idea Processing Systems", Brown Publishers, 1989.

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|-----------------|----------------------------|----------|----------|----------|----------|--------------------|
| AEET4140 | ROBOTICS TECHNOLOGY | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: AEET2107-Microprocessor and Microcontroller

COURSE OBJECTIVES

- To introduce the basic concepts, parts of robots and types of robots.
- To make the student familiar with the various drive systems for robot, sensors
- To gain knowledge on the applications in robots and programming of robots.
- To discuss about the various applications of robots, justification and implementation of robot.
- To learn about path planning and programming

UNIT 1 INTRODUCTION

9 Hrs

Specifications of Robots- Classifications of robots – Work envelope - Flexible automation versus Robotic technology – Applications of Robots ROBOT KINEMATICS AND DYNAMICS Positions, Orientations and frames, Mappings: Changing descriptions from frame to frame, Operators: Translations, Rotations and Transformations - Transformation Arithmetic - D-H Representation - Forward and inverse Kinematics Of Six Degree of Freedom Robot Arm – Robot Arm dynamics

UNIT 2 ROBOT DRIVES AND POWER TRANSMISSION SYSTEMS

9 Hrs

Robot drive mechanisms, hydraulic – electric – servomotor- stepper motor - pneumatic drives, Mechanical transmission method - Gear transmission, Belt drives, cables, Roller chains, Link - Rod systems - Rotary-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearing screws

UNIT 3 MANIPULATORS

9 Hrs

Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and Pneumatic manipulators

UNIT 4 ROBOT END EFFECTORS

9 Hrs

Classification of End effectors – Tools as end effectors. Drive system for grippers-Mechanicaladhesive-vacuum-magnetic-grippers. Hooks&scoops. Gripper force analysis and gripper design. Active and passive grippers.

UNIT 5 PATH PLANNING & PROGRAMMING

9 Hrs

Trajectory planning and avoidance of obstacles, path planning, skew motion, joint integrated motion – straight line motion-Robot languages -.computer control and Robot software.

TOTAL HOURS : 45

COURSE OUTCOMES:

- CO1: The Student must be able to design automatic manufacturing cells
 CO2: Use robotic control using the principle behind robotic drive system
 CO3: Understand end effectors and sensors
 CO4: Understand machine vision robot kinematics and programming.
 CO5: Understand path planning and programming

TEXT BOOKS

1. Deb S. R. and Deb S., "Robotics Technology and Flexible Automation", Tata McGraw Hill Education Pvt. Ltd, 2010.
2. John J.Craig , "Introduction to Robotics", Pearson, 2009.
3. Mikell P. Groover et. al., "Industrial Robots - Technology, Programming and Applications", McGraw Hill, New York, 2008.

REFERENCES

1. Richard D Klafter, Thomas A Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd.,
 2. Fu K S, Gonzalez R C, Lee C.S.G, "Robotics : Control, Sensing, Vision and Intelligence", McGraw Hill, 1987

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|-----------------|----------------------------------------|----------|----------|----------|----------|------------------------|
| ACST4140 | SOFTWARE PROJECT MANAGEMENT | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

COURSE OBJECTIVES

- To outline the need for Software Project Management
- To highlight different techniques for software cost estimation and activity planning.

UNIT I PROJECT EVALUATION AND PROJECT PLANNING 9 Hrs

Importance of Software Project Management – Activities Methodologies – Categorization of Software Projects – Setting objectives – Management Principles – Management Control – Project portfolio Management – Cost-benefit evaluation technology – Risk evaluation – Strategic program Management – Stepwise Project Planning.

UNIT II PROJECT LIFE CYCLE AND EFFORT ESTIMATION 9 Hrs

Software process and Process Models – Choice of Process models - mental delivery – Rapid Application development – Agile methods – Extreme Programming – SCRUM – Managing interactive processes – Basics of Software estimation – Effort and Cost estimation techniques – COSMIC Full function points - COCOMO II A Parametric Productivity Model - Staffing Pattern.

UNIT III ACTIVITY PLANNING AND RISK MANAGEMENT 9 Hrs

Objectives of Activity planning – Project schedules – Activities – Sequencing and scheduling – Network Planning models – Forward Pass & Backward Pass techniques – Critical path (CRM) method – Risk identification – Assessment – Monitoring – PERT technique – Monte Carlo simulation – Resource Allocation – Creation of critical patterns – Cost schedules.

UNIT IV PROJECT MANAGEMENT AND CONTROL 9 Hrs

Framework for Management and control – Collection of data Project termination – Visualizing progress – Cost monitoring – Earned Value Analysis- Project tracking – Change control- Software Configuration Management – Managing contracts – Contract Management.

UNIT V STAFFING IN SOFTWARE PROJECTS 9 Hrs

Managing people – Organizational behavior – Best methods of staff selection – Motivation – The Oldham-Hackman job characteristic model – Ethical and Programmed concerns – Working in teams – Decision-making – Team structures – Virtual teams – Communications genres – Communication plans.

TOTAL HOURS: 45

COURSE OUTCOMES

Upon completion of the Course, the students will be able to

- CO1: Analyze Project Evaluation and Planning while developing software.
- CO2: Able to understand the project life cycle and estimate efforts.
- CO3: Analyze the activity planning and risk management.
- CO4: Understand project management and control.
- CO5: Able to know about staffing in software projects.

TEXT BOOKS

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

REFERENCES

1. Robert K. Wysocki “Effective Software Project Management” – Wiley Publication, 2011.
2. Walker Royce: “Software Project Management”- Addison-Wesley, 1998.
3. Gopaldaswamy Ramesh, “Managing Global Software Projects” – McGraw Hill Education (India), Fourteenth Reprint 2013.

PROGRAM ELECTIVE –VI (VIII SEMESTER)

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|----------|------------------------------------------|---|---|---|---|-------------|
| ACST4136 | INTELLIGENT SYSTEMS AND ITS APPLICATIONS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST3109-Artificial Intelligence

COURSE OBJECTIVES

The objective of this course is to:

- Introduce Agents
- Make students understand AI problems
- Understand about planning
- Understand AI algorithms
- Understand Markov Decision Process

UNIT 1 INTRODUCTION**9Hrs**

Introduction-Lisp- Agents-Uninformed Search-Informed search- heuristics-Informed search-Simulated annealing

UNIT 2 AI PROBLEMS**9Hrs**

Constraint Satisfaction Problems-Game playing-Robotics- Computer Vision- Genetic Algorithms
Propositional Logic-First Order Logic- Inference- Representation-Reasoning

UNIT 3 PLANNING**9Hrs**

Planning- Partial Order Planning- Bayes's Nets- Markov Chain Monte Carlo (MCMC) , utility functions
Introduction to Hidden Markov Model- generalization vs. overfitting- language recognition (speech, sign, handwriting)- Neural Nets- Decision trees

UNIT 4 AI ALGORITHMS**9Hrs**

Cross Validation, Leave-one-out training, Maximum Likelihood, MAP-k-NN, Minimum Description Length, Principal Component Analysis-Linear Discriminant Analysis-Independent component analysis

UNIT 5 MARKOV DECISION PROCESS**9Hrs**

Markov Decision Process-Partially Observable Markov Decision Process,Mahalanobis distance,
ADABOOST-Communication -Natural Language

TOTAL HOURS : 45**COURSE OUTCOMES**

Upon Completion of the course, the students will be able to

- CO1: Describe and solve AI problems
- CO2: Gain knowledge on AI algorithm
- CO3: Understand planning
- CO4: Understand cross validation techniques
- CO5: Apply markov decision process for problem solving

TEXT BOOKS

1. Stuart Russel and Peter Norvig “AI – A Modern Approach”, 2nd Edition, Pearson Education 2007.

REFERENCES

1. Deepak Khemani “Artificial Intelligence”, Tata Mc Graw Hill Education 2013.
2. Peter Seibel, “Practical Common Lisp”, Apress
3. <http://nptel.ac.in>

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|----------|----------------------------------------------------|---|---|---|---|----------------|
| ACST4137 | INTRODUCTION TO SECURITY ASSESSMENT AND TESTING | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST4122-Network and Information Security

COURSE OBJECTIVES

The objectives of this course is to

- Introduce Information Security Performance Metrics and Audit
- Familiarize with Information Security Audit Tasks
- Introduce Vulnerability Management
- Understand information security assessments
- Manage Configuration reviews

UNIT 1 INFORMATION SECURITY PERFORMANCE METRICS AND AUDIT 9 Hrs

Security Metrics and Reporting, Common Issues and Variances of Performance Metrics, Introduction to Security Audit, Servers and Storage devices, Infrastructure and Networks, Communication Routes, Information Security Methodologies (Black-box, White-box, Greybox), Phases of Information Security Audit and Strategies, Ethics of an Information Security Auditor etc., Maintain Healthy, Safe & Secure Working environment

UNIT 2 INFORMATION SECURITY AUDIT TASKS, REPORTS AND POST AUDITINGACTIONS

9 Hrs

Pre-audit checklist, Information Gathering, Vulnerability Analysis, External Security Audit, Internal Network Security Audit, Firewall Security Audit, IDS Security Auditing, Social Engineering Security Auditing, Web Application Security Auditing, Information Security Audit Deliverables & Writing Report, Result Analysis, Post Auditing Actions, Report Retention etc.

UNIT 3 VULNERABILITY MANAGEMENT

9 Hrs

Information Security Vulnerabilities – Threats and Vulnerabilities, Human-based Social Engineering, Computer-based Social Engineering, Social Media Countermeasures, Vulnerability Management – Vulnerability Scanning, Testing, Threat management, Remediation etc.

UNIT 4 INFORMATION SECURITY ASSESSMENTS

9 Hrs

Vulnerability Assessment, Classification, Types of Vulnerability Assessment, Vulnerability Assessment Phases, Vulnerability Analysis Stages, Characteristics of a Good Vulnerability-Assessment Solutions & Considerations, Vulnerability Assessment Reports – Tools and choosing a right Tool, Information Security Risk Assessment, Risk Treatment, Residual Risk, Risk Acceptance, Risk Management Feedback Loops etc.

UNIT 5 CONFIGURATION REVIEWS

9 Hrs

Introduction to Configuration Management, Configuration Management Requirements-PlanControl, Development of configuration Control Policies, Testing Configuration Management etc.

TOTAL HOURS : 45

COURSE OUTCOMES

Upon Completion of the course, the students will be able to

CO1: Describe Phases of Information Security Audit and Strategies

CO2: Gain knowledge on Information Security Vulnerabilities

CO4: Understand about Vulnerability Assessment

CO5: Understand Configuration Management

TEXT BOOKS:

1. A Vladimirov, K.Gavrilenko, and A.Michajlowski,"Assessing Information Security (strategies, tactics logic and framework)
2. Peter Szor,"The Art of Computer Virus Research and Defense ",

REFERENCES:

1. <https://www.sans.org/readingroom/whitepapers/threats/implementing-vulnerability-management-process-34180>
2. <http://csrc.nist.gov/publications/nistpubs/800-40-Ver2/SP800-40v2.pdf>

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|----------|-------------------------|---|---|---|---|-------------|
| ACST4139 | APPLIED CLOUD COMPUTING | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST4123-Grid and Cloud Computing

COURSE OBJECTIVES

The student should be made to:

- Understand Evolution of Information Technology and Business Computing Models
- Compare with traditional computing architecture
- Learn the various services
- Be expose to Service Management and Security in Cloud Computing
- Learn the case studies

UNIT 1 INTRODUCTION TO THE CLOUD

9 Hrs

History, Evolution of Information Technology and Business Computing Models - Definition of Cloud Computing. Business Drivers for the Cloud, Key Advantages, Essential Characteristics - Cloud service providers, properties, Cloud computing, Role of Open Standards, Cloud computing vs. Cluster computing vs. Grid Computing Architecture, Enabling Technologies Service and Deployment Models, Popular Cloud Stacks and Use Cases, Benefits, Risks, and Challenges of Cloud Computing

UNIT 2 CLOUD COMPUTING STACK

9 Hrs

Comparison with traditional computing architecture (client/server). Services provided at various levels Types of Cloud services - Public, Private, and Hybrid, Distinctions based on other characteristics. How Cloud Computing Works , Role of Networks in Cloud computing, protocols used and Web services. Service Models (XaaS) - Deployment Models: Public cloud, Private cloud, Hybrid cloud, Community cloud

UNIT 3 SERVICES

9 Hrs

Infrastructure as a Service (IaaS): Introduction to IaaS, Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine (VM) Resource, Virtualization Server Storage Network, Virtual Machine (resource) provisioning and manageability. Data storage in cloud computing (storage as a service). Case Study: Amazon EC2, Software Defined Networks (SDN), Software Comparison with traditional computing architecture (client/server). Services provided at various levels Types of Cloud services - Public, Private, and Hybrid, Defined Storage (SDS)

Platform as a Service (PaaS): Introduction to PaaS, Service Oriented Architecture (SOA), Cloud Platform and Management, Introduction to Storage Systems, Cloud Storage Concepts, Distributed File Systems (HDFS, CephFS), Cloud Databases (HBase, MongoDB, Cassandra, DynamoDB), Cloud Object Storage (Amazon S3, OpenStack Swift, Ceph), Case Study: Google App Engine, Microsoft Azure

Software as a Service (SaaS) : Introduction to SaaS, Web services, Web 2.0, WebOS. Distributed Programming for the Cloud. Case Study on SaaS

UNIT 4 SERVICE MANAGEMENT AND SECURITY IN CLOUD COMPUTING 9 Hrs

Service management - Service Level Agreements (SLAs), Billing and Accounting- Service Improvement and Roadmap -Cloud Security - Infrastructure Security, Network level security, Host level security, Application level security, Data security and Storage Data privacy and security Issues, Jurisdictional issues - Data location Identity, Access Management, Access Control Trust, Reputation, Risk Authentication in cloud computing - Client access in cloud- Cloud contracting Model, Commercial and business considerations

UNIT 5 CASE STUDIES 9 Hrs

Kubernetes (K8s) - An open-source system for automating deployment, scaling, and management of containerized applications- AWS Database Migration Service – Cloud ETL - Amazon SageMaker – Platform to build, train, and deploy machine learning models quickly- Cloud-based Analytic databases - Amazon Redshift, Snowflake, and Google BigQuery

TOTAL HOURS : 45

COURSE OUTCOMES

Upon completion of the course, the student should be able to:

- CO1: Explain the Role of Open Standards
- CO2: Analyze the types of Cloud services
- CO3: Understand cloud services
- CO4: Understand various levels of cloud security
- CO5: Evaluate various case studies

TEXT BOOK

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, “Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet”, First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

REFERENCES

1. Jason Venner, “Pro Hadoop- Build Scalable, Distributed Applications in the Cloud”, APress, 2009.
2. Tom White, “Hadoop The Definitive Guide”, First Edition. O’Reilly, 2009.

| AITT4135 | USABILITY DESIGN OF SOFTWARE APPLICATIONS | L | T | P | C | Total Marks |
|----------|-------------------------------------------|---|---|---|---|-------------|
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: None

COURSE OBJECTIVES

The objective of this course is to:

- Usability Fundamentals and Quality
- Familiarize User Interface and User Experience
- User experience analysis and design
- Understand Usability Design of Mobile Applications
- Understand Information Visualization

UNIT 1 USABILITY FUNDAMENTALS AND QUALITY

9 Hrs

Usability and Utility- Ease of Use, and Necessity of usability considerations, cost and time considerations- Quality concepts, internal and external quality criteria- Industry quality standards

UNIT 2 USER INTERFACE AND USER EXPERIENCE

9 Hrs

Software Development Life Cycle- User Interface Development Process- User Experience Design Principles- Design Thinking and Problem solving approach

UNIT 3 USER EXPERIENCE ANALYSIS AND DESIGN

9 Hrs

Understanding Users, Requirements, perceptions, abilities and constraints-Human-Computer Interaction (HCI) – Constant iterative Optimization and Prototyping- Five Dimensions of Interaction Design

UNIT 4 USABILITY DESIGN OF MOBILE APPLICATIONS

9 Hrs

Defining Mobile Learning (mLearning)- Pedagogy of mLearning- Cognitive Load Theory - Design Considerations for the Mobile Devices and optimization with responsive design

UNIT 5 INFORMATION VISUALIZATION

9 Hrs

Understanding Visualization -Common Uses for Information Visualization -Design Scenarios - Information Visualization Techniques with intelligent Data

TOTAL HOURS : 45

COURSE OUTCOMES

Upon Completion of the course, the students will be able to

CO1: Describe Usability and Utility

CO2: Gain knowledge on User Experience Design Principles

CO3: Understand about Users, Requirements, perceptions, abilities and constraints

CO4: Understand about Usability design of mobile applications

CO5: Understand information visualization

TEXT BOOKS

1.Norman D.A. “Design of Everyday Things”, New York, NY:Doubleday , 1990

2.Nielsen.J.”UsabilityEngineering”,Burlington, MA: Academic Press, 1994

3.Mullet.K and D.Sano,”Designing Visual Interfaces:Communication Oriented Techniques”, Prentice Hall, 1994

REFERENCES

1.Baecker R.M et al, “Readings in Human Computer Interaction:Toward the Year 2000”, Morgan Kaufmann, 1995

2.Schneiderman,B “Designing the User Interface: Strategies for Effective Human Computer Interaction”, 4th Ed Addison-Wesley, 2004

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|----------|------------------------------------------|---|---|---|---|-------------|
| ACST4138 | FOUNDATIONS OF ADHOC AND SENSOR NETWORKS | L | T | P | C | Total Marks |
| | | 3 | 0 | 0 | 3 | 100 |

PREREQUISITES: ACST3110-Computer Networks

COURSE OBJECTIVES

The student should be made to

- Understand the design issues in ad hoc and sensor networks.
- Learn the different types of MAC protocols.
- Be familiar with different types of Adhoc routing protocols.
- Be expose to the TCP issues in Adhoc networks.
- Learn the architecture and protocols of wireless sensor networks.

UNIT 1 INTRODUCTION

9 Hrs

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel

UNIT 2 MOBILE AD HOC NETWORKS

9 Hrs

mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs) :concepts and architectures. Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

UNIT 3 MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS

9 Hrs

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols

UNIT 4 CONTENTION BASED PROTOCOLS

9 Hrs

Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

UNIT 5 ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS

9 Hrs

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

TOTAL HOURS : 45

COURSE OUTCOMES

Upon completion of the course, the student should be able to:

- CO1.Explain the concepts, network architectures and applications of ad hoc and wireless sensor networks
- CO2.Analyze the protocol design issues of ad hoc and sensor networks
- CO3.Design routing protocols for ad hoc and wireless sensor networks
- CO4.Evaluate the QoS related performance measurements of ad hoc and sensor networks
- CO5:Understand routing protocols and transport layer in adhoc wireless networks

TEXT BOOK

1.C. Siva Ram Murthy, and B. S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols “, Prentice Hall Professional Technical Reference, 2008.

REFERENCES

1. Carlos De Moraes Cordeiro, Dharma Prakash Agrawal “Ad Hoc & Sensor Networks: Theory and Applications”, World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, “Wireless Sensor Networks”, Elsevier Publication, 2002.
3. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005
4. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007.
5. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

| ACST4141 | ADVANCED COMPUTER NETWORKS | L | T | P | C | Total Marks |
|----------|----------------------------|---|---|---|---|-------------|
| | | 3 | 0 | 0 | 3 | 100 |

PRE-REQUISITE: Computer Networks

COURSE OBJECTIVES

- To introduce topics related to computer networks and internet operating system
- To gain knowledge on how to develop products over them
- To introduce the basics of Linux Kernel Architecture where the network devices are based and its interface with various products developed for these devices.

UNIT I LINUX KERNEL MODULE

9 Hrs

Linux Kernel Programming Introduction, Static & Dynamic Linking of modules, User v/s Kernel Space, Systems Calls, Make file for modules. Shell Programming. Writing shell programs related to shell function, line count of several files and wait and sleep commands.

UNIT II NETWORK DRIVERS MODULE

9 Hrs

Introduction to Network Device Drivers. Character Device Driver Development, Process Synchronization and Scheduling, Interrupt Handling, Kernel Debugging. Writing a kernel program, compiling and inserting and removing a module in kernel

UNIT III eBPF - Networking and Security

9 Hrs

Basics of eBPF, Packet Filters basics, Introduction to Kernel's Traffic Control Layer, Use of C for eBPF. Writing a simple C program to interact with eBPF using syscall

UNIT IV Network Operating System Programming Module

9 Hrs

Introduction to Internet Operating System. Basics of Cisco IOS XR7, Cisco IOS and Open Network Linux. Basics of Overlay Networking and Virtualization, Content Delivery Networks and Network Automation. Writing a C program to capture network packets.

UNIT V Network Drivers Testing

9 Hrs

Socket basics, Loopback Addressing, Structure of SNULL (Simple Network Utility for Loading Localities) Writing a simple C program on SNULL (Simple Network Utility for Loading Localities).

TOTAL HOURS: 45

COURSE OUTCOMES

Upon completion of the Course, the students will be able to

CO1: Equip the computer science students with the skills to understand Kernel architecture

CO2: Develop products related to advanced computer networks.

CO3: Introduce deep knowledge of the structure of networks, the protocol content and usage

CO4: Understand the internet operating systems running in routers and switches

CO5: Develop and maintain products run in these networks and network devices.

REFERENCES

1. Robert Love, Linux Kernel Development, 3 rd edition, Addison Wesley, 2010, ISBN: 8131758184.
2. Andrew S.Tanenbaum, David J.Wetherall, Computer Networks, 5th Edition, Pearson, ISBN-13: 978-0-13-212695-3
3. M J Bach, The Design of the Unix Operating System, 1st edition, Pearson Education,2015, ISBN: 9332549575.
4. J Cooperstein, Writing Linux Device Drivers - A Guide with Exercises, Createspace, 2009, ISBN: 1448672384.